

R/V AHI Safety and Operations Manual



National Marine Fisheries Service
Pacific Islands Fisheries Science Center
Coral Reef Ecosystem Investigation

Purpose: This document was created to promote safe and standardized operations of the R/V AHI.

Authority: The R/V AHI is owned and operated by the Coral Reef Ecosystem Investigation (CREI) of the Pacific Islands Fisheries Science Center (PIFSC) in Honolulu, Hawaii. All operations shall be conducted according to the guidelines described within.

Intended Audience: All individuals involved with the daily operations of the AHI shall be familiar with this manual and shall adhere to the policies and procedures described within.

Acknowledgements: Many sections of this manual are based on the USCG Non-Standard Boat Operator's Handbook.

Record of Changes

Revision number	Date of change	Changed by	Summary of changes
1.0	24 Jul 2003	SF	Initial draft
1.1	25 Jul 2003	SF	Addition of Operational Record; edits throughout
1.2	15 Dec 2003	SF	Added AHI Iridium phone # to float plan
1.3	19 Apr 2005	JJ	Change GPS, life vest info, and added Maint sch.
1.4	13 July 2005	SF	Compressed images
1.5	23 Nov. 2005	JM	Added circuit breakers to check list

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Vessel description

The research vessel AHI (Acoustic Habitat Investigator) is a 25' aluminum-hulled vessel with enclosed cabin as shown in Figure 1. The R/V AHI was designed to transport personnel and survey electronics for seabed mapping surveys in the U.S. Pacific islands. The AHI was outfitted for daytime operations, either working in conjunction with a mother ship such as a NOAA research vessel, or for independent operations based out of small boat harbors in inhabited island groups.



Figure 1: R/V AHI profile drawing

For a vessel of this size, the AHI is designed to be very seaworthy. The hull is built of 5/16" aluminum with three buoyancy tanks integral to the hull. The boat is heavily constructed in order to withstand routine deployment and recovery from a mother ship via boat davits or ship's crane. A rigid foam collar provides redundant flotation and stability in rough waters as well as protecting the boat when coming alongside the mother ship. The enclosed cabin is air-conditioned and is designed to protect both passengers and survey electronics from the environment.

The AHI was specially built for high-resolution surveying of the seabed in depths from 5 to 200 meters. The hull and cabin house a 240 kHz RESON 8101 multibeam echosounder, a POS/MV position and orientation sensor (with two GPS antennas and an inertial measurement unit), and a small rack of survey electronics and computers. The boat can carry up to six people but typically operates with two or three people, including a coxswain and one or two surveyors. There is no enclosed berthing space. A portable toilet and a cooler for food and water are stored on deck.

Vessel particulars

- Vessel call sign: WTEQ
- Vessel number: NOAA F2505
- Hull color: Unpainted aluminum cabin and hull with orange foam collar
- Length overall: 25'
- Beam: 10'
- Draft: 3.3'
- Air draft: 8.7' w/life raft on cabin top
12.2' w/ VHF antenna up

- Weight in air: 9,500 lbs
- Weight on trailer: 11,700 lbs

Mechanical systems

The AHI has a planing hull with a deep-V construction (25° deadrise) and a maximum speed of 21 knots. The boat typically transits at 15 to 18 knots and surveys at 6 to 10 knots. A single fuel tank holds 100 gallons of diesel fuel. Actual fuel consumption figures haven't been developed at this time but the boat's range is conservatively estimated at 150 n mi.

The main engine is a 230 hp Volvo Penta KAD43 with dual propeller (DP-S) inboard/outboard drive. The main engine's fuel is delivered through two parallel Racor primary filters and a single Volvo secondary filter. A 3.5 kW Kohler marine generator powers the survey electronics and battery charger. The generator's fuel is delivered through separate primary and secondary filters. The survey electronics and cabin are cooled by an engine-driven air conditioner.

Electrical systems

Two 12 V marine, deep-cycle 55 A hr. batteries are charged by the main engine's 60 A alternator, the generator's 15 A alternator and a Guest 15 A three-stage battery charger. These batteries are separated to support engine and house loads but a battery combiner to automatically charges both batteries. 120 VAC is provided either by the generator or shore power. A 2200 watt uninterruptible power supply conditions power for the survey electronics.

Navigation lights conform to USCG Navigation Rules (COMDTINST M16672.2C) for motor vessels. Interior and exterior lights are available for day and night operations.

Deck equipment and ground tackle

- Light anchor: 7 lb Fortress FX-11 with 15' of 5/16" chain and 150' of 5/8" rode
- Heavy anchor: 50 lb Danforth-type with 100' of 5/16" chain and 100' of 3/4" rode
- Chafe protection: 20' old firehose
- Docklines: two 25' and two 15' three-strand 5/8"
- Fenders: two small and one large
- Utility line: 50' of 1" double braid and 600' of 5/8" double braid

Safety equipment

- Life raft: 4-man USCG-approved with SOLAS A-pack, cradle & hydrostatic release
- EPIRB: 406 MHz Cat I ID: ADCD0237E941801
- Life ring, type IV and buoyant cushion, type IV
- Six PFDs (6 type II auto inflatables) with whistles and lightsticks
- SOLAS flares (1 Mk 3 Parachute, 4 Mk 7 Red, 2 Mk 5 Orange Smoke)
- Fire extinguishers
 - Main cabin: 11 lb Holatron (A,B,C)
 - Engine compartment: 7 lb FE-241 with automatic & manual activation and engine shutoff

- Air horn
- First aid kit
- Handheld 12 VDC Searchlight
- Two Rule 500 GPH bilge pumps
- Carbon monoxide alarm
- Two paddles

Communications equipment

- Raymarine console-mounted VHF
- Horizon Handheld VHF
- Cellular phone
- Iridium satellite phone (emergency use only)

Navigation equipment

- Magnetic steering compass
- Binoculars with compass
- Handheld bearing compass and Weems plotter
- Paper charts of the operating area
- POS/MV survey-grade position and orientation system providing GPS-derived position, velocity and heading
- Raymarine 120LP console-mounted GPS
- Garmin 76Map handheld with external antennae
- RESON survey-grade 8101 240 kHz multibeam echosounder (400 m slant range)
- Raymarine L760+ dual frequency (200 and 50 kHz) echosounder
- Raymarine ST6001 autopilot with fluxgate compass
- Nobeltec Visual Navigator with digital charts

Chain of authority

As described in the NOAA Small Boat Policy, the following personnel are responsible for the safe operations of the R/V AHI. This vessel is designated as a Class I motorboat according to the Small Boat Policy.

- The NOAA Small Boat Program Coordinator is responsible for developing and maintaining the NOAA Small Boat Policy (NAO 217-103?) and to facilitate the implementation of this policy.
- The Pacific Islands Fisheries Science Center Director is responsible for all boat operations conducted at PIFSC and for developing a comprehensive policy that covers those operations.
- Chief of the Coral Reef Ecosystems Investigation: The chief of CREI has oversight of the overall scientific operations of the R/V AHI and for ensuring that operations are conducted safely and within the guidelines of the PIFSC vessel policy.
- PIFSC Small Boat Manager: The Center Director has delegated responsibility for small boat operations to the Small Boat Manager. The Small Boat Manager is responsible for the safe operation, inspection compliance, life cycle management and material condition of all of the PIFSC boats; for developing a vessel policy and/or

vessel operations manuals for the boats; for obtaining written guidance from the NOAA Small Boat Program during the development of the vessel policy and vessel operations manuals; and for assigning routine management and oversight of each boat to a responsible person.

- Captain: The captain of the R/V AHI, as the person primarily responsible for this vessel, has oversight of the daily operations of the vessel. This includes routine vessel maintenance, scheduling scientific operations, ensuring that all coxswains are appropriately trained and that operations are conducted in accordance with this manual.
- Coxswains: A list of individuals who are authorized to operate the AHI shall be maintained by the captain. These individuals are recommended by the captain and approved by the PIFSC Small Boat Manager. The captain or coxswain may temporarily allow another crewmember to operate the vessel but a designated coxswain must be onboard at all times and shall remain in charge of the vessel.

Safety procedures

Safety procedures include those which help ensure personal safety, that the vessel is being operated safely, and that should the vessel become disabled and overdue it will be reported promptly.

Personal safety

1. Personal floatation devices (PFDs) shall be worn at all times while underway. Personnel operating in the cabin should wear type II inflatable PFDs.
2. Closed-toed shoes shall be worn during deck operations.
3. Hardhats shall be worn when loading and unloading the vessel from the mother ship or when transferring equipment between the boat and the ship.
4. Personnel shall not leave the cabin or the after deck without permission of the coxswain. In particular, personnel shall not walk forward to the foredeck or step over the transom onto the boarding platforms while the boat is underway.
5. Hat, long pants and long-sleeved shirts shall be available should it be necessary to abandon ship.
6. All personnel shall be briefed in the following activities prior to departure:
 - Starting and stopping the main engine and generator,
 - Activation of fire extinguishers,
 - Manual deployment of EPIRB, and
 - Manual deployment of the life raft.

Operating parameters

Operating parameters of the R/V AHI include safe navigation practices, limitations on operational areas, matching vessel speed and trim to water conditions, planning fuel usage and identification of disabling casualties which prevent the vessel from being operated.

Safe navigation practices

All vessel actions shall be conducted in accordance with the USCG Navigation Rules (COMDTINST M16672.2C).

Limitations on operational areas

The vessel shall not be operated in the surf zone or in swells near surf breaks!

Coxswains must be aware of the danger of surf breaks. When operating in swells near shore care must be taken to avoid being “beam to” the seas. Because of the nature of the AHI’s survey equipment it is most natural to survey parallel to the surf break but should anything go wrong (e.g., engine failure or a large swell) the boat could be set into the surf break. Avoid the temptation to survey into these regions.

As a general rule, the vessel shall not be operated in less than ten feet (three meters) of water. If there is any swell running increase the safety margin by not operating in less than 15 feet (5 meters) of water. Recall that damaging the I/O drive can disable the vessel and that the sonar transducer costs \$235,000. In very calm conditions, it may be acceptable to navigate in water shallower than ten feet but it must be at idle speed and with great caution.

Although the AHI is very ruggedly designed it is not equipped to operate in the open ocean or in remote areas unattended. Operations in these areas shall not be undertaken without an escort vessel. Transits between islands or channel crossings may be undertaken unattended only if a written float plan has been filed that describes the transit, and the vessel is in communication with the shoreside person responsible for monitoring the float plan. At a minimum the shoreside contact must be informed of the time the vessel is entering the channel and estimated time the crossing will be completed. The shoreside contact must also be informed once the crossing is over.

Vessel speed and trim

A large number of small boat mishaps can be attributed to excessive speed. Generally, the coxswain will be the last person onboard to tire as he or she can instinctively adjust his or her stance and body position to the conditions. Speed is hard on the body and on equipment. The AHI is equipped with some very expensive equipment. You don’t want to be the coxswain that hurts someone or damages equipment because of excessive speed. As a crewmember, never hesitate to ask the coxswain to slow down or take up a more forgiving heading.

The trim of a planing-hulled vessel can have a significant impact on hull efficiency, engine performance and reduction of impact stress. Once the vessel is brought up on a plane the trim can be adjusted to reduce water contact (drag). The ideal trim angle is found by gradual manipulation of the trim controls in various sea states until the coxswain becomes acclimated to the hull’s response in a variety of conditions. The following are general guidelines for proper trimming of a planing vessel:

- Bring the boat onto a plane in fairly flat water and trim up (positive numbers on the trim display) to free the hull from the water and reduce drag. Trimming up (or out) raises the bow. If you trim up too far the bow will rise and begin to bounce.
- Trimming down (in) will tuck the outdrive closer against the transom. The boat will handle better when driving into waves but will slow down and create more spray.
- When properly trimmed, the controls will feel light to the touch, speed will increase and spray will be reduced. This is because less wetted surface area of the hull is in contact with the water.

Recall that the AHI has a large sonar on the keel (figure 1) and that this protrusion has a significant effect on vessel operation. When planing, the sonar remains in contact with the water and causes drag which reduces the hull's speed by at least ten knots over other vessels of this design. You will also notice a spray of water to be ejected out either side of the vessel. Trim still has a significant effect on the AHI's performance but it may not be as noticeable as with other boats.

Another effect of the sonar dome is that the AHI does not track straight at idle speed. The boat seems to pivot about its center so care must be taken when maneuvering alongside a dock.

Fuel level

The amount of fuel onboard the AHI is a critical limitation for any operation. When conducting routine operations the vessel should be fueled any time the fuel gauge indicates less than 5/8 full. The fuel tank is not rectangular; the lower half of the tank contains less fuel than the upper half. Proper mission planning should include completing the operation with at least 25 gallons of fuel remaining (3/8 on the gauge).

Disabling casualties

Disabling casualties are those which make the boat unserviceable. If a disabling casualty is identified when the AHI is moored, *the boat shall not get underway until the casualty is corrected*. The following is a list of disabling casualties:

- Engine fails to start.
- Engine overheats or is operating above normal temperature range.
- Engine controls (throttle & shift) are inoperable.
- Engine kill switch (motor safety lanyard) is inoperable or missing.
- Engine fails to shift into and out of gear (forward or reverse).
- Engine trim mechanism fails to operate.
- Engine and generator emergency alarms are inoperative.
- Any electrical arcing or sparking occurs.
- Battery boxes are not properly secured.
- Batteries are not covered or protected against accidental contact with other objects.
- Batteries will not charge.
- Steering system is inoperable or restricted (binding or less than full movement).
- Any fuel or lube oil leaks are dripping on a hot portion of the engine or generator.
- Magnetic steering compass is missing or inoperable.
- Both radios are inoperable.
- Both echosounders are inoperable.
- Either bilge pump is inoperable.
- Either cabin or engine compartment fire extinguisher are inoperable.
- Foam collar is loose, incomplete or otherwise not secure.
- Any hull breach or structural damage to hull or cabin.

Float plans

- Float plans will be filed any time the vessel is operated beyond the sea buoy of the harbor. A float plan form is included in Appendix A.

- Float plans must include, at a minimum, the vessel name, date & time of departure, intended destination or working area, estimated date and time of arrival, the names of persons onboard and the type of operation planned. The float plan will designate a person on shore who is responsible for determining whether the vessel is overdue and will initiate appropriate action as designated by the float plan.
- For operations that will take less than twelve (12) hours and will not require crossing a channel or otherwise operating in the open ocean, a verbal float plan may be filed.
- For operations that will take longer than twelve (12) hours, or will require crossing a channel or otherwise operating in the open ocean, a written float plan is required. This plan shall be accompanied by a tracking and communications procedure that requires the boat to report its position at least twice a day.
- Each person embarking on the vessel must have on file a list of emergency contact information. If contact information is not already on file, it may be added to the float plan.

Passengers

Passengers (non-mission critical personnel) may not be transported aboard the AHI unless approved by the Center Director or his designee. Such passengers may include members of the media, guests, VIPs or service organizations. Approvals will normally be granted when such actions are in the best interest of the Government; the boat is being used for official purposes; and the passengers will not interfere with normal operations.

The boat operator may authorize the boarding and carriage of passengers in emergency situations involving the protection of life at sea.

Operations records

- An operational record form shall be filled out each time the vessel gets underway. The objectives of the operational record are to guide the coxswain in assessing whether the weather, the personnel and the vessel and its equipment are able to safely conduct operations and to record the type of operation being conducted.
- Operational records are the primary means of recording the daily operations of the R/V AHI. The operational record consists of a departure checklist, a brief description of the times and type of operations, and an arrival checklist. Appendix B contains an operations record form.
- The operations record is not a scientific or a maintenance log; this information shall be recorded elsewhere.
- Any fueling operation, failure of the vessel's equipment or maintenance required while underway shall be recorded.

Accident Reporting

Any collision, unintentional grounding, injury to personnel, discharge of oil or fuel, extensive flooding of the vessel or damage to a protected or endangered natural resource shall be recorded in the Operations Record. Any such incident shall be reported immediately to the vessel's captain and the PIFSC Small Boat Manager.

Maintenance records

TASK	50 hrs	100 hrs	200 hrs	500 hrs	14 days	2 yrs	Pt #, grade, viscosity, and/or volume
Lube steering shaft bearings	X						
Engine oil and filter change		X					VDS-2SAE, 15W/40, 11.0 litre with filter change
Compressor check oil level		X					Oil part # 1141641-9, .1 dm ³
Air filter change		X					Volvo Part # 876185-0
Drive belt (check tension)		X					Volvo Part # 861564
Power steering belt (check tension)		X					Volvo Pt # 973487
Fuel filter/ Prefilter change		X					Volvo Part # 3588378/ Racor Part # 411298
Coolant change			X				20 Litres 50% H2O and 50 % Volvo Pt# 9434699-6
Exhaust pipe check			X				
Seawater pump (check impeller)			X				Volvo Pt # 877061
DP Drive oil change			X				API G 15, SAE 75W/90, PT # 1141634-4
DP Drive check joint and exhaust bellows			X				
DP Drive Re-tighten steering helm screws			X				
DP Drive belt change, compressor			X				
DP Drive belt change, circulation pump			X				Volvo Pt # 977542
Valve clearance adj.				X			0.40 mm (cold eng)
Turbo check				X			
Racor, drain water					X		
Drive belts check					X		
Sea water filter cleaning					X		
Battery, check electrolyte levels					X		
Drive, check corrosion protection					X		
Power trim pump, check oil level					X		Dexron-III (auto trans fluid)
Steering, check oil level					X		
DP Drive change universal joint						X	
DP Drive change exhaust bellows						X	

KAD 43 Volvo diesel engine with a DP I/O drive

Task	Daily	50 hrs 1 mo	100 hrs 3 mo	200 hrs 6 mo	400 hrs 12 mo	600 hrs 18 mo	Part #'s
Check for abnormal Fuel injection sound	X						
Check crankcase oil level and add oil as necessary	X						HD (API) CD,CC/CD,or CC: 10W/40: 1.25 qts
Check seawater outlet and clean as necessary	X						
Inspect the exhaust system components	X						
Check exhaust gas condition. If blue or black contact Mechanic	X						
Check for water, fuel, and oil leakage	X						
Retighten any loose nuts or bolts	X						
Check and tighten the electrical connections		X					
Remove the sediment from the fuel tank and drain the fuel tank			X				
Replace The oil in crankcase			X				
Check the anode			X				GM20853 (kohler)
Check the seawater pump seal and impeller			X				GM 20852 (Kohler)
Adjust the intake/exhaust valve clearance			X				
Replace the fuel filter				X			GM20850 (Kohler)
Clean the oil strainer				X			GM24013 (kohler)
Clean the intake silencer element				X			GM20848 (kohler)
Check the mounting bolts/vibromounts and tighten If necessary				X			
Check the fuel injection nozzles/check the injection spray condition					X		
Replace the seawater pump seal and impeller					X		
Replace the intake silencer element					X		
Inspect the complete exhaust system					X		
Clean the battery cables					X		
Check the remote control operation					X		
Blow dust out of the generator					X		
Clean the filter inserters of the fuel transfer pump						X	
Replace the anticorrosion zinc anode						X	

Kohler 4 EOZ diesel generator

Appendices

- A. Float Plan
- B. Emergency Contact Form
- C. Operational Record
- D. Preventive Maintenance Checklist

R/V AHI Float Plan



Call sign: WTEQ
 VHF base and handheld radios
 Hull number: NOAA F2505
 Hull color: Unpainted aluminum cabin & hull with orange foam collar
 Length overall: 25'
 Beam: 10'
 Draft: 3.3'

Engine: single 230 hp diesel w/ I/O drive

Fuel capacity: 100 gal

Transit speed: 15 – 18 kts

Operational speed: 6 – 10 kts

Safety equipment:

- Life raft: 4-man USCG-approved with SOLAS A-pack, cradle & hydrostatic release
- EPIRB: 406 MHz Cat I, ID: ADCD0237E941801
- Life ring, type IV and buoyant cushion, type IV
- Six PFDs (3type II inflatable vests, 3type III workvests) with whistles and lightsticks
- SOLAS flares (1 Mk 3 Parachute, 4 Mk 7 Red, 2 Mk 5 Orange Smoke)
- Fire extinguishers
 - Main cabin: 11 lb Holatron (A,B,C)
 - Engine compartment: 7 lb FE-241 with automatic & manual activation and engine shutoff

Cell phones: _____ Satellite phone: **8816 315 60389** (not kept on)

Departure location: _____

Date & time of departure: _____

Intended working area: _____

Type of operation: _____

Intended arrival location: _____

Estimated date & time of arrival: _____

Names of persons onboard: _____

Communications plan : _____

Boat problems or other notes: _____

Emergency Contact Form

Name: _____

Address: _____

Home phone: _____



Next of kin: _____

Relationship: _____

Address: _____

Home phone: _____

Work phone: _____



Other contact: _____

Relationship: _____

Address: _____

Home phone: _____

Work phone: _____

Operational Record

Date: _____ Coxswain: _____

Intended operating areas: _____

Intended transit distances: _____

Weather forecast: _____

Adverse Weather conditions? _____

Record fuel level: _____ (fraction of tank) Enough for work? Y / N

Persons on board: _____

Float plan filed? Y/N Responsible person ashore: _____

Departure Checklist done? Y / N Startup Checklist done? Y / N

Point of Departure: _____ Departure time: _____

Transit RPM & Speed: _____ Transit time: _____

Operating area: _____ Arrival time: _____

Operating RPM & Speed: _____ Time of departure: _____

Transit RPM & Speed: _____ Transit time: _____

Operating area: _____ Arrival time: _____

Operating RPM & Speed: _____ Time of departure: _____

Transit RPM & Speed: _____ Transit time: _____

Operating area: _____ Arrival time: _____

Operating RPM & Speed: _____ Time of departure: _____

Transit RPM & Speed: _____ Transit time: _____

Point of Arrival: _____ Arrival time: _____

Float plan closed? Y / N

Shutdown Checklist done? Y / N Arrival Checklist done? Y / N

Layup Checklist done? Y / N / NA Accident report required? Y / N

First Aid kit replenishment needed? Y / N _____

Equipment Problems? Y / N _____

Preventive Maintenance Needed? Y / N _____

Actions required prior to next departure: _____

Operational Record Checklists

Date: _____

Coxswain: _____

Departure Checklist

Daily:

- Check PFD activation cartridges
- Check Raymarine VHF radio
- Check handheld VHF radio
- Check cellular phone battery & signal
- Check Raymarine GPS position
- Check POS/MV position
- Check Raymarine echosounder
- Check RESON echosounder
- Check Raymarine autopilot
- Raise Antennas if needed
- Mount EPIRB if needed
- Store Food & water onboard

Weekly check (1st day of week)

- Inspect life raft & hydrostatic release
- Inspect Iridium satellite phone
- Inspect handheld GPS
- Inspect handheld Searchlight

Monthly or beginning of operation

- Check cabin fire ext. charge
- Check eng. fire ext. charge (use mirror!)
- Check first aid kit contents
- Check flares & smoke canisters
- Test Air horn
- Test EPIRB
- Check hand bearing compass
- Verify paper charts are onboard

Arrival Checklist

- Back up data
- Shutdown ISS-2000 computer
- Turn off RESON & POS/MV
- Turn off survey UPS
- Turn off Raymarine VHF
- Turn off Handheld VHF
- Turn off Chartplotter
- Turn off autopilot
- Clean cabin
- Stow EPIRB (if necessary)
- Stow antennas (if necessary)
- Cell phone off or ashore
- Secure Iridium phone
- Clean and wash down deck & cabin
- Clean cooler
- Take food ashore

Layup Checklist

- Stow EPIRB
- Stow antennas
- Check drive lube oil level
- Check zincs
- Flush generator with fresh water
- Flush engine with fresh water

Startup Checklist

- Record engine hours: _____
- Turn both battery switches on
- Turn on DC circuit breakers
- Inspect engine compartment.
- Look for leaks or dripping water
- Open generator & air conditioning seacocks
- Inspect Bilges:
 - Excessive water? Y / N
 - Oil in water? Y / N
- Check bilge pump operation
- Check engine oil level
- Check water coolant level
- Check steering hydraulic fluid
- Check trim motor hydraulic fluid
- Check engine raw water strainer
- Check air conditioning water strainer
- Check generator water strainer
- Check tension on all belts
- Record genset hours (on housing) _____
- Inspect generator.
- Check generator oil level
- Secure dockside power
- Start engine
- Air conditioning fan on
- Check engine and air con. water flow
- Start air conditioning
- Start generator
- Turn switch to "Generator"
- Turn on AC circuit breakers
- Check steering Center steering.
- Check I/O trim. Set trim to 0°
- Turn on UPS
- Start POS/MV & RESON
- Start ISS-2000 computer
- Is prestart maintenance required? Y / N

Maint. Actions: _____

Shutdown Checklist

- Trim I/O down to -4°
- Turn generator off
- Turn air cond. off
- Turn engine off
- Record engine hours
- Record fuel level
- Record generator hours
- Inspect generator
- Inspect engine compartment
- Inspect for leaks or dripping water
- Inspect bilges
- Inspect strainers
- Connect power cord (if necessary)
- Close seacocks closed (if necessary)
- Turn all circuit breakers off
- Turn both battery switches off