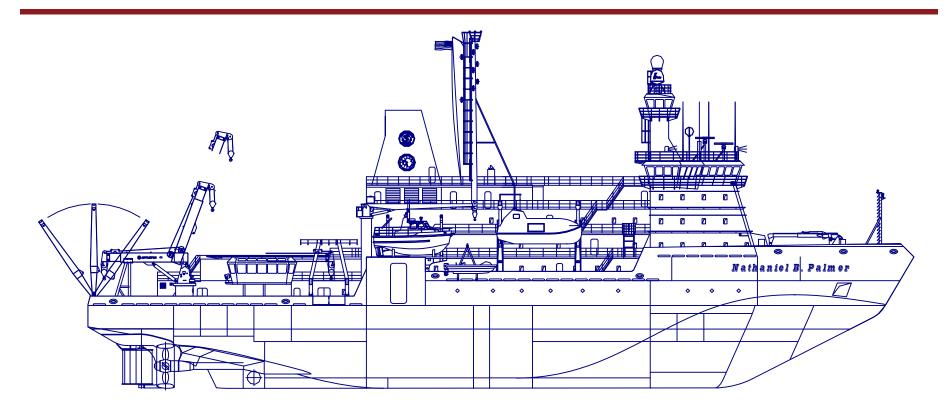
#### Nathaniel B. Palmer

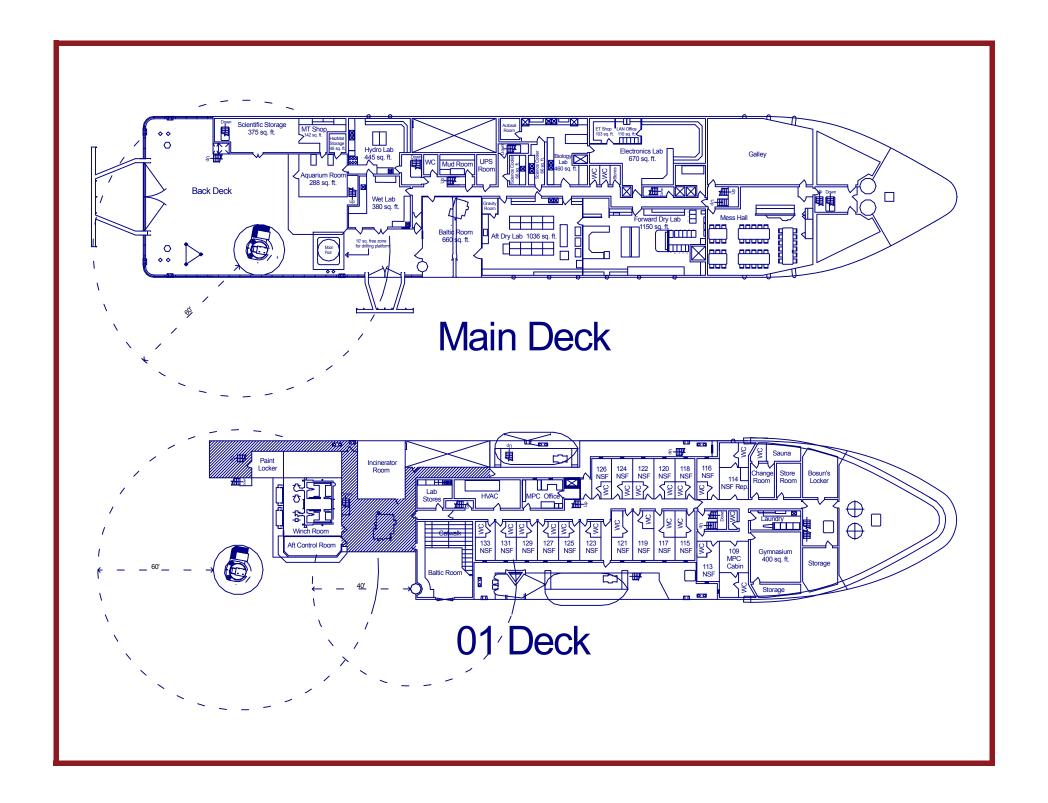
Research Vessel / Icebreaker

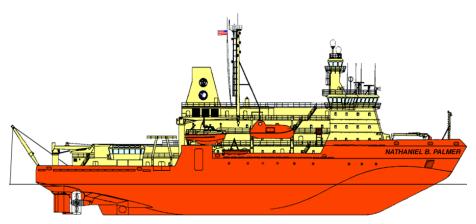


Operated for the National Science Foundation, Office of Polar Programs by

**Raytheon** Polar Services

Under a charter with **Edison Chouest Offshore** 





The R/V Nathaniel B. Palmer is operated by Raytheon Polar Services on a long-term charter from Edison Chouest Offshore (ECO), Galliano, Louisiana. Raytheon staffs the vessel with a charter representative to coordinate cruise planning and scheduling, and with a technical staff to support science operations. ECO provides the vessel master, ice pilot and crew.

The vessel was named after merchant marine and ship builder, Nathaniel B. Palmer (8 August 1799 - 21 June 1877). The son of a Connecticut ship builder, Palmer had a prosperous and adventurous life as a sealer and whaler, a sea captain, and a ship designer and builder. He was a pioneer in the clipper era and some historians credit Palmer with the discovery of Antarctica, although others challenge this view. The Palmer, completed in 1992, is 308 ft long and is ice-classed ABS-A2, capable of breaking three feet of level ice at three knots. The Palmer can accommodate 39 scientists and staff in one and two-person state-

rooms. Each stateroom has a television and computer Ethernet connection. The ship has a galley and a common dining area, conference room/library, lounge with audio and visual systems, a sauna and an exercise room.

RVIB Nathaniel B. Palmer
<b>Principal Features and Technical Information</b>

	1 1111016	ar r oatar oo arr
	General	
Vessel Owner	Edison Chouest Offsl	hore
Builder	North American Ship	building, U.S.A.
Year Commissioned	1992	
Chartered to	Raytheon Polar Servi	ices
Classification	ABS A1, AMS, E, AC	C, Ice Class A2
Flag	U.S.A.	
Princi	pal Dimensions	
Length Overall	308.50 ft	94.0 m
Length on Waterline	279.85 ft	85.3 m
Breadth Moulded	60 ft	18.3 m
Draft, Design	22.5 ft	6.8 m
Depth	30.0 ft	9.1 m
Displacement	6800 LT	6909 t
Light Ship Weight	4800 LT	4877 t
Main Pro	pulsion Machiner	у
Shafts		
Number of Shafts	2	
Total Shaft HorsePower	12,700 SHP	9500 kW
Transmission and shafting efficiency	0.96	-
Shaftline Bearing Loss	2%	
Gearing Loss	2%	
Total Brake Horsepower (BHP)	13,200 BHP	9,900 kW
Main Engines		
Number of Engines	4	
Manufacturer   Model	Caterpillar	3608
Prime Mover	Diesel	
Rating of Engine	3300 BHP @ 900 rpr	n
Transmission System	Reduction Gear	

Toominoar information	•	
Gear Box		
Manufacturer   Model	Lohmann & Stoltefort	GVL 1250B
Gear Ratio	6.4 to 1	
Propellers		
Number of Propellers	2	
Propeller Diameter	13.12 ft	4 m
Number of Blades	4	
Material	NiAlBr	
Direction of Rotation	Inboard turning	
Hub Diameter	4.36 ft	1.33 m
Hub to Prop Diameter Ratio	0.33	
Manufacturer	Ullstein, Norway	
Nozzles		
Inside Diameter	13.28 ft	4.05 m
Outside Diameter	16.14 ft	4.92 m
Material	Stainless Steel	
Stern Tub Bearing		
Manufacturer	Thordon	
G	enerators	
Number	4	
Rating of each	1400 BHP	1050 kW
Total Auxiliary Power	5600 BHP	4200 kW
Manufacturer   Model	Caterpillar	3512
Electric Power	AC=480/240/120V, 60Hz, DC=24V	
Thrusters		
Bow Thruster		
Number	1	
Туре	Water Jet Azimuthing	Flush Mounted
Thrust	10.0 LT	
Rating	1400 BHP	1050 kW

Stern Thruster				
Туре	Tunnel			
Thrust	6.0 LT	6.0 LT		
Prime Mover	Electric Motor			
	Rudders			
Number	2			
Туре	Schiling High-Lift			
Evaporator/Fresh Water Maker				
Number	3			
Manufacturer   Type	Alfa Laval	JWP-26-C80		
Rating of each (daily)	15 LT			
Н	eeling System			
Number of Tanks	1 Pair			
Number of Pumps	1			
Total Heeling System Horsepower	1400 BHP	1050 kW		
Manufacturer   Model	Caterpillar	3512		
Induced Roll & Time Period	5° roll side to side	5° roll side to side in 2 minutes		
Anti-roll tanks				
Number	2 pair			
Dimensions	10 ft. (W) x 60 ft (	L)		
Percent Roll Reduction, Sea State 6	40-50%			
Waste Disposal System				
Incinerator	1			
Manufacturer	Golar 500			
	2-hour duration			

lechnical Information			
Emergency Diesel Generator			
Number	1		
Rating	300 kW		
Manufacturer	Caterpillar		
Glyco	I Heating System	n	
Number	2		
Rating of each	6,600,000 BTU/hr		
Manufacturer	Vapor Corporation	1	
Ex	terior Lighting		
Searchlights			
Number	4 single	1 double	
Rating	2.5 kW zenon with	2.5 kW zenon with heather circuit	
Manufacturer	Carlisle and Finch		
Та	ınk Capacities		
Fuel	425,000		
At 22.5 ft draft	1,550 LT	1,574 t	
At 95% maximum capacity	1,740 LT	1,768 t	
Fresh Water at 95%	215 LT	218 t	
Ballast Water at 95%	1,000 LT	1016 t	
Aviation Fuel at 95%	34 LT	34 LT	
Heeling Tanks (16 ft level)	227 LT		
Antiroll Tanks (4.5 ft level)	173 LT	173 LT	
Endurance	15,000 NM @ 12	15,000 NM @ 12 knots	
Accommodations			
Crew   Owner	22	5	
Scientists and Staff	39		
Spare	2		
Total Accommodations	Total Accommodations 68		

Spec	cial Features		
Helicopter hangar and ability to carry tw	o small helicopters and 7,	200 gallons of fuel	
Low friction hull coating (Inerta 160)			
No fuel oil in double bottom			
One compartment damage stability star	ndard		
Overboard discharge on port side only			
Uninterruptible and conditioned power i	n main work area and con	nputer lab	
Two boilers to circulate water/antifreeze	mixture under exterior de	eck on main level	
Design Air Temperature	100° to -50° F	37.8° to 45.6° C	
Design Water Temperature	85° to 28° F	29.4° to -2.2° C	
Drinking water made from seawater	12,000 gal/day maximun	n production	
Other Features and Space Allocations			
Aloft Observation Station (deck height)	80 ft above water surface	80 ft above water surface	
Pilot House (deck height)	54 ft above water surface	е	
Main Science Deck aft (deck height)	9 ft above water surface		
Pilot House (interior width)	e (interior width) 74 ft		
Overhang at vessel side	12 ft		
Helicopter Hangar	40 ft x 32 ft	1300 sq ft	
Flight Deck	54 ft x 44 ft	2500 sq ft	
Boats			
Survey Boat "Cajun Cruncher"			
Length	28.8 ft	8.8 m	
Breadth	10.75 ft	3.3 m	
Depth	7.25 ft	2.2 m	
Draft (keel)	4 ft	1.2 m	
Displacement	11.3 LT	11.5 t	
A-frame	800 lbs		
Winch	300 m 5/16" cable		
Personnel Capacity	4 scientists 2 crew		

Boats (continued)		
Diesel Manufacturer	GM	8V-71
Diesel Engine Horsepower	230	•
Propeller Diameter	36", fixed pitch, in a noz	zle
Cooling System	Keel cooler	
Lifeboats with Davits	•	
Number	2 (1 port, 1 starboard)	
Capacity of each	76	
Features	Enclosed, powered (55 l	HP)
Material	Fiberglass	
Manufacturer	Schat Watercraft	
Inflatable Rafts		
Number	1	
Capacity of each	20	
Manufacturer	Suitlik	
Rescue Boat with Davits		
Number	1	
Length	19.7 ft	
Features	100 HP outboard, 25 km	ots
Manufacturer	J&V, Grimstad, Norway	
Missellensous Vessel Facts		

#### **Miscellaneous Vessel Facts**

Over 3,000 10x40-ft steel plates & 810,000 linear feet of welding were used on the ship

The steel plate in the bow is 1 9/16" thick and is twice the strength of regular steel

The steel on the hull is made with a low-temperature alloy rated to -60° C

75,000 ft (14 miles) of pipe were used to outfit the ship

There are 2,700,000 feet, (511 miles) of wire inside the vessel

Total electrical generating capacity is 4.63 million watts (nearly 4,000 hair dryers)

The vessel is capable of carrying twenty, 20 ft cargo containers

Over-the-Si	ide Handling Equipm	ent	
Cranes			
Bow Crane	5,000 lbs	30 ft reach	
Main Crane, forward	20,000 lbs	40 ft reach	
Telescoping Main Crane	50,000 lbs	60 ft reach	
Manufacturer of all cranes	Appleton Marine		
A-frames			
A-frame on Fantail (20 tons)	18 ft horizontal reach	30 ft vertical reach	
A-frame on Starboard Side (20 tons)	) 13 ft horizontal reach	17 ft vertical reach	
Telescoping Boom for Baltic Room	6 ton capacity, 13 ft rea	ich from side of vessel	
Winches			
	Deep Sea Trawl Winch	Deep Sea Trawl Winch, double drum	
Markey DUSH 911	9/16-inch mechanical w	vire (to starboard)	
Markey Boottott	.680-inch coaxial electro (to port)	.680-inch coaxial electro-mechanical (EM) cable (to port)	
	Waterfall Hydrographic	Winch, double drum	
Markey DUSH 5-5	Lower drum carries 10, cal wire	,000 m of 5/16" mechani-	
	Upper drum carries 10, EM cable	,000 m of .322 conductor	
	Oceanographic winch i	Oceanographic winch in Baltic Room	
Markey DUSH 5	10,000 m of .322 3-con	iductor EM cable	
Water Colur	mn Sampling Equipm	ent	
Blake Trawl	5 ft		
Otter Trawls (2)	18 ft	30 ft	
Isaac Kidd Midwater Trawl	1 m	3 frames	
Flat Trawl	35 ft	_ 1	
MOCNESS (2)	1 m	10 m	
Tucker Trawl (opening/closing)	3 nets	1 m	
Optical Plankton Counter			

#### **Conductivity Temperature Depth (CTD) Sensor**

The Sea-Bird 911+ CTD system offers real-time operation via sea cable telemetry, includes a solid state memory module, and has a maximum depth of 6800 m. The CTD is mounted on a 24 bottle General Oceanics rosette sampler. 5, 12, and 30L bottles are available.

	Make	Model
Altimeter	Datasonics	PSA-916D
Conductivity	Sea-Bird	4-02/O
Conductivity	Sea-Bird	4C, 6800 m
Conductivity	Sea-Bird	4M, 6800
CTD Fish	Sea-Bird	SBE 9+
CTD Pressure Sensor	Paroscientific	410K-105
Dissolved Oxygen	Sea-Bird	SBE 43
CTD Pump	Sea-Bird	SBE 5
CTD Pump	Sea-Bird	5T
Fluorometer	WET Labs	AFLT
Pinger 12 kHz	OIS	6000 (6000 m)
PAR	Biospherical Instruments	QSP-200L4S
PAR	Biospherical Instruments	QCP-2300
Temperature	Sea-Bird	3-02/F
Temperature	Sea-Bird	3plus, 6800 m
Transmissometer	WET Labs	C-Star
Water-Sampling Bottle	Niskin	Bullister design
XBT / XCTD	Sippican	MK-21

#### **Uncontaminated Seawater System**

The seawater system supplies uncontaminated seawater to the Aquarium Room, Wet Lab, Hydro Lab, Helo Deck, Helo Hangar, and Baltic Room. Green strand piping, a non-metallic, chemically resistant material has been used throughout the system to minimize algae and bacterial growth. It also maintains its structural integrity under low temperatures. Large diameter piping and a minimum of 90° turns helps prevent frazil ice formation in the system. The seawater system is also equipped with a centrifugal ice strainer/debubbler.

RVIB Nathani	iel B. Palmer
<b>Principal Features and</b>	Technical Information

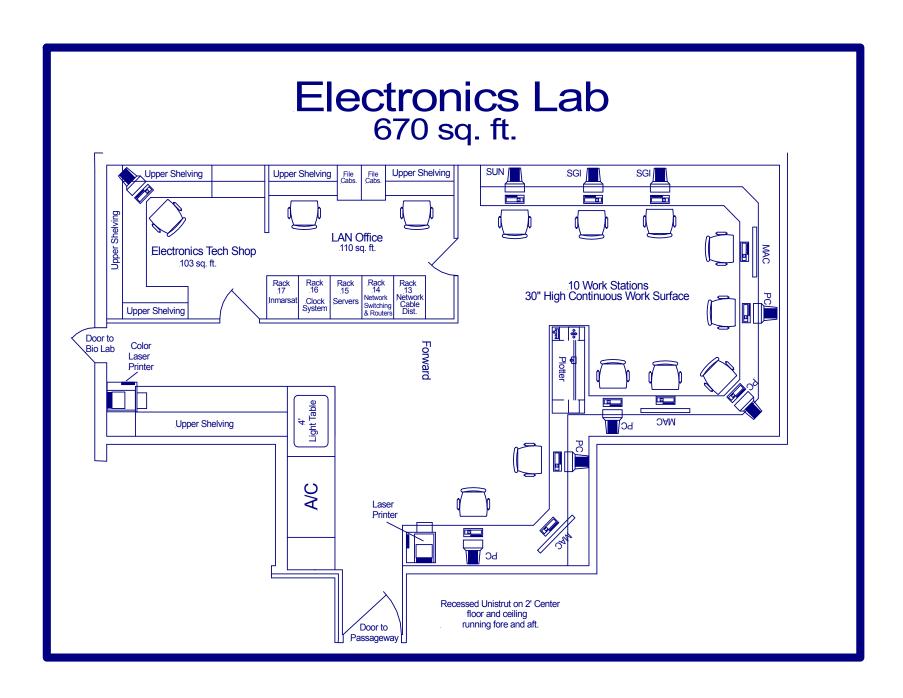
Uncontaminated Seawater System (continued)			
Three Seawater Intakes			
Main	At Stern Thruster	6 in. diameter	
Secondary	At Moon Pool	6 in. diameter	
Tertiary	At Center of Hull	2.5 in. diameter	
Surface Seawater Sampling Equ	ipment		
Fluorometer	Turner	10-AU-005	
Thermosalinograph	Sea-Bird	SBE-45	
Transmissometer	WET Labs	C-Star	
Digital Remote Temperature Sensor	Sea-Bird	SBE-38	
pCO <sub>2</sub> Equilibration System	Lamont-Doherty Earth	Observatory	
Aquaria			
Two permanent fiberglass tanks, space	e for four additional Xactio	tanks (4' x 4' x4')	
Deck Incubators			
Number	3		
Material   Type	Plexiglas	UV Transparent	
Water Pu	rification Systems		
E-pure four-holder system	Barnstead	Type I water (ultra- pure), 2 L per minute	
Diamond UV	Barnstead	TOC-free water	
Bottom Sa	ampling Equipment		
Dredges			
Small Chain Dredge, Rock Dredge	Kahl Scientific		
Large Chain Dredge, Rock Dredge	Kahl Scientific		
Coring Equipment			
The vessel can be equipped with several different coring devices designed to take vertical samples of sediment from below the sea floor.			
Jumbo Piston Corer	Woods Hole Oceanographic Institute		
Standard Piston Corer	Woods Hole Oceanogra	Woods Hole Oceanographic Institute	
Gravity Corer			

Toominour innormation	•		
Bottom Sampling Equipment (continued)			
Kasten Corer State University of New York/Ocean Instruments			
Mega Corer	Mark I		
Deep Sea Rock Dredge	Scripps Institute of Ocea	nography	
Grab Sampler	Smith-MacIntyre		
Seismic	Instrumentation		
Seismic Data Logger	Triton Elics Delph	Records data in SEG- Y format by converting SEG-2 32 to SEG-Y	
Research Vessel Data Acquisition System (RVDAS)	Lamont Doherty Earth Observatory / Raytheon Polar Services	Linux-Based Data Acquisition System	
Magnetometer	Marine Magnetics	Seaspy	
Digital Benthic Camera, with Strobe	Ocean Imaging Systems	DSC 10000 Strobe Model: 3831	
GCS-90 Seismic Gun Controller	Syntron	Consists of two com- ponents: the SPS-90 Solenoid Power Sup- ply and the GCS-90 Gun Controller	
Cable-Leveling System (RCL-5 Birds)	Input/Output Inc.	Digibird 50-10	
48-Channel Seismic Data Logger	OYO	DAS-1	
Gravity Meter	LaCoste & Romberg	Air-Sea Gravity Meter	
Streamers			
Multi-Channel Seismic Streamer Cable, Oil-Filled, 48 Channels	Teledyne	Length: 1,200 m, with a 300 m lead-in	
Single Channel Streamers			
Geometrics	Innovative Transducers	Inc. (ITI)	
Seismic Sound Sources			
Generator Injector (GI) Seismic Air Guns (6)	Seismic Systems Inc.	210 cu in. configurable in volume and mode by using volume and port reducers	

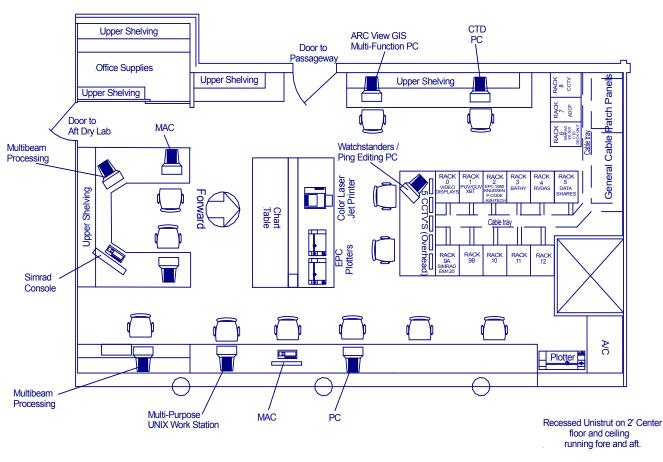
Dive Compressors (1 on board)  Bauer  Fills to 3000 psi  chlorophyll, weather, and navigation. Data are supplied to grantees and NASA.  Communication Equipment				iel B. Palmer Technical Information			
800, 500, 450, 400, 350, 300, 200, 145, 80 40, 200, 200, 200, 200, 200, 200, 200,	Seismic Sound Sources (continued)			Meteorological Sensor Suite (continu	ıed)		
GI Water Gun (1) Seismic Systems Inc.  Seismic Air Compressors Borsig-LMF 1200 scfm, 2000 psi  Sonar Systems  Acoustic Doppler Current Profiler RD Instruments VM-150 Narrow Band Depth Indicator DataMarine VM-150 Narrow Band 3.5 kHz sub-bottom profiler O.D.E.C. Bathy 2000W 12 kHz bottom tracker O.D.E.C. Bathy 2000W 12 kHz bottom tracker Knudsen 320 B/R. 2 kW 12 kHz bottom tracker Knudsen 320 B/R. 2 kW 12 kHz bottom tracker Simrad 12 kHz full ocean depth swath mapping The EM 120 uses a fan of narrow acoustic beams to create a map of the sea floor. Preliminary maps can be produced and plotted almost immediately affer a survey is finished. Acoustic Doppler Current Profiler RD instruments Eppley PfR Px R Radiometer Eppley PfR Px R Radiometer Biospherical QSR-240 PRR (mast) Biospherical PRR-610 GUV (mast) Biospherical PRR-610 GUV (mast) Biospherical PRR-610 GUV (mast) Biospherical PV-2500 DETA RAK 8812-11 Time Systems  Time Systems  Time Systems  Rubidium Time Standard Clock TRAK 8812-11 Time & Frequency Receiver and Clock Symmetricom XL-GPS  Navigation Systems  GPS Trimble  GPS Furuno  GPS Furuno  GPS, with heading and attitude (2) Seatex SeaPath 200 HF WEFAX Furuno DFAX  10 cm Radar (X-band) Furuno FAR 2837S  12 kHz PDR (for pinger tracking) O.D.E.C. / Raytheon  Towed Bio-Acoustic Sonar HTI 38 & 120 kHz  Chirp Sidescan Sonar / Sub-Bottom Profiler 1000 mx. depth 1000 m	Bolt Gun 1500 Long Life Airgun	Bolt Technology Corp.		Anemometer	RM Young	5106	
GI Water Gun (1) Seismic Systems Inc. 15 cu in.  Seismic Air Compressors Borsig-LMF 1200 scfm, 2000 psi  Sonar Systems  Acoustic Doppler Current Profiler RD Instruments VM-150 Narrow Band Depth Indicator DataMarine VM-150 Narrow Band 3.5 kHz sub-bottom profiler O.D.E.C. Bathy 2000W 3.5 kHz sub-bottom profiler Knudsen 320 B/R. 2 KW 12 kHz bottom tracker O.D.E.C. Bathy 2000W 3.5 kHz sub-bottom profiler Knudsen 320 B/R. 2 KW 12 kHz bottom tracker Knudsen 320 B/R. 2 KW 12 kHz bottom tracker Knudsen 320 B/R. 2 KW 12 kHz bottom tracker Knudsen 320 B/R. 2 KW 14 kHz full ocean depth swath mapping The EM 120 uses a fan of narrow acoustic beams to create a map of the sea floor, Preliminary maps can be produced and plotted almost immediately after a survey is finished. Acoustic Doppler Current Profiler RD instruments EK-500 12 kHz PDR (for pinger tracking) O.D.E.C. / Raytheon Towed Bio-Acoustic Sonar HTI 38 & 120 kHz Chirp Sidescan Sonar / Sub-Bottom Datasonics SIS-1000, max. depth 1000 m Diving Equipment  Diving Equipment  Dive Compressors (1 on board) Bauer Fills to 3000 psi Dive Van (for storage/setup of dive 20' x 8' x 8.5')  PAR Radiometer Biospherical QSR-240 PRAR adiometer Biospherical GUV (mast) Biospherical GUV-2511 PUV (underwater) Biospherical GUV-2510 PUV (underwater) Biospherical GUV-2510 PUV (underwater) Biospherical GUV (mast) Biospherical GUV (mast) Biospherical GUV (past) PRR-610 GUV (mast) Biospherical GUV (past) PRR-610 GUV (mast) Biospherical PRR-610 GUV (mast) Biospherical PRR-610 GUV (mast) Biospherical Biospherical GUV (puderwater) Biospherical GUV (puderwater) Biospherical PRR-610 GUV (mast) Biospherical PRR-610 GUV (mast) Biospherical GUV (puderwater) Biospherical GUV (puderwater) Biospherical GUV (puderwater) Biospherical PRR-610 GUV (mast) Bios				Precision Infrared Radiometer	Eppley	PIR	
Seismic Air Compressors    Borsig-LMF   1200 scfm, 2000 psi	GI Water Gun (1)	Seismic Systems Inc.		Pyranometer	Eppley	PSP	
Sonar Systems  Acoustic Doppler Current Profiler RD Instruments VM-150 Narrow Band Depth Indicator DataMarine VM-150 Narrow Band 3.5 kHz sub-bottom profiler O.D.E.C. Bathy 2000W, 8.3 kW 12 kHz bottom tracker O.D.E.C. Bathy 2000W 3.5 kHz sub-bottom profiler Knudsen 320 B/R, 2 kW 12 kHz bottom tracker Knudsen 320 B/R 2 kHz bottom tracker Knudse	. ,	,			Biospherical	QSR-240	
Acoustic Doppler Current Profiler RD Instruments VM-150 Narrow Band Depth Indicator DataMarine VM-150 Narrow Band 3.5 kHz sub-bottom profiler O.D.E.C. Bathy 2000W, 8.3 kW 12 kHz bottom tracker O.D.E.C. Bathy 2000W 3.5 kHz sub-bottom profiler Knudsen 320 B/R, 2 kW 12 kHz bottom tracker Knudsen 320 B/R, 2 kW 12 kHz bottom tracker Knudsen 320 B/R EM 120 Multibeam System Simrad 12 kHz full ocean depth swath mapping The EM 120 uses a fan of narrow acoustic beams to create a map of the sea floor. Preliminary maps can be produced and plotted almost immediately after a survey is finished. Acoustic Doppler Current Profiler RD instruments 38, 120 and 200 kHz Fish Finder Simrad EK-500 12 kHz PDR (for pinger tracking) O.D.E.C. / Raytheon Towed Bio-Acoustic Sonar HTI 38 & 120 kHz Chirp Sidescan Sonar / Sub-Bottom Datasonics SiS-1000, max. depth Profiler, towed  Diving Equipment  Dive Compressors (1 on board) Bauer Fills to 3000 psi Dive Van (for storage/setup of dive 20' x 8' x 8.5'  Dive Van (for storage/setup of dive 20' x 8' x 8.5'  Dive Van (for storage/setup of dive 20' x 8' x 8.5'  Dive Van (for storage/setup of dive 20' x 8' x 8.5'  Dive Matha Supplied to Survey Bathy 2000W Time Standard Clock TRAK 8812-11 Track Sequency Receiver and Clock Symmetricom XL-GPS  Rubidium Time Standard Clock TRAK 8812-11 Track Frequency Receiver and Clock Symmetricom XL-GPS  Trimble GPS  Trimble GPS  Furuno GPS  Furuno  GPS  Furuno  GPS  Furuno  FAR 2837S  3 cm Radar (X-band) Furuno FAR 2837S  3 cm Radar (X-band) Furuno FAR 2822X  The TeraScan Track 8812-11  TeraScan Trimble  Trime Systems  TRAK 8812-11  Track Seciever and Clock Symmetricom XL-GPS  Trimble  GPS  Furuno  GPS  Furuno  GPS  HF WEFAX Furuno FAR 2837S  3 cm Radar (X-band) Furuno FAR 2837S  3 cm Radar (X-band) Furuno FAR 2822X  The TeraScan Track and Datason Furuno FAR 2822X  The Tera			1.200 00, 2000 po.	, ,	Biospherical	PRR-610	
Depth Indicator  DataMarine  VM-150 Narrow Band 3.5 kHz sub-bottom profiler  O.D.E.C.  Bathy 2000W, 8.3 KW 12 kHz bottom tracker  O.D.E.C.  Bathy 2000W 3.5 kHz sub-bottom profiler  Knudsen 320 B/R, 2 KW 12 kHz bottom tracker  Knudsen 320 B/R  EM 120 Multibeam System  Simrad  12 kHz full ocean depth swath mapping The EM 120 uses a fan of narrow acoustic beams to create a map of the sea floor. Preliminary maps can be produced and plotted almost immediately after a survey is finished.  Acoustic Doppler Current Profiler  RD instruments  38, 120 and 200 kHz Fish Finder  Simrad  EK-500  12 kHz PDR (for pinger tracking)  O.D.E.C. / Raytheon  Towed Bio-Acoustic Sonar  HTI  38 & 120 kHz  Chirp Sidescan Sonar / Sub-Bottom  Profiler, towed  Diving Equipment  Dive Compressors (1 on board)  Bauer  Fills to 3000 psi  Dive Van (for storage/setup of dive)  VM-150 Narrow Band  Time Standard Clock  TRAK  8812-11  Time & Frequency Receiver and Clock Symmetricom  XL-GPS  Navigation Systems  Gyrocompass (2)  Yokogawa  KM008-E  GPS  Trimble  GPS  Furuno  GPS, with heading and attitude (2)  Seatex  SeaPath 200  HF WEFAX  10 cm Radar (X-band)  Furuno  FAR 2827X  HF Radio Direction Finder (RDF)  Simrad  VHF Radio Direction Finder  TreaScan  TeraScan  DL500  The TeraScan  The TeraScan DL500  Communication Equipment		iai Systems		GUV (mast)	Biospherical	GUV-2511	
3.5 kHz sub-bottom profiler O.D.E.C. Bathy 2000W, 8.3 kW 12 kHz bottom tracker O.D.E.C. Bathy 2000W 3.5 kHz sub-bottom profiler Knudsen 320 B/R, 2 kW 12 kHz bottom tracker Knudsen 320 B/R EM 120 Multibeam System Simrad 12 kHz full ocean depth swath mapping The EM 120 uses a fan of narrow acoustic beams to create a map of the sea floor. Preliminary maps can be produced and plotted almost immediately after a survey is finished. Acoustic Doppler Current Profiler RD instruments R12 kHz PDR (for pinger tracking) Towed Bio-Acoustic Sonar HTI Simrad EK-500 Diving Equipment Dive Compressors (1 on board) Bauer Fills to 3000 psi Dive Van (for storage/setup of dive)  Bathy 2000W, 8.3 kW Rubidium Time Standard Clock TRAK RM (8812-11 Time & Frequency Receiver and Clock Symmetricom XL-GPS Navigation Systems Gyrocompass (2) Yokogawa KM008-E GPS Trimble GPS Furuno GPS, with heading and attitude (2) GPS, with heading and attitude		RD Instruments	VM-150 Narrow Band	PUV (underwater)	Biospherical	PUV-2500	
12 kHz bottom tracker 3.5 kHz sub-bottom profiler 4. Knudsen 320 B/R, 2 KW  12 kHz bottom tracker 5. Knudsen 4. 12 kHz full ocean depth swath mapping The EM 120 wess a fan of narrow acoustic beams to create a map of the sea floor. Preliminary maps can be produced and plotted almost immediately after a survey is finished.  Acoustic Doppler Current Profiler 38, 120 and 200 kHz Fish Finder 4. KHz PDR (for pinger tracking) 5. Chirp Sidescan Sonar / Sub-Bottom Profiler, towed  Diving Equipment  Dive Compressors (1 on board)  Dive Van (for storage/setup of dive  O.D.E.C. / Bathy 2000W  Sangual Clock  Symmetricom XL-GPS  Wavigation Systems  Gyrocompass (2) Yokogawa KM008-E  GPS Trimble  GPS GPS Furuno  GPS, with heading and attitude (2) Seatex SeaPath 200  FMF WEFAX Furuno FAR 2837S  3 cm Radar (X-band) Furuno FAR 2837S  3 cm Radar (X-band) Furuno FAR 2822X  WHF Radio Direction Finder Faliyo TeraScan TeraScan TeraScan TeraScan DL500  The TeraScan is a dual-processing ground station providing high-resolution images of chlorophyll, weather, and navigation. Data are supplied to grantees and NASA.  Communication Equipment				Tim	Time Systems		
12 kHz bottom tracker 3.5 kHz sub-bottom profiler Knudsen 320 B/R, 2 kW  12 kHz bottom tracker Knudsen 320 B/R EM 120 Multibeam System Simrad 12 kHz full ocean depth swath mapping The EM 120 uses a fan of narrow acoustic beams to create a map of the sea floor. Preliminary maps can be produced and plotted almost immediately after a survey is finished.  Acoustic Doppler Current Profiler RD instruments  38, 120 and 200 kHz Fish Finder Simrad EK-500 12 kHz PDR (for pinger tracking) Chirp Sidescan Sonar / Sub-Bottom Profiler, towed  Diving Equipment  Dive Compressors (1 on board) Bauer Fills to 3000 psi  Dive Van (for storage/setup of dive  O.D.E.C. Bathy 2000W  Time & Frequency Receiver and Clock Symmetricom XL-GPS  Navigation Systems  Gyrocompass (2) Yokogawa KM008-E  GPS Furuno GPS, with heading and attitude (2) Seatex SeaPath 200 HF WEFAX 10 cm Radar (S-band) Furuno FAR 2827X  HF Radio Direction Finder (RDF) Simrad  VHF Radio Direction Finder Taiyo TDC338H2 MKI  TeraScan	·		*				
12 kHz bottom tracker Knudsen 320 B/R, 2 kW  12 kHz bottom tracker Knudsen 320 B/R, 2 kW  EM 120 Multibeam System Simrad 12 kHz full ocean depth swath mapping The EM 120 uses a fan of narrow acoustic beams to create a map of the sea floor. Preliminary maps can be produced and plotted almost immediately after a survey is finished.  Acoustic Doppler Current Profiler RD instruments  38, 120 and 200 kHz Fish Finder Simrad EK-500  12 kHz PDR (for pinger tracking) O.D.E.C. / Raytheon  Towed Bio-Acoustic Sonar HTI 38 & 120 kHz Chirp Sidescan Sonar / Sub-Bottom Profiler, towed  Diving Equipment  Dive Compressors (1 on board) Bauer Fills to 3000 psi  Dive Van (for storage/setup of dive 20' x 8' x 8.5'  Navigation Systems  Gyrocompass (2) Yokogawa KM008-E  GPS GPS GPS GPS GPS GPS GPS GPS GPS GP			*	Time & Frequency Receiver and Clock	Symmetricom		
EM 120 Multibeam System  Simrad  12 kHz full ocean depth swath mapping The EM 120 uses a fan of narrow acoustic beams to create a map of the sea floor. Preliminary maps can be produced and plotted almost immediately after a survey is finished.  Acoustic Doppler Current Profiler  RD instruments  RD instruments  EK-500  12 kHz PDR (for pinger tracking)  Towed Bio-Acoustic Sonar  Chirp Sidescan Sonar / Sub-Bottom Profiler, towed  Diving Equipment  Dive Compressors (1 on board)  Bauer  Fills to 3000 psi  Dive Van (for storage/setup of dive)  Simrad  12 kHz full ocean depth swath mapping GPS  Furuno  GPS  Furuno  GPS, with heading and attitude (2)  Seatex  SeaPath 200  HF WEFAX  10 cm Radar (S-band)  Furuno  FAR 2837S  3 cm Radar (X-band)  Furuno  FAR 2822X  HF Radio Direction Finder (RDF)  Simrad  VHF Radio Direction Finder  TeraScan  TeraScan  TeraScan  The TeraScan is a dual-processing ground station providing high-resolution images of ichlorophyll, weather, and navigation. Data are supplied to grantees and NASA.  Communication Equipment	<u>'</u>		· ·				
The EM 120 uses a fan of narrow acoustic beams to create a map of the sea floor. Preliminary maps can be produced and plotted almost immediately after a survey is finished.  Acoustic Doppler Current Profiler RD instruments  38, 120 and 200 kHz Fish Finder Simrad EK-500  12 kHz PDR (for pinger tracking) O.D.E.C. / Raytheon  Towed Bio-Acoustic Sonar HTI 38 & 120 kHz  Chirp Sidescan Sonar / Sub-Bottom Profiler, towed  Diving Equipment  Dive Compressors (1 on board) Bauer Fills to 3000 psi  Dive Van (for storage/setup of dive 20' x 8' x 8.5')  Furuno  GPS Furuno  GPS, with heading and attitude (2) Seatex SeaPath 200  HF WEFAX Furuno DFAX  10 cm Radar (S-band) Furuno FAR 2837S  3 cm Radar (X-band) Furuno FAR 2822X  HF Radio Direction Finder (RDF) Simrad  VHF Radio Direction Finder Taiyo TDC338H2 MKI  TeraScan TeraScan DL500  The TeraScan is a dual-processing ground station providing high-resolution images of inchlorophyll, weather, and navigation. Data are supplied to grantees and NASA.  Communication Equipment	12 kHz bottom tracker	Knudsen	320 B/R				
The EM 120 uses a fan of narrow acoustic beams to create a map of the sea floor. Preliminary maps can be produced and plotted almost immediately after a survey is finished.  Acoustic Doppler Current Profiler RD instruments Simrad EK-500  12 kHz PDR (for pinger tracking) O.D.E.C. / Raytheon Towed Bio-Acoustic Sonar HTI S8 & 120 kHz  Chirp Sidescan Sonar / Sub-Bottom Profiler, towed Diving Equipment  Diving Equipment  Dive Compressors (1 on board) Bauer Fills to 3000 psi  Dive Van (for storage/setup of dive 20' x 8' x 8.5'  GPS Furuno  GPS, with heading and attitude (2) Seatex SeaPath 200  HF WEFAX Furuno DFAX  10 cm Radar (S-band) Furuno FAR 2837S  3 cm Radar (X-band) Furuno FAR 2822X  HF Radio Direction Finder (RDF) Simrad  VHF Radio Direction Finder Taiyo TDC338H2 MKI  TeraScan TeraScan DL500  The TeraScan is a dual-processing ground station providing high-resolution images of chlorophyll, weather, and navigation. Data are supplied to grantees and NASA.	EM 120 Multibeam System	Simrad		, , , , ,		KIVIUUO-E	
inary maps can be produced and plotted almost immediately after a survey is finished.  Acoustic Doppler Current Profiler RD instruments B38, 120 and 200 kHz Fish Finder Simrad EK-500 HF WEFAX Furuno DFAX  12 kHz PDR (for pinger tracking) O.D.E.C. / Raytheon Towed Bio-Acoustic Sonar HTI Sidescan Sonar / Sub-Bottom Profiler, towed Bolivary Equipment  Diving Equipment  Dive Compressors (1 on board) Bauer Fills to 3000 psi  Dive Van (for storage/setup of dive 20' x 8' x 8.5'  GPS, with heading and attitude (2) Seatex SeaPath 200  HF WEFAX Furuno DFAX  10 cm Radar (S-band) Furuno FAR 2837S  3 cm Radar (X-band) Furuno FAR 2822X  HF Radio Direction Finder (RDF) Simrad  VHF Radio Direction Finder Taiyo TDC338H2 MKI  TeraScan TeraScan DL500  The TeraScan is a dual-processing ground station providing high-resolution images of chlorophyll, weather, and navigation. Data are supplied to grantees and NASA.  Communication Equipment							
Acoustic Doppler Current Profiler RD instruments						SeaPath 200	
38, 120 and 200 kHz Fish Finder Simrad EK-500  12 kHz PDR (for pinger tracking) O.D.E.C. / Raytheon  Towed Bio-Acoustic Sonar HTI 38 & 120 kHz  Chirp Sidescan Sonar / Sub-Bottom Profiler, towed  Diving Equipment  Dive Compressors (1 on board) Bauer Fills to 3000 psi  Dive Van (for storage/setup of dive 20' x 8' x 8.5')  EK-500  10 cm Radar (S-band) Furuno FAR 2837S  3 cm Radar (X-band) Furuno FAR 2822X  HF Radio Direction Finder (RDF) Simrad  VHF Radio Direction Finder Taiyo TDC338H2 MKI  TeraScan TeraScan DL500  The TeraScan is a dual-processing ground station providing high-resolution images of chlorophyll, weather, and navigation. Data are supplied to grantees and NASA.  Communication Equipment	Acoustic Doppler Current Profiler	RD instruments		<u> </u>			
12 kHz PDR (for pinger tracking)  O.D.E.C. / Raytheon  Towed Bio-Acoustic Sonar  HTI  38 & 120 kHz  Chirp Sidescan Sonar / Sub-Bottom Profiler, towed  Diving Equipment  Dive Compressors (1 on board)  Dive Van (for storage/setup of dive  O.D.E.C. / Raytheon  ARYTHOGOLOGY  ARYTHEON  38 & 120 kHz  SIS-1000, max. depth 1000 m  SIS-1000, max. depth 1000 m  The Radio Direction Finder  Taiyo  Toc338H2 MKI  TeraScan  TeraScan  The TeraScan is a dual-processing ground station providing high-resolution images of chlorophyll, weather, and navigation. Data are supplied to grantees and NASA.  Communication Equipment	38, 120 and 200 kHz Fish Finder	Simrad	EK-500				
Towed Bio-Acoustic Sonar  Chirp Sidescan Sonar / Sub-Bottom Profiler, towed  Diving Equipment  Dive Compressors (1 on board)  Dive Van (for storage/setup of dive  Dive Sidescan Sonar / Sub-Bottom Profiler, towed  Diving Equipment  SIS-1000, max. depth 1000 m  SIS-1000, max. depth 1000 m  The Radio Direction Finder (RDF)  Simrad  VHF Radio Direction Finder  Taiyo  Toc338H2 MKI  TeraScan  The TeraScan is a dual-processing ground station providing high-resolution images of chlorophyll, weather, and navigation. Data are supplied to grantees and NASA.  Communication Equipment	12 kHz PDR (for pinger tracking)	O.D.E.C. / Raytheon		,	Furuno	FAR 2822X	
Profiler, towed  Diving Equipment  Dive Compressors (1 on board)  Dive Van (for storage/setup of dive	Towed Bio-Acoustic Sonar	HTI	38 & 120 kHz	0.400 [4]			
Diving Equipment  Dive Compressors (1 on board)  Dive Van (for storage/setup of dive  Dive Van (for storage/setup of dive  Dive Compressors  Dive Van (for storage/setup of dive		Datasonics		VHF Radio Direction Finder	Taiyo	TDC338H2 MKI	
Dive Compressors (1 on board)  Dive Van (for storage/setup of dive  20' x 8' x 8.5'  The TeraScart's a dual-processing ground station providing high-resolution images of a chlorophyll, weather, and navigation. Data are supplied to grantees and NASA.  Communication Equipment	, and the second		1000 m	TeraScan	TeraScan	DL500	
Dive Van (for storage/setup of dive 20' x 8' x 8.5'  Communication Equipment	- 1 1			The TeraScan is a dual-processing ground station providing high-resolution images of ice,			
	Dive Compressors (1 on board)	'		chlorophyll, weather, and navigation. Data are supplied to grantees and NASA.			
equipment)	ive Van (for storage/setup of dive quipment) 20' x 8' x 8.5'						
	DAN (Divers Alert Network) Oxygen Kit			The NBP is Global Maritime Distress Safety System (GMDSS) compliant. This means there is automatic, complete redundancy for ship to ship & ship to shore communication.			
Meteorological Sensor Suite    Fleet 77   Sailor   Fleet 77+	Meteorological Sensor Suite						
Humidity/Wet Temp RM Young 41372LC Inmarsat-C Sailor	Humidity/Wet Temp	RM Young	41372LC	Inmarsat-C	Sailor		
Barometer RM Young 61201 Iridium Phones Motorola 9500	Barometer	RM Young	61201	Iridium Phones	Motorola	9500	

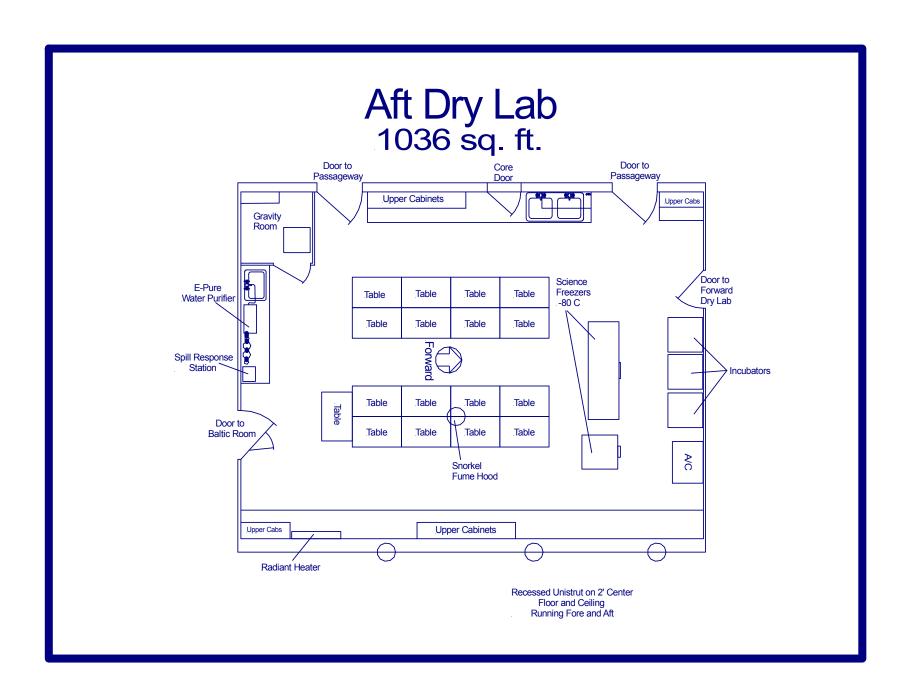
Communications Equipment (co	ontinued)			
VHF Radios				
Sailor	RT146	Bridge to Bridge		
Sailor	RT2048	, , , , , , , , , , , , , , , , , , ,		
Sailor	RM2042	Watch Receiver		
HF SSB Radios				
Sailor	SP300			
Sailor	T2130			
Comp	uters and Networkir	ng		
Windows, Macintosh, Solaris, and ally 8 to 10 computers available fo				
Network	400 LAN drops throu	ughout ship, including cabins		
E-mail		Transmitted three times daily via satellite. User allotment of 25 KB/day may be used any time during a cruise.		
Individual email size restrictions	100 KB outgoing	75 KB incoming		
\$	Space Allocation			
Lab spaces feature recessed unist	rut on 2' centers, floor and	ceiling, running fore and aft		
Main Deck				
Electronics/Computer Lab	670 sq. ft			
Forward Dry Lab	1150 sq. ft			
Aft Dry Lab	1036 sq. ft			
Hydro Lab	445 sq. ft			
Wet Lab	416 sq. ft			
Bio Lab	460 sq. ft			
Science Coolers	2 @ 86 and 68 sq. f	t		
Baltic Room / Staging Area	680 sq. ft			
Aquarium Room	298 sq. ft			
Marine Tech Workshop	142 sq. ft			
cientific Storage 375 sq. ft				

Space Allocation (continued)					
Electronic Equipment Room	96 sq. ft				
Changing / Mud Room / Darkroom	100 sq. ft				
Lower Deck					
Scientific Storage	170 sq. ft				
Scientific Storage	four 20' containers				
Exterior Main Deck					
Deck tie down points are located at 2 ft centers on the main deck and helo deck					
Science Vans					
Radioisotope Vans	2 vans	20' x 8' x 8'			
Freezer Lab Vans	2 vans	20' x 8' x 8'			
Garage/Trace Metal Clean Van	1 van	20' x 8' x 8'			
Recreation / Leisure Spaces					
Library / Conference Room (03 Deck)	700 sq. ft				
TV Lounge (02 Deck) 510 sq. ft					
Gymnasium (01 Deck) 400 sq. ft					

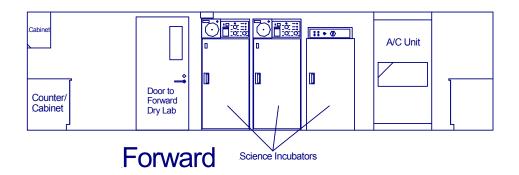


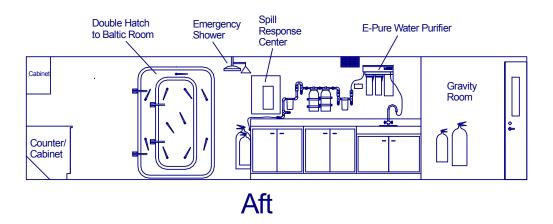
## Forward Dry Lab 1150 sq. ft.

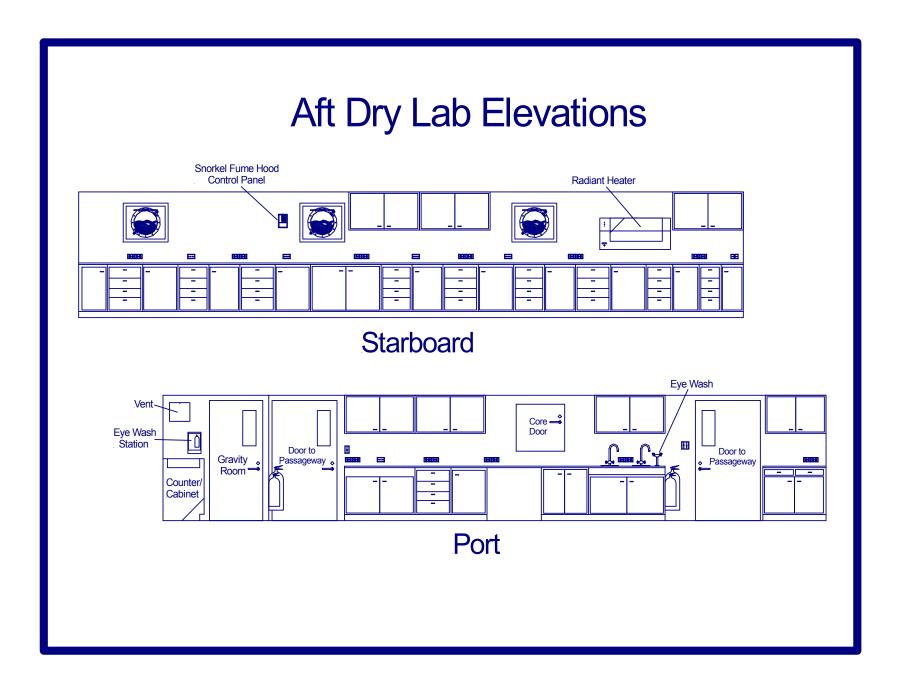




### Aft Dry Lab Elevations

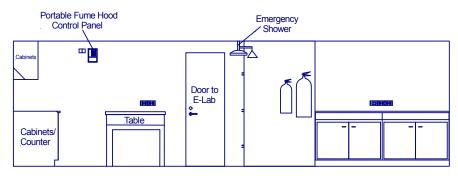




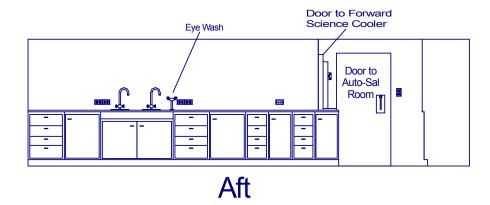


### Bio Lab 460 sq. ft. Eye-Wash Upper Cabinets Upper Cabinets Upper Cabs Fume Fume Box. Box Auto-Sal Room Table Table Door to Electronics Lab Emergency Shower Science Cooler 86 sq. ft. Door to Passageway Door to Door to Passageway Passageway Floor and Ceiling Unistrut on 2' center running fore and aft. Wall Mounted Unistrut at 16", 32", and 48" from deck for gas bottle storage

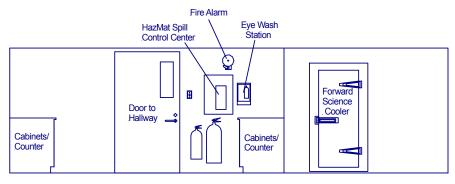
### **Bio Lab Elevations**



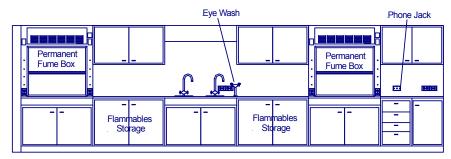
### **Forward**



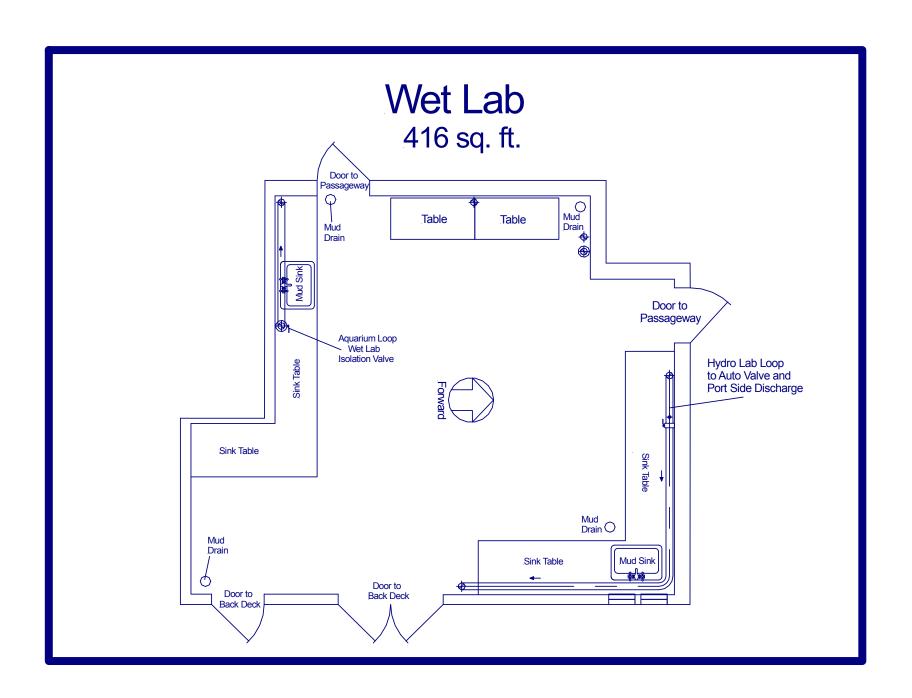
### **Bio Lab Elevations**



### Starboard

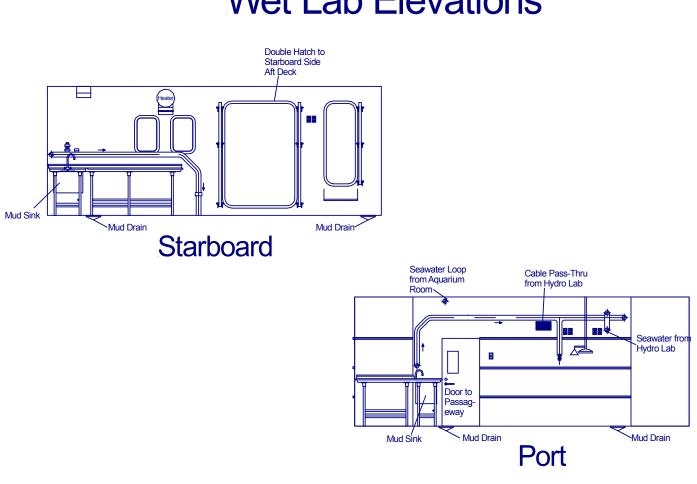


Port

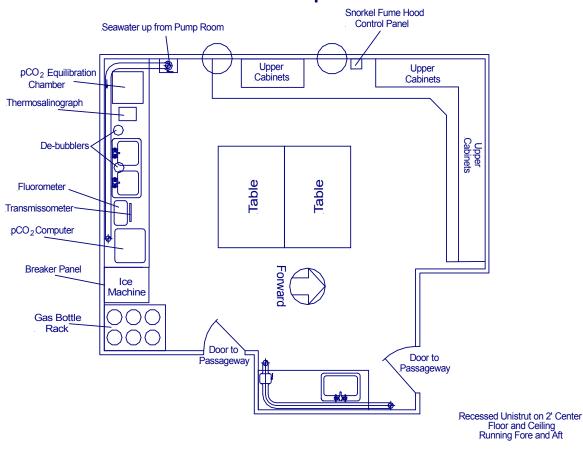


#### Wet Lab Elevations Seawater to Wet Lab Seawater from Baltic Room Isolation Hydro Lab **CCTV Monitor** Valve Door to Hallway Mud Sink **Forward** Mud Drain Cable Pass-Thru to Aft Main Deck Mud Drain Aquarium Loop Seawater from Wet Lab Aquarium Room Isolation Valve Mud Drain-Mud Drain Aft

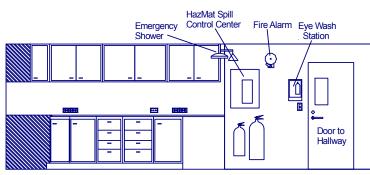
### Wet Lab Elevations



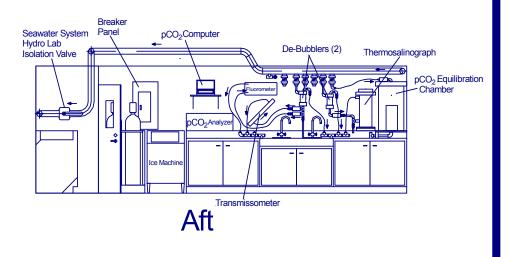
## Hydro Lab 445 sq. ft.



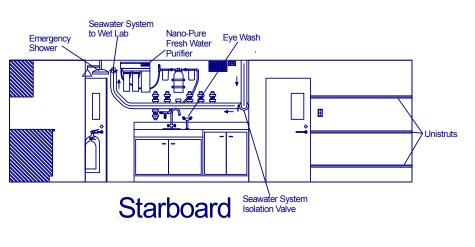
## Hydro Lab Elevations

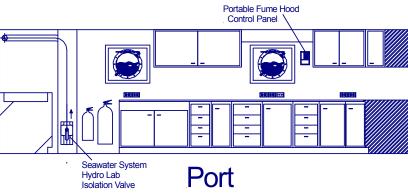


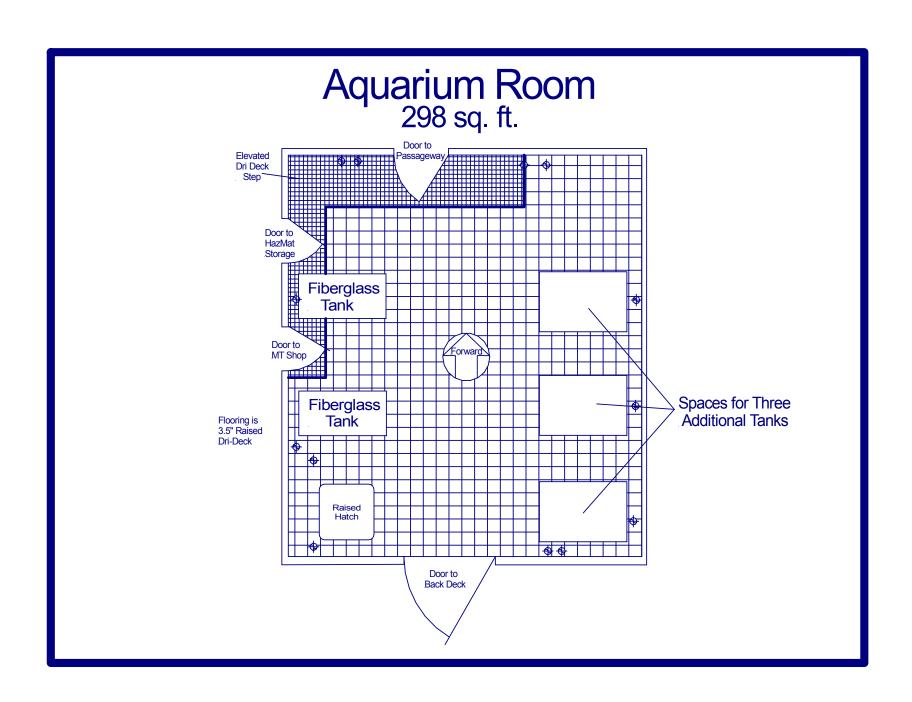
**Forward** 



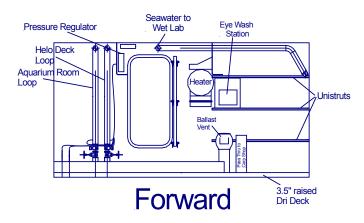
## Hydro Lab Elevations

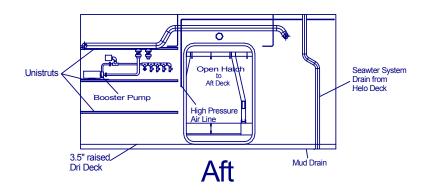




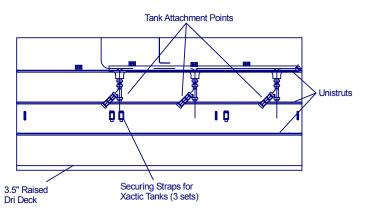


### **Aquarium Room Elevations**





### **Aquarium Room Elevations**



#### Starboard

