Oregon State University
Marine Mammal Institute

R/V Pacific Storm

Operations & Safety Manual

Marine Mammal Institute

Oregon State University

2030 SE Marine Science Dr.

Newport, Oregon 97365

(541) 867-0202

Welcome Aboard!

The research vessel (R/V) Pacific Storm is owned and operated by the Marine Mammal Institute (MMI) through the College of Agricultural Science at Oregon State University (OSU). The *R/V Pacific Storm* is operated both coastally and regionally in support of marine research and education. This vessel has been used successfully to support whale tagging projects, sea-floor mapping, sediment coring, remotely operated vehicle (ROV) operations, mooring recoveries, and many other projects and we look forward to successfully supporting your project.

On the *R/V Pacific Storm*, safety is our highest priority and we are committed to completing your cruise as safely and efficiently as possible. If at any time during your cruise you have questions about any aspects of the operation of the vessel, speak to the captain or the chief scientist. This will help ensure your cruise goes as smoothly and as safely as possible. Alternate points of contact are also available in this manual.

This operations and safety manual has been developed to provide the vessel's user with the arrangement and operational capabilities of the *R/V Pacific Storm*. The manual delineates the various procedures, policies, regulations, safety, and lifesaving precautions for embarked personnel. All vessel users should review this manual with regard to the specific requirements of the proposed project. This manual also provides information on the operations and emergency procedures used by MMI to help ensure the safe and efficient use of the vessel.

If there are any items required for a project that are not delineated in this manual please contact MMI (541-867-0202). Comments and/or corrections that will help clarify any aspects of this manual, or make it more user-friendly, are welcome.

It is the sole purpose of the *R/V Pacific Storm*'s crew and support personnel to provide you with a safe platform with well-maintained equipment that will help you accomplish your scientific objectives. We are here to support your project and give you an exceptional cruise experience.

Welcome Aboard!

_____

Dr. Lisa Ballance
Director of Marine Mammal Institute

Contents

List of Appendices

Appendix I. Departure Checklist

Appendix II. Arrival Checklist

Appendix III. Lithium Battery Use Policy

Appendix IV. Pre-cruise Safety Orientation Key Points

List of Abbreviations

AAUS	American Academy of Underwater Sciences
AED	Automated External Defibrillator
AIS	Automatic Identification System
AUV	Autonomous Underwater Vehicle
CCTV	Closed-Circuit Television
CFR	Code of Federal Regulations
CMMS	Computerized Maintenance Management Software
CPR	Cardiopulmonary Resuscitation
DC	Direct Current
DEMOB	Demobilization
DSC	Digital Selective Calling
DSO	Diving Safety Officer
EOA	Office of Equal Opportunity and Access
gpm	gallons per minute
GPS	Global Positioning System
h	hours
hp	horsepower
ISM	International Safety Management
kW	kilowatt
lb	pound
LED	Light-Emitting Diode
LOTO	Lock Out/Tag Out
m	meters
MARPOL	International Convention for the Prevention of Pollution from Ships
MMI	Marine Mammal Institute
MOB	Mobilization
MSD	Marine Sanitation Device

MSDS	Material Safety Data Sheets
NFPA	National Fire Protection Agency
nm	Nautical Mile
NOAA	National Oceanic and Atmospheric Administration
NUC	Not Under Command
NTSB	National Transportation Safety Board
OEP	Onboard Emergency Procedures
OSU	Oregon State University
PFD	Personal Flotation Device
PIC	Person In Charge
PPE	Personal Protective Equipment
PRP	Pollution Response Plan
psi	pounds per square inch
R/V	Research Vessel
RHIB	Rigid-Hulled Inflatable Boat
ROV	Remotely Operated Vehicle
rpm	revolutions per minute
RVOC	Research Vessel Operators Committee
RVSS	Research Vessel Safety Standards
STCW	Standard Training Certification Watchkeeping
SWL	Safe Working Load
UNOLS	University-National Oceanographic Laboratory System
UPS	Uninterruptable Power Supply
USACOE	United States Army Corps of Engineers
USCG	United States Coast Guard
V	Volts
VDC	Volts of Direct Current
VHF	Very High Frequency
VTS	Vessel Traffic Service

W	watt

SECTION 1: VESSEL AND VESSEL EQUIPMENT

1.1. General Information

The *R/V Pacific Storm* is a steel-hulled vessel built in 1979 as a commercial trawler. The vessel was gifted to MMI in 2004 and was subsequently reconfigured as a research vessel. Since that time, the vessel has conducted research on marine mammals, seabirds, and physical and biological oceanography in locations ranging from the eastern tropical Pacific to the Bering Sea with durations ranging from day trips to projects spending 30 continuous days at sea, hundreds of miles from shore.

The R/V Pacific Storm is a documented vessel and designated as an oceanographic research vessel by the United States Coast Guard (USCG). The vessel operates under the Code of Federal Regulations (CFR) 46 Subchapter U and completes a safety inspection by the USCG annually. The vessel is of steel construction and is powered by a single main engine and propeller. The home port for the vessel is Newport, OR and it is typically berthed at Port Dock 3 in the North Commercial harbor in Yaquina Bay.

1.1.1. General Vessel Specifications

Vessel name: *R/V Pacific Storm*
Owner: Marine Mammal Institute, Oregon State University
Operator: Marine Mammal Institute
Year built: 1979
Maximum Capacity: 12 (7 for science party)
Builder/location: Spence Bros. Boatyard, Valparasio, FL
Length overall: 84 feet
Beam: 24 feet
Navigational draft: 10 feet
International Gross Tons: 153 tons
Operated as: Oceanographic Research Vessel
USCG Letter of Designation: Oceanographic Research Vessel
IMO: 7942685

1.1.2. Propulsion

Single, 4-blade stainless propeller
Main Engine: 520 BHP Caterpillar 3412 C Diesel Engine
Bow Thruster: Westmar 18” hydraulic bow thruster

FIGURE 1. R/V PACIFIC STORM HULL, SHOWN FROM THE BOW (LEFT PANEL) AND PROPELLOR AND RUDDER (RIGHT PANEL).

1.1.3. Range, Speed, and Endurance

Cruise Speed:	8.0 knots
Maximum Speed:	10 knots
Range at Cruise Speed:	5000 miles. (weather dependent)
Endurance:	30 days continuous duty

1.1.4. Electrical Service

The *R/V Pacific Storm* is equipped with two power generators – John Deer 70-kilowatt (kW; 110/220VAC 3 phase) and an Isuzu 30-kW (110/220VAC 3 phase).

Uninterruptible power supplies (UPSs) are available for scientific use although researchers are encouraged to bring their own UPS units to ensure coverage.

If total power requirements exceed the level available, please contact MMI in advance of your cruise so other arrangements can be made to accommodate your needs. The vessel has often added an additional generator to facilitate specific power requirements of the science party. Contact the captain for additional details.

1.1.5. Seawater

A Seawater supply outlet (3/4 inch) is located on the starboard aft deck area. This water is provided by an 18-gallon per minute (gpm) pump at 30 pounds per square inch (psi) from an intake located approximately 10 feet below the water line. This water can also be accessible in the science lab for flow-through instrumentation. The use of seawater for rinsing nets or other sampling gear takes place on the aft deck.

1.1.6. Fresh Potable Water

The vessel holds 2,000 gallons of fresh water and is capable of producing 900 gallons of potable water per day via a reverse osmosis water maker. During longer cruises, it is important to conserve fresh water whenever possible.

1.1.7. Compressed Air

Compressed air is available on the vessel. Maximum pressure is 120 psi with the ability to regulate the maximum/minimum pressure settings as requested.

1.1.8. Crane

The vessel is equipped with a 5-ton knuckle marine grade crane used primarily to load/unload the vessel at the dock and re-position deck gear. The crane is also capable of launching auxiliary vessels (i.e., rigid-hulled inflatable boats [RHIBs], maximum weight of 4,500-pounds [lbs]) while at sea. The crane hydraulics are powered by a 300-horsepower (hp) Cummins in-line 6-cylinder engine driving three hydraulic pumps. The crane has a safe working load (SWL) of 2,250 lbs at 30 feet and is load tested annually.

FIGURE 2. R/V PACIFIC STORM CRANE, SHOWN FROM UPPER DECK LOOKING TOWARD THE STERN.

1.2. Deck Layout

The vessel is of welded steel construction with a raked bow, hard chine, and square transom. The aft deck is covered with “trex” style composite decking suspended above the steel deck, allowing water that sloshes on deck to drain quickly and empty over-board via scuppers, thus providing a largely dry deck environment. Designated areas are provided for the bolting of gear to the deck. The upper deck is of steel construction with space available for securing gear or mounting equipment.

FIGURE 3. AFT DECK OF THE R/V PACIFIC STORM, AS SEEN FROM THE UPPER DECK.

1.2.1. Observation Platform

The vessel has a large observation platform located on the mast. The platform can be used for different purposes including marine mammal or bird observations, mounting of user-supplied scientific instrumentation, for photo and video coverage of the weather and aft deck work areas, or unobstructed views of the sky or horizon. The mast standing area is surrounded by restraining rails and is suitable for up to five observers. It is accessed via a sloped stairway with handrails on the back of the wheelhouse and a second sloped stairway with handrails on top of the wheelhouse. The rail on the observation platform is suitable for mounting a laptop enclosure for recording real-time data if necessary.

FIGURE 4. R/V PACIFIC STORM, SHOWING THE OBSERVATION PLATFORM (CROW'S NEXT) OUTLINED IN YELLOW.

1.2.2. A-Frame

This custom-designed heavy-duty A-frame is stern mounted with 21 feet of reach. A PullCaptain H-18 winch is located on the A-frame's cross member which can be fitted with various diameter lines. The winch and A-frame regularly handle loads associated with the deployment and recovery of RHIBs and complex moorings.

FIGURE 5. A-FRAME OF THE R/V PACIFIC STORM, IN DEPLOYED POSITION.

Safe Working Load: 10,000 lbs
Vertical Clearance: 26 feet (from pad eye with a-frame center over deck)
Reach: 21 feet out – 10 feet inward
H-18 PullCaptain winch
Drum Capacity: 300 meters (m) of 0.250-inch diameter synthetic line (capable of adding various diameters)
Safe Working Load of line: various
Line Pull: 18,000 lbs
Location: Mounted to A-Frame

1.2.3. Haulback Winch #1

H-18 PullCaptain
Drum Capacity: 300 m of 0.250-inch diameter synthetic line (capable of adding various diameters)
Safe Working Load of line: various
Line Pull: 18,000 lbs.

Location: Upper deck facing aft through A-frame

1.2.4. Haulback Winch #2

PL4 PullCaptain
Drum Capacity: 75 m of 0.250-inch diameter synthetic line (capable of adding various diameters)
Safe Working Load of line: various
Line Pull: 4,000 lbs.
Location: Upper deck facing aft through A-frame

1.2.5. Work Boat

A 6.8-meter RHIB is available. This boat is powered by an in-board diesel engine and has been deployed extensively from the *R/V Pacific Storm* for tagging marine mammals and other related activities. Additional expenses will be incurred should a science party request this type of asset. Contact the captain or MMI for additional information regarding rates.

1.2.6, Navigation

The vessel utilizes the following electronic navigation and communication equipment:

- Kongsberg Automatic Identification System (AIS) 200
- Furuno 1935 AIS Radar with 48-mile range
- Furuno 1832 Radar with 36-mile range
- Comnav 2000 autopilot with 2 Furuno GP 37 Global Positioning Systems (GPSs)
- Furuno SC502 satellite compass
- Furuno FCV-292 600-watt (W) dual-frequency (50/200) echosounder
- Nobletec NavTrack plotting software
- Garmin chart plotter
- Very High Frequency (VHF) Icom radios – multiple available for vessel and auxiliary vessel communications
- Iridium Satellite Phone
- Starlink Satellite Internet
- Garmin inReach Satellite Tracking System
- Panasonic Bridge Watch Alarm
- Closed-circuit television (CCTV) cameras on aft deck, in science lab, lazaret, and engine room, fed to wheelhouse

1.2.7. General Capacities

Diesel fuel	15,500 gallons
Freshwater	2,000 gallons
Hydraulic Oil	450 gallons
Lube Oil	110 gallons
Wastewater	300 gallons

1.2.8. Science Lab Space

A 300 square foot science lab is available with bench space and storage for computers and scientific equipment. The science lab has the following specifications:

- Located midway along the centerline of the vessel
- Serves as vessel's dedicated instrumentation room and repair space
- Space is configurable to the specific type of research being conducted
- Laboratory shelving and bench space available
- Air conditioned and heated
- Uninterrupted, point-of-use power available
- Freshwater and saltwater available in a stainless-steel sink
- General use computer with internet access

1.3. Operating Parameters and Endurance

The standard operating range for the vessel stretches from the California/Oregon border to the international Canadian border and offshore to 200 miles. With prior approval and detailed planning, the vessel has completed complex cruises working as far south as Costa Rica and north into the central Bering Sea.

The vessel has an endurance of approximately 30 days away from port at full capacity. This can be extended depending on the number of embarked scientists and appropriate pre-cruise planning. Limitations are primarily based on food storage.

The vessel typically sails with a crew of three for day trips of 12 hours (h) or less. Additional crew may be required based on the nature of work being conducted. The vessel has berths for up to seven scientists.

With appropriate crew, the vessel is capable of supporting 24-h operations at sea. If required by the science party, the vessel can also make arrangements for port calls each night. This is a fairly common mode of operation for the vessel.


PACIFIC STORM

SECTION 2: PRE-CRUISE PLANNING

Pre-cruise planning is critical to the success of any cruise. Key to this planning is communicating with MMI and the captain as early as possible. If at anytime during the pre-cruise planning process there are questions or concerns that are not addressed in this manual or on the cruise planning form, the chief scientist or the primary point of contact for the cruise should not hesitate to contact the MMI personnel listed in this section.

2.1. Contacts

Marine Mammal Institute Research Coordinator
Barb Lagerquist
barb.lagerquist@oregonstate.edu
541-867-0322

Captain
Ron Briggs
briggsro@oregonstate.edu
541-272-7206 mobile

Director of the Marine Mammal Institute
Lisa Ballance lisa.ballance@oregonstate.edu
541-867-0445

Marine Mammal Institute Fiscal Manager
Dee Kennedy
dee.kennedy@oregonstate.edu
541-867-0288

2.2. Shipping Address

Marine Mammal Institute
Hatfield Marine Science Center
2030 SE Marine Science Drive
Newport, OR. 97365
Attn: *R/V Pacific Storm*
(Providing tracking numbers to the captain or MMI is very helpful)

2.3. Webpages

R/V Pacific Storm - https://mmi.oregonstate.edu/research-vessels

Marine Mammal Institute - https://mmi.oregonstate.edu/

2.4. Scheduling/Daily Rate

To schedule or discuss charter for the *R/V Pacific Storm* please contact the MMI research coordinator or the captain. All vessel users must also complete a cruise plan (see below) to help the captain and vessel crew prepare for your cruise and help ensure your scientific objectives are met.

Contact the MMI research coordinator for daily rates for the vessel as well as days in port for mobilization/demobilization (MOB/DEMOB). Rates are adjusted annually. For an estimate of future changes to rates (i.e., multi-year proposal budgets) please contact MMI. Actual day rates for the vessel can vary depending on the number of crew and special equipment required. Daily rates provide for a standard crew of three, any local shared-use equipment, and accommodations for up to seven science personnel. Science party food and vessel fuel are added to the base daily rate and charged for all operational (transit and science) days. Other costs not part of the daily rate (i.e., dockage away from home port, crane rental, portable generator rentals, etc.) will be charged at cost. If a day is lost at sea due to vessel mechanical failure the day will NOT be charged to the project. All weather days that result in a loss of science operational days will be charged to the project. All rates will be documented in the Charter Party Agreement (CPA) and approved prior to a cruise.

2.5. Cruise Plan

A pre-cruise planning form (Cruise Plan) must be completed and received a minimum of **seven days in advance** of the cruise. Please contact the MMI Research Coordinator for these forms or visit the *R/V Pacific Storm*'s webpage for a downloadable version. These documents are important to ensure that the vessel's equipment and personnel are available and ready for your cruise. Information about dietary restrictions will be requested in this documentation. In addition to the plan, we recommend communicating early via email or verbally with the captain prior to the cruise. When developing a cruise plan please consider the following:

2.5.1. Personnel

All cruise personnel who are not explicitly members of the vessel's crew are considered to be members of the scientific party and, as such, are under the direction of the chief scientist. The chief scientist has the authority to determine the makeup of the science party and the responsibility to assure compliance with institution policies. A Release and Consent form and a Medical Information form will be required of all scientific party members ahead of the cruise.

2.5.2. Release and Consent Forms

A Release and Consent form is required for each scientist. The chief scientist will circulate the Release and Consent form to all members of the science party to be completed, signed, and turned in to the captain prior to cruise departure. The vessel will not sail unless a form is completed for each embarked cruise participant.

2.5.3. Medical Information

A Medical Information form, including emergency contact information, is required for each scientist, to be turned in (in a sealed envelope) to the captain upon boarding. The medical information requested is voluntary but can be very important to assist personnel in case of an emergency. Those with a medical condition or taking prescription medication should note the condition and medications on the Medical Information form. This information will be used only in case of emergency and will remain sealed under the control of the captain.

Each person going to sea is responsible for bringing their own prescription and general medications. The vessel carries only a modest supply of over-the-counter medications for pain and seasickness plus specialized medical equipment for emergency use under the direction of our certified crew members, who are trained in CPR, First Aid, and the use of an on-board automated external defibrillator (AED). Individuals are responsible for discussing any known medical conditions with the chief scientist for the cruise and judging the liability they pose to themselves and the scientific mission. In the case of serious injury or medical emergency, scientific work will be terminated and the vessel will proceed to evacuate the patient to the nearest competent medical facility.

2.5.4. Scientific Crew Berthing

The *R/V Pacific Storm* has seven bunks for scientific personnel, set up in three rooms (two, 2-person rooms and one 3-person room). The chief scientist is responsible for assigning berthing arrangements for the scientific complement. The chief scientist should work with their group to ensure that all are comfortable with their berthing assignments.

Scientists are responsible for keeping their quarters clean and orderly. Clean sheets, blankets, pillowcases, and towels are provided. Upon completion of the cruise, the departing scientists shall give their quarters a thorough cleaning so they will be habitable for the next occupants. They shall also strip their bunks and place their linens and towels next to the vessel's washing machine.

2.5.5. Mobilization/Demobilization

In general, one day will be allowed for loading (MOB) the *R/V Pacific Storm* prior to a cruise. A crane operator and other members of the crew will be available during the normal workday (0800-1630) to assist. The chief scientist, with the assistance of the captain, is responsible for arranging any shore-side support (forklifts, etc.) required in ports away from Newport, Oregon. The scientific party is responsible for the arrangement and securing of scientific equipment on deck and in laboratories. *R/V Pacific Storm* crew can assist with heavy equipment on deck and has a limited supply of straps, chain, and chain binders for securing equipment. One day is normally allowed for unloading (DEMOB). Any charges associated with MOB/DEMOB the vessel will be based on posted rates and will be applied as described.

2.5.6. Equipment Insurance

No insurance coverage is provided for scientific equipment supplied by the charterer. Please check with your home institution on their policy regarding insuring equipment and personnel while in use at sea.

2.6. Special Operations

The operations below should be identified in the cruise plan and should be coordinated with the captain and MMI well in advance of your cruise.

2.6.1. Radioisotope Work

Research requiring the use of radioisotopes is not permitted on the vessel.

2.6.2. Hazardous Materials

Programs using hazardous materials shall be coordinated well in advance with the captain. The chief scientist is responsible for the safe use, storage, and disposal of all hazardous materials brought on the *R/V Pacific Storm*. The chief scientist shall ensure that Material Safety Data Sheets (MSDS) for all hazardous materials are brought onboard and made available to the captain prior to departing port. The chief scientist will also ensure that adequate containment-holding materials, neutralizing agents, etc., are available on the vessel to deal with spills or other accidents. In general, hazardous materials (e.g., formalin) are not to be used in the vessel's science lab and must be confined to open decks.

2.6.3. Diving Operations

Diving operations from *R/V Pacific Storm* are subject to the American Academy of Underwater Sciences (AAUS) and OSU Dive guidelines and procedures. Projects with dive operations should

contact MMI well in advance of the cruise. Once it is determined that diving operations can be safely conducted from the vessel, MMI will help coordinate communications between OSU's Diving Safety Officer (DSO) and the chief scientist. No diving will be conducted without the approval of OSU's DSO and the captain.

2.6.4. Lithium Batteries

The science party is required to inform the vessel of any lithium batteries brought onboard. For a complete lithium battery policy see Appendix III. The captain must also be notified prior to a cruise if sub-surface gear is being recovered that contains lithium sources. This includes, but is not limited to, autonomous underwater vehicles (AUV) and autonomous gliders. This is critical to ensuring the safety of the science party and crew.

2.6.5. Reporting of Surface and Subsurface Obstacles

Surface and subsurface moorings and bottom mounted instrument packages can present hazards to navigation to surface vessels or submarines and can damage, or be damaged by, fishing vessels. The principal investigator/chief scientist is responsible for obtaining any necessary permits from appropriate regulatory bodies (e.g., USCG and USACOE for designated navigation channels, traffic schemes, etc.; NOAA Sanctuary Managers for designated marine sanctuaries, etc.) and for reporting the establishment and disestablishment on any surface or subsurface obstacles. This also includes the submission of 'Local Notice to Mariners' notifications to the USCG. Information on designated areas is available from the latest nautical charts for the operating area, the Coast Pilot or Sailing Directions for the area.

2.6.6. Compressed Gas Cylinders

Compressed gas cylinders must be secured at all times on board *R/V Pacific Storm*. Portable racks are available for a limited number of bottles. Projects using a large number of bottles should provide racks or pallets. Bottles not in use are to be stowed upright with the caps in place. Flammable gasses must be stowed on the open decks.

SECTION 3: DURING THE CRUISE

The MMI operates the *R/V Pacific Storm* to support scientists conducting oceanographic research and education. A clear understanding of the roles and responsibilities of the captain, chief scientist, and shore-side support staff is critical to ensuring both the safety and success of any cruise.

3.1. Responsibilities, Authorities and Interactions

3.1.1. Captain

The captain of a vessel, by law and long-standing tradition, has the full and final responsibility for the vessel and all people onboard. In association with this responsibility they have full authority over all operations and embarked personnel, both crew and scientific party. If circumstances require alterations of the scientific operations for safety or legal reasons, the captain shall inform the chief scientist and work collaboratively on developing an alternative plan that will address the scientific objectives of a cruise.

Disagreements between the captain and the chief scientist which cannot be resolved onboard shall be expeditiously referred to the director of MMI. However, in all decisions regarding safety or legal matters while the vessel is at sea, the captain's authority is absolute.

A pre-cruise safety orientation briefing will be held prior to departure of each cruise. The details associated with this safety orientation are included in Appendix IV.

3.1.2. Chief Scientist

Prior to departure, a member of the embarked scientific party will be designated as the chief scientist. This designation is critical and required to provide a clean line of communication between the vessel crew and the scientific party. This individual is responsible for the scheduling of all scientific projects for the duration of the cruise. In addition, the chief scientist is responsible for supervising the scientific party in matters of organization, administration, safety, and compliance with vessel regulations and legal requirements (e.g., occupational safety and health, environmental compliance, etc.). The chief scientist is responsible for collecting all Release and Consent forms as well as Medical Information forms.

The chief scientist should consult regularly with the captain regarding the operational details and progress of the cruise. The chief scientist has the authority to modify the scope and order of work, cruise track, etc., within the general scope of the cruise plan. Deviations from the cruise plan are to be discussed with the captain before implementation. It is critical that this type of information is conveyed to the captain by the chief scientist and not through other

members of the science party. MMI shall be notified by the captain of any major deviation in program objectives, operating areas, or schedule once the changes have been agreed upon by the chief scientist and the captain.

3.1.3. Shore-Side Personnel

The MMI is available on a 24/7 basis to provide shore-side support when necessary. Contact the MMI Research Coordinator for scheduling and cruise planning. For billing related questions, contact the MMI Fiscal Manager. For all other matters, the Director of MMI is the primary point of contact. If there is an issue dealing with one of the vessel's crew or any issue related to the safe operation of the vessel that cannot be resolved with the captain, the Director should be contacted. While the captain's authority is absolute when the vessel is underway, the Director has the authority to direct the captain to return to the nearest port, presuming it is safe to do so. Once the vessel is safely in port, the Director can mandate certain courses of action to the captain should this become necessary.

3.2. Sexual Harassment and Discrimination

OSU and MMI are committed to preventing any forms of sexual harassment or discrimination at any of their facilities or on any of their vessels. If at any time during the course of a cruise a member of the embarked science party or crew feel they are in any way being harassed or discriminated against, they should immediately bring their concerns to either the captain or the chief scientist. If they do not feel comfortable expressing their concerns to the captain or chief scientist, they may reach out directly to the director of MMI or OSU's Office of Equal Opportunity and Access. Contact numbers for these off-vessel resources are available here:

Marine Mammal Institute, Director
Dr. Lisa Balance
Phone: 541-867-0445

Office of Equal Opportunity and Access (EOA)
Phone: 541-737-3556
Location: 330 Snell Hall
Web: Office of Equal Opportunity & Access
Hours: 8am-5pm, Monday-Friday

Additional details regarding this policy as well as additional resources can be found in Section 4.5 of this manual.

3.3. Prohibited Items

The following items are not permitted onboard the *R/V Pacific Storm*:

- Alcoholic beverages
- Narcotics and other controlled substances as defined by the Federal Government
- Pets (including service animals)
- Firearms and personal-use non-folding sheath knives

As noted on the Release and Consent form, members of the science party may be subject to drug/alcohol testing if involved in a "Serious Marine Incident" as defined by the CFR's.

3.4. Vessel Communications Policy

MMI will maintain an ability to communicate with the R/V Pacific Storm at all times when the vessel is at sea. If the scientific objectives of a cruise require the vessel to operate outside of typical cellular coverage areas, emergency satellite communications will be available on the vessel. The vessel's satellite communications will be tested and logged no less than monthly to ensure operational readiness.

If an individual needs to communicate with a crewmember or embarked scientist while the vessel is at sea and out of cellular range, MMI Leadership should be contacted to help facilitate communications with the vessel.

3.5. Smoking Policy

In accordance with Oregon State law and OSU policy, smoking, vaping, or using any tobacco product, is prohibited in all spaces of the *R/V Pacific Storm* (laboratories, public areas, berthing areas, etc.), including open decks. For the purposes of this university standard, a "tobacco product" does not include any cessation product specifically approved by the U.S. Food and Drug Administration for use in treating nicotine or tobacco dependence.

3.6. Reporting of Injuries and Accidents While Onboard

The *R/V Pacific Storm* has limited medical capabilities onboard as described in the pre-cruise planning section of this manual. Any accidents, injuries, or illnesses are to be immediately brought to the attention of the captain or crew member on watch on the bridge (watch officer). The captain will see that appropriate treatment is provided based on the medical supplies available onboard the vessel. In the case of a medical emergency, the captain has the final responsibility and authority for the appropriate course of action including medical evacuation by the USCG or the termination of the cruise.

3.7. Departure and Return Times

Vessel departure times will be determined in coordination with the captain and chief scientist and are often weather and tide dependent. The science party will be expected to arrive at the vessel at a pre-determined (by the captain) time ahead of vessel departure time. The science party will participate in a pre-cruise safety briefing (approximately 1.5 h), ideally one to two days prior to departure. If not conducted on a day prior to departure, the science party must arrive at a minimum of two hours ahead of departure time to conduct the safety briefing. The science party may request berthing onboard the vessel the night before departure. These requests will be considered on a case-by-case basis and are ultimately at the discretion of the captain.

Return to home port will also be determined in coordination with the captain and chief scientist. The science party shall clear and clean the laboratory and berthing spaces and be off the vessel within approximately two hours of docking. Removal of larger scientific equipment (DEMOB) may take place at a later time, usually the following day.

Special circumstances may require modification of these procedures. Cruise planners should consult with the captain in advance and be sure to include alternate departure and arrival times on the cruise planning form.

3.8. Messing Facilities

The mess area can accommodate approximately 5 people at a sitting. Meals are served cafeteria style during hours discussed during the pre-cruise briefing. The ending time of a meal indicates the time one should finish, not arrive. Given the limited amount of space in the galley and mess area, consideration should be given to completing your meal in a timely manner so that others may be seated.

Those with special dietary requirements should indicate them on the Cruise Planning form. The galley refrigerator is stocked for snacks after the evening meal. The vessel's refrigerators and dry stores areas are off-limits unless permission is granted by the captain. Users of the galley and mess area must properly dispose of all trash and leave the area in an orderly condition.

Suitable clothing will be worn at all meals; shoes and shirts are mandatory. Rain gear, coveralls or clothes dirty from work shall not be worn in the mess area or in berthing areas. The vessel is the home for scientific personnel and the crew; courtesy dictates that conduct, including wearing apparel, be within acceptable standards.

For longer duration cruises, a dedicated cook may be requested/required. The use of a dedicated cook will be reflected as an increase in the daily rate for the vessel.

3.9. Refuse Disposal

The *R/V Pacific Storm* complies with Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78 which forbids the overboard discharge of all plastics and restricts all other overboard disposal. No refuse shall be thrown overboard without the permission of the captain. Separate containers for plastic waste are provided. "Sharps" shall be disposed of in appropriate containers rather than in the general garbage. Each science party is responsible for bringing their own sharps containers if their work involves sharps. Specific details associated with the vessels Waste Management policy can be found in Section 4.12 of this manual.

3.10. Sanitation System

The *R/V Pacific Storm* is provided with approved Marine Sanitation Devices (MSDs). Please note and comply with the posted restrictions regarding what may be put into the system. The vessel “locks” the black water holding tank from being pumped out when the vessel is in port or too close to shore.

3.11. Vessel-Supplied Personal Protection Equipment (PPE) and Other Items

The vessel provides hard hats and work vests (for flotation). All other items are the responsibility of the individual cruise participant. Open-toed shoes or sandals are hazardous to the wearer onboard the vessel and are not to be worn outside of the berthing area. Closed-toed shoes or boots are required everywhere else on the vessel. Persons working on deck should consider safety shoes with reinforced toes.

A seven-day supply of clothing is recommended for longer cruises since fresh water is limited. There is laundry equipment on board, but it is shared by many people. The laundry will not operate in heavy weather.

The vessel provides bed linens, towels, and hand soap. Individuals are responsible for their own toiletries (bath soap, shaving gear, toothbrush, and paste, etc.) Items such as coffee pots, heaters, hot plates, etc., are not permitted in staterooms because of health and safety concerns.

3.12. Potable Water

The potable water is produced by an on-board, reverse-osmosis system and thus supplies can be limited. Efforts should be made to conserve fresh water whenever possible. This can be done by using water sparingly when showering.

3.13. Emergency Drills

An abandon-ship drill will occur shortly before or after departure and will include instruction from the captain or chief mate. This drill is mandatory for all members of the scientific party. It is the responsibility of the science party to become familiar with their assignments for each drill and to know the location of the survival suits, life jackets, and emergency breathing apparatus in their berthing area as appropriate.

Drills are to be taken seriously as training for survival. All members of the science party will attend drills properly attired with hat, jacket, and life jacket as if the vessel were to be abandoned.

3.14. Safety

Working and living on a vessel at sea is inherently dangerous. Each member of the science party, as well as the crew, must be safety conscious at all times. Any situation or condition that might constitute a safety or fire hazard shall be corrected at once, either by the person observing the condition if it's within their purview or by notifying the captain or watch officer for further action.

3.14.1. UNOLS RVOC Safety Manual

Personnel embarking on trips greater than 24 hours are provided with an electronic copy of the "RVOC Safety Training Manual - Chapter 1 Research Party Supplement" and are required to acknowledge they have read it prior to cruise departure. A hard copy of the document is also provided in each stateroom. Individuals who have not read it are strongly encouraged to do so -- it contains much useful information which can help prevent serious injury or even death.

3.14.2. Personal Protective Equipment

Work vests (Personal Flotation Devices; PFDs) are to be worn by everyone on open decks. Hard hats are required for any operations with cranes, A-frames, etc.

Life vests or other appropriate flotation devices are to be worn at all times in boats deployed from the *R/V Pacific Storm*.

The chief scientist plays a key role in helping to ensure all members of the science party adhere to these safety requirements. If the captain feels that these requirements are not being adhered to, all operations will stop until the lack of appropriate safety equipment is addressed. Repeated violations of these policies can result in the termination of a cruise.

3.14.3. Doors, Hatches, Wire Ropes

Given the nature of the work conducted from research vessels, lines and cables associated with winches are regularly used to meet scientific objectives. Stand clear of all wires, ropes, and blocks that are under load or moving. Do not get caught between a moving object and a stationary part of the vessel. Do not stand in the bight of a line that is under tension. Never wrap a line around your hand or other part of your body so that you can't let go of it immediately if you need to. Keep fingers, hands, and feet away from the knife edges of watertight doors and hatches.

All hatches must be closed and dogged. Open doors must be secured. Closed doors must be dogged. Doors are never to be allowed to swing freely with the motion of the vessel. Brief exceptions may be granted for opening hatches in calm sea conditions (with the approval of the watch officer).

The watertight door between the engine room and the forward machinery space will remain closed while the vessel is at sea. The watertight door between lower berthing and dry stores will remain open while the vessel is underway. This space will have a dedicated smoke detector and a safety zone will be painted on the deck ensuring that access will always be available to secure the door when necessary.

The lazarette access to the steering void is to remain free of obstructions at all times. The captain or chief mate will confirm this prior to departing port and will periodically ensure this remains free of obstructions throughout a cruise. In addition, a CCTV camera monitors this space.

3.14.4. Restricted Areas

Personnel are not to enter the following areas:

- Anyone's stateroom without their explicit approval
- The engine room or other machinery space without approval of the chief engineer or captain (hearing protection will be required)
- The bridge unless approved by a crew member
- The top of the pilot house, mast, stacks, or other elevated area without permission of the mate on watch. The vessel's radars and communications equipment may have to be secured to eliminate RF and microwave energy hazards.

3.15. Post Cruise Obligations

3.15.1. Vessel Clean-up

The chief scientist is responsible for assuring that the members of the science party remove all personal belongings and tidy up all berthing and laboratory areas used during the cruise. This is necessary to make these areas available to the next oncoming science party.

Cleaning guidelines are:

- Laboratories: Ensure all science party equipment is removed and any garbage/recycling is placed in the applicable containers on the vessel.
- Berths: Remove all personal belongings; place all garbage/recycling in applicable containers on the vessel; fold blankets and leave at the foot of the bunks; strip beds and place linens and towels in the pillowcase and deposit next to the laundry facilities near the galley.
- Heads and Showers: Remove all personal belongings.

Please leave these areas in the condition you would like to find them when you come onboard – this will be greatly appreciated by the next scientific party.

The chief scientist is also responsible for assuring that all hazardous materials are removed and disposed of properly. If the vessel incurs any direct costs, such as crew overtime, professional cleaning fees, or hazardous waste disposal fees because the science party did not fulfill their obligation to clean the designated areas or dispose of materials, these costs will be billed to the chief scientist as appropriate.

3.15.2. Off-Loading

The crew will assist the science party in unloading all equipment either as part of a charter day or charged as a DEMOB activity. The chief scientist is responsible for identifying the need for any shoreside services required in other ports and relaying that information to the captain. The captain may assist in securing support if required. All off-loading and cleaning should be complete by the evening of arrival so the next science party can begin loading the next morning. The departing science party will not normally be provided with berthing on the vessel on the night of their return.

3.15.3. Cruise Assessment Survey

Upon completion of a cruise, the chief scientist will complete a Cruise Assessment Survey (CAS). This form is available on the MMI website and can be emailed to the chief scientist upon request. Once the form is completed, it should be emailed to the Director of the MMI (email available on form).

Feedback from cruise participants is critical in helping to facilitate MMI's process of continuous improvement for vessel operations. The details associated with this form will be treated with discretion on the part of the Director. As vessel operators, we are aware that cruise participants often have repeated cruises on the vessel and at times, feedback can be critical of the vessel or crew. The director is keenly aware that this critical feedback has the potential to strain future vessel relations. Ultimately however, it is crucial for MMI to be made aware of issues so these can be corrected for future cruises. If a chief scientist is uncomfortable completing this form, they can contact the Director directly using the contact numbers provided in this manual or on the website.

SECTION 4: VESSEL OPERATIONS

In this section, details on the policies and procedures associated with the safe operation of the vessel are documented. This includes the responsibilities of key personnel as well as the operational procedures for the vessel.

4.1. Captain's Responsibilities and Authority

4.1.1. Responsibility

The captain is responsible for:

- The safe and efficient day-to-day operation of the vessel
- Maintaining an accurate log of offshore activities, including
    - Maintaining daily communication with Designated Shore Contact for trips >24 hours
- Complying with the laws of navigation and the entire body of statutes that regulate vessels and seagoing matters
- Maintaining the seaworthiness of the vessel and protecting the interests of the MMI
- Accomplishing the objective of each cruise as directed by management
- Implementing the Safety and Environmental Protection policies as defined in this manual
- Motivating the crew in the observation of those policies
- Monitoring and reviewing this manual and reporting any deficiencies to the leadership at MMI in accordance with other provisions of this manual

4.1.2. Authority

The MMI ensures that the captain is properly qualified for command and fully conversant with the vessel and this manual prior to taking command. The captain has the full support of the Director of MMI in performing their duties to ensure that safety, security, and environmental concerns are conducted in accordance with our policies.

The captain is in overall command of all personnel and operations aboard the vessel. Their authority at sea is supreme and overriding. They have the authority and responsibility to make decisions with respect to safety, security, and pollution prevention and to request assistance from MMI leadership, the USCG, or any other appropriate source when necessary.

4.1.3. Policies & Procedures

The captain must support, implement, enforce, and be conversant with the following:

- All policies and procedures included in this manual
- International Safety Management (ISM) Code
- Oil Pollution Emergency Response Plan
- Stability/Ballast Procedures
- Waste Management Plan
- International and Federal regulations applicable to vessel operations
- All applicable state and local regulations
- All applicable OSU and MMI policies and procedures

4.2. Chief Engineer's Responsibilities

4.2.1. Responsibility

- **Maintenance** - The chief engineer's primary responsibility is to keep the vessel's equipment maintained as per the vessel's CMMS.
- **Crane/Winch Operations** – In support of scientific operations the chief engineer may be required to operate the crane, A-Frame, and winches in a manner that is safe both for the crew operating on deck and for the longevity of the equipment.
- **Cleanliness of Engine Room** – The chief engineer is responsible for maintaining an engine room that is both clean and ready for sea.
- **Pollution Prevention** –The chief engineer should routinely walk through the engine room inspecting valves, hoses, pumps, lines, and bilges for evidence of non-conformities that may lead to an unwanted discharge of pollutants into the water.
- **Fueling** – Unless otherwise directed, the chief engineer should be considered the Person in Charge (PIC) of taking on fuel, oils, or discharging slops/bilge waste. The chief engineer should follow the **Fuel & Lube Oil Systems** procedures found in this manual.
- **Fuel Level Monitoring** – Although it is the captain's responsibility to ensure that they have enough fuel to complete the vessels voyage or operations, the chief engineer may determine that the fuel levels, due to ballasting, may not be efficient, and recommend the captain take on more fuel.
- **Fuel Transfers** – The chief engineer, under the direction of the captain, will determine when it is necessary to transfer fuel to maintain a proper list of the vessel and to maintain safe fuel level for vessel operations, following the Fuel & Lube Oil Systems section (Section 4.13) in this manual.
- **Ballast/Trim** – The chief engineer will be responsible for maintaining safe trim of the vessel by means of transferring fuel, water, or ballast. The captain will direct the chief engineer based on anticipation of weather, operational demands, or to be in compliance with the vessel's Load Line Certificate and stability requirements.
- **Training and Certification** – It is the chief engineer's responsibility to qualify all persons conducting Engine Room Rounds and operating crane and heavy deck equipment as per the procedures outlined in this manual.
- **As Needed** – The chief engineer will perform any tasks as required of them requested by the captain that are in keeping with their credentials and qualifications.

In addition to the responsibilities set forth above, the chief engineer may be required to perform galley duties. These duties may include provisioning, food preparation, and cleaning. The chief engineer will be required to hold appropriate food handling qualifications.

4.3. Chief Mate and Crew Responsibilities

4.3.1. Responsibilities

Ultimately it is the responsibility of the chief mate and other crew to support the captain and the scientific mission of the cruise. Given the size of the *R/V Pacific Storm* and her capabilities to conduct multiple disciplines of scientific research simultaneously, it is incumbent on the chief mate to coordinate these efforts and to be versatile in their abilities and duties.

4.3.2. General

The chief mate and crew of the *R/V Pacific Storm* consists of licensed personnel. Each licensed crew member acts as a watch officer and has specific routine responsibilities as well as responsibilities defined on the Station Bill aboard the vessel.

The workday for an individual is dictated by the activities the vessel is engaged in and the STCW standards that are set forth in 46 CFR 15.1111. In particular, the following apply:

- Each person assigned to a navigational watch shall receive a minimum of 10 h of rest in a 24-h period.
- The hours of rest required may be divided into no more than two periods, of which one must be at least 6 hours in length.
- The requirements above need not be maintained in the case of an emergency or drill or in other overriding operational conditions.
- The minimum period of 10 hours of rest may be reduced to not less than 6 consecutive hours as long as:
    - No reduction extends beyond 2 days; and
    - Not less than 77 hours of rest are provided each 7-day period
- The minimum period of rest required may not be devoted to watch-keeping or other duties.

In addition to the responsibilities set forth in the OSU/MMI job descriptions for each position, the chief mate and other crew members may be required to perform galley duties. These duties may include provisioning, food preparation, and cleaning. The chief mate and crew members will be required to hold appropriate food handling qualifications.

4.4. Captain's Standing Orders

4.4.1. Responsibility

It is the responsibility of the captain to establish standing orders and to ensure that all crew are aware of those orders. It is the responsibility of the chief mate to ensure that these orders are enforced on watch.

4.4.2. General

Every captain may establish their own Standing Orders as a means of communicating base guidelines to which they intend for the vessel to be operated. These Standing Orders will be reviewed by MMI leadership

When a relief captain is assigned, they may amend or supplement the existing standing orders with approval of MMI leadership. All crew shall review, acknowledge, and sign these orders prior to assuming their first watch under the relief captain.

Any captain may, at their discretion, publish Night Orders for navigation and other operations when not in attendance in the wheelhouse. If published, the chief mate shall review and acknowledge the Night Orders prior to assuming the watch and shall ensure that all watch officers carry out these orders.

4.4.3. Reporting

The captain shall provide a current copy of the Standing Orders to MMI leadership at least annually, and at any time the orders are revised. A relief captain shall provide a copy of any amended Standing Orders to MMI leadership at the completion of their relief.

Night Orders will be retained on board for the duration of each cruise. Acknowledgement of acceptance shall be noted in the vessel's log.

4.5. Sexual Harassment and Prevention

This policy highlights OSU and MMIs commitment to creating and maintaining an equitable and inclusive working and learning environment free of all violence, harassment, and discrimination.

4.5.1. Reference

- OSU Sexual Misconduct and Discrimination Policy: https://policy.oregonstate.edu/UPSM/05-001_sexual_misconduct_discrimination
- UNOLS Research Vessel Safety Standards, Appendix 'E'
- UNOLS Research Vessel Safety Standards, Section 6.1.4
- Ship Operations Cooperative Program, Best Practices on the Prevention of Sexual Assault and Sexual Harassment in the U.S. Merchant Marine: www.socp.us/article.html?aid=211

4.5.2. General

It is recognized that working and living on a research vessel often creates unique situations that are not typically found in an on-campus environment. Given this, it is critical that all cruise participants, both scientists and crew, work together to create an environment that is inclusive as well as free of harassment and prejudice.

As the operator of the *R/V Pacific Storm*, MMI Leadership will not tolerate any form of harassment or discrimination on the vessel and reserves the right to terminate a cruise at anytime should such activities occur.

If a member of the science party, whether part of OSU or part of a visiting institution or agency, feels they have been or are being harassed in any form, they should report this to the chief scientist or the captain immediately. If they do not feel comfortable discussing the situation with either the chief scientist or captain, they should contact MMI leadership. Reports will be discussed and forwarded to OSU's Office of Equal Opportunity and Access (EOA) who, under the direction of the university's Title IX Coordinator, is responsible for following up on all reports of harassment. Contact numbers for each of these resources are listed below.

4.5.3. Reporting

Marine Mammal Institute, Director
Dr. Lisa Balance
Phone: 541-867-0445

Office of Equal Opportunity and Access
Phone: 541-737-3556
Location: 330 Snell Hall
Web: Office of Equal Opportunity & Access
Hours: 8am-5pm, Monday-Friday

The EOA accepts inquiries, formal, and informal reports of sexual harassment and sexual violence. In addition to handling grievances, the staff offers consultation and advice on what procedure is likely to have the most positive outcome.

Survivor Advocacy & Resource Center (SARC):
Phone: 541-737-2030
Location: 311 Plageman Building,
Corvallis, OR
Web: https://cape.oregonstate.edu/
Email: survivoradvocacy@oregonstate.edu

The OSU Survivor Advocacy and Resource Center is a safe and confidential space for all university community members, including students, faculty, and staff affected by different forms of violence. Call for safe, *confidential* support and resources.

Bureau of Labor and Industry (BOLI):
Phone: 971-245-3844
Web: www.oregon.gov/boli/pages/index.aspx
Email: crdemail@boli.state.or.us

Oregon BOLI is a state agency charged with investigating complaints of discrimination in employment based on protected classes when the last date of harm has occurred within one year of receipt of the complaint. A BOLI investigation will not impact a university investigation and can be conducted concurrently.

Rape, Abuse, and Incest National Network (RAINN)
www.rainn.org
(800) 656-HOPE (4673)

RAINN is a national non-profit group that is available if an individual feels that they need to talk to someone regarding sexual harassment/assault but are not sure that they want to trigger the legal reporting process.

4.6. Departure and Arrival Procedures

4.6.1. Responsibility

The captain is responsible for evaluating the readiness status of the vessel. This will be accomplished with the assistance of the chief mate, chief engineer, chief scientist, and other personnel as directed.

4.6.2. General

The operational demands of the *R/V Pacific Storm* can take the vessel into diverse waters, from rivers to bays and oceans, from shoal water to deep channels, and from un-trafficked waters to heavily trafficked shipping lanes, often within a single voyage. As such, it is of the utmost importance that pre-sail navigational and engineering checks are completed, prior to getting underway, to ensure that all systems are online and operational. The regulation included in 33 CFR 164.25 defines a series of performance checks between the bridge and the engine room.

To the best of the captain's ability every attempt at the development of a plan for voyage or passage, as well as the close and continuous monitoring of the vessel's progress and position during the execution of such a plan are of essential importance for safety of life at sea, safety and efficiency of navigation, and protection of the marine environment. Further, plans during a voyage can change as the demands of the scientific operations change, and so the vessel may be required to deviate from a course or track into unfamiliar waters. As such the captain and crew should be prepared to make such revisions to their route and voyage plan while underway, and if the captain deems necessary, communicate such deviations with MMI leadership.

4.6.3. Departure

Once the departure time has been agreed upon between the captain and chief scientist, the crew is notified to give them the appropriate time to prepare. Any change in the day or time of departure, which will have an impact on subsequent scheduled cruises, should be reviewed by MMI leadership.

It is always understood that the departure time may be flexible in order to accommodate a variety of unforeseen issues which may cause delay, or conversely in some cases, an early departure. In each case, every attempt will be made to adhere to the established time.

4.6.3.1. Prior to departure:

- The chief engineer will attend to the procedures required to make ready for getting underway. This includes but is not limited to:
  - Bringing systems online for testing and warm up
  - Switching to vessel's power
  - Testing or observing the testing of all vital systems
  - Verifying that the vessel is in correct trim

  When all procedures have been completed, the chief engineer will report to the captain that they are ready to get underway or, if not, will report deficiencies in need of attention.

- The chief mate will inspect the decks and attendant interior spaces to ensure that all gear and equipment has been properly secured. Properly secured means that the vessel is ready to proceed into all potential weather conditions.

- The chief scientist will ensure labs and equipment are properly secured for sea, and that all members of the science party are on board and ready to proceed.

- The captain or chief mate will ensure that all bridge and navigation systems are online and in good order and that the requisite systems have been tested (steering/propulsion/bow thruster, etc.). Once completed, the chief mate will report to the captain (if completed by the chief mate) that the bridge is ready or report deficiencies in need of attention. After testing the vessel's bow thruster, propulsion controls, and steering on the bridge the captain may determine that the vessel is ready to get underway.

4.6.3.2. Departure Checklist

In accordance with 33 CFR 164.25 and 46 CFR Subpart E, Pre-Sail Navigational, Documentation, Safety, and Equipment Checks (hereafter referred to as departure checklist) shall be conducted and documented prior to getting underway from the dock.

The *R/V Pacific Storm* departure checklist can be found in Appendix I of this document. The departure checklist shall be completed by the captain or their designee and noted in the vessel's log. Completed hard copies of these checklists are not required to be printed or stored.

4.6.4. Voyage Planning

While planning a voyage or course, all relevant information should be considered. The following items should be taken into account in the captain's planning:

- The condition of the vessel
- Any special characteristics of the operations (trawling, long-lining, towing scientific gear, etc.)
- Effect of current or tidal depths
- Forecasted weather
- Vessel Traffic Service (VTS), if applicable
- Traffic likely to be encountered throughout the voyage
- Port or berth information
- Consulted Local Notice to Mariners

4.6.5. Prior to Return

Prior to the return to home port (or arrival to any port), the captain or chief mate will ensure that the following have been addressed:

- Bow thruster engaged and tested
- Depth sounder available and working correctly
- Weather restrictions currently in place at the port of arrival
- Ensure that at least one VHF radio has been tested and confirmed operational within the last 24 hours
- Anchoring system is operational in the event that it is needed in an emergency
- Chief engineer or chief mate (at a minimum) are on watch and ready to assist with lines
- All scientific gear is appropriately stowed and there is no gear deployed that will in anyway hinder the ability of the vessel to safely moor

After the vessel is safely moored, the time will be noted in the vessel's log.

4.7. Stability/Ballast

4.7.1. References

- 46 CFR 42.15-1(b),
- 46 CFR 170.110,
- 46 CFR 170.120(a),
- *R/V Pacific Storm* "Trim and Stability Booklet" Doc. No. 604146 Rev. 0 dated August 2, 2011.

4.7.2. Responsibilities

- The captain will work with MMI Leadership to ensure that all baseline stability data are current, accurate, and available. Changes to the vessel are controlled and managed to ensure compliance with applicable regulations. This includes scheduling and conducting stability tests as necessary.
- MMI Leadership will ensure that the vessel is provided with a current Trim and Stability booklet.
- The captain will ensure that various loads are managed so that the stability requirements are met. Any concerns regarding the stability of the vessel will be conveyed to MMI Leadership as necessary.

4.7.3. Procedures

4.7.3.1. Stability

- Stability calculations should be made when the captain determines loads on the vessel could impact safety. These calculations should be made at the beginning of a cruise and at any other time the captain deems appropriate (i.e., when significant changes in load take place).
- The vessel's Trim and Stability Booklet provides instructions and information for calculating the vessel's stability.
- Stability calculations should be double-checked by confirming the drafts of the vessel at the bow and stern prior to departure.
- Maintaining the vessel's trim will primarily involve the transfer of fuel.

4.7.4. Reporting

- The captain is responsible for addressing all stability concerns prior to departure.

- The drafts and load line mark of the vessel will be reviewed during the Departure Checklist and recorded in the Deck Log when part of any stability calculations.
- When within 25% of the vessel's maximum loading capacity, calculations verifying the vessel stability will be required and will be recorded in the Deck Log.

4.8. Lookout/Low Visibility

4.8.1. References

- 33 CFR 83.05
- 33 CFR 83.06
- 33 CFR 83.07
- 33 CFR 83.19
- 33 CFR 83.35

4.8.2. Responsibilities

It is the responsibility of the captain to attempt to avoid any forecasted low visibility areas. It is the responsibility of the person standing a navigational watch to provide a good lookout should low visibility be encountered.

4.8.3. General

These guidelines address the duties required of a "Lookout" as defined by 33 CFR 83.05 – Lookout (Rule 5). While operating any vessel, there may be periods when fog, rain, snow, dust, or other weather can cause reduced visibility. Careful consideration and judgment should be given in making safe decisions while operating under reduced visibility conditions that are in the best keeping with 33 CFR 83.19 – Conduct of vessels in restricted visibility (Rule 19).

No schedule is more important than the safety of personnel, the vessel, or the environment. Remaining at a safe mooring and NOT getting underway into reduced visibility is always the best practice if possible. Additional lookouts may be needed and should be put on watch if, in the judgment of the captain, the visibility is reduced creating an increase of risk.

4.8.4. Procedures

- The captain/watch officer should determine if restricted or reduced visibility conditions exist, by fastest practical means. Visual lookout, radar observations, communications with other vessels/stations, and any other means applicable can aid in the avoidance of/preparedness for a low visibility scenario. Precautions should be considered and taken to actively and continuously determine the presence of other vessels, risk of collision, navigation aids, and dangers.

- In accordance with 33 CFR 83.07 (Rule 7), regardless of visibility, but especially in the case of low visibility, the radar shall be used to provide long-range scanning to help obtain

early warning of risk of collision. Speed should be reduced for safety of navigation to avoid collision/allisions. Should the vessel's radar become inoperable, the vessel should hove to, or set the anchor until visibility improves.

- When it has been determined that the vessel is operating in low visibility the vessel operator shall reduce the speed of the vessel to a speed in which the vessel can be stopped or maneuvered in a safe distance as determined by the prevailing conditions, traffic density, sea state, current, depth of water, restricted maneuverability due to close navigational situations, etc., as set forth by 33 CFR 83.06 Safe Speed (Rule 6).

- In a low visibility situation, the proper sound signals shall be sounded. The sound signal shall be in accordance with 33 CFR 83.35 – Sound signals in restricted visibility (Rule 35), and shall be as follows:
    - If underway and making way, one prolonged blast shall be sounded every 2 minutes.
    - If underway but not making way, 2 prolonged blasts shall be sounded every 2 minutes with about 2 seconds between each blast.
    - If at anchor, the vessel's bell should be sounded every 1 minute and rung rapidly for about 5 seconds.
    - If the vessel is engaged in fishing at the time of the reduced visibility she should sound 1 prolonged blast followed by 2 short blasts every 2 minutes.
    - For any other situation refer to the referenced rule.

- In a reduced visibility scenario, the vessel's running lights should be turned on to reflect the vessel's navigational status.

- A second watch officer should be present in a low visibility situation so that they can provide a second set of eyes and ears, as well as be present in case needed. No other duties shall be issued to the secondary watch stander providing lookout.

- The watch officer may determine that it is prudent to give security calls on VHF Channel 13 and 16 in the case of low visibility. Should this be the case, security calls should be given routinely indicating the vessel's position, the visibility in that area, and navigational status.

4.9. Heavy Weather Precautions

4.9.1. Responsibility

It is the ultimate responsibility of the captain to make every attempt to avoid steaming into heavy weather that may present, in their best judgment, a hazardous situation to the safety of the vessel and crew.

Further, acknowledging that at times encountering heavy weather is unavoidable, it is the captain's responsibility to ensure that the vessel maintains a state of seaworthiness to meet the demands of storm force conditions. This includes the stowage of gear on decks and below decks to prevent items from becoming dislodged and causing harm. The captain may delegate these responsibilities to members of the crew, though ultimately the responsibility still rests with them.

4.9.2. General

These procedures address heavy weather and dangerous environmental conditions that pose risks and hazards to the vessel and personnel. Hazardous weather has been responsible for more maritime injuries, fatalities, and losses than any other historical causes. Hazards due to heavy or dangerous weather are many. Sinking, swamping, capsizing, flooding, personnel injuries or fatalities, damage to the vessel, etc., are real consequences of being unprepared for exposure to heavy weather either underway or dockside.

Determining whether a hazardous weather situation exists will be at the discretion of the captain, taking into account the onsite conditions at that particular time.

Proper voyage planning is critical in determining risks from inclement weather and continued monitoring of weather systems through all means available are essential in preventing a hazardous situation for vessel and crew. At no time should the vessel get underway or commence scientific operations if the captain determines that prevailing or deteriorating weather conditions present a risk to vessel, equipment, or the well-being of personnel onboard.

4.9.3. Procedures

- During voyage planning, or preparing for operations, it is the captain's responsibility to avoid and evade heavy weather, severe storms, and any other adverse environmental conditions that could endanger the vessel or vessel's personnel.

- The watch officer shall frequently monitor weather forecasts for the area of operations and planned areas of operation.
    - Various Internet/Mobile Apps are good sources for weather forecasts while in an area of cell service but should not be the primary and sole source of information when determining if a risk of weather exists.
    - Consider contacting other vessels operating ahead in the vicinity of the intended track to inquire about current weather conditions. Further, the watch officer shall monitor VHF 16 and 22a for the USCG Local Notice to Mariner Safety Bulletins.
    - While operating offshore, information regarding weather forecasts can be received via the satellite communications installed on the vessel.
    - Should the vessel lose ability to acquire a current weather forecast, the captain should make a note of this in the vessel's log and should make arrangements for MMI Leadership to provide updated forecasts to the vessel.

- Make frequent local observations of barometric pressure, cloud cover, etc.

- Keep crew informed of anticipated weather conditions.

- Secure the exterior and interior of the vessel from loose objects and ensure maximum watertight integrity is set and checked well before the onset of heavy weather.

- Ensure vessel systems, especially navigational, steering control, propulsion, and electrical systems are checked and ready for maximum reliability. This may include topping of the day tank to prevent the need to conduct a fuel transfer in heavy weather.

- Review potential divert ports and, if necessary, divert to nearest port.

- Open decks shall be restricted from all personnel unless access is deemed necessary by the captain or the watch officer.

- As appropriate, communications will be maintained with the MMI Leadership.

- Should the vessel be offshore when the onset of a heavy weather situation presents itself, it is advisable that the captain, at their discretion, establish communications with the USCG. This can be done in coordination with MMI Leadership.

4.10. Watch Turnover

4.10.1. Responsibilities

It is the responsibility of each watch officer to allow themselves enough time to become acquainted with the vessel's operations, the prevailing weather and conditions, other traffic in the operating area, and any other information as pertains to their watch prior to their watch turnover time.

4.10.2. General

Navigational Watch – A Navigational Watch turnover will include the following information:

- Location
- Course and Speed
- Weather and Current Observations
- Vessel/Scientific Operations
- Engineering Status
- Traffic and Standing Passing Arrangements
- Radar Targets
- Marine Safety Bulletins/Nearby Vessel Security Calls
- Potential hazards to navigation

4.10.3. Reporting

Watch turnovers shall be recorded in the Deck Log.

4.11. Life Saving and Survival Equipment

4.11.1. References

- 46 CFR 199190(e)
- SOLAS Reg. III/20.7
- NVIC 01-08

4.11.2. Responsibilities

It is the responsibility of the captain to ensure that all the appropriate survival equipment is provided to the vessel and to provide access to certified third-party inspectors, when required, for the survival equipment to be inspected per the manufacturer's instructions.

It is the responsibility of the captain to ensure that all lifesaving and survival equipment is in serviceable condition and that personnel are trained on the use of the equipment. Serviceable condition means that the equipment is functional and safe to use and is current on all inspections, both by vessel crew and by a third party in accordance to the manufacturer's instructions.

The captain may delegate these responsibilities to another crew member, but ultimately inspecting and maintaining equipment, training vessel personnel on the proper use of equipment, and maintaining records of inspections and maintenance of the vessel's lifesaving and survival equipment is the responsibility of the captain.

4.11.3. General

4.11.3.1. Life Jackets

- Life jackets are located in the science lab and wheelhouse.
- There shall be a life jacket on board for each person.
- Life jackets shall be stowed so that they are clearly visible and unobstructed.
- Life jackets should be able to be freely pulled from their storage location and the storage location marked with the proper symbol.
- Each life jacket is marked with the vessel name and has one whistle and one light attached to it.
- An inventory of life jackets should be conducted every month,
- An inspection of life jackets shall be conducted monthly to ensure that:
    - Each life jacket is free of tears and straps, clips, and reflective tape are still serviceable

- Each life jacket has a sound signaling device and a strobe light
- The water activated lights or the Lithium AA batteries for the manual flashing strobes have not expired and are replaced on the expiration date or every 5 years, as per manufacturer's recommendations

4.11.3.2. Survival Suits

- Survival suits are located in the closets located in the science lab.
- There shall be a survival suit on board for each individual.
- Survival suits shall be stowed so that they are clearly visible and unobstructed.
- The survival suits should be able to be freely pulled from their storage location and the storage location marked with the appropriate symbol.
- Each survival suit is marked with the vessel's name and has one whistle and one manually operated flashing strobe attached to it.
- An inventory of all survival suits should be made monthly and/or prior to getting underway
- Inspections of survival suits shall be conducted monthly as per 46 CFR 199190(e) and SOLAS Reg. III/20.7, and shall include:
  - Examination of the storage bag:
    - General condition/closures
    - Ease of removal of suit
    - Donning instructions are legible
    - Confirm that suit is type and size identified on the bag
  - Placement of the suit on a clean flat surface:
    - Make sure the suit is dry inside and out
    - Visually check for damage
    - Rips, tears, or punctures should be repaired in accordance with the manufacturer's instructions by a suitable repair station
  - Examination of the zipper
    - Slide up and down, check for ease of operation
    - Lubricate front and back of the zipper and the slide fastener using lubricant recommended by the manufacturer
    - If the zipper is not functional then the suit must be removed from service and discarded or returned for repair to manufacturer or suitable repair station
  - Examination of the inflatable head support and/or buoyancy ring if fitted
    - Check for damage/ensure it is properly attached
    - Check inflation hoses for deterioration

        - At least quarterly the head support/buoyancy ring should be inflated and tested for leaks
        - Leaks should be repaired in accordance with the manufacturer's instructions at a suitable repair station
    - Examination of reflective tape for condition and adhesion and replace if necessary
    - Confirmation that each survival suit has a sound signaling device and a strobe light
        - Examination of the expiration date for the Lithium AA batteries for the manual flashing strobes and replacement as per manufacturer's recommendation every 5 years
    - Replace the suit into the bag with zippers fully open.
    - Training: Take the time during monthly inspections for the crew to practice donning the immersion suits.
- Monthly survival suit inspections shall be recorded in the CMMS system unless the suits are 10 years old, or older, in which case they shall be removed from service.
- For further reference to the inspection and maintenance of Survival Suits refer to NVIC 01-08

4.11.3.3. Life Rafts

- Two, 12-person life rafts are located on the port and starboard side of the top of the wheelhouse.
- Life rafts shall be inventoried and visually inspected for serviceability monthly, and/or prior to getting underway. The inspection shall confirm:
    - The life raft canister does not have cracks
    - The straps are in serviceable condition
    - The pelican hook is secure
    - The sea painter is intact and serviceable
    - The hydrostatic release is present and within its date of expiration
- The life rafts are inspected and certified by a third-party certified inspector annually.
- The hydrostatic releases are replaced every 2 years.

4.11.3.4. Life Rings

- Life Rings are located:
    - Two on either side of the wheelhouse
    - On the aft deck, port side

- Life Rings are marked with the vessel name.
- Two life rings on the wheelhouse are equipped with a strobe and 15-minute orange smoke signal; all other life rings have throw bags attached.
- Each life ring shall be inspected monthly for excessive wear, operation of light, expiration of the smoke canister, and condition of throw rope.

4.11.3.5. EPIRB

- The vessel's EPIRB is located on the upper deck.
- It is equipped with a hydrostatic release.
- The EPIRB shall be inspected monthly as follows:
  - Remove the cover and visually inspect the device and hydrostatic release. The hydrostatic release expires every two years.
  - To test the EPIRB lift the tab on the right-hand side to the up position and hold it there. A green light will flash 6 times. This indicates that the EPIRB is operational.
- To activate the EPIRB flip the switch all the way over. A red light should begin to flash indicating that it is activated.
- Should the hydrostatic release be tripped, the EPIRB will automatically be activated.
- The EPIRB must be registered and the registration renewed every 2 years. The registration is located in the folder with the vessel's documents.

4.11.3.6. Flares

- Flares should be inventoried monthly.
- Flares should be inspected to ensure that they are not expired.
- Flares should be visually inspected for signs of wear, deterioration, or any other indication that might question their serviceability.

4..11.4. Reporting

All inspections and any corrective actions will be logged either on the vessel's log or in a CMMS.

4.12. Waste Management

4.12.1. References

- MARPOL 73/78 ANNEX V

4.12.2. Responsibilities

With the knowledge and approval of the captain:

- The chief engineer is responsible for management and disposal of waste oil.
- The chief engineer is responsible for management, treatment, and disposal of sewage.
- The captain is responsible for management, storage, and disposal of trash.

4.12.3. General

Under no circumstances will anything be discharged over the side of the vessel without the approval of the captain or watch officer.

4.12.3.1. Waste Oil

Discharge of Oil Prohibited
The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters of the United States, or the waters of the contiguous zone, or which may affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States, if such discharge causes a film or discoloration of the surface of the water or causes a sludge or emulsion beneath the surface of the water. Violators are subject to substantial civil penalties and/or criminal sanctions including fines and imprisonment.

- Waste oil is transferred to an approved shoreside facility/container/hauler for proper disposal. All oil changes are recorded in the vessel's CMMS with a note as to where the oil was recycled.

4.12.3.2. Bilge Slops

- The *R/V Pacific Storm* is not equipped with a bilge slop tank and as such, any bilge waste shall be properly transferred to an approved shoreside facility.

4.12.3.3.Sewage

Under no circumstances will untreated sewage be pumped directly over the side while in port.

- *R/V Pacific Storm* is equipped with a USCG- and International Maritime Organization (IMO)-approved Type III MSD. Wherever practicable and/or required by law, the MSD shall be used for treatment of vessel's sewage prior to over the side discharge. Local laws and regulations may prohibit any discharge even of MSD-treated sewage.
- In port, if deemed necessary or prudent, vessel sewage will be pumped ashore to an approved facility. This may be an approved tank, shoreside sewage discharge line, or truck. The procedure will be conducted at the direction of the port authorities.
- At sea, sewage is discharged in compliance with the Federal Clean Water Act. Every effort shall be made to discharge as far out as possible. In keeping with the law, untreated sewage shall never be discharged closer than 3 nautical miles from shore. These limits may be modified or extended to comply with local laws and regulations. Sewage may be retained on board upon the high seas for an extended period, within practical limitations, if requested by the chief scientist so as to not compromise the science work.

4.12.3.4. Trash

Under no circumstances are plastics to be disposed of in the ocean or waterways.

- In port, local law or regulations generally dictate discharge of trash. All trash will be retained on board until it can be discharged at a proper facility.
- At sea, disposal of trash is done in accordance with the restrictions set forth in the MARPOL 73/78 ANNEX V.
    - Trash is separated on board, recyclables in separate containers and trash in others.
    - Plastics and most other trash are kept on board and properly disposed of at the port of arrival.
    - Permission must be obtained from the captain before dumping of trash is allowed in order to ensure compliance with regulations or to prevent harm to the science project.

4.12.4. Reporting

The records required above will be retained onboard the vessel as required by law and regulation. MMI Leadership, in coordination with the captain, will ensure that all necessary trash logs are being kept and they are in compliance with this document.

4.13. Fuel & Lube Oil Systems

4.13.1. References

- 33 CFR Subchapter O (Pollution)
- MARPOL Annex VI *R/V Pacific Storm* "Trim and Stability Booklet" Doc. No. 604146

4.13.2. Responsibilities

The captain is responsible for ensuring that all requirements of law regarding the safe transfer and handling of oils are satisfied.

The chief engineer is responsible for monitoring fuel and oil tank levels on the vessel, maintaining all fuel and oil piping and machinery, and transferring fuel between tanks, and is the primary PIC for all bunkering operations.

The captain is responsible for ensuring safe deck and mooring conditions for all bunkering operations.

4.13.2.1. Qualifications for Person in Charge (PIC)

- The vessel's chief engineer is deemed qualified to serve as the primary PIC. Relief chief engineers and other personnel may be qualified as follows:
  - Any licensed engineering officer or any unlicensed engineer may be qualified as PIC at the discretion of MMI Leadership and the captain. Completion of one full bunkering evolution under the supervision of the permanent chief engineer will be required before qualification.
  - Crew or staff members not meeting these requirements may be qualified as PIC at the discretion of the MMI Leadership and the captain, assuming they have proof of completion of a USCG-approved "Tankship – Dangerous Liquids" course (or proof of substantially similar training), and completion of two full bunkering evolutions under the supervision of the permanent chief engineer.

4.13.3. General

These guidelines address procedures for the safe transferring of fuel and other oils. The purpose is to reduce the risks of oil spill, fire, damage to facilities/vessels, injury to personnel, or pollution of the environment.

Prior to proceeding with any fueling operation, the crew will reduce, to the best of their ability, any possibility of contaminating the water via an oil spill or fueling incident. All crew involved in the fueling operation should be present and attentive to the fueling process for as long as the evolution lasts.

Tank levels should be monitored continuously throughout the bunkering process.

The *R/V Pacific Storm* maintains pollution insurance through a plan provider in which the Safe Harbor Spill Management Team (877-397-9252 or internationally at 00+1+516-795-8800) will be contracted as the designated response organization in the event of an incident or emergency.

4.13.4. Procedures

4.13.4.1. Fuel and Oil Bunkering:

Bunkering of fuel and lube oil may be conducted at any facility the captain sees fit. The *R/V* Pacific Storm has a fuel oil capacity of approximately 15,500 gallons at 95% full on all storage and day tanks, and a lubricating oil capacity of approximately 110 gallons at 100% full. The hydraulic oil capacity is 450 gallons at 100% capacity.

Fuel oil storage tanks will normally not be filled to exceed 95% capacity due to the risk of tank venting with thermal expansion; any transfer plan that requires filling beyond this point must be approved by MMI Leadership.

All fuel oil will be either #2 off-road or marine diesel oil (may be red-dyed or un-dyed). Fuel oil samples will be drawn, sealed, and recorded periodically as per the chief engineer's discretion.

Fueling Procedures are as follows:

- The PIC will conduct an inspection of the engine room and engineering spaces ensuring that all hoses, manifold piping, valves, pumps, and other related equipment are in serviceable order and free from leaks and in proper alignment to take on fuel.
- Proper containment measures will be taken to ensure that, in the event of a spill, the fuel oil/lube oil is contained and will not go over the side.
- The captain will raise the bravo flag during the day or energize the all-around red light during the night.

- The level of fuel currently on board will be verified and the amount which will be taken on will be calculated to ensure that there is enough room on board.
- Once the operator that will be transferring fuel or oil is on site, communication shall be established:
  - The emergency shutdown procedure will be agreed upon.
  - The rate of flow will be established.
  - A vessel's radio will be provided to the onshore person for communication if necessary and a radio station agreed upon and used by the PIC, shore personnel and the captain.
- When necessary, a crew member will be placed as a watch by the hose junction in case of a failure at the intake.
- At this time the PIC will notify the captain and shore personnel that they are ready to take on fuel and the captain will make an entry in the log that fuel is being transferred.
- Once pumping has begun, another check of all the hoses, pipes, valves, and pumps shall be conducted.
- Should at anytime a crew member see a leak developing they shall notify the shore personnel to stop fueling,
- Once the desired amount of fuel has been brought on board, the PIC will notify the shore personnel to stop fueling and, once the fuel pump from shore has been shut off, will secure all valves to the tanks.
- The captain will be notified that all fuel is on board and that the hose is off the vessel.
- At this time all pollution prevention measures can be re-stowed.
- The bravo flag can be lowered.
- The amount taken onboard as well as an entry indicating that fueling operations have been secured should be logged in the vessel's log.
- The vessel can get underway.

4.14. Overboarding Operations

4.14.1. Responsibilities

Prior to conducting an overboard operation, a pre-deployment brief should be conducted by the captain.

All crew members and scientific personnel, including Marine Technicians, participating in overboarding operations should be part of the pre-deployment brief to ensure they understand the activity and are aware of their roles and responsibilities. Crewmembers should take appropriate precautions, including wearing PPE when necessary. Communicating preventive safety precautions can be effectively accomplished by holding pre-deployment briefings.

4.14.2. Procedures

4.14.2.1. Planning

Unique, first-time, or one-time-only operations pose special difficulties and demand additional attention to planning.

Pre-cruise planning must address the general overboarding requirements. It is the responsibility of the chief scientist to work with the captain and chief engineer to ensure that all unusual requirements are raised and considered.

4.14.2.2. Communications

Communications between the PIC on deck, the watch officer and the winch operator must be clear, unmistakable, and thoroughly tested prior to the beginning of operations.

4.14.2.3. Operations

- Follow the plan.
- Only those with assigned duties may be on deck in the vicinity of the overboarding operations.
- Scientists standing by to retrieve samples or equipment must wait until the PIC on deck gives permission before moving to the equipment.

No equipment will be put over the side or recovered until permission from the watch officer is obtained. If, during launching or pickup of towed gear, it appears the propeller or rudder may be fouled, the watch officer will immediately stop the propeller (de-clutch) and refer to the emergency procedure. When working over the side, proper safety precautions and appropriate PPE (work vests while on deck, hard hats while working with overhead equipment, gloves and safety glasses as determined in the pre-deployment brief) will be observed at all times.

4.15. Overboarding Equipment

4.15.1. Purpose

The purpose of this procedure is to set forth standards to ensure safe overboarding of equipment on *R/V Pacific Storm* and to define responsibilities to ensure that there are no injuries or loss of equipment during overboarding operations on the vessel. This procedure covers the installation, maintenance, and inspection of overboarding equipment on the *R/V Pacific Storm*.

4.15.2. Reference

- UNOLS Research Vessel Safety Standards, 11th Edition

4.15.3. Definitions

- **Overboarding** - is defined as the use of the overboarding equipment, sometimes referred to as "working over the side."
- **Overboarding equipment** - is defined as all mechanical gear involved in removing equipment from a location on deck and lowering into the water. There are three general categories of this equipment:
    - **Permanent Vessel Equipment** - is defined as machinery or equipment such as cranes, winches, capstans, blocks, and rigging regularly associated with the vessel and maintained by the vessel's crew.
    - **Institution Scientific Equipment -** is defined as machinery or equipment such as winches, cranes, and blocks owned by other groups within OSU and not regularly associated with a particular vessel but may be used on the *R/V Pacific Storm.*
    - **Temporary Scientific Equipment -** is defined as machinery or equipment such as winches, cranes, and blocks used on the vessel for a short period of time, such as the duration of a scientific operation. This machinery is not owned or maintained by MMI or other groups within OSU.
- **Safe working load (SWL) -** is defined as the maximum mass or force that a piece of equipment is authorized to support in general service when the pull is applied in-line. This is analogous to safe working tension.

4.15.4. Responsibility

The safety of all persons on board the vessel is ultimately the responsibility of the captain. It is the responsibility of the captain to be familiar with the requirements of load-handling gear

and the relevant UNOLS Research Vessel Safety Standards and to ensure compliance while the equipment is on the vessel. Specific responsibilities of the captain may be designated to other crew on board. It is the responsibility of those on board to know their jobs via this procedure.

4.15.4.1. Captain

It is the responsibility of the captain to ensure that all overboarding activities are done in a safe manner.

4.15.4.2. Chief Engineer

It is the responsibility of the chief engineer to maintain the overboarding equipment (except blocks and loose equipment) in a safe and reliable condition. All maintenance, failures, and repairs to vessel overboarding equipment should be tracked in the vessel's computerized maintenance management software (CMMS).

4.15.4.3. Chief Mate

It is the responsibility of the chief mate to maintain in safe and working condition, and test, as per Permanent Vessel Equipment below, the blocks and loose equipment. Records of Maintenance are to be kept via the CMMS of all testing, maintenance, failures, and repairs to blocks and loose equipment.

4.15.4.4. Permanent Vessel Equipment

Design - It is the responsibility of the captain to ensure that the correct equipment is used in each application and the SWL is not exceeded. It is the responsibility of MMI leadership to ensure that all new equipment is designed, built, and installed to the proper specifications.

Testing - It is the responsibility of the captain or their designee, to ensure that all load-handling gear is tested and logged in accordance with policies and procedures outlined in this document with additional guidance provided by the UNOLS RVSS.

4.15.4.5. Institution Scientific Equipment

Design - It is the ultimate responsibility of the captain to ensure that the correct equipment is used in each application and the SWL is not exceeded. The captain, or their designee, are responsible to collect information proving the suitability of the

equipment well in advance of planned use. The captain, or their designee, will ensure that the equipment is installed as planned and in a safe manner.

Testing - It is the ultimate responsibility of the captain to ensure that all load-handling gear is tested when installed on the vessel and logged in accordance with procedures outlined in this document. It is the responsibility of the group that owns the equipment to prove the certified rating of the equipment to the captain prior to installation on the vessel. In occasions of a fast turnaround, the captain, in direct coordination with Marine Mammal Institute leadership, can agree to waive this requirement based on recent use of the equipment under similar conditions or a load test that has been performed recently and with corresponding documentation.

4.15.4.6. Temporary Scientific Equipment

Mission-specific and new scientific gear is regularly produced and is expected to be used on board as new demands are made by science. It is the responsibility of the equipment owners to be familiar with acceptable standards for offshore load-handling equipment and to assess each new piece of gear to ensure that the proper engineering and testing has been done prior to delivery to the vessel. This equipment should have an SWL rating on it or relevant documentation that describes its operating parameters. It is the responsibility of the captain to assess each new piece of gear to ensure that the proper engineering and testing has been done prior to delivery to the vessel. The captain can provide assistance to the science party in evaluating or specifying equipment for offshore operations. The captain ultimately has discretionary control over the use of any equipment that is used for load-handling gear.

4.15.5. Procedures

Hard hats are to be worn by any person involved in crane operations and work vests are to be worn by any person working near the rail where the risk of falling overboard exists.

Always obtain permission from the captain or watch officer prior to putting anything over the side of the vessel regardless of the size or weight.

Heavy Equipment Standing Operating Procedures are as follows:

- ONLY PERSONNEL QUALIFIED BY THE CAPTAIN OR CHIEF ENGINEER SHALL OPERATE THE CRANE, A-FRAME, J FRAME, TRAWL WINCHES, CTD WINCH, OR ANCHOR WINDLASS.

- Before using any equipment, the operator shall visually inspect to ensure there are no deficiencies or irregularities with the equipment. If there are deficiencies, tag out the equipment using Lock Out/Tag Out (LOTO) procedures until the problem is corrected.
- The operator SHALL NOT engage in any activity that will divert their attention while operating any equipment.
- Ensure all personnel working on deck within range of the heavy equipment are wearing hard hats and other appropriate PPE for the evolution being conducted.
- The operator will respond only to signals from a person designated by the operator while operating deck equipment.
- The operator MUST obey a STOP signal at all times no matter who gives the signal.
- AT NO TIME WILL A LOAD BE MOVED OVER PEOPLE.

4.15.6. Record Keeping

The captain is responsible for maintaining a log of all load-handling gear tests in accordance with procedures outlined in this manual.

The chief engineer will maintain maintenance logs via the vessel's CMMS for overboarding equipment, excluding blocks and loose equipment.

The captain, or chief mate if so designated, will use the vessel's CMMS for logging and recording all testing of blocks and loose equipment.

4.16. Personal Protective Equipment (PPE)

4.16.1. Reference

- UNOLS Safety Training Manual (Chapter 1 of the RVSS)
- OSHA 3790 – Respiratory Protection
- OSHA Standard – 1910.134

4.16.2. Responsibilities

Each crew member or science party member is responsible for ensuring that they have the proper PPE to complete the operation they are tasked with, and that they are using that equipment properly. If that person does not have the appropriate PPE to complete a task, they are responsible for contacting the captain or chief scientist.

4.16.3. Procedures

- The captain will consult USCG requirements when determining what PPE is to be required for vessel operations. Ultimately, it will be the captain's decision to determine what PPE is required for a particular evolution on the vessel.
- The captain shall establish requirements to ensure workplace safety as conditions change. Required PPE standards may be waived in an extreme emergency requiring prompt action to save life, property, or to protect the environment.
- At sea, all personnel working on open decks or at any other time as required by the captain must wear approved personal flotation devices (PFDs).
- All personnel in the vicinity of vessel crane operations, including shore cranes, or under the A-Frame/ pedestal crane during operations must wear approved hard hats.
- All personnel going aloft (on the A frame) must wear safety harnesses. The captain may also require safety harnesses for individuals working over the side or working on open decks during inclement weather.
- All personnel in machinery spaces must wear approved ear protection while engines or other devices generating high noise levels are in service.
- Eye and face protection: All operations with bench or handheld grinders, chippers, or other tools that may cause eye hazards require eye or face protection. Eye protection may also be required in the science lab (inside the vessel) when working with chemicals. It is the responsibility of the chief scientist to make the determination and enforce the use of appropriate equipment when working with chemicals. Full-face protectors, if required, should be provided by the chief scientist for use in the science lab.
- Personnel utilizing the vessel's work boat must wear approved PFD's appropriate to the prevailing conditions, closed-toed footwear, and clothing sufficient for the

expected duration of the operation. At the discretion of the captain, exposure suits may be required when using the vessel's work boat in inclement weather.

- While responding to vessel emergencies and drills, all personnel must report to their muster area with their required survival gear.

Respirators shall be provided to the vessel's crew when required. Should a respirator be required, a fit test should be conducted per OSHA recommendations.

4.17. Confined Space Entry

4.17.1. Responsibility

It shall be the responsibility of the captain to ensure that the policies set forth in this procedure are followed. The captain may designate an individual to coordinate the proper training of personnel in confined space entry.

4.17.2. Definitions

Confined Space - A confined space is any poorly ventilated space that has limited entry and exit openings. Confined spaces are not necessarily designed for people; however, they are large enough for personnel to enter and perform certain jobs. Such spaces may lack sufficient oxygen to support life or may contain flammable liquids and explosive or toxic gases. The confined spaces on the R/V Pacific Storm include:

Space Name	Location
Lazarette	Stern
Potable Water Tank	Forward, mid ships
Fuel Tank	Port and starboard, fore and aft
Oil Tank	Port and starboard, fore and aft

Gas Free Certificate - A gas free certificate is a document issued by a Marine Chemist stating tests were conducted and the status of a space at the time of the test. The certificate will also indicate the type of work that is permitted in the space (Safe for Workers, Safe for Hot Work, etc.).

Marine Chemist - An individual recognized by the National Fire Protection Agency (NFPA) as qualified to test confined spaces and determine their condition with respect to oxygen sufficiency, explosive vapors, or toxic gases.

4.17.3. General

All confined spaces should be assumed to be dangerous until proven otherwise. Such spaces must be ventilated and tested prior to entry. Confined spaces must be tested for oxygen content and the presence of explosive gases prior to entry.

It is preferable to ventilate confined spaces using a portable blower. This portable blower should be explosion proof; however, if a non-explosion proof device is used to ventilate a confined

space, care must be used in setting up the device so that the vapors contained in the space are not drawn through the ventilating device. In general, fresh air should be supplied to the confined space through the blower and an alternate exhaust path should be provided to allow the vapors to exit the confined space and vent to the exterior of the vessel. Alternately, the blower can be used to draw vapors out of the space using portable ducting presuming there is sufficient ventilation to allow for fresh, “make up” air. The vapors from the confined space should be vented to the exterior of the vessel.

No one may access a confined space without the attendance of someone outside the space who is knowledgeable in identifying warning symptoms in the actions of those in the space and who can respond effectively in the event of an emergency.

When underway or in port (with the exception of shipyards or other contractor facilities), the individuals authorized to test the conditions of a confined space and certify the space as safe shall be the captain or the chief engineer. When in shipyards or other contractor facilities, the policies and procedures for the facility will be followed unless they are in direct contrast to the policies described in this document. In that case, the procedures in this document will be followed.

The verification of a certified marine chemist is required when performing hot work in any confined space.

4.18. Lock Out/Tag Out (LOTO) Procedures

4.18.1. References

- 29 CFR 1910.147

4.18.2. Responsibility

It shall be the responsibility of the captain to ensure that a lockout/tag out (LOTO) system is in place and is being used on the *R/V Pacific Storm*. It shall be the responsibility of the chief engineer to monitor the LOTO system and to maintain the log used to record LOTO activity.

4.18.3. General

Locking out and tagging out equipment, either when maintenance is being performed around certain equipment that presents a risk to personal safety, or when equipment becomes unsafe to use, provides a safe work practice that should safeguard life, property, and the environment from injury or damage.

The purpose of LOTO practices is intended to temporarily isolate an item of equipment, or system, from its energy source, from unintended operation, or dangerous contact with individuals. This is done so that inspection, maintenance, or repair actions can be performed safely. Lock out actions involve blocking a flow of energy. Typically, this is done by opening a circuit breaker, closing a valve, disconnecting a cable, or interrupting other similar power source. Tag out actions may involve installing a visual notice on an energy-isolating device to alert others of the shutdown condition. Such actions should establish a safety "zone" within the equipment and/or system(s) to reduce risk, contain possible dangers, and alert other individuals to potential safety hazards.

Primary hazards associated with a LOTO involve direct contact with a source of energy. A number of energy sources are found onboard vessels. These include, but are not limited to:

- Electricity
- Hydraulics (fluid power)
- Pneumatics (compressed air)
- Internal combustion engines
- Hot surfaces
- Falling objects

Particular events that may trigger a LOTO may be, but are not limited to:

- When performing maintenance, LOTO a piece of equipment that:
    - Stores energy

  - That if energized during maintenance may result in personal injury
  - That if energized may cause damage to the equipment
- When equipment or systems become excessively worn or damaged and are no longer safe or suitable for intended use, they should be taken out of service and/or tagged out of commission. The tag is a label or other means of alert placed on the equipment or on its control that warns others of the item's unsafe condition and that it should not be used.
-

Training on the LOTO policy will be conducted and logged on the vessels CMMS and will be conducted on an annual basis.

The LOTO policy and practices apply to all crew, vendors, shipyard workers, or any other person on board conducting maintenance or inspections of equipment when a risk exists regarding that work.

4.18.4. Procedures

- Tags, markings, or other labels should be distinguishable in their appearance. The tag is a label or other means of alert or attention placed on the machine, equipment, or device or on its control that warns others of the item's potentially unsafe condition. Tags, marking devices, or labels should be available onboard and may be produced on the boat if of appropriate fashion to be sufficiently conspicuous in marking a danger.
- Tags should be attached to the item so that it should not come loose, become separated, weathered, or be easily removed.
- Tag Out applies to all types of vessel equipment: permanent and portable. Items that may require periodic attention include, but are not limited to, the following:
  - Air operated tools
  - Electrically operated hand tools including drill motors, grinders, circular saws, etc.
  - Electrical appliances including heaters, fans or blowers, portable pumps, stoves, and microwave ovens, etc.
  - Light fixtures, especially high wattage spotlights or flood lights, drop lights, etc.
  - Electrically powered navigation equipment including radars, radios, fathometers, etc.
  - Electric motor driven pumps: bilge, fire, fuel, steering, etc.
  - Battery cables or electrical wiring, etc.
  - Electric motor driven deck winches, gears, chain drives, level -winds, pawls, etc.
  - Galley equipment, etc.
- Tags should be marked with "Do Not Operate" and should be attached to the item and/or its power source, when appropriate.

- Whenever vessel maintenance and repair are being conducted that requires LOTO, “upstream” energy sources that can present a hazard should be isolated. The sources should be disconnected, de-energized, depleted, or eliminated prior to working on the equipment. Actions necessary for these sources includes, but are not limited to:
    - Securing and tagging engine controls in the wheelhouse before allowing work to commence on propulsion or auxiliary engines, shaft, propeller, rudder, etc.
    - Turning off and tagging electrical sources and controls (circuit breakers and/or switches, batteries, capacitors) supplying radars, starters, radios, steering motors, spotlights, etc.
    - Securing and tagging appropriate hydraulic or electrical controls for a steering system component, winch, or power packs, etc.
    - Draining/bleeding off pressure in air receivers and securing electrical supply to the air compressor’s motor or other pressurized lines in the system to be opened, etc.
    - Securing valves as necessary to isolate fire, main engine, or bilge system piping (or securing the pump). Securing sea valves requires attention to maintain watertight integrity.

After an item has been repaired, and in preparation to return it to service, the energy source control should be unlocked, and the tag removed by the person who worked on the system or equipment.

The unauthorized removal of a LOTO tag or the energizing of a piece of equipment that has been assigned a LOTO tag, is cause for immediate discipline including immediate removal from the vessel or termination.

4.19. Flammable and Combustible Liquids

4.19.1. References

- 46 CFR 147.45

4.19.2. Definitions

- **Flammable Liquids** - are defined as any liquid which gives off flammable vapors (as determined by flashpoint from an open-cup tester, as used for test of burning oils) at or below a temperature of 80 °F (26.7 °C).
- **Combustible Liquids** - are defined as any liquid having a flash point at or above 140 °F (60 °C) and below 200 °F (93.4 °C).

4.19.3. Procedures

- Flammable or combustible liquids must be stowed in a designated, marked, and approved locker.
- No more than 19 liters (five gallons) of flammable liquids may be stowed in any machinery space. The flammable liquids must be in containers of 3.8 liters (one gallon) or less.
- No more than 208 liters (55 gallons) of combustible liquids may be stowed in any machinery space.
- Flammable/combustible materials brought on board by the science party will be secured appropriately in the science lab or on open decks, and the MSDS will be provided to the captain. Any excess of 7.6 liters (two gallons) must be stowed on open decks in a storage locker or area that is approved by the captain.
- Flammable and combustible liquids used as fuel for portable auxiliary equipment (such as an outboard motor) must be stored in:
    - Integral tanks that form part of the deployed vessel's structure
    - An independent approved storage locker or location
    - A portable approved outboard fuel tank. (To determine if a tank is approved reference the CFR of this section)
- Each portable container of flammable or combustible liquid used for portable auxiliary equipment must be stowed in a locker or an open location designated by the captain.
- Fuel tanks for portable auxiliary equipment using flammable or combustible liquids may only be refilled on a vessel:
    - By using an approved container which has a capacity not exceeding 23 liters (6 gallons)

- Portable containers or portable outboard fuel tanks may be refilled from a larger container of flammable or combustible liquid on the aft deck of the vessel provided that:

- A drip pan of adequate size or spoil pad is used to collect any drippings; and
- At least one USCG approved Type B, Size I, fire extinguisher is within three meters (9.75 feet) of the refilling location.

When refilling workboats on the aft deck that have integrated fuel tanks, spoil pads will be used to collect any drippings. Tanks will be filled to a volume that allows for an appropriate amount of expansion in warmer weather. Fueling of workboats with integrated fuel tanks will only be conducted under the supervision of the chief engineer or their designee.

4.20. Working Aloft

Working aloft or over the side means work that is performed at a height and involving a risk of falling, resulting in an injury. For the purpose of this section, the vessel's mast will not be considered part of the 'Working Aloft' policy.

4.20.1. Procedures

Under no circumstances shall crew members or personnel work aloft near exhausts that are actively discharging gasses.

- While working aloft all proper PPE and clothing appropriate for the task shall be donned and worn at all times.
- Personnel going aloft shall inspect all safety equipment. This safety equipment shall include, but not be limited to, safety harnesses, tethers with appropriate shackles or fastenings, work vests, ladders, and lines to secure ladders or staging.
- Personnel working aloft should ensure that the area is clear of any slipping hazard.
- Should the personnel be working close to, or over the side, a life buoy should be kept at the ready at all times.
- The captain should be notified when a person is going aloft and when the operations aloft have been completed.
- Unless in the case of an emergency and approved by the captain, personnel should not go aloft in inclement weather.
- The personnel working aloft shall be attended by another crew member during operations.
- Any tools being used while working aloft should be fixed to the person performing the maintenance using lanyards or raised and lowered in a device such as a bucket.
- Persons attending the personnel working aloft should remain at a safe distance from falling tools and special care should be taken to prevent the dropping of tools on the deck or equipment.

4.21. Hot Work

4.21.1. Definitions

Hot Work - Hot work includes, but is not limited to, any work requiring the use of electric arc or gas welding equipment, cutting burner equipment, or other forms of naked flame, as well as heating or spark-generating tools which are not certified for use in hazardous areas.

4.21.2. Procedures

No person on board should conduct any hot work without the proper training and certification appropriate for the job, and without notifying and receiving permission from both the captain and the chief engineer.

Hot work is not considered a part of routine maintenance, and unless deemed an emergency by the captain, shall only be conducted dockside, or if possible, in a shipyard. Proper ventilation shall be established prior to beginning hot work and a fire and safety watch shall be established (including the opposite side of a bulkhead) where a fire hazard may be present. Under no circumstance shall hot work be conducted on a deck or bulkhead that composes a part of a tank holding flammable or combustible materials.

The following procedures should be followed when conducting hot work:

- Ensure the space is well ventilated
- If flammable gasses are suspected, test before and during the hot work task
- Check that the immediate area is free from combustibles
- Check neighboring or connected areas (such as other side of bulkhead) or internal areas (such as inside a tank) that may be heat affected to make sure they are free from flammables and combustibles
- Bulkhead insulation may need to be removed
- If appropriate, use portable barriers or shields and warning signs
- Maintain a dedicated fire watch for both the immediate area and any potentially affected neighboring/connected areas throughout the full operation. Maintain the fire watch until otherwise directed by the captain or chief engineer.

- Proper use of PPE, such as welding mask, goggles, gloves, apron
- Make sure the welding and burning equipment is properly maintained and serviced.
- Welding and burning equipment must be checked by a competent person before every use. Check that the hoses, cables, and connections are in good condition.
- Check that flame arrestors are in place on both the oxygen and acetylene lines at both the torch and bottle ends.
- These policies shall be discussed with all outside vendors or shipyard representatives PRIOR to initiating any hot work.

4.22. Small Boat Operations

4.22.1. General

The vessel may carry one or more Rigid-Hulled Inflatable Boats (RHIB) secured to the open decks. These boats may be owned by MMI and provided at the request of the science party or owned by science party personnel. RHIBs are intended to be used in support of scientific objectives but may be used for other purposes as deemed appropriate by the captain.

4.22.2. Responsibility

Small boat operations are conducted at the direction of the captain. The captain or their designee shall confirm the required certifications of all small boat operators and oversee the training of these operators in *R/V Pacific Storm*-specific small boat procedures.

The chief engineer shall be responsible for engine maintenance of MMI-owned RHIBs in use on the *R/V Pacific Storm*, both periodic and planned, whether done on board or contracted to an outside source. Maintenance records shall be maintained on the vessel's CMMS and shall be the responsibility of the chief engineer.

The chief engineer will be responsible for the general overall boat maintenance and readiness condition of small boats in use on the *R/V Pacific Storm* including providing adequate quantities of fuel and proper inflation of pontoons. The captain will collaborate with the chief engineer as needed to address maintenance and repair issues.

The chief engineer or other person designated by the captain is in charge of the deck during launch and recovery of small boats. While a small boat is underway, the small boat operator is in command and responsible for the embarked personnel and safe operation of the small boat.

4.22.3. Procedures

The captain will determine which personnel will be qualified to use small boats based on the qualification procedures outlined in this manual. In some cases, personnel under training will be allowed to operate small boats under supervision of a trained operator. Special care must be exercised to keep loads to a minimum during all deployment operations so as not to overtax the lifting bridle or boat lift points.

The operator of the small boat shall ensure the following are addressed:

- The boat is in proper condition, adequately inflated and seaworthy
- The boat contains equipment as required by the USCG for the size motorboat being operated
    - The required equipment is kept in good condition, up to date, and ready for immediate use
    - A watertight boat box is provided for those items that must be kept dry
- A VHF radio is on board, fully charged, and tuned to the agreed upon frequency, is turned on, and is ready for use
- The boat is operated in a safe manner observing all applicable rules of the road
- The number of persons and gear does not exceed the manufacturer's weight limits and that the weight is evenly distributed for proper operation under the prevailing conditions
- A radio check is conducted prior to getting underway from the vessel, and regularly thereafter as agreed to by the bridge

The small boat operator will follow all special instructions given by the watch officer.

4.22.3.1. Launch/Recovery

RHIBs and other small boats will be launched and recovered off the stern through the vessel's A-frame or, for smaller boats, over the side using the vessel's crane. All personnel involved in the launching procedure shall wear hard hats. When required, tag lines are fair lead fore and aft with positive control using cleats or other securing points.

During launching or recovery, the operator of a load-handling device and any line handlers will follow the directions of the crew member in charge of the deck or other individual designated by the captain to lead the evolution.

In general, the procedure for launching RHIBs or other small boats is as follows but may be modified to suit the situation at hand:

- The small boat is raised from the deck, lifted over the rail, lowered to the loading position on the aft deck (if needed) and is secured.
- Gear may be loaded at this time.
- On signal, the small boat is swung out and lowered to the water. Once positively afloat, the operator boards the small boat and releases the crane hook, keeping the lifting bridle inside the boat.
- As the hook is being raised, the line handlers provide long leads fore and aft to keep the boat safely alongside.

- The boarding ladder is deployed over the side. Designated persons board the small boat and additional gear is passed down if needed.
- Once all hands are seated, the motor is running, and communications have been established with the bridge, the bridge will give permission for the small boat to get underway. Fore and aft lead lines will be passed to personnel in the small boat and secured.
- Upon recovery, the process is essentially reversed, the small boat is returned to the deck and secured as before.

Note: Once the small boat has been launched, the operator of the small boat is in charge and responsible for all persons aboard. All lines are to be safely secured inside the small boat.

4.22.4. Reporting

The watch officer on the *R/V Pacific Storm* will note in the vessel's log when small boats are launched and recovered. The watch officer will also log the confirmation that a pre-deployment check of the vessel was completed and by whom.

SECTION 5. EMERGENCY PREPAREDNESS

This section will outline the procedures used to respond to emergency situations, focusing on three subsections: drills, training, and safety inspections.

5.1. References

- Training and Drills, 46 CFR §199.180
- Operational readiness, maintenance, and inspection of lifesaving equipment, 46 CFR §199.190
- Shipboard Inspection and Testing of Immersion Suits, NVIC 01-08

5.2. Responsibilities

The responsibility of emergency preparedness rests with MMI leadership. It is their responsibility to ensure that adequate plans, in coordination with the captain of the vessel, are in place and personnel are adequately trained to deal with emergency situations.

The captain is responsible for ensuring that the vessel has the required equipment and supplies, in sufficient quantity, to be able to react decisively to an emergency on board. The captain is responsible for inspecting and maintaining vessel lifesaving and firefighting equipment and ensuring that vessel personnel are adequately trained to use such equipment for emergencies. The captain shall ensure that MMI leadership is notified of all emergencies.

It is the responsibility of the captain to ensure that a pollution response plan (PRP) is in place. Any changes to the PRP shall be documented and sent to MMI leadership for review and incorporation. Review of the PRP should be accomplished annually.

5.3. Procedures

5.3.1. Drills

As per 46 CFR §199.180, drills must, as far as practicable, be conducted as if there were an actual emergency.

Every crew member on board must participate in a minimum of at least one Abandon-Ship Drill, one Man-Overboard Drill, and one Fire Drill every month. Further, an Abandon-Ship Drill or Fire Drill for the crew and non-crew members on board must take place within 24 hours of the vessel leaving a port if more than 25 percent of the crew have not participated in abandon-ship and fire drills on board that vessel in the previous month.

Emergency drills shall be conducted under the direction of the captain as required by the USCG and other regulations. In addition, the captain shall evaluate the adequacy of vessel personnel to address emergency situations and shall conduct such training as deemed necessary to adequately train vessel personnel in various emergencies. After drills and the proper securing of drill equipment, the captain will hold a debrief with the crew to discuss the drill, lessons learned, safety precautions, and effectiveness of communications.

A drill schedule is established in the vessel's CMMS. The CMMS will prompt the crew when drills are scheduled, but that should not restrict the crew from conducting a drill when they recognize a need to comply with regulation or as an exercise to correct a near miss. In addition to the monthly emergency drills the following drills shall be conducted no less than annually:

- Collision/allision/grounding
- Flooding
- First aid/medical emergency
- Loss of steering
- Loss of power
- Line in propeller/rudder

When conducting the quarterly required PRP Onboard Emergency Procedure (OEP) Exercise, the following topics are required to be addressed at least once annually:

- Transfer system leak
- Tank overflows
- Suspected fuel tank or hull leak
- Stranding
- Grounding
- Collision
- Fire and explosion
- Hull failure
- Excessive list
- Equipment failure: main engine
- Use of anchors
- Emergency towing

5.3.2. Reporting

All drills will be documented in the vessel's log and on the CMMS.

5.4. Training

The following topics should be discussed quarterly during vessel meetings or in response to a Near Miss occurrence.

- Training topics should include, but not be limited to:
  - Lifesaving procedures and equipment
  - Firefighting procedures and equipment
  - LOTO procedures
  - Working aloft/divers in the water/overboarding equipment
  - Pre-deployment briefs (job safety analysis)
  - Security awareness
  - Fueling procedures/oil spill response
  - Food safety/handling and hygiene
  - Waste management
  - Anchor handling procedures
  - CMMS
  - Other training; at the captain's discretion topics may include:
    - Change in procedures
    - In response to an incident/near miss
    - Update in regulations, technologies, etc.
    - After a serious maritime industry investigation by the National Transportation Safety Board (NTSB)

5.4.1. Reporting

All training will be documented on the vessel's log and captured in the CMMS.

5.5. Safety Inspections

The captain shall ensure that safety equipment on the vessel is maintained in a ready condition and inspected regularly to adequately ensure its readiness.

Inspections for safety and firefighting equipment will be conducted and logged on the intervals defined by the CMMS. The following procedures should be followed when conducting an inspection of any safety or firefighting equipment.

5.5.1. First Aid

- **Automated External Defibrillator (AED)** – The AED should be inspected as per the owner's manual instructions and per the prompting on the vessel's CMMS at least once every month.
- **First Aid Kit** – An inventory of supplies should be conducted and logged in the CMMS once every three months, and new supplies ordered as necessary. This inventory includes taking stock of all the pre-packaged medications and medical supplies and ordering supplies that are running low.
- **Trauma Kit** –The trauma kit should be inspected, inventoried, and logged in the CMMS once every three months, and/or after each use. Inspection is for wear and damage to the kit or packaging, and supplies ordered as needed.

5.5.2. PPE

- **PPE** - PPE should be inspected prior to each use and is the personal responsibility of the user. Personnel will be trained on how to inspect and when to use PPE during the new crewmember safety orientation. Vessel equipment including issued eye or hearing protection and hard hats will be visually inspected for damage monthly.
- **Work Vests** – Work vests will be inspected for tears, damage, worn zippers or clips, and worn reflective material monthly.
- **Work Vest Lights** – Work Vest Lights have an expiration date will be visually inspected when the work vest is inspected each month and replaced as needed.

5.5.3. Safety

- **EPIRB/EPIRB Battery** – The EPIRB battery is inspected every two weeks as per the manufacturer's recommendation and in accordance with the Life Saving and Survival Equipment section (Section 4.11) of this manual. The EPIRB registration shall be kept current and on board the vessel.
- **EPIRB Hydrostatic Release** – The hydrostatic release should be inspected every two weeks for visual damage, and to ensure it has not been triggered. The expiration date should be verified. The expiration date is a hole punched into the month and year on the release itself.
- **Flares** – Flares are located in the cabinet in the science lab muster area. Their expiration date should be verified and an inventory and visual inspection for damage shall occur once a month.

- **Life Jackets** – As per the Life Saving and Survival Equipment section (Section 4.11) of this manual, an inventory of all life jackets should be conducted monthly to ensure there is a life jacket for each person on board. A visual inspection should be conducted every month to inspect for rips, tears, damage, missing fastenings, sound signaling device, and lights.
- **Life Jacket Lights** – The LED lights on the life jackets are equipped with Lithium AA batteries. The lights should be turned on every 3 months and should be replaced every five years.
- **Life Raft Hydrostatic Release** – The hydrostatic release on the life raft has an expiration date which is logged in the Safety Inspection Sheet, and should be replaced when the release expires
- **Life Raft** – The life rafts should be inspected monthly as per the Life Saving and Survival Equipment section (Section 4.11) of this manual. Life rafts should be inspected for signs of damage or wear. The hold down straps should be inspected as well as the fastenings and pelican hooks that hold the life raft down. The painter should also be inspected for visual wear, as well as the hydrostatic release. The life raft is required to be fully inspected by a certified inspector annually.
- **Life Rings, Throw Ropes, Strobes** – Life Rings should be inspected monthly as per the Life Saving and Survival Equipment section (Section 4.11) of this manual. The Life Rings should be inspected every month for signs of wear. They should be inspected for legibility of the vessel's name as well as for wear of the reflective material. The throw ropes should be inspected for serviceability, wear, and tears. The strobe lights should be held upright and tested for illumination. Any smoke release system shall be verified that they have not expired.
- **Immersion Suits** – Immersion Suits shall be inspected monthly as per NVIC 01-08, and as per the Life Saving and Survival Equipment section (Section 4.11) of this manual. In accordance with Coast Guard and manufacturer recommendations, immersion suits shall be air tested every three years. For suits that are over 10 years in age the suits should be air tested by a certified repair facility annually.

5.5.4. Fire Fighting

- **Fire Extinguishers** – The fire extinguishers should be inventoried and inspected monthly for evidence of having been tampered with, that the pull pins are intact, visual damage, and, in the case of dry chem and wet chem (K), that the extinguisher has a full charge. The Fire Extinguishers are professionally inspected by a third-party contractor once every year.
- **CO2 Bottles** – The CO2 bottle is inspected by a third-party inspector annually.
- **Fire Stations** – The fire stations should be inspected monthly for serviceability of the hoses, including wear and tear, that the nozzle is present and can be opened, that the

valve is not seized, and that the hose spanner wrench is present. The inspection should be logged on the inspection card with the inspector's initials.

- **Fire Pumps** – Fire pumps should be run monthly, the suction and discharge pressure should be recorded, and the pump and piping visually inspected for leaks or damage.
- **Bilge Alarms** – Bilge Alarms should be tested monthly by lifting the float and waiting for the alarm.
- **Damage Control Panel** – The damage control panel is inspected annually but should be tested monthly by pressing the Lamp Test button.
- **Smoke/Heat Alarms –** The smoke alarms should be tested monthly with batteries replaced no less than annually.
- **General Alarm –** The general alarm should be inspected prior to getting underway or at least once a month.
- **Ventilation Shut Off** - The ventilation shut offs for the engine room should be inspected prior to getting underway or once a month
- **Fuel Shutoff** – The fuel shutoffs should be inspected or tested monthly. This will be recorded in the CMMS.
- **Emergency Lighting** – The emergency lighting should be inspected monthly.

5.5.5. Reporting

All safety inventories and inspections shall be triggered and documented on the vessel's CMMS.

5.6. Man Overboard (MOB)

5.6.1. Purpose

The purpose of this procedure is to define the best practice for responding to a Man Overboard (MOB) situation.

5.6.2. References

- IMO Guide to Recovery Techniques

5.6.3. Responsibilities

It is the responsibility of MMI leadership to ensure that the vessel is equipped with appropriate lifesaving gear for retrieving a man in the water. It is also the responsibility of MMI leadership to ensure that the vessel is crewed with adequately trained and qualified persons to respond to all emergency situations, particularly a man overboard.

The captain shall develop a procedure for conducting an MOB rescue and recovery and shall be responsible for training and drills on that procedure to prepare all hands for emergency recovery actions in the event of a man overboard. The captain should assign Station Bill duties to the crew, as appropriate. They should ensure new crew members are given training as soon as possible upon joining the crew.

The captain or their designee should inspect lifesaving equipment such as life rings, strobe lights, throw lines, etc., in accordance with the Life Saving and Survival Equipment section (Section 4.11) of this manual.

The responsibilities of crew members and non-crew members during an MOB situation can be found on the vessel's Emergency Station Bill.

5.6.4. Procedure

In the event of an MOB situation, either if an individual witnesses a person fall overboard or it is determined that an individual is missing and may have fallen overboard, then the general alarm will be sounded and all persons shall report to their muster station as per the vessel's Station Bill.

As every MOB is situational it will be at the captain's discretion to determine the best means of rescue and recovery of a person in the water. At a minimum the following procedures will be followed by the captain:

- Should a person fall overboard and recovered without harm to their person or any other person then the event should be logged in the Deck Log and MMI leadership shall be notified.
- In the event of physical harm that cannot be treated by first aid, either to the victim or to a person aiding in recovery, the event should be logged in the deck log, MMI leadership notified, and the procedures for Marine Casualty and Incident Reporting shall be followed.
- In the event that an MOB is the result of a missing person the event should be logged in the Deck Log and the USCG and MMI leadership shall be notified.

5.6.5. Reporting

All MOB events for rescue and recovery shall be entered into the Deck Log. In the event that first aid has to be administered to the victim, or that the victim requires advanced medical care, the forms and procedures stated in the Medical Incident section (Section 5.11) of this manual shall be referenced and followed.

5.7. Abandon Ship

5.7.1. Purpose

The purpose of this procedure is to define the procedures for abandoning ship.

5.7.2. Responsibilities

It is the responsibility of MMI leadership to ensure that the vessel is equipped with appropriate survival equipment in the event that the vessel has to be abandoned. It is also the responsibility of MMI leadership to ensure that the vessel is crewed with adequately trained and qualified persons to respond to and direct scientific personnel to properly and safely abandon the vessel.

The captain is responsible and accountable for the training and drills to prepare all hands for the possibility of abandoning the vessel. The captain should inspect life rafts, flares, life jackets, survival suits, EPIRB, and any other emergency gear that may become necessary in the event that the vessel must be abandoned. These inspections and maintenance shall be in accordance with the Life Saving and Survival Equipment and Emergency Preparedness sections of this manual. The captain should assign Station Bill duties to the crew, as appropriate. They should ensure new crew members are given training as soon as possible upon joining the crew.

The responsibilities of crew members and non-crew members during an abandon ship situation can be found on the vessel's Emergency Station Bill.

5.7.3. Procedures

In the event that the captain of the vessel feels that it is necessary to Abandon Ship due to flooding, fire, or any other circumstance which would make the vessel unsafe to occupy, the captain will sound the general alarm. The alarm will be a continuous ringing of the internal alarm system.

The procedures for launching the life rafts are as follows:

- Should the captain still be capable of maneuvering the vessel they should maneuver the vessel so that the port side is the windward side, providing a lee by the starboard stern quarter where personnel can more easily board the life raft. If that is not possible the crew should attempt to launch the leeward life raft first.
- Check that one end of the painter of the raft is well secured to a strong point on vessel's deck or structure.
- Remove the lashing from the container of the raft.

- Check that the vessel side where the raft to be launched is clear.
- Two people should lift the container from both sides horizontally and throw the container.
- Make sure the painter is still fixed at a strong point so that the raft should not be carried away by the sea.
- Pull the painter with a hard jerk to fire the gas bottle and inflate the raft.
- The life raft will take 20-30 seconds to inflate.
- The crew will attempt to manipulate the length of the painter so that the raft sits just aft of the knuckle crane, or if on the port side then well aft of the stack.
- The crew and passengers will board from the aft deck, preferably from the starboard side aft of the superstructure. However, it may be necessary that personnel load from the port side. In which case they will have to climb over the bulwark rail and enter the water, then swim for the raft.
- Personnel will board directly by lowering themselves down the boarding ladder and jumping into the life raft, or they will board the life raft by jumping into the water one at a time and using rope ladder provided on the life raft.
- Avoid sharp objects like knives, shoes, and other sharp objects etc., which may damage the raft surface.
- When everybody is aboard the life raft and a head count is completed, cut the painter with a knife included in the life raft upon the captain's orders or if it is no longer safe to remain tethered to the vessel.

Should the situation be as such that the vessel is sinking so quickly that there is not enough time to properly launch the life rafts, then the Hydro-Static Release Unit will automatically launch the life raft. The following procedure should be followed:

- It is assumed that at this time all persons will be in the water, hopefully with their survival suits on. Persons in the water should swim to one another and use the tethers on the survival suits to connect to one another.
- Persons in the water should swim away from the vessel and watch for the surfacing life raft. Once the life rafts launch they will surface rapidly and could cause injury.
- The hydro-static release acts as a connecting point between life raft container and vessel deck, where it is stored.
    - The hydrostatic release comes into action under the pressure of water exerted on the unit when the vessel sinks below 4 m of water level.
    - The hydrostatic release consists of a sharp knife or chisel which is used to cut the strap lashed over the container carrying the life raft, but it still holds the painter at the weak link.
    - When the vessel sinks the hydrostatic release cuts the rope and the container floats to the surface of water.

    - As the vessel sinks further, the tension in the painter causes the life raft to inflate out of the container.
    - The tension acting on the weak link will cause it to break making the life raft free from the vessel, unless the vessel sinks in shallow water, in which case the life raft will remain secure to the vessel.
- Once the life raft surfaces it may be required to be righted. If available a trained crewmember will right the life raft by grabbing the righting strap and rocking the raft backward.
- The persons in the water can then board the life raft using the boarding ladder.
- A head count and inventory of survival supplies should be conducted.

The EPIRB also has a hydrostatic release and should float free. Should there be enough time the chief mate is responsible for manually collecting the EPIRB. If not, it will be the responsibility of all persons in the water, directed by the crew, to keep lookout for the EPIRB as it surfaces and collect it if possible.

5.8. Collisions/Allisions/Groundings

5.8.1. Purpose

The purpose of this procedure is to define the best practice of responding to a collision, allision, or grounding situation.

5.8.2. References

- 46 CFR 4.05-1
- Marine Casualty Reporting Instruction NVIC 01-15

5.8.3. Definitions

- **Unintended Grounding**- Interpreted as any situation where the vessel is unintentionally brought or placed on the ground, historically identified as being "ground" beneath the water line (e.g., sea floor, riverbed, silt, or rocks) except in circumstances where the grounding can be classified as a "bump and go" grounding.

- **"Bump and Go" Groundings** - groundings are occurrences where the involved vessel captain or licensed mate on watch attests that the grounding (including grounded barges under the control of a towing vessel) was only momentary (e.g., reversing engines frees the grounded vessel on the first attempt, no assist vessel is needed to free the vessel, all towing connections remain intact) and that the grounding did not result in any other marine casualty.

- **Unintended Strike (Allison)** – defined as contact with an affixed or stationary object under or above the water line. Contrast the definition of "allision" with the term "collision," which is contact between two or more moving vessels/objects. It does not matter whether the unintended strike (allision) resulted in any damage, pollution, or injuries.

- **Intended Grounding** – A grounding is considered "intended" if it is a controlled, intentional maneuver to, among other things, hold position to adjust cargo, offload passengers, and/or hold position to allow other traffic to safely transit.

- **Intended strike of bridge**– A strike (lay-up or landing) of a bridge is considered "intended" if it is a controlled, intentional maneuver to, among other things, assist, guide or walk a vessel through the bridge or hold position using the bridge or its protective fendering system. Due to the potential of compromising the integrity of the bridge or its protective systems, all intended strikes (allisions) that cause any damage, however minimal, shall be

reported to the local USCG Sector Command Center as a hazardous condition under 33 CFR 160.216. Strike (allision) with a bridge is in itself a reportable marine casualty.

5.8.4. Responsibilities

It is the responsibility of MMI leadership to maintain contract with a Third Party Qualified Individual (QI), Salvage and Marine Fire Fighting response company (SMFF), as well as an Oil Spill Response Organization. MMI leadership will serve as a point of contact to the QI and shall be the company representative in the event of a collision/allision/grounding situation that requires the services of a QI, salvor, or oil spill response.

It is the responsibility of MMI leadership to ensure that the vessel is equipped with appropriate damage control equipment in the event that the vessel's hull integrity is compromised. It is also the responsibility of MMI leadership to ensure that the vessel is crewed with adequately trained and qualified persons to respond to an emergency situation involving a collision/allision/grounding.

The captain is responsible for notifying the USCG and/or other agencies as required by state and federal regulations. The captain is responsible and accountable for the training and drills to prepare all hands for the possibility of a collision/allision/grounding situation. The captain should inspect the vessel's damage control kit, as well as any other equipment used in the event of compromised hull integrity. This may include, but is not limited to, oils spill response kit, medical trauma kit, dewatering pumps, firefighting equipment, etc. These inspections and maintenance shall be logged in the vessel's CMMS. The captain should assign Station Bill duties to the crew, as appropriate. They should ensure new crew members are given training as soon as possible upon joining the crew, per the Crew Orientation and Training subsections addressed elsewhere in this manual.

The responsibilities of crew members and non-crew members during a collision/allision/grounding situation can be found on the vessel's Station Bill.

5.8.5. General

As per the vessel's PRP any collision, allision, or grounding is reportable to the QI, who is represented by a third-party entity. The reporting procedures to the QI and important contacts for reporting are defined in the PRP.

Should the incident be of a non-reportable nature, such as a "bump and go", in which no known damage has been done to the vessel or other structure, the captain should communicate the event to MMI leadership.

5.8.6. Procedures

Should the collision, allision, or grounding be determined by the captain or mate on watch to be of the nature that could have in any way caused damage to the vessel or to another vessel or structure, then it may be determined that it is necessary to sound the general alarm. Should this be the case the general alarm should be sounded immediately. The responsibilities of the crew, in the event of collision, allision, or grounding are as follows:

In the event of an unintended collision or allision, the operator should:

- Sound the General Alarm.
- Muster all persons aboard the vessel and determine if any of those persons are injured or require medical assistance.
- At this time the chief engineer and chief mate will establish communications with the wheelhouse and will conduct a damage control survey of the hull and vessel structure to assess the damage. Should damage be identified, damage control measures should be initiated.
- The captain shall report the incident to MMI leadership.
- In accordance with 46 CFR 4.05-1 the captain shall then report the incident to the United States Coast Guard (USCG), following the reporting procedures in this manual.
- Should there be another vessel or structure with whom the vessel collided or allided, and given that the circumstances permit them, assistance should be rendered to the other parties involved in the incident.
- The captain should keep the vessel on the scene, should make the proper security calls to other concerned traffic, and should coordinate rescue and damage control efforts, including notifying nearby vessels and seeking assistance from them.
- As soon as the situation presents itself, all possible forms of documentation should be made, including gathering personal information of persons and other vessels involved, keeping a clear and accurate log of events, and taking pictures of the scene.

If the allision incident involves a bridge, dock, pier, or other similar fixed structure:

- If the structure is manned or monitored, immediately contact the Bridge tender, Dock Manager, or similar PIC of the structure, to advise of the incident. Immediately notify the USCG via fastest means.
- If unmanned, immediately notify the USCG via fastest means.
- Document the damage, including photographs, drawings, statements of witnesses and other pertinent information.
- In all incidents, promptly notify MMI leadership.

If the allision incident has involved an aid to navigation:

- Immediately notify the USCG via fastest means. Provide details of the buoy, day marker, etc., and of its status, e.g., sunk, adrift, dragged off station, tilted off station, etc.
- Document the damage, including photographs, drawings, statements of witnesses and other pertinent information.
- The captain shall report the incident to MMI leadership.
- In accordance with 46 CFR 4.05-1 the captain or MMI leadership shall then report the incident to the USCG, following the reporting procedures in this manual.

In the event of an unintended hard grounding:

- Alert crew members immediately by sounding the general alarm.
- Stop engines and the swing of the rudders.
- Inspect the vessel for hull damage; sound all tanks and hull compartments, bilges, inspect all accessible hull spaces, etc.
- Examine the rudder tube, fathomer transducer thru-hull and other through-hull fittings to determine whether there is any leakage.
- The captain shall report the incident to MMI leadership.
- In accordance with 46 CFR 4.05-1 the captain or MMI leadership shall then report the incident to the USCG, following the reporting procedures in this manual.
- Determine the state of the tide and current. Calculate the next high tide.
- As weather conditions permit, launch the small boat and use a boat hook, lead line, or a similar object to obtain soundings of the water on both sides, and at the stern -- as far aft behind the vessel as circumstances allow. To the extent possible, determine whether there is anything in the immediate area that might damage the rudder, propeller, or shaft.
- If the water depth is found to be adequate and there is no indication of obstruction to the propeller, a test of the propulsion system at dead slow speed for a short duration may be attempted.
    - During the test, station a man in the engine room to note levels of sound, vibration, and movement of the shaft.
- Determine whether the vessel is taking on water and, if so, initiate damage control measures such as using plugs, patches, shoring, pumping, etc.
- Determine whether the vessel is leaking oil and, if so, immediately initiate oil spill containment and notification/clean up measures in accordance with the Oil Spill Response Plan found in this manual.
- Should the vessel be determined to be hard aground, notify USCG of the incident.
- Depending upon any unsafe conditions posing harm to the crew, the vessel, or the environment, determine whether to wait for an assist vessel, wait for a change of tide with additional water depth, or to attempt to back off.

- NOTE: ATTEMPTING TO BACK OFF PRESENTS RISK OF DAMAGE TO THE RUDDERS, PROPELLERS, SHAFTS, AND OTHER UNDER HULL PROJECTIONS.
- If remaining in position is desired or if attempts to back off fail, anchor the boat, if possible, to prevent shifting or harder grounding due to wind, wave, current, or tidal action.
- Notify nearby vessels and request assistance, if necessary, prudent, and available. If necessary, request MMI leadership to arrange for commercial towing or salvage assistance.
- Document the event as thoroughly as possible.
- Promptly submit appropriate, and if required, USCG Form 2692.

5.9. Flooding

5.9.1. Purpose

The purpose of this procedure is to define the best practices for responding to flooding.

5.9.2. Responsibilities

It is the responsibility of MMI leadership to maintain contract with a Salvage and Marine Fire Fighting response company (SMFF) as well as an Oil Spill Response Organization (OSRO), to serve as a point of contact and responder in the event of a flooding situation.

It is the responsibility of MMI leadership, in close collaboration with the captain, to ensure that the vessel is equipped with appropriate damage control equipment in the event that the vessel's hull integrity is compromised. It is also the responsibility of MMI leadership to ensure that the vessel is crewed with adequately trained and qualified persons to respond to an emergency situation that results in flooding.

The captain is responsible and accountable for the training and drills to prepare all hands for the possibility of a flooding situation. The captain should inspect the vessel's damage control kit, as well as any other equipment used in the event of compromised hull integrity. These inspections and maintenance shall be logged in the vessel's CMMS. The captain should assign Station Bill duties to the crew, as appropriate. They should ensure new crew members are given training as soon as possible upon joining the crew, per the Crew Orientation and Training subsections addressed elsewhere in this manual.

The responsibilities of crew members and non-crew members during a flooding situation can be found on the vessel's Station Bill.

5.9.3. General

The R/V Pacific Storm is fitted with pumps which can serve as Fire Pumps, Bilge Pumps, and De-watering Pumps interchangeably. Should the need arise, the pumps can be brought online either through:

- A switch located opposite the engine room door (i.e., in the companion way)

In addition, an emergency dewatering pump is available for dewatering lower berthing and dry stores. This pump is operated from the same location as the Fire Pump control board in the

companionway. Should the need arise to de-water the vessel, the engineer should be responsible for energizing the dewatering pumps.

There are four suction ports located in separate areas in the engine room as well as a suction port located in the lazarette.

In addition, there are four High Water Alarms, which when triggered, will sound an alarm in the wheelhouse.

5.9.4. Procedures

Should a situation occur where the vessel is taking on water, then, at a minimum, the procedures to be followed should be:

- Upon discovery of flooding such as high bilge water, significant leaks, etc., immediately investigate for the possible source(s).
- The captain will at that time determine if the flooding is such that an emergency exists and will use their discretion as to whether they should sound the General Alarm and alert all others onboard of the situation. If there is any doubt as to whether or not the situation is an emergency, then the captain should sound the General Alarm regardless.
- Crew and non-crew should report to their assigned post in accordance with the Emergency Station Bill.
- The captain shall notify MMI leadership, who will notify the proper authorities and determine if it is necessary to activate the PRP.
- Begin dewatering.
    - Start the bilge pump and any other pumps that can take suction on the incoming water. Only pump bilge water directly overboard to prevent sinking. Avoid pumping oily waste directly overboard, if at all possible.
        - Should the flooding be able to be contained and the transfer of oily waste be transferred to an internal tank without affecting the vessel's stability, then such action should be taken.
        - The captain must authorize the pumping overboard of oily wastes in the event of emergency.
- As soon as possible, locate the source of flooding, assess the damage, and initiate damage control measures (utilize damage control kit).
- If flooding is deemed severe, uncontrolled, and/or progressive, then:
    - Initiate a "MAYDAY" emergency call on Channel 16.

    - The captain may determine it necessary to issue a Digital Selective Calling (DSC) distress call if they deem it necessary and immediate assistance is required from nearby vessels.
- If the vessel is in danger of sinking, determine whether the vessel can proceed to shallow water and be run aground. If so, steer for the shallow water, attempt to find a soft bottom to steer the vessel onto to minimize the risk of injury to the crew or damage to the hull.
- If flooding reaches a dangerous level or stability is compromised and danger of capsizing exists, prepare to abandon ship, following the Abandon Ship procedures found in this manual.

5.10. Fire Fighting

5.10.1. Purpose

The purpose of this procedure is to define the best practices for fighting a fire onboard the *R/V Pacific Storm*.

5.10.2. Responsibilities

It is the responsibility of MMI leadership to maintain a contract with a Salvage and Marine Fire Fighting response company (SMFF) as well as an Oil Spill Response Organization (OSRO), to serve as a point of contact and responder in the event of a situation in which a fire renders the vessel unsafe to operate or forcing an abandon ship situation.

It is the responsibility of MMI leadership to ensure that the vessel is equipped with appropriate firefighting equipment. It is also the responsibility of MMI leadership to ensure that the vessel is crewed with adequately trained and qualified persons to respond to an emergency situation involving a firefighting situation.

The captain is responsible and accountable for the training and drills to prepare all hands for the possibility of an onboard fire. The captain should inspect the firefighting and emergency response equipment as listed below and defined in the Emergency Preparedness section of this manual. These inspections and maintenance shall be logged in the vessel's CMMS. The captain should assign Station Bill duties to the crew, as appropriate. They should ensure new crew members are given training as soon as possible upon joining the crew, per the Crew Orientation and Training subsections addressed elsewhere in this manual.

The responsibilities of crew members and non-crew members during a firefighting situation can be found on the vessel's Station Bill.

5.10.3. Scope

In a firefighting situation, certain circumstances which cannot be foreseen may prevent the crew from responding to the emergency as per the instruction of this section. The procedures laid out in this section are not intended to be absolute or binding. The captain and crew shall, at all times, be able to deviate from these instructions should such deviation be necessary for the safety of persons on board and/or preservation of environment and the vessel. These procedures are intended to serve as a guideline for training, drilling, and best practices in case of emergency.

5.10.4. General

- **The Vessel Fire and Safety Plan (Research Vessel Operators Committee [RVOC] Safety Book):** Copies of the plan are located in the following locations on the vessel and will be reviewed no less than annually.
    - Wheelhouse
    - Science lab
    - Galley
    - Lower berthing

- **Fire Pumps/Switches/Stations:** The *R/V Pacific Storm* is fitted with two fire/bilge pumps. They are located:
    - Engine Room, Aft Bulkhead, both port and starboard of midships
    - The switches to activate the fire pumps are located:
        - In the companion way between science lab and galley

- **Portable Fire Extinguishers:** The *R/V Pacific Storm* is outfitted with 21 portable fire extinguishers. These extinguishers are located:

Location	Type
Wheelhouse	Dry Chem (10 lb)
	Co2 (15lb)
Galley	Dry Chem (10lb)
	Wet Chem (K)
Science Lab	Dry Chem (10lb)
	Co2 (15lb)
	Dry Powder (30lb)
	Dry Chem (10lb)
Second Deck P-way	Dry Chem (10lb)
ER	Co2 (15lb)
	Co2 (15lb)
Steering	Co2 (15lb)
Lower Berthing	Co2 (15lb)

- **Fixed Systems:**
    - **Engine Room:** The engine room is protected by a fixed CO2 system. The bottle is stored in a CO2 room on the main deck. The switch to activate the CO2 system is located in the companion way adjacent to the science lab.

- **Fuel Shutoff:** The fuel shutoff is located in the galley on the forward bulkhead.

- **Ventilation Engine Shutoff:** The main engine ventilation is wired to the CO2 system and will be activated when the system is triggered. The main engine can be shut down in the wheelhouse and galley**.**

- **Alarms:** The *R/V Pacific Storm* is equipped with an alarm panel located in the wheelhouse. All smoke and heat detection units are part of the system and will automatically trigger the alarm, should heat or smoke be detected.

- **"Point of Use" Smoke Detectors**: A number of "Point of Use" smoke/CO2 detectors are mounted throughout the vessel.

5.10.5. Procedures

5.10.5.1. Main Engine Room Fire

- If the fire is detected while working in the engine room and the person that detects the fire is confident that they can suppress the fire with available means, that person should make an attempt to:
    - Sound the alarm
    - Shut off the fuel source of the fire. Shutoff a fuel valve for a Class B fire. Shutoff the electrical circuit for a Class C fire.
    - Attempt to suppress the fire with the appropriate portable extinguisher
    - Should the fire be suppressed that person shall stand flashback watch until backup arrives.

- If the fire is detected by a person in the main engine space who does not have confidence that they can fight the fire, observes that the fire is spreading too quickly, threatens their ability to exit the space, or for any other reason feels unsafe, that person should immediately exit the space and close any doors/hatches or openings behind them to contain the spread of the fire, and sound the alarm.

- If the fire is detected by a heat or smoke alarm:

- All persons should immediately report to their muster stations as defined on the Station Bill.
- The captain will attempt to assess how large the fire is, where the fire is located, and what type of fire it is by using the CCTV system.
- The chief engineer and chief mate will establish communications with the wheelhouse if not already established.
- If the captain can with all certainty determine that the fire can be fought safely, and that it is a fire that is contained from spreading (i.e., oily rags in a metal trash can with no fuel or electrical wiring in close proximity), they may instruct the crew to fight the fire using portable extinguishers.
- Should the captain assess that the fire cannot be safely fought on scene or is in any doubt as to the size and containment of the fire, they may direct the engineer to fight the fire remotely. In this case:
  - The captain will have to decide if they should immediately implement CO2 procedures, which would result in losing all propulsion and power, or if for the safety of the crew the vessel needs to be maneuvered in a way that would position the vessel so that one casualty did not become a secondary casualty due to loss of propulsion (i.e., the fire is detected as the vessel is steaming under a bridge and the loss of power would result in an allision which could result in flooding).
  - Should the captain determine that the vessel is in a safe location for a loss of propulsion, the chief engineer will shut off the main engines, generators, and ventilation.
  - The captain will send a DSC Distress call and contact MMI leadership.
  - The Engineer will shut off the fuel from the remote shutoff switch located in the galley.
  - After shutting off the fuel, the chief engineer will stand by the CO2 remote release station.
  - The captain should at this time ensure that a muster of the vessel has occurred, and that all persons are accounted for. Once the captain has concluded that all persons are accounted for, they will order the chief engineer to charge the CO2 System.
  - ONCE THE CO2 SYSTEM IS ACTIVATED AN ALARM WILL SOUND CONTINUOUSLY, ALLOWING ANY PERSON IN THE ENGINE ROOM TO EVACUATE THE SPACE. FAILURE TO EVACUATE THE SPACE WILL RESULT IN THAT PERSONS DEATH.
- Meanwhile, the crew will roll out fire houses on the aft deck and prepare to use them to cool the deck plates, fight the fire by cooling adjacent

bulkheads if needed, and monitor for the spread of the fire through the overheads, ventilation, and wiring systems of the vessel.
    - Once the CO2 is released the chief engineer should begin a damage assessment, while also monitoring for the spread of the fire to other spaces.
    - Once the anchor is set, the crew will continue to set fire watches and monitor for signs that the fire has spread.
    - A full muster should be conducted.
    - All logs should be updated listing the steps taken to fight the fire.
    - The captain should prepare an incident report.
    - The crew should prepare for receiving assistance either from a tow, the USCG, or a fire boat.

5.10.5.2. Galley Fire

- Should a fire occur in the galley the following procedures should be followed:
    - If the fire is the result of overheated cooking oil, the first attempt to extinguish the fire should be to, if applicable, place a lid over the pot and smother the fire.
    - If the fire is on the range, the fire should be extinguished using the Wet Chemical (K) extinguisher.
    - Should the fire be in the oven, the fire should be extinguished using the Wet Chemical (K) extinguisher.
    - In any case, the heat source (range, microwave, toaster, etc.) should be turned off and power to it isolated.

5.10.5.3. Auxiliary Engineering Space Fire

- A fire in the auxiliary engineering space will most likely be the result of a Class B fire from the hydraulics, or a Class C fire from the power sources that power the bow thruster, reverse osmosis, water heater, or air compressor. There are also organic materials stored in the auxiliary engineering space which could be ignited, contributing to, or causing a fire. Should a person discover a fire, they should:
    - Sound the alarm.
    - Attempt to extinguish the fire using the local CO2 or Dry Chemical extinguisher, unless deemed that the fire is too large, or it is unsafe to attempt to extinguish the fire.
    - Should the fire be deemed unsafe to fight, the person should evacuate the space and close any doors or hatches.
- Should the heat or smoke alarm indicate a fire in the auxiliary engineering space:

- The General Alarm will sound, and all persons shall report to their muster station as per the Station Bill and a full muster should be initiated.
- The captain and/or chief engineer should attempt to determine what kind of fire, the size, and location using the CCTV system or verbal communications with crew members or scientists.
- All ventilation, including space vents located on exterior decks, should be closed off and secured in an attempt to smother the fire instead of fighting it directly.
- Fire Stations should be charged (by starting the fire pump) and hoses rolled out to adjacent spaces, including to the galley, mess, science lab, and lower berthing if necessary.
- Should the decks heat and off gassing of paint and decking begin to occur the decks should be cooled off with water.
- Dewatering equipment, if available, should be brought out to those spaces and charged.
- The captain will notify MMI leadership and a decision should be made as to whether or not the vessel can arrive to a port on her own power, or arrangements for a tow should be made.
- Once the vessel is safely secured an incident report should be written and filed to the USCG.

5.10.5.4. Main Space Fire

- Should a fire occur in the wheelhouse, crew berthing space, science lab space, storage space, or other crew accommodation space, the following precautions should be taken:
  - The General Alarm will sound, and all persons shall report to their muster station as per the Station Bill, and a full muster should be initiated.
  - The response to the fire should be in accordance with the class of the fire:

    - **Class A (Alpha Fire – combustible solids)** – an attempt to extinguish the fire using a portable extinguisher should be made. If not successful, charge the fire station, enter the space with a heavy fog, focusing the stream in the overhead, and, when the fire has been reduced, break up the organic material using a steady stream. A flashback fire watch should be established.

    - **Class B (Bravo Fire – flammable liquids)** – every attempt should be made to locate the source of the fire (i.e., fuel leak) and isolate the source. Once the source is isolated the fire should be fought using a CO2 extinguisher. If the fire is too big the area should be isolated

and the ventilation to the space closed off to smother the fire. Should the space have to be isolated, secondary cooling should be prepared in case it is needed and dewatering on standby. A flashback fire watch should be established.

- **Class C (Charlie Fire – live electrical current)** – A Class Charlie Fire is most likely to occur under the wheelhouse, the engineering spaces, in the overheads, or in an electrical panel, however, it could occur anywhere. Should a Class C fire be detected, the power source should be immediately isolated, and the fire fought using Dry Chemical or CO2 extinguisher. An inspection of the overheads and power sources should be conducted to detect the spread of the fire through the vessel's wiring system. Secondary cooling should be prepared in case it is needed and dewatering on standby. A flashback fire watch should be established.

- **Class D (Delta Fire – combustible metals)** – Should a Class D fire be detected extreme care must be taken. These fires are typically fueled by lithium or magnesium. The lithium battery policy in this document will provide additional procedures for addressing Class D fires. Science groups will be responsible for providing specialized extinguishing agents. Secondary cooling should be prepared in case it is needed and dewatering on standby. A flashback fire watch should be established. Any lithium or magnesium batteries that show signs of ignition or have actively started to burn will be removed from the vessel immediately upon discovery.

5.11. First Aid/CPR (Medical Incident)

5.11.1. Purpose

The purpose of this procedure is to establish a best practice for responding to a medical emergency.

5.11.2. Responsibilities

It is the responsibility of MMI leadership to ensure that the vessel is equipped with appropriate first aid and trauma response equipment. It is also the responsibility of MMI leadership to ensure that the vessel is crewed with adequately trained and qualified persons to respond to a medical emergency. MMI leadership will provide a system for reporting injuries, and corrective action if necessary.

The captain is responsible and accountable for the training and drills to prepare all hands for the possibility of a medical emergency. The captain should inspect and inventory the vessel's first aid equipment. These inspections and inventories shall be logged in the vessel's CMMS

The captain may designate a qualified vessel Medical Officer, who will be the PIC in the event of a medical casualty. This person may be delegated with maintaining the vessel's First Aid Box and Trauma Kit, as well as conduct training, but ultimately the responsibility still remains the captain's to maintain medical readiness on board the vessel.

The captain is also responsible for ensuring that accurate and updated records of the patient are kept. This may be delegated to another crew member or member of the science party if applicable. These records are extremely important when communicating to medical authorities. The captain is responsible for coordinating any medical evacuation from the vessel.

5.11.3. General

Medical emergencies can occur at any time, in any place, and be of any degree of urgency. It is important that the crew be prepared to meet the challenges of treating one or multiple persons aboard the vessel in case of an injury.

All crew sailing aboard the *R/V Pacific Storm* shall be trained and certified in Basic First Aid, AED, and Cardiopulmonary Resuscitation (CPR). These certifications shall be maintained at two-year intervals and be from USCG-approved courses. Medical drills shall be conducted on a routine basis as set forth by the Drills procedures in this manual and recorded on the CMMS. Further, a USCG-approved vessel medical care provider reference book shall be kept onboard in the trauma bag for easy access in case of emergency.

Should an injury occur that requires a medical evacuation, the captain will determine which means are the safest and quickest for transporting the person to the care of advanced medical providers and will coordinate with MMI leadership and with shoreside responders to safely transfer the patient. This may mean that the individual is transferred to medical care providers at the closest dock, onto another rescue vessel, or by means of a USCG airlift. Whichever the case, the captain will coordinate with the responders, communicating the operational restrictions given the patient, vessel, and environmental conditions, and will coordinate and cooperate with the responders to the best of their ability.

5.11.4. Reporting

Minor injuries are described as injuries that only require the most basic first aid such as disinfectant, band aids, gauzes, and ice treatment for small cuts and bruises. Any injuries above and beyond this should require prompt off-boat medical evaluation and treatment as quickly as possible following the accident.

MMI leadership should be promptly notified by the captain of all injuries, and what measures are/were taken to treat the injury. The injury and treatment should be logged in the deck log by the captain or watch officer in red ink. Reports required either by MMI leadership or USCG, should be filed following the Marine Casualty and Reporting procedures.

MMI leadership or the captain should notify the USCG and make a report for any injury that is not considered minor as defined above.

NOTE: INJURIES BEYOND MINOR WITH QUICKLY APPLIED FIRST AID TO TREATABLE INJURIES, AS SUGGESTED ABOVE, REQUIRE THE VICTIM TO RECEIVE PROMPT MEDICAL EVALUATION AT A MEDICAL TREATMENT CENTER. THE INJURED INDIVIDUAL DOES NOT HAVE THE OPTION TO CONTINUE TO WORK ONBOARD UNTIL THEY ARE EVALUATED BY COMPETENT MEDICAL AUTHORITY. THIS IS TO PREVENT WORSENING OF THE INJURY BY CONTINUED WORK. THE CAPTAIN IS EXPECTED TO USE PRUDENT JUDGMENT, BUT IF IN DOUBT, SEND THE VICTIM FOR MEDICAL EVALUATION AND/OR CONSULT WITH MARINE MAMMAL INSTITUTE LEADERSHIP AND OR SAFETY OFFICER IMMEDIATELY.

5.12. Loss of Steering

5.12.1. Purpose

The purpose of this procedure is to establish a response in the event of a loss of steering.

5.12.2. Reference

- 33 CFR 164.25

5.12.3. Responsibilities

It is the responsibility of the chief engineer to ensure that all personnel respond to Loss of Steering emergencies in a timely manner, and to have adequate instructions available to handle those emergencies. The captain is responsible for implementing these procedures.

5.12.4. General

The *R/V Pacific Storm* is equipped with a single steering pump to control the direction of the rudder. The steering pump can be activated from the wheelhouse.

Prior to getting underway an inspection of the steering system should be conducted in accordance with 33 CFR 164.25 and documented in the pre-sail checklists. A visual check to ensure that the rudder is swinging can be conducted using the installed CCTV camera.

5.12.5. Procedures

- Should the vessel lose steering but still have power, the first action to be taken should be to switch the mode of steering. If the vessel is on autopilot, the steering should be switched to hand-steering.
- A failure to bring the steering back online by switching either the mode of steering or the pump will result in immediately taking headway off the vessel and notifying the captain and chief engineer if they are currently not on watch.
- Without the use of the rudder the vessel can still be steered by using the directional thrust of the bow thruster which can control the direction of the bow.
- In extreme cases, for instance due to a loss of electrical power, none of the above methods may serve to bring the vessel under control of steering. Should this be the case then:
    - The General Alarm should be sounded

  - Every action should be taken to reduce the speed of the vessel, considering any navigational hazards such as wind, current, water depth, etc., that might create a hazard of hard grounding, collision, allision, etc.
  - Should it be necessary to navigate the vessel out of harm's way or to an appropriate anchorage, a survey of the engine room and steering compartment should be made using the CCTV, and if safe, the engineer should report to the steering compartment, with an internal communication radio, so that they can steer the vessel manually.
  - The anchor should be made ready to be let go.
  - When the captain has determined that the vessel is in a safe location for anchoring, the anchor should be dropped, and an anchor watch set while a survey of the steering system is conducted.
- MMI leadership should be notified by the captain, a survey of the steering system conducted, and appropriate action taken to correct the problem.
- The vessel shall not get underway again until the steering has been restored to the satisfaction of the captain and MMI leadership.

5.13. Loss of Power

5.13.1. Purpose

The purpose of this procedure is to establish a response in the event of a loss of power.

5.13.2. Responsibilities

It is the responsibility of the chief engineer to ensure that all engineering personnel respond to Loss of Power emergencies in a timely manner, and to have adequate instructions available to handle those emergencies. The captain is responsible for the bridge personnel and implementing these procedures.

5.13.3. General

A loss of power may constitute either a loss of propulsion due to a loss of the main engine, a loss of propulsion due to a failure in the gearbox or main hydraulic gear, or the loss of vessel's AC power supply due to a failure in the vessel's power generating system. This section will address preparedness for each of these potential vessel casualties and suggested responses from the operators.

5.13.4. Procedures

5.13.4.1. Loss of Main Engine Power

- Should the engine be operating and then suddenly come offline, the captain/watch officer should:
  - Immediately notify the chief engineer either by internal communication or the vessel's General Alarm. If the chief mate is on watch they should also notify the captain of the engineering casualty.
  - Bring the revolutions per minute (rpm) to idle and disengage the engine (if engaged).
  - Take into consideration any navigational hazards such as shoal water, narrow channels, shipping traffic, wind, currents, etc., and attempt, while operating without power, to use the remaining momentum and elements to as best as possible navigate to a safe anchorage.
  - Prepare the anchoring gear to be ready to be let go if needed.

- Should the main engine lose power, the captain/watch officer should:
  - Immediately notify the chief engineer either by internal communication or the vessel's General Alarm. If the chief mate is on watch they should also notify the captain of the engineering casualty.

- Take into consideration any navigational hazards such as shoal water, narrow channels, shipping traffic, wind, currents, etc., and attempt, while operating without power, to use the remaining momentum and elements to as best as possible navigate to a safe anchorage.
- If the engine cannot be immediately brought back on-line and the vessel is navigating in an area with any traffic, a navigational channel, or harbor/port, a security call should be made to alert other vessels of the loss of power and the AIS, day, and night signals should reflect that the vessel's navigational status is Not Under Command.
- The captain/chief mate should make ready the anchor gear to be let go, and as best as possible find an area for deploying the anchoring gear so to secure the vessel from drifting while attempting to bring the main engines back online.

- Should the vessel remain without power and the main engine cannot be immediately brought back online, the captain should:
  - Notify MMI leadership (when safe to do so).
  - If adrift, should make security calls notifying all other traffic of the vessel's status as a vessel Not Under Command (NUC):
    - If at night, burn the appropriate NUC light designation (2 all-around red mast lights).
    - If at day, display the appropriate NUC day shape designation (2 spherical shapes in a vertical line).
    - Should broadcast the NUC navigational status designation (02) on the AIS
  - Should the vessel be brought to anchor, the vessel should:
    - If at night, burn the all-around white anchor light, while extinguishing the running lights.
    - If during the day, display the single spherical day shape on the flag halyard.
    - Broadcast the AIS navigational status designation for a vessel at anchor (01)
  - Should the loss of power place the vessel in a situation of distress, the captain should broadcast a distress signal via the vessel's VHF radio, make a distress call to the USCG, and notify MMI leadership of the nature of the situation.

5.13.4.2. Loss of Bow Thruster

The bow thruster is a key component for maneuvering to and from the dock. The bow thruster is powered by a hydraulic motor. A loss of power from the main engine will not affect the operational capabilities of the bow thruster.

Should there be a loss of bow thruster:

- The captain should take into consideration any navigational or situational hazards and respond to those threats first and foremost.
- The captain should notify the chief engineer, and when appropriate, MMI leadership of the loss of bow thruster.
- If there is a loss of the bow thruster, the captain should cease any scientific operations and have the crew bring on board any gear that is over the side or in the water.
- If the loss of bow thruster occurs prior to entering port, the captain should:
    - Consider the weather, current, and maneuvering conditions of the port they are entering and determine if they feel that it is safe to proceed to the dock under the power of the propeller and the control of the rudder alone.
    - If the captain determines that it is not safe to maneuver into port, they may decide to either anchor or moor the vessel, or to call for an assist.

5.13.4.3. Loss of Generator Power

Although the loss of generator power constitutes a vessel emergency, the vessel is still equipped to navigate without the use of AC power. The chart plotter, AIS, GPS, autopilot, VHF, and navigational lights are all connected to the emergency backup power system. The vessel would still have the capability of utilizing the bow thruster.

Should power be lost to the system:

- Immediately notify the chief engineer via the internal communications system or the General Alarm. If the chief mate is on watch they should also notify the captain of the engineering casualty.
- All headway should be taken off the vessel, and the operator should take into consideration any navigational hazards such as shoal water, narrow channels, shipping traffic, wind, currents, etc., and if deemed necessary, should prepare the anchoring gear to be let go. If it is necessary to drop anchor:
    - If at night, burn the all-around white anchor light, while extinguishing the running lights.
    - If during the day, display the single spherical day shape on the flag halyard.

    - Broadcast the AIS navigational status designation for a vessel at anchor (01)
- If no hazards to navigation are determined to be present, the vessel may drift while the chief engineer troubleshoots the generator problem. While drifting the vessel should be considered to be NUC and should:
    - If at night, burn the appropriate NUC light designation (2 all-around red mast lights)
    - If at day, display the appropriate NUC day shape designation (2 spherical shapes in a vertical line)
    - Broadcast the NUC navigational status designation (02) on the AIS
- Should it be determined that the system is beyond repair at sea and a port is required and the vessel can still operate under its power, the captain may use their discretion as to whether they feel that it is safe to proceed under the emergency power system, utilizing the manual steering features. Should this be the case:
    - MMI leadership should be notified of the situation.
    - The chief engineer and one other crew member should go into the lazarette compartment and prepare to operate the steering manually by:
        - Opening the by-pass valve to eliminate hydraulic pressure and center the rudder
        - Closing by-pass valves to retain position of the rudder
    - Once the valves are aligned the chief engineer can communicate with the captain of the vessel through a communication system (hand-held radio).
    - The shaft of the rudder is labeled with degrees of rudder angle so that the chief engineer can control the steering starboard to port as required from the captain.
    - As the vessel nears a safe port the captain should decide if they feel that it is safe to enter the harbor and attempt docking the vessel given the loss of steering/bow thruster.
    - Should the captain feel that it is safe to dock they should arrange for extra line handlers to be present, as the crew will be shorthanded due to the occupation of the steering system.
    - Should the captain feel that it is too hazardous to navigate into the harbor, an assist tug should be arranged.

5.14. Line in the Rudder or Propeller

5.14.1. Purpose

The purpose of this procedure is to establish a response in the event of a line being caught in the rudder or wheel.

5.14.2. Responsibilities

It is the responsibility of the captain to conduct a Risk Assessment/Job Safety Analysis of the scientific operations to attempt to minimize the risk of having a line caught in the wheel or rudder. Further, it is the captain's responsibility to train any operators on how to avoid having a line caught in the wheel or rudder, or how to respond should it occur.

5.14.3. General

Due to the nature of the vessel's work, equipment may be operated off the stern, whether by means of towing, or through the use of the A-Frame. Given the design of the vessel, the rudder is located close to the stern bulkhead of the hull and, if not careful, lines can get caught around the shaft, or other protrusions (zincs) in the rudder. The vessel has no shaft brake and, as a result, even if the engine is out of gear, the blade may still spin slightly. Given these considerations it can be easy, if the operator is not careful, for the vessel to steam over a line or piece of equipment off the stern and have it become fouled.

As the *R/V Pacific Storm* operates in a variety of conditions with a variety of means in which materials can become caught in the propeller or rudder, it is difficult to develop any one set of response procedures. Regardless, there are some general guidelines to help the operator prepare to respond in the event that a line or object becomes fouled.

AT NO TIME WILL ANYONE ON THE VESSEL BE ALLOWED TO DIVE ON THE VESSEL WHILE IT IS AT SEA TO TRY TO EVALUATE THE SITUATION OR ATTEMPT TO REMOVE A FOULED LINE OR OBSTRUCTION. IN EXTRODINARY SITUATIONS WHERE PUTTING A PERSON IN THE WATER IS BEING CONSIDERED BY THE CAPTAIN, MARINE MAMMAL INSTITUTE LEADERSHIP MUST BE INFORMED AND PROVIDE APPROVAL BEFORE ANYONE GOES INTO THE WATER.

5.14.4. Procedures

5.14.4.1. Line Caught in the Rudder

- Should a line become caught in the rudder every precaution should be taken to prevent the line from becoming further caught in the propeller. Maintaining

slight forward propulsion helps create wash that will blow the line or gear away from the propeller.

- Given that the vessel is in safe waters and no navigational hazards exist, the engine can be disengaged, and the bow thruster can be engaged to help prevent the shaft and propeller from spinning. The crew can then work to free the line as best as possible
- If the line or gear cannot be freed by the crew, it may be necessary to return to port and to have a diver dive on the rudder to free the line. In this instance it is important that the operator has every confidence that the line has been secured in a way that it will not become further fouled in the propeller before engaging the engine and transiting towards the dock. Once alongside the dock and machinery has been secured, the main engines and steering should be tagged out, along with the fire pumps which may cause suction and potential harm to a diver. The Alpha flag should be flown indicating that a diver is below in the water.

5.14.4.2. Line Caught in the Wheel

- Should a line become entangled in the wheel the operator should:
  - Taking into consideration the safety of navigations, immediately stop the turn of the propeller by disengaging the engine.
  - Engage the bow thruster to maintain maneuverability.
  - Attempt using the bow thruster, boat hook, or grappling hook to pull the line taught, hook it, and bring it to the surface so that the line can be cut.
  - Once the line is cleared from any other gear or equipment, it is the responsibility of the captain to determine if the line has sufficiently been cleared from the wheel to operate the propeller, or if the vessel should return to port, or anchor, and receive the services of a diver.
  - Should a diver be employed in the removal of any line, the main engines, steering hydraulics, and fire/bilge pumps should be secured using LOTO protocols to keep from creating suction that could endanger the diver. The Alpha flag should be flown indicating that a diver is below in the water.

Appendix I. Departure Checklist

Machinery space and engine room:

1. Check main engine, generators, and hydro engine for proper oil level and coolant levels.
2. Turn on 32-, 24-, and 12-volts of direct current (VDC) battery banks in generator room.
3. Check that main engine controls are in neutral and at idle.
4. Check for proper alignment for fuel valves throughout the system.
5. Check potable water level in tank.
6. Start generators and hydraulic engine to ensure proper operation.
7. Start main engine to warm it up.
8. Switch load from shore power to generator and secure shore tie.

In Pilot House:

1. Energize direct current (DC) breakers for electronics.
2. Energize power steering.
3. Energize navigation lights and inspect for proper operations.
4. Turn on navigation computer and software.
5. Power up VHF radios, radars, and GPS's and check for proper operations.
6. Turn on Comnav auto pilot and check steering and rudder indicator.
7. Check proper operation of main engine throttle and shifter.
8. Confirm that pre-cruise safety briefing tour and demonstration has been completed.
9. Walk through vessel and decks to confirm everything is secure and ready to go to sea.
10. Confirm that all personnel are on board before departure.
11. Log departure checks complete.
12. Energize bow thruster, take in lines, and log departure.
13. Once underway and away from traffic, lower stabilizer poles.

Appendix II. Arrival Checklist

Prior to arrival in port and when still beyond the 3 nautical mile (nm) limit, pump black and gray water tanks. Unlock blackwater pump-out valve in generator machinery space and open valve inline. Turn on the pump to discharge black water. After pumping, close valve and relock in closed position.

The gray water pump switch is located on the aft bulkhead of the engine room on the gray water control panel. To discharge gray water, turn on pump and run until all Light-Emitting Diode (LED) lights on the panel turn off. Turn off the pump.

Before arriving to the dock, turn on hydraulic engine and engage bow thruster. Test thruster for proper operation.

After alongside dock, tied up, and securely moored

1. Log arrival.
2. Turn off bow thruster and secure hydraulic engine.
3. Turn off all electronics.
4. Shutdown navigation computer.
5. Shutdown power steering pump.
6. Secure all DC circuit breakers on wheelhouse panel.
7. Secure main engine after proper cool down time.
8. Connect shore power cable.
9. Chief engineer will transfer load to shore power and secure generator.
10. Chief engineer will secure all battery banks, with exception of one 12-V bank, and leave charger on trickle charge to keep the alarm system energized.
11. Check engine room bilges, shaft alley, and lazarette for any water or oil.
12. Clean up boat, wash down, and lock doors.
13. Visually inspect forward cutlass-bearing stuffing-box for running water, tighten packing rings if necessary to maintain water-tight integrity.

Appendix III. Lithium Battery Use Policy

Purpose

The purpose of this document is to outline the safe handling, usage, storage, disposal, and emergency procedures for lithium and lithium-ion batteries aboard the *R/V Pacific Storm* and to define related responsibilities for shore side staff, vessel crew, and science personnel. The chief scientist has the primary responsibility for ensuring safety procedures are followed and lithium sources are used safely aboard the vessel. Ultimate responsibility and control of lithium sources on the vessel still resides with the captain.

Additional information on the safe handling of lithium sources can be found in Chapter 9 of the UNOLS Research Vessel Safety Standards (RVSS) available on the UNOLS website.

Battery Types

Primary or Non-Rechargeable Metallic Lithium Cells
Primary lithium batteries feature high energy density and long shelf life. They are generally used for smoke alarms, LED lighting, and outdoor devices. They are not rechargeable and differ from lithium-ion (Li-ion) batteries by being constructed with metallic lithium. The metallic lithium in a non- rechargeable primary lithium battery is a combustible alkali metal that self-ignites at 352°F, and when exposed to water or seawater reacts exothermically and releases hydrogen.

Secondary or Rechargeable Lithium Ion Cells
Rechargeable secondary cells utilize lithium ions that are intercalated into graphite, lithium metal oxides, and or lithium salts. There is no metallic lithium in a Li-ion battery. Li-ion cells prefer partial discharge to deep discharge, so it's best to avoid completely discharging the battery. If the voltage of a Li-ion cell drops below a certain level, it's ruined. Since Li-ion chemistry does not have a "memory", you do not harm the battery pack with a partial discharge. These batteries do age and have a maximum shelf life of three years, even when unused. Avoid using or storing rechargeable Li-ion cells at elevated temperatures as heat degrades the batteries.

Because of the differences in the chemistries of the two types of Lithium batteries and the resulting differences in emergency procedures, non-rechargeable primary lithium batteries should be stored separately from rechargeable Li-ion batteries.

Responsibilities

Vessel Management

- Development and dissemination of appropriate guidelines and safety procedures for lithium and Li-ion batteries
- Provide vessel crew with necessary equipment and training for handling emergencies involving lithium and Li-ion batteries.
- Include appropriate information in pre-cruise forms.

Vessel Captain (or designee)

- Identify all lithium and Li-ion batteries stored on the vessel and brought aboard by science parties.
- Ensure MSDS's are provided by the chief scientist.
- Include lithium and Li-ion emergency procedures in drills and training (can be completed verbally before a cruise using lithium batteries).
- Provide science parties with lithium battery safe handling procedures that are specific to the vessel.
- Confirm with chief scientist and vessel crew on the type and size of batteries to be brought aboard through pre-cruise form or on-board meeting.
- Confirm with chief scientist on the location and procedures for charging the lithium batteries brought on board.
- Understand responsibilities during response to lithium battery emergency.

Handling and Usage Procedures

The primary hazard associated with both primary and secondary lithium batteries is short circuiting. Short circuiting allows current to follow an unintended path, potentially causing overheating, circuit damage, fire and/or explosion. Hazards can be minimized by following the guidelines below:

- As appropriate, wear safety glasses when handling batteries.
- When opening underwater housings that contain lithium battery sources, a pressure relief valve must be vented before the housing is opened. The vent must remain open when the housing is stored on the vessel or until re-deployed.
- Remove jewelry items such as rings, wristwatches, pendants, etc., that could come in contact with battery terminals.

- All dented cells or batteries with dented cells should be disposed of, regardless of electrolyte leakage. Denting of sides or ends of batteries increases the likelihood of developing an internal short circuit at a later time.
- Cover all metal work surfaces with an insulating material such as an anti-static mat. Work areas should be clean, dry, and free of sharp objects that could puncture the insulating sleeve on each cell.
- If cells are removed from their original packages for inspection, they should be
- arranged to preclude shorting. Do not stack or scatter the cells. They should be placed in non-conductive carrying trays with individual compartments for each cell.
- Cells should be transported in non-conductive trays. This will reduce the chances of cells being dropped, causing shorting or other physical damage.
- All inspection tools (including calipers, rulers, etc.) should be made from or covered with a non-conductive material.
- Measure the open circuit voltage (OCV) of the cell. The Nominal OCV for each
- cell's chemistry is printed on the cell label or the manufacturer's data sheet. An open circuit voltage of 0.0 volts may be indicative of a blown fuse. However, if no fuses are present in the circuit, 0.0 volts could be a result of complete discharge.
- After a cell has been inspected it should be returned to its original container, if possible.
- If leads or solder tabs need to be shortened, only cut one lead at a time. Cutting both leads at the same time can short the cell.
- Never touch a cell case directly with a hot soldering iron. When making battery packs, always use cells with factory solder tabs. Heat sinks should be used when soldering to the tabs and contact with the solder tabs should be limited to a few seconds.
- Cells should not be forced into battery holders or other types of housings. This could deform the bottom of the case causing an internal short circuit. Furthermore, the terminal cap could be crushed, putting pressure on the glass to metal seal. This could result in a cell venting. Check for proper fit before inserting the cells into any type of housing.
- Excessive force should not be used to free a cell or battery lodged inside a housing.
- Cells and/or batteries should not be exposed to high voltage AC sources or other DC power supplies that could result in subjecting the cells to unanticipated charging or forced discharging currents. Secondary cells should be charged only according to the cell or battery manufacturer's directions, particularly with respect to maximum applied voltage.

Storage

- Store cells in original containers away from combustible materials.

- Store cells in a ventilated, dry area within manufacturer recommended temperatures.
- Separate fresh and depleted cells, and limit the number kept in a single area.
- Make class D and ABC fire extinguishers available at the storage location as appropriate and recommended by relevant regulatory agencies and subject matter experts.
- Avoid crushing or puncturing by not stacking heavy objects on cell containers.

Disposal

- Disposal of all lithium and Li-ion batteries must be in accordance with all OSU, local, state, and federal regulations.
- Waste batteries should be stored inside a weather-proof location.
- Individual batteries or a container of batteries must be labeled:
  - “UGA Waste Battery” with a start date
- Large batteries should be stored on a pallet, out of the weather for disposal.
- Small batteries should be labeled and inside a container.

Appendix IV. Pre-cruise Safety Orientation Key Points

1. Stowage location of life preservers and immersion suits

2. Location and use of life rings and life rafts

3. Location of fire extinguishers, fire alarms, and fire suppression system

4. Work vests are available and are to be used when:
   - Outside the interior spaces of the vessel (on all decks)
   - Working from deployed small boats
   - Participating in fire and boat drills
   - Assisting in docking/undocking operations.

5. Hard hats are available and to be used when winches or the deck crane are being used.

6. Never place any equipment over the side without the permission of the captain and/or Watch Officer.

7. The sink in the science lab drains directly over the side. Do not put any chemicals or petroleum-based products down this drain.

8. At no time will any trash be disposed of at sea from the vessel unless it is in compliance with MARPOL 73/78 ANNEX V and with the captain's approval.

9. No sandals – closed toed shoes only, steel-toed safety shoes recommended.

10. Report accidents, illnesses, and injuries immediately to the captain.

11. No smoking or vaping on board the vessel unless in designated areas.

12. No drugs or alcohol on board the vessel.

13. No firearms on board the vessel

14. Any incident of harassment of any kind should be reported to the chief scientist, captain, and MMI as soon as possible.

15. When shifting from vessel power to shore power, there will be a short power outage to non-UPS protected outlets. The crew will make every effort to remind you of this outage but be aware that this loss of power will occur.

16. You will receive a vessel safety, fire, and man-overboard lecture immediately prior to your cruise. Please pay attention and feel free to ask pertinent questions at that time or anytime thereafter.

17. Talk to the captain/crew about any lithium batteries that are brought on board.