



Operational Guidelines

The following are meant as guidelines, not formal policy. Members of the Scientific Boating Safety Association may use relevant sections of this document, along with Section 5 of the *SBSA Boating Safety Manual* as a framework upon which they can develop specific guidelines or policy to meet local personnel and equipment resources as well as environmental conditions and project requirements.

Program contact information for the contributors to these guidelines is listed at the end of each section. More information, comments or requests for editable versions of these guidelines can be directed to the contributors or to the SBSA.

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CREW GUIDELINES AND RESPONSIBILITIES

A. **Boat Crew Duties & Responsibilities Introduction:**

Scientific boating crews perform operations that require specialized skills and knowledge. It is necessary that these skills be identified to ensure maximum safety and performance.

B. **Minimum Crew Requirements for Risk Management:**

Due to the often complex nature of scientific boat operations, vessels should be staffed by a minimum of two persons—an operator and at least one crew member. Inexperienced crew may not necessarily be qualified to act in either capacity without proper guidance and supervision. Exceptions to minimum crew staffing may be authorized by managers and/or supervisors of vessel operations.

1. **Vessel Operator (Captain):**

Authorized to operate a specific vessel type within designated areas under specific conditions. Key attributes: knowledge of local conditions, equipment being used and operational goals, effective leadership, crew coordination, situational awareness and risk management skills.

Responsibilities:

- a. safe conduct of crew members and scientific observers
- b. safe transport, operation and navigation of watercraft
- c. completion of timely cancellation of mission
- d. identify and report discrepancies and/or hazards
- e. comply with applicable laws, regulations and policies
- f. complete and submit required logs, documents and reports

Advanced training may be required for areas of hazardous operation, e.g., open or remote water, surf zones: reefs, bars & inlets, swift water & rapids, air boats, night operations.

2. **Vessel Crew Members:**

Authorized to perform boat duties under the supervision of the operator.

Must demonstrate and/or perform:

- a. communication skills
- b. lookout, helmsman, deck safety watch (e.g., anchor, tow, dive, etc.)
- c. rigging operations, damage control, safety and first aid
- d. corrective or preventative maintenance on vessel

3. **Trainee:**

Has been approved by OM to participate in boating operations under the supervision of a qualified operator to further develop their skills and knowledge for boat operations.

4. **Scientific Observer:**

Authorized to accompany scientific boat crews for the purposes of making specific observations of the studied environment, related biological or ecological species or observing specific scientific operations onboard the watercraft.

5. **Scientific Diver:**

Authorized for transport onboard scientific watercraft for the purposes of scientific diving as prescribed by the Diving Control Board and Diving Safety Manual. Scientific Divers may

also be authorized to perform duties of vessel captain or crew member in conjunction with dive operations during transit to and from dive sites.

C. Basic Performance Skills & Knowledge Requirements:

To be effective boat crews must have the knowledge and experience to foresee and prevent incidents. The following items are essential knowledge components and performance criteria to maximize crew safety and effectiveness.

Scientific Boat Operations & Safety Training Topics

Boat types, nomenclature, terminology and their performance characteristics:

1. Vessel stability, loading and limitations
2. Engine/propulsion types and performance characteristics
3. Boat and engine maintenance, troubleshooting and repair
4. Required and recommended equipment
5. Trailering and transporting small boats
6. Watertight integrity—flooding and damage control
7. Fire suppression and emergency procedures
8. Safety and survival procedures
9. Marlinspike and rigging
10. Deck operations (mission specific: dive, tow, trawl, anchor, etc.)
11. Lookout duties and responsibilities
12. Aids to navigation
13. Rules of the road
14. Navigation and piloting
15. Weather, tides and oceanographic forces
16. Docking and close quarter maneuvering
17. Persons and/or objects in water recovery
18. First aid for professionals training and emergency management procedures
19. Rendering assistance
20. Communications
21. Pre and post trip--corrective and preventative maintenance procedures
22. Documentation and administrative reporting procedures
23. Advanced operations (remote areas, night ops, surf, fast water, etc.)
24. Local area familiarization requirements
25. Lessons learned and common boating mishaps

Additional Training: Specifically *Crew Communication, Coordination & Risk Awareness* and *Risk Management Training* have been proven to enhance the safety and effectiveness of even the most seasoned boat crews. Ongoing proficiency training with basic boat operations increases member knowledge and the ongoing training practices for newly assigned team members and beginners.

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EMERGENCY PROCEDURES AT SEA

*See Appendix 4, Boating Emergency Management Procedures in
SBSA Boating Safety Manual*

Some emergencies require fast and correct action to save life and property. A good boat operator thinks through the required action ahead of time and periodically while underway to make action automatic. She/he makes sure that at least one other person aboard knows the action and boat operation in case the primary boat operator is rendered out of commission. The most important aspect of any emergency operation underway is clear communication between the vessel operator, crew and others involved.

The following may be used as guidance in the event of a previously unforeseen problem. Each situation is different and will require unique action based on the circumstances of that event. These are only suggestions and should be interpreted with sound logic and common sense to successfully overcome the unique nature of the emergency.

At the first indication of trouble or developing emergency always call for assistance. This can be to nearest US Coast Guard or local authorities on VHF channel 16, to another vessel or shore support by radio, cell phone or voice. The single most important information to get out is your location. This can be augmented with vessel description, number on board, what the emergency is and how it is being addressed as time allows. All persons on board should don pfd's, if not already being worn.

A. Foul Weather *(Also see Small Boating Weather, page 8)*

When wind and waves start to build or are immediately forecasted, determine their present and forecasted direction, then:

1. Call for help when you foresee losing control.
2. Locate the nearest cove or harbor protected from that wind and wave direction. If you are moored in it, stay there. If not, head for it.
3. Don life jackets and keep calm.
4. If the swell exhibits extremely steep or breaking waves, steer to take each wave 45° to one side of bow. Use only enough power to steer with control of the vessel, without pounding. Do not let bow get far off angle; waves may broach or roll boat. If propeller lifts out of water, throttle down to prevent "engine racing."
5. If shelter direction requires driving down hill in a following sea and control is difficult, a sea anchor or drogue may be deployed off transom.
6. If engine fails, immediately deploy sea anchor, bucket, anchor, shirt with knotted sleeves, or any other drag on a line and make fast to bow bit to hold bow into the waves and avoid broaching.

B. Capsize

Most small boats will still float with the outboard motor(s) attached.

1. Call for help.
2. Stay with the boat. It is easier to be seen by rescue personal than if separated from the boat and also provides your flotation. Swimming distances are always several times what they

seem from the water and require more energy.

3. Don life jackets.
4. Right the boat if possible. Get in and bail it out or use paddles and/or hands to get it closer to shore.

C. Fire

1. Call for help.
2. Throw burning materials overboard if possible.
3. Slow the boat to idle and change heading to keep fire and smoke downwind.
4. Don life jackets ASAP.
5. Turn off electricity.
6. If in or under upholstery or bedding, rip it out and jettison. If inside engine compartment, shut off fuel tanks and discharge fixed system if available.
7. Close all hatches, doors, ports and ventilators that will confine fire to the smallest space and reduce its oxygen supply. Don't open until extinguisher is ready to trigger and point.
8. Direct hand extinguisher at base of flames and sweep side to side. If heat and smoke prevent working close enough, lock the extinguisher on and throw it into the center of the area and close all openings around it.
9. Use buckets of water only on burning wood, cloth and upholstery. Never use water on fuel, oil or grease.

D. Submerged Object Struck

1. Stop engines instantly, drift and/or set anchor.
2. Open all floorboards and hatches and look for leaks. If water is rising, look around stern, propeller shaft or outdrive area.
3. For moderate leaks, use bilge pumps or hand bail with buckets.
4. If leaking badly, close a through-hull cooling-water intake valve, remove bottom of hose, cover with screen if possible, and use engine (in neutral) to pump bilge. Watch water level so that engine does not overheat for lack of water.
5. If leak can be reached, try an internal patch of something soft like cushion or clothing. Back up with a flat hard piece of wood or metal, shored and wedged.
6. If leak cannot be reached, get a sail, side curtain, plastic sheet, or boat cover over the OUTSIDE of the hull. Pull into place and hold by ropes to its corners, at least one of which must go under the keel to the far side.

7. If there is no serious leak, or it is under control, slowly try to get underway to nearest harbor with haul-out facilities.
8. If vibration is excessive due to bent shaft or propeller, stop engine and try to row or get a tow.

E. Grounded

1. Stop engine.
2. Check tide direction, bottom composition, direction, and proximity of deeper water.
3. Determine what part of boat is aground and whether there are any leaks. If leaking, see above section *Submerged Object Struck*.
4. To refloat a small boat, do not start the engine. Try shifting weight in the boat and push off with oars.
5. Alternatively, try taking anchor out and plant it in deeper water. Then pull and keep heavy strain holding boat bow/stern to sea and deeper water. Move all people and gear to the end opposite to that grounded. With continuous strain, it should come off in a rising tide.
6. If in soft sand or mud, suction on a flat wide hull may be broken by another boat making a good wake seaward of your anchor line. Do not run engine. Plug cooling water intakes.
7. If the tide is falling and you can't get the boat free in a few minutes, you are probably stuck until the next flood tide. Have a mattress, cushions, or other padding standing by to cover over any rocks against which it may pound.
8. If you are towed off, secure to more than one bit or cleat. For a very heavy expected pull, run bridle all around hull just below deck level.

F. Abandoning Ship

Before abandoning your boat due to fire, swamping, capsizing or other emergency:

1. Call for assistance, give your location
2. Don life jackets, immersion suits or other thermal protection (wet or dry suit) if available.
3. Call for help. Use visual or sound signal devices if help is close, but do not waste flares or other resources with little likelihood of being seen or heard. Wait for something to signal to.
4. Hoist a radar reflector or other piece of irregular shaped metallic piece as high as possible on the raft.
5. Before abandoning, tell your radio contact what channels you have available and agree upon one for direction finder homing. Then, lock or wire the microphone button down for continuous transmission. Activate EPIRB and bring with you.

6. Estimate distance to shore, which will be farther than it looks. See Life Expectancy table below. Consider the distance, water temperature, injuries, and swimming capabilities of all aboard before deciding whether anyone should try it.
7. Put mirrors, flashlight, dye markers, flares, matches and anything else potentially useful for attracting attention into one or more plastic bags and make a watertight closure by twisting and rubber banding. Take them with you along with fresh water.
8. Do not leave the area unless you are only minutes from shore. If surf conditions won't let you ashore, get back near the boat. A damaged boat can be sighted much more easily than people floating alone and it may help you to keep afloat. Many burned out hulls have floated indefinitely.

LIFE EXPECTANCY IN WATER WITHOUT THERMAL PROTECTION

| Water Temp. (°F) | Safe | Marginal | Lethal |
|-------------------------|-------------|-----------------|---------------|
| 65 | 4 h | >4h | - |
| 60 | 2 h | >2h | - |
| 55 | 72 min | >72 min | - |
| 50 | 50 min | - | >3.9h |
| 45 | 40 min | - | >2.7h |
| 40 | 30 min | - | >2h |
| 35 | 25 min | - | >1.5h |
| 30 | 15 min | - | >1.1h |

Data submitted by Eddie Kisfaludy, Scripps Institution of Oceanography, UCSD

G. Sinking

1. If bilge pumps, hand bailing, engine cooling jury rig, etc cannot keep up with a bad leak, lifeguard boats, harbor patrol and Coast Guard usually carry portable engine driven high volume pumps for use while waiting for a tow. Call for assistance.
2. It may be possible to haul the boat to shallow water at high tide:
 - a. Set anchor in deep water on your way into shore.
 - b. Land.
 - c. Drain or pump as the tide goes down.
 - d. Temporally stop and fix leak.
 - e. Float off at the next high tide if you have set anchor at water deep enough to help you off.
3. Small boats usually have enough flotation within the hull that they will not sink.

RENDERING ASSISTANCE (TBA)

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RECOMMENDED CREW OVERBOARD (COB) PROCEDURES **FOR BOATERS**

1. Shout “Man overboard!!!” and mark MOB position on the GPS or by visual fix. Call for help.
2. Begin throwing flotation objects overboard including type 4 PFD, to mark position and vessel track.
3. If there are others on board, instruct crew members to watch the person in the water and point continuously*. Consider “talk, reach, throw, row, go” options to recover the person.
4. Quickly stop the boat’s forward progress and reverse course by turning hard in the direction the person went over.
5. If you cannot see the person in the water or have any doubt about your ability to recover him/her, send a “Pan pan” call through Channel 16 on your VHF radio making sure to include GPS coordinates, or other information pinpointing your position
6. Determine the wind/current speed and direction.
7. The approach will vary depending on location, weather conditions and the type of boat. Under power, you can motor slowly towards the person in the water, aiming just to windward or leeward according to conditions and your best judgment. Call out to crew when the boat is in neutral (or engine turned off).
8. Provide the person with a flotation device and throw a line to pull the person along side the boat if needed. If unconscious, make a careful approach and grab the victim using a boat hook or other device. Take care to cause no additional injuries to victim or crew when getting the person back into the boat. The boat operator should never enter the water during a rescue.
9. Ensure the propeller is not turning when you are alongside the person in the water and turn the helm towards the person in the water.
10. Provide first aid and treat for hypothermia if needed. Send out an end of emergency situation call on VHF channel 16.

* The most important aspect of any emergency operation underway is clear communication between the vessel operator, crew and others involved. In a COB situation, the crew must keep the boat operator informed about the direction and distance of the person in the water from the boat, what equipment is available to assist in a recovery and the apparent condition of the COB.

The operator must warn the crew of any sudden changes in speed or direction, as well as how she/he will approach the COB, the method of bringing the person on board once alongside and when the vessel is in neutral or engine stopped. The operator should also make or direct a crew person to make an emergency call on the VHF radio. Vessel and crew safety, position relative to other hazards, traffic and conditions are also the responsibility of the operator.

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RECOMMENDED MISSING DIVER PROCEDURES FOR BOATERS

1. Call appropriate EMS--Coast Guard (Ch 16 VHF), 911 or other local EMS.
2. Drop an anchored buoy (anchor and life jacket or attach something to the kelp) or select the MOB (man overboard) button on the GPS at the last known location or the start point of the dive.
3. Note current direction at the time the diver was last seen. Drop a highly visible floating object with submerged portion attached to help note current direction and speed.
4. Recall other divers.
5. Note time: Start of dive and present time, depth of water. Attempt to determine when air supply should be depleted. Account for and question dive partner, noting anything unusual about the dive.
6. Briefly search for the diver and their bubbles within the dive area and down current while also looking towards the shore and/or any other area the diver may have sought refuge.
7. If unable to locate the missing diver, return to last known position. Prepare dive teams at marker buoy and await instructions from EMS.

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SMALL BOATING WEATHER

Storms and their associated wind and waves do not “come out of nowhere.” Whether it’s a light breeze or full-blown hurricane, weather phenomena have a definite life cycle that can be tracked and, in a general sense, predicted. Obtaining a good weather briefing is in the interest of safety. Every boat operator should develop a good “weather eye,” the ability to judge local weather conditions. It is the boat operator’s responsibility to ensure that all the needed information is obtained to make a safe voyage.

Local weather at sea does not commonly behave as what is more commonly encountered on land. Don’t go out when advisories or warnings are in effect unless adequate boating experience says you can handle the boat in forecasted conditions. If you’re already out, safety may require heading for safe refuge. If you’re in a harbor or cove that’s likely to be exposed (as nearly all are in some direction) get out and head for protected waters that you can reach in time.

Marine Forecasts

The [National Weather Service's Marine and Coastal Weather Services Branch](#) provides the most accurate general weather information relating to U.S. coast, coastal and offshore waters. [Local National Weather Service Forecast Offices](#) have regionally focused marine web pages that are overflowing with information such as local forecasts, predicted tides and buoy observations.

Swell Reports and Forecasts

The [Coastal Data Information Program](#) has comprehensive and accurate swell reporting and a forecast system for most locations. Specific local forecast models should be reviewed prior to boating.

Radio Reports

The NOAA Weather Radio system is a direct broadcast by the National Weather Service on the VHF-FM band.

The broadcast is a continuous cycle of individual products, providing a tailored weather information package for residents within the weather radio broadcast area. The product format varies with the time of day and with the season. A warning alarm is transmitted whenever severe weather, a national emergency, or other hazardous event requires rapid public warnings.

NOAA Weather Radio broadcasts can usually be heard approximately 50 miles from the antenna site, sometimes farther. The effective range depends on many factors, particularly the height of the broadcasting antenna, terrain, quality of the receiver, and type of receiving antenna.

Weather

A mariner needs to understand the interactions of temperature, pressure, and moisture, which will affect wind, swells, and rain. Even a basic understanding of these forces will make your trips safer.

Weather is affected by global and local forces. Globally, the sun beating on tropical oceans creates warm, moist air masses that rise and move toward the poles. Cold polar air masses move toward the equator to replace the warm air masses. Due to the rotation of the earth, the air masses do not travel in straight lines north and south. Rather, they curve their way in their migrations to and from the poles. Consequently, in the Northern Hemisphere, the predominant wind flows are west to east.

Air masses have characteristics depending on their origin. They can originate in either polar or tropical areas, and over continental or maritime regions. Polar air masses tend to be cool, where tropical air masses generally are quite warm and energetic. Maritime air masses are loaded with moisture, while continental air masses tend to be dry.

When air masses with different characteristics collide, a front is formed. The name of the front depends on the nature of the arriving air mass. An overtaking cold air mass forms a cold front and similarly, an overtaking warm air mass, a warm front.

Cold fronts move rapidly, anywhere from 10 to 50 kts. In winter they tend to move 2 to 3 times faster than they do in summer. They are usually preceded by altocumulus clouds (see [cloud classifications](#)), puffy white clouds at a middle altitude, up to 150 miles ahead of the front. These are followed by lowering and thickening nimbostratus, a low cloud with rain and wind. As the cold front sweeps along, it rapidly lifts the warm, moist air ahead of it, often 7 or 8 miles high. Frequently they are preceded by high winds that shift directions suddenly. A squall line may follow with heavy rains. After the front passes, the wind direction will shift abruptly clockwise, with continuous gusts, and the temperature will fall. The front is normally followed by some heavy rain, then by clearing and gusty winds from the west to northwest. Afterwards, expect several days of cool, clear weather with westerly winds,

Warm fronts act in a different way. They are preceded by high, thin cirrus clouds, up to 1000 miles ahead. The front advances slowly, with the clouds lowering and thickening. The wind picks up and as the front approaches, rain or snow starts falling. As the front passes, the winds shift clockwise and diminish, the temperature rises, and visibility is often poor. Behind the front are some stratus clouds and perhaps a little more rain. After the front has completely passed, the skies will clear and winds will normally come from the southwest. Frequently, a cold front will immediately follow a warm front, so the duration of good weather following a warm front is often quite short.

Weather is also influenced by local factors. West coast weather is dominated by the Pacific High, a high pressure area usually 1000 miles off the coast of California. The high builds strength during the summer, deflecting the storm track to the north, causing California's dry summers. During the winter, the high breaks down, allowing storms from the Gulf of Alaska into the west coast.

The Pacific High also affects the wind patterns along the coast. Winds sweeping clockwise from the high blow northwesterly along the coast, through breaks in the coastal range, to a low pressure system caused by warm temperatures, generally located in Nevada. Always be aware that high local winds can occur in the vicinity of coastal canyons where there are mountain ranges along the coast.

These northwesterlies occur in late spring and summer, diminishing in late September or early October. Their usual pattern is to start picking up around 11:30 am or 12:00 pm. They continue until 6:00 or 7:00 in the evening, often reversing with a gentle easterly or northerly around sunset. But it is not uncommon for the northwesterly to continue blowing until 1:00 or 2:00 in the morning during spring and early summer. These winds build up from 25 to 30 kts, generating wind swells to 8 feet. These are small craft advisory conditions and care should be taken not to be caught in them. The northwesterly always announces its arrival with a few gentle puffs. Within an hour, the wind will build to 15 kts and white caps will start to appear. The time to take decisive action is at the first appearance of northwesterly wind.

In the winter and spring, when the high is not so strong, the air flow will often reverse, causing strong easterlies near coastal canyons and valleys. These offshore breezes tend to die down in the afternoon. They are often stronger near shore, and dissipate in strength farther offshore (10 to 20 miles). Caution should be exercised with these easterlies. The distance they cross water (fetch) is short, so the wind waves they generate are close together. They can build up seas that are 3 feet high but very close together. The waves may also cross existing wave trains, making very choppy seas, with occasional waves much larger due to the additive effect of the opposing waves.

Fog

In the summer, coastal waters are frequently cooler than offshore waters due to upwelling. Thick layers of advection fog form inshore. Fog generally forms in the late night and early morning hours; however these

fog banks can swiftly move into a sunny area, blocking the sun and visibility to the shore. The fog will usually burn off by mid-morning or early afternoon, although if the marine layer is thick enough, it may persist for several days. When advection fog burns off, it is often accompanied by strong winds. Be especially careful along the edge of fog lines where the wind can suddenly increase by 15 or 20 knots.

Radiation fog occurs when moist air cools suddenly over land. This happens in the early evening, particularly as the maritime air blows early in late fall or winter. It can sweep out to sea, becoming very hazardous to mariners. Visibility is often limited to 10 to 20 feet. Sound is muffled and it is difficult to locate the direction from which it is coming. This fog layer is very shallow, often allowing visibility of the moon and stars. It will burn off as soon as the sun rises the next morning.

At first indication of growing fog while underway:

1. Establish boat position from still-visible buoys and landmarks; if none in sight, use GPS or dead reckoning.
2. Mark position on a chart or GPS.
3. Determine course to nearest safe landing.
4. Estimate time en route at reduced speed.
5. Hoist radar reflector (if available) before fog closes in.
6. In low visibility, hold speed down so that boat can be stopped dead within HALF the distance you can see.
7. Listen and watch continuously for other boats from a forward position of least engine noise.
8. Mark position whenever speed or course is changed, or at least every 15 minutes and recalculate time to arrive at landing.

Thunderstorms

A condition of importance to many mariners is a thunderstorm. Although many areas do not experience thunderstorms, the sudden high winds and lightning strikes can be frightening and fatal, especially on a boat. Thunderstorms develop from detached, puffy cumulus clouds. They rapidly transition into thunderheads with up to 40,000 feet of height and sharp vertical walls. At this point, the cloud will often form its characteristic anvil shape as the top of the cloud flattens horizontally. Static may be heard on AM radios. Hot, muggy, hazy afternoons are perfect weather for forming thunderheads, but haze may obscure their development. Be very careful whenever hot conditions and cloud cover might indicate thundershower activity. Violent winds and heavy rain often accompany a thundercloud. If you suspect that a thunderstorm might be forming, get off the water immediately. Don't wait to see lightning, as there is very little that can be done to protect yourself on the water. Get under cover as quickly as possible. Avoid passing under the base of any cloud.

The following lists of indicators can help predict local weather conditions.

Indicators of Deteriorating Weather

- Clouds lowering and thickening
- Clouds increasing in number, moving fast across the sky
- Veils or sheets of gray clouds increasing on the western horizon; clouds moving in different directions at different heights

- Clouds moving from east or northeast toward the south; barometer falling steadily or rapidly
- Static on the AM radio
- Strong wind in the morning

Indicators of Impending Precipitation

- Distant objects seem to stand above the horizon
- Sounds are very clear and heard for great distances
- Transparent, veil-like clouds thickening and lowering
- Increasing south wind, with clouds moving from the west
- Wind (especially north wind) shifts to west and then to south (backing wind)
- Steadily falling barometer
- Pale sunset
- Red sky at dawn
- No dew after a hot day

Indicators of Clearing Weather

- Cloud bases rise
- Wind shifts to west, especially from east through south; barometer rises quickly
- Gray early in the morning
- Morning fog or dew

Indicators of Continuing Fair Weather

- Early morning fog that clears
- Gentle wind from west or northwest
- Barometer steady or rising slightly
- Red sunset
- Bright moon and light breeze
- Heavy dew or frost
- Clear blue morning sky
- Dull hearing, short range of sound

The most important resource that a mariner has to deal with weather is the VHF weather broadcasts. Be sure to listen to the most up to date recording right before leaving on your trip. The information should help you access your local conditions and give you an idea of what to expect during your time on the water.

Conditions change rapidly and you are the best judge of what are acceptable conditions. Use caution in making your own predictions. Keep a weather eye out during the whole trip. Be aware of wind, sea, fog, and cloud conditions and the way they change.

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PADDLE CRAFT GUIDELINES

A. **Introduction:**

The operator is responsible for the carrying of necessary equipment and for the safety of the vessel at all times. The following guidelines are established to ensure that personnel are afforded the necessary training and equipment to safely and effectively perform paddle craft functions in a manner that minimizes risk.

B. **Risk Assessment:**

Due to the inherent nature of paddle craft activities and the high degree of exposure to the elements; hydrodynamic forces, hull type-performance characteristics, personal protective equipment, self rescue techniques, and methods for rendering assistance, these activities deserve a particularly high training emphasis.

C. **Recommended Training Objectives:**

1. Operators should complete an approved training course(s) as required by state boating laws including:
 - a. Local and institutional policy and guidelines
 - b. Paddle craft operation
 - c. Rescue and survival skills
2. Required and recommended equipment
3. Personal protective equipment (PPE)
4. Pre-trip equipment inspections and gear preparations
5. Trip notifications, float plan and emergency management plan.
6. Geographical influences, weather patterns, hydrodynamic forces and their effects on paddlecraft
7. Basic use of navigation and communication tools
8. Maintenance and field repairs
9. Accident reporting requirements

D. **Approved Training Courses:**

Paddle Craft training courses should consist of both knowledge based information and performance based skill training.

E. **Paddle Craft Skills and Stroke Mechanics:**

The following minimum skills should be demonstrated and practiced:

1. Body positioning and bracing mechanics
2. Loading and weight distribution
3. Launching and recovery techniques

4. Forward and reverse strokes
5. Draw stroke and sweep strokes
6. High, low, and skull braces
7. Recognized paddle and hand signals
8. Self-rescue, solo rescue and assisted rescue
9. Re-righting capsized vessel
10. Re-entering paddle craft from the water

F. Required and Recommended Equipment:

The following required safety gear must be carried aboard all paddle craft (excluding surfboards and sailboards):

1. Required Equipment

- a. Properly sized personal flotation device (PFD) for each person
- b. Oars or paddle(s)
- c. 15 ft line (minimum)
- d. Visual and audible signaling devices
- e. Drinking water and nutritional subsistence
- f. Boat plug and bailing device
- g. Kayak spray skirt and bladders as applicable for sit in craft

2. Recommended Equipment:

- a. Small anchor or sea anchor with line
- b. Dry bag
- c. First aid kit
- d. Visual distress signals (VDS, day and night)
- e. Handheld VHF radio (waterproof design and/or in a waterproof pouch)
- f. EPIRB or personal locator device
- g. Chem-light sticks (minimum of 3)
- h. Waterproof flashlight, headlamp and/or strobe
- i. Local marine chart
- j. Handheld GPS
- k. Deck-mounted or handheld compass (with lanyard)
- l. Knife
- m. Cell phone

G. Personal Protective Equipment (PPE):

1. PFD or paddle jacket
2. Clothing: waterproof or water resistant with appropriate thermal protection

3. Wet suit/dry suit or paddle jacket and pants
4. Hat or stocking cap, helmet for advanced or hazardous operations
5. Gloves and booties
6. Sunglasses
7. Sunscreen and lip balm
8. Post-trip bag: towel and change of clothes (optional)

H. Pre-trip Equipment Inspections and Gear Preparations:

Pre-trip equipment inspections and individual gear preparations are essential. Each person shall be outfitted with the proper equipment that is in good and serviceable condition. Each operator assumes responsibility for the condition of the equipment and should report any deficiencies prior to its use, or at the earliest opportunity during and/or after use.

Defective or damaged equipment should be removed from service at the earliest opportunity and labeled as non-serviceable to prevent the item from being reintroduced into service. Post-trip maintenance and inspections should be performed prior to placing the equipment back into service.

I. Vessel and Equipment Inspection Criteria:

1. Clean and stowed properly, free of dirt and/or corrosion
2. No cracks, severe stress fractures or excessive wear
3. Watertight compartments / bags / boxes (gaskets and edges seal properly)
4. Emergency and First Aid kits are sufficiently stocked
5. Electronics are protected and functioning properly (plenty of spare charged batteries)
6. Bladders, when applicable, are leak free

J. Trip Notifications, Float Plans and Emergency Management Plan:

The operator, guide or group leader is responsible for making the proper trip notifications and obtaining necessary permits or permission for certain bodies of water. It is imperative that each outing have a specific "Float Plan" filed with a shore-based contact that will notify the appropriate individuals and/or authorities should the individual or group not return or check in within a prescribed time frame. (*See Float Plan, SBSA Boating Safety Manual, Appendix 2*)

Should an incident arise, the operator, guide or group leader is responsible for having an "Emergency Management Plan" established and communicated to the shore-based contact and the group when applicable. (*See Boating Emergency Management Plan, Boating Safety Manual Appendix 4 & section "Emergency Procedures Underway", page 3*)

K. Geographical Influences, Weather Patterns and Hydrodynamic Forces:

Before the trip study the areas of operation to gain an understanding of the effects of geographical and weather influences. Be aware the conditions may change and be prepared.

Boaters need to understand the different environmental forces that influence paddle craft, as well as the distinct advantages and disadvantages of different hull types in specific conditions. (*See section "Small Boating Weather," page 8*)

1. Geographical Influences to Observe:

- River class, characteristics and flow patterns
- River waves, eddies, hole strainers, chutes and rapids
- River mouths, obstructions, breaking surf, tidal ranges
- Open water, bays, coastal wave patterns
- Bottom depths, influences, rocks and sand bars
- Aquatic animals and plant hazards
- Vessel traffic, activities and patterns for specific areas
- Dam and reservoir, hazard areas
- Put in and pull out sites, alternate sites
- Shelter, safe routes and areas protected from extreme conditions

2. Weather Patterns to Forecast and Observe:

- Analyze present conditions, 12 hour and 24 hour forecast.
- Predominant seasonal weather flow
- Alternate weather patterns
- River current velocity
- Wave height and swell period
- Wind direction and velocity
- Rain and visibility forecast
- Air and water temperatures
- Tidal forecast
- Times for sunset and sunrise
- Cloud behavior and storm warnings
- VHF-FM Channel 1-10 NOAA WX radio

L. Sources of Information

1. NOAA National Weather Service
2. U.S. Coast Guard, Park Services, local Harbormaster and marinas
3. Local news, television and AM/FM radio broadcasts
4. Physical observations

M. Guidelines for Trip Alterations, Cancellation or Termination

The operator should consider the following guidelines regarding weather and take appropriate action.

1. Winds greater than 15 kts are predicted for the area of operation, extra caution in the form of frequent reevaluation of trip conditions shall be exercised.
2. Wave swell heights are predicted to increase beyond 6 ft with more than 2 ft of surface chop and intervals fall below 8 sec.
3. Trips should be canceled due to weather if:
 - a. Winds are greater than 15 kts and wind chop greater than 2 ft
 - b. Small craft advisories are posted or displayed
 - c. River flows are expected to rise near flood stage
 - d. Excessive runoff from storms is expected
 - e. High surf advisories and swell conditions above 4 ft
 - f. Visibility falls below ½ nautical mile

N. Hydrodynamic forces and specific hull types

Paddlecraft have hull types specific to the environment / conditions they are to be used in.

1. Calm Water
 - a. utility row boat or dinghy
 - b. rowing skulls / shells
 - c. canoes
2. Calm to Moderate Water
 - a. inflatable raft
3. Calm and Moderate to Big Water (avoid extreme conditions)
 - a. Ocean kayak
4. Calm to Extreme Water
 - a. Whitewater kayak
 - b. Whitewater raft
5. Calm to Extreme Breaking Surf
 - a. Surf kayak

O. Basic Use of Navigation and Communication Tools:

Each operator should be trained in the use of nautical charts, lake and river maps for the area of operation, as well as the ability to use a handheld or deck-mounted compass. The use of a portable GPS unit is recommended to supplement core navigation skills and increase navigational efficiency.

In addition, the proper use of a VHF / FM handheld radio for weather monitoring, advisory broadcasts, routine and emergency communications is recommended. Backup communications and personal locator devices are also strongly recommended.

P. Maintenance and Field Repairs:

Most of today's paddle craft are built of sturdy construction using synthetic materials. General maintenance and repair procedures can typically be performed with a simple tool kit assembled for the specific hull type and construction. Follow the manufacturer's recommendation for repair kits, as many synthetic materials may only allow certain materials to be used. Failure to follow

the manufacturer's advice may result in further damage or catastrophic failure exposing the operator to unsafe conditions.

A thorough wash down to ensure the removal of dirt and debris, allowing the vessel to dry and keeping it stored out of direct sunlight will typically increase the life and serviceability of most paddle craft. Through good cleaning practices it will afford the user the ability to make detailed inspections and identify leaking or damaged areas on the vessel. Accessory gear and rigging should also be cleaned and inspected for corrosion and wear—replace any equipment that is damaged or beyond the service life.

Q. Accident Reporting Requirements:

Paddle craft operators are subject to State accident reporting laws; operators are required to report any incidents requiring medical treatment beyond first aid, when a person goes missing or the incident results in a death, damage in excess of \$500 or the complete loss of a vessel. Most states require the report be submitted within 48 hours for major accidents, within 10 days for minor accidents and mishaps. If the operator is performing paddle craft operations under the auspices of an institution or agency, individual policy may require a separate accident report. Failure to submit an accident report may result in monetary penalties from the state authorities and a loss of watercraft privileges within the agency or institution. (*See Accident Reporting SBSA Boating Safety Manual, Appendix 5*)

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**PROCEDURE FOR LAUNCHING AND RECOVERING A SMALL BOAT
WITH A CRANE OR HOIST**

A. The Crane and Crane Operator:

1. should have a thorough understanding of how the crane operates, its limits, emergency cut off switch, and power supply.
2. should also demonstrate safe and competent use of the crane to a senior crane operator (as per OM requirements) prior to lifting any loads.
3. should understand the catastrophic effect of “two-blocking,” i.e., running the crane hook up to and past the limit switch into the sheaves.

NEVER TWO-BLOCK A CRANE!

4. A good hoisting cable for boats is often terminated with a pear-shaped link. The reason for a link instead of a hook is because of the destructive nature of a hook on the boats. A hook may damage helms, rails, engine controls etc. The hooks are often placed on the boat bridles.

B. Safe Work Loads

1. The safe work load of a crane may be exceeded by the surface tension of seawater from a wave passing beneath the boat, or by a boat that has taken on water by flooding or carrying containers of water to hold specimens.
2. The snap strain is tempered by the use of oversize nylon boat lifting bridles. Nylon is recommended for bridles because it is dynamic, stretching 15% before limits are exceeded. Cable or chain bridles do not stretch and can be destructive to boat lifting points.

C. Boat Launching

1. Suitable small boats to launch from cranes, depending on crane limits and configuration:
 - a. Boston Whaler-type skiff with square bow to 18 ft.
 - b. Inflatable boats of most types to 22 ft. Skiffs and inflatables are unsinkable, at least for the short period of time that they spend under the boat hoist. Their bows tend not to hang up on ladders (a very desirable feature near the surf zone) and they are very stable.
2. Essential pre-launch boat equipment:
 - a. Boat launching bridle
 - b. Bow line
 - c. Oars
 - d. Two anchors are recommended. One primary anchor with 200 ft of nylon line and 10 ft of 5/16 in or larger nylon line and 10 ft of 5/16 in chain attached. Bow anchor must be

tied on.

e. Boat hook

3. Pre-launch boat preparation

- a. *Lifting Points*: Ensure the vessel has adequate lifting attachment fittings (usually one on the bow, and two at the stern) that are bolted through the hull and reinforced, and that the eyes are large enough to accommodate the bridle shackles.
- b. *Bridles*: Either a 1 in diameter nylon line or 3 in nylon webbing is recommended for the bridle. Pre-made bridles may be available commercially. These will have the safe workload shown on them. The bridle should be set up so the boat hangs level when off the trailer or water.
- c. *Bridle Hooks*: Hooks for 16-22 ft boats should be 3 ton galvanized swivel steel safety hooks or better. Over-engineering, to some extent, is a good idea in all the lifting gear.
- d. *Bow Line*: The bow line used to attach the boat to the ladder, pier, support ship, dock, etc., is an important piece of rigging. It should be at least long enough to reach the ladder, pier, support ship or dock when the boat is hanging directly below the hoist. If it is too long or not kept taut, the boat engine may crash into a hard point astern of the vessel. This can result in total loss of the engine. If the bow line is too short, the crew won't be able to easily hook and unhook from the ladder, pier, support ship or dock.
- e. *Bow Line Hook*: Ensure the hook on the bow line is compatible with the bit making fast to, and is strong enough. The shape of the hook is important because it can be jerked through a hand. This can be avoided by splicing a "pigtail" of line, a couple of feet long, into the bow line so that crew holds the pigtail, not the hook. The bow line is held lightly at all times when ascending or descending the ladder.
- f. *Oars*: The oars should be good ones, and at least 7 ft long for boats over 16 ft. Oar locks must be strong.
- g. *Boat Hook*: The boat hook can be extendable or solid, as long as it is strong.
- h. *Crash Bars*: Crash bars around an outboard are a good idea to protect the engine(s) from being damaged.

4. Loading:

- a. The US Coast Guard has a small-boat loading formula for PERSONNEL only: *Length multiplied by width divided by 16*
- b. SBSA recommends this small-boat loading formula for DIVERS doing one dive on a CALM day only: *Length multiplied by width divided by 20*. This formula works well on skiffs.
- c. The center of gravity (CG) is directly below the center of the hoisting bridle when it is taut. All gear should be loaded equally fore and aft of the CG. If it is necessary to load

unequally, it is better to load a little heavier aft.

- d. Load gear so that it cannot shift. Experience is the best teacher, so use an experienced hand to load anything but light, stable loads. When loading gear back into the boat while at sea, keep in mind where CG is so that the boat will hoist evenly out of the water.
- e. This section does not speak of the obvious other safety equipment required by the US Coast Guard (PFDs, whistle, flares throwable cushions, etc.) or communications equipment (VHF radio, cell phones and GPS) needed for work away from the launch platform.

D. Weather and Wave Judgment

1. A minimum period of 15-30 minutes (one cup of coffee) is needed to properly judge wind, wave, current and swell.
2. A maximum limit of 1 m wave or swell height is recommended.
3. Maximum current should not exceed 1 kt.
4. Wind should not exceed 10 kts. In most locations winds are usually much stronger in the afternoon.
5. Visibility should be greater than 2 mi.
6. Future conditions should be checked by NOAA marine weather reports or other sources, including local knowledge and *<Insert local websites here>*. Any adverse predictions or worsening conditions should be heeded.
7. Tides must be taken into account. The waves will be shorter and steeper at low tide near shore. Spring tides may create longshore currents that reverse at the turn of the tide. If possible, launch and retrieve on the lee side of the ladder, pier or dock. A combination of all the above forces will determine which side that is. The wind is usually, but not always, the strongest of the forces.

E. Launching

If it is determined that launching will proceed in spite of adverse conditions, re-evaluate your mission goals against benefit/risk analysis and crew and equipment capabilities.

1. With the bow line in his hand, the operator (coxswain) signals the crane operator to lift the boat high enough off the trailer to clear the safety lines or rail.
2. When the boat is clear of the trailer and has a clear path to the rail, the coxswain signals the crane operator to take the boat over the rail at a steady speed till the boat is clear of launching platform.
3. The coxswain signals to have the boat lowered enough to make the bow line fast onto the launch platform forward of the boat.

4. The coxswain or crew kills the swing of the boat using tag lines, aligns it to clear the rail, then signals to have the boat lowered till the bow line is not quite taut.
5. The coxswain now descends the ladder or ramp with the bow line pigtail either in hand or made fast to the main launch platform.
6. The coxswain descends with the boat to a point at least 1 m above the swell height. The crane operator has to keep up with the coxswain, so as not to get ahead of him/her.
7. The coxswain then secures the bow line to the launch platform and asks the crane operator to lower the boat into the water during a lull period. Set the boat in the water between two of the smaller swells.
8. The coxswain now enters the boat, unhooks the hoist, and signals it to be raised while still holding the headache ball. She/he holds on to it until it is well above her/his head.
9. The coxswain now starts the engine in neutral gear at idle speed; then, if conditions allow, shifts to reverse while backing the boat steadily at idle speed to a position $\sim 90^\circ$ (or at right angles) to the pier while keeping an eye on seas. This helps minimize damage to the boat and landing.
10. With the boat idling in reverse, the crew comes down one at a time as directed by the boat operator. With the boat pulling slightly on the launch platform, descending down the ladder is slightly more difficult, but it is safer for the boat and the crew. If the crew cannot pull the boat in against the pull of the boat, the coxswain may shift into neutral gear for the personnel transfer, but as soon as that person is aboard, she/he should shift into reverse gear again until all are on board.
11. Once all are onboard and settled the bow line is released from the launch platform and the coxswain backs slowly away, turns on course, and exits the launch area.

F. Returning to the Launch Platform

1. Slow to idle speed at least 150 ft from the platform to assess the conditions, which may have changed. Determine the true lee side of the platform. Look for swimmers, divers, snorkelers and other hazards.
2. After an assessment of the conditions, approach the lee side at idle speed, slowing to a stop at the platform by reversing the engine in idle speed. Have the crew attach the bow line to the platform. Once attached disembark the crew one at a time as directed by the boat operator. When all the crew is up on the platform, the coxswain backs at idle speed to a position directly beneath the crane. She/he requests the lifting bit or eye to be lowered, grabs hold of it and secures it to the lifting bridle. With the engine off, she/he calls for the crane operator to hoist just short of taut.
3. The coxswain requests that the crane operator hoist the boat up as soon as conditions allow. With the hoist cable plumb, the crane operator pulls the boat up to a height 1 m above the wave height. When the swing is mostly taken off, the coxswain descends, kills the rest of the swing completely, unhooks the bow line, exchanges the hook for the pigtail and ascends with the boat to a position that will just clear the safety lines.

4. The coxswain climbs up onto the platform, detaches the boat from the platform and directs the crane operator to steadily bring the boat to a position directly above the trailer. The coxswain refines this position and the boat is lowered to approximately 1 ft above the trailer. The trailer is repositioned and with two people steadying the boat (one forward and one aft) the coxswain ensures all is clear and requests the crane operator to lower the boat onto the trailer.
5. The coxswain unhooks the bridle, the boat is moved away from the area (if used by others) and the crane is secured.
6. The boat is washed, the engine flushed, the log is filled out, the boat is stowed and a visual check is made for personal items left onboard.

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OFFSHORE STRUCTURE BOATING RECOMMENDATIONS

The following recommendations by the UCSB Diving Safety Program review some of the key points to consider when diving and/or boating around some types of offshore structures. Although these recommendations may include relevant procedural requirements, any specific diving or boating operation must be approved by the operator/owner of the offshore structure and the organization conducting the diving and/or boating.

OFFSHORE STRUCTURE DIVING: OVERVIEW

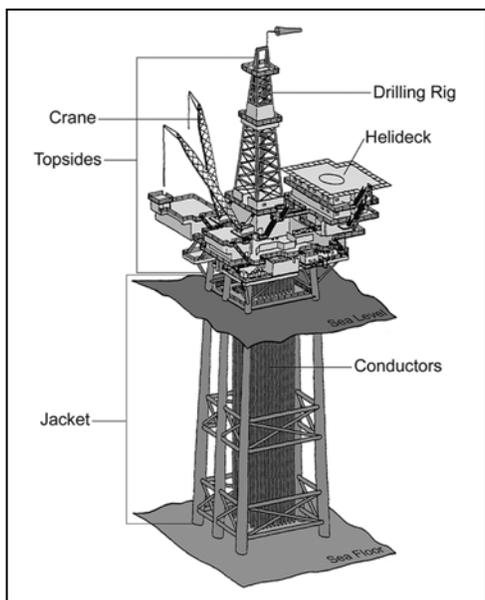


Image by Donna Schroeder

DIVER TRAINING / EXPERIENCE RECOMMENDATIONS

Diver Skill Level

- Scientific Diver Depth Certification: min. 60 ft certification for all offshore structure dives
- Strong swimming ability: able to swim in currents, conduct independent rescue
- Anxiety Level: first dive(s) for a diver should be led by an experienced diver as an orientation dive only

Lead Diver

- Should have experience diving on offshore structure and is responsible to review the full dive plan and safety procedures with the divers and boat captain.

Safety Equipment for Each Diver

- Audible and visual signaling device: Signaling tube & whistle
- Quick release equipment
 - Given the increased chance for entanglement, gear (game bags, slates sampling gear) gear, if attached, should be so it could be easily removed if needed
- Dive knife/scissors for possible monofilament line

Boat Driver Experience

- Previous supervised captaining experience on offshore structures

COMMUNICATION CONSIDERATION WITH STRUCTURE

Authorization

Homeland Security considerations: Security clearance may be required. Written authorization from the operator of the offshore structure is most likely required. Call to confirm the day before the boating/diving operations, once again when you arrive at the structure and before leaving the structure.

Radio

- Confirm with offshore structure and support vessels (crew boats) the VHF channel to be continuously monitor while at the structure.

Other Vessels

- Establish contact if any boat approaches the offshore structure if divers are in the water.

Dive Flag

- Always have the dive flag up when divers are in the water and down when all divers are back in boat in case any boats approach the structure.

Warning Signal

- Confirm with the operator of the offshore structure the type of warning signals since these vary. Some possible signals include fog, fire, oil spill and hydrogen sulfide signals.

ENVIRONMENTAL FACTORS AND POTENTIAL HAZARDS

Forecast

- Check conditions the day prior, the morning of and periodically while at the structure.

Fog

- Diving and boating operations should never be conducted in reduced visibility near offshore structures. If divers surface and cannot see the boat, they should stay in direct contact with the structure.

Wind

- Windy/white-capping conditions reduce both the visibility for spotting divers and basic control of the boat near a structure.

Swell

- It is recommended to cancel the dive if the swell is >6 ft.

Surface/Subsurface Currents

- Cancel dive in strong currents or when it is difficult for a diver to swim into the current.
- Some offshore structure may be prone to strong currents
- Currents occur at multiple depths
- Down current side of structure may have a weaker current

Underwater Visibility

- Can dramatically differ throughout the water column and dives should be canceled in low visibility

Compasses Do Not Work

- Ferrous (iron, steel) objects, magnets and any flowing electrical current will influence the reading of the compass. An error will result in the compass readout near many offshore structures.

Entanglement

- Fishing line, nets and other monofilament line can be found on and around the offshore structures. All divers should have a cutting device and minimize all attached gear to a diver should be easily removed (bolt-snaps or a quick release device).

Sharp Objects

- Gloves should be worn to minimize cuts from sharp objects.

Falling Objects

- Before making the dive, scan the structure for any potential areas of activity (crane, etc) where objects (tools/materials) could fall into the water. Boats and divers should stay well away from these areas.

Using Lift Bags

- Moderate and strong currents can prevent the safe use of lift bags.
- Used by experienced offshore structure divers only and a secondary air source for lift the bag is recommended.

Support Vessels

- A support vessel for the structure may arrive during the dive and this may create loud sounds underwater. If divers must surface while a boat is at the structure they should surface under the structure well away from the docking area.

Other Boats

- Recreational boats may fish near offshore structures. Boat captains should contact any boat approaching to the offshore structure to notify them of divers in the water.

Fumes

- Some offshore structures may be in areas of high amount of fumes in the air
- Should a gas alarm sound on the offshore structure
 - ✓ Travel upwind, away from structure
 - ✓ Monitor radio
 - ✓ Use SCUBA units if necessary

Flaring

- On occasions an offshore structure collecting oil/gas may burn off gases from the top of its platform. This “flaring” is very loud and can be startling, but is normal.

Diffusers

- Diffusers pipes can be located under any offshore structures collecting oil/gas and may release gases creating a mass of bubbles in the water column. Divers should swim well around any area that has bubbles in the water column so not to become disoriented in the water column.

Sub-surface Saltwater Intake Pipes

- All divers must stay well clear of all sub-surface saltwater intake pipes located under the structure.

EMERGENCY PLANNING CONSIDERATIONS

(See *Emergency Procedures Underway*, page 4)

- Helicopters may be able to land on offshore structure such as an oil platform.
- Personnel on the structure and its support vessels may be contacted.

LOST DIVER/BOAT PROCEDURES (See *Missing Diver*, page 9)

Divers: If a diver should surface and cannot see the boat they should make physical contact to the structure until the boat makes visual contact. If divers surface away from structure and cannot return (current, etc) to the structure, use the signaling devices (signaling tube, whistle, dive slate), stay together and release weights if necessary.

Boat Captain:

1. Note current direction when diver was last seen. Drop a highly visible floating object with submerged portion attached to help note current direction and speed.
2. Recall other divers.
3. Note time: Start of dive & Present Time; Depth of water. Attempt to determine when air supply should be depleted. Account for & question dive partner noting anything unusual about the dive.
4. Briefly search for the diver and their bubbles within the dive area and down current while also looking towards the structure and/or any other area the diver may have sought refuge.
5. Call appropriate EMS: Coast Guard (Ch 16 VHF), 911 or other local EMS.
6. If unable to locate the missing diver return to last known position. Prepare dive teams at structure and await instructions from EMS.

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LIVE BOATING GUIDELINES

Purpose:

This summary is intended to provide basic instruction for boat operators when working in support of dive operations. Standard dive tending practices are included as well as specific instructions for safe operations when maneuvering vessels in close proximity to divers in the water.

Definition of Live Boating:

Maintaining a mobile vessel in support of dive operations. This method of dive tending is preferred in instances where anchoring is difficult, under conditions with high currents, when the dive plan makes it likely that divers will move away from the initial dive location, and in locations where divers may need to be shielded from other vessel traffic.

Operator Qualifications:

Live Boating requires exceptional boat handling skills and situational awareness. Qualified operators must demonstrate good close quarters maneuvering skills and be able to communicate and navigate effectively. Previous dive experience is highly recommended. Novice operators should work in the company of more experienced personnel until the necessary skills have been developed.

GENERAL GUIDELINES

Dockside

- Verify that all required and recommended equipment is on board before getting underway (see Pre-Dive Checklist), including Emergency O2 kit and phone numbers for DAN and local recompression chambers.
- Review dive plan with all participants. Make sure everyone understands the plan before leaving the dock. This includes dive emergency procedure, lost buddy procedure, diver recall signal (series of 3 short engine revs, repeated 3 times – repeat sequence if there is no diver response), and expected maximum time, depth and distance/direction of travel. Have dive slate available for boat driver/dive tender to keep track of dive data.
- Stow gear securely and monitor equipment while in transit. Keep deck as clear as possible.

On Station

- Scan area for potential hazards such as boat traffic, or dangerous animals. Note the rate of drift or other signs of strong current.
- Evaluate sea state/weather conditions. Are local conditions likely to change during the period of dives?
- **Put up the dive flag**

- Call shore contact via radio or cell phone to confirm operational status and ability to communicate.
- Assist divers donning gear as needed. Be prepared to hand equipment over the side once divers are in the water.

Before Deploying Divers

- Make sure engine is idling in neutral – confirm with divers by stating “neutral,” or “all stops.”
- Deploy divers as far away from the engine as possible. Be certain the boat is not in a position to drift over divers.
- In areas of strong wind and/or current, the vessel should be positioned up current from the drop location. All divers need to enter the water as a unit when given the OK to avoid getting separated at the surface. Deploy divers up current from the target so they do not have to swim against the current before descending. Have divers enter the water on the up current side of the boat to keep the boat from drifting over them.
- Once divers are clear of the boat, floating at the surface, and have given the surface OK signal (one hand on top of head) it is safe to engage the engine and move a short distance (25') away. Note your current position by GPS or by taking line-ups to points on shore.

During Dive

- Mark time on dive slate when divers begin descent
- ***Dive tending requires singular focus. Do not attempt any other sampling or instrument deployments that could distract the operator or make recovering divers difficult***
- Keep the boat down weather (wind and/or current) from the drop location if possible. The sun should be behind you for best visibility, and the wind should be in your face.
 - **Keep bubbles in sight at all times.** Wind chop, glare and kelp canopies can make this difficult, so it is important to minimize distractions and stay focused on the divers. It may be preferable to position the boat parallel to the diver's bubbles if they are moving with a current. When the dive team is transecting under dense kelp, a rendezvous strategy may be employed allowing the boat to parallel the divers while transiting just offshore from the kelp line. Closed circuit diving (no bubbles) requires a different strategy. Consult with your DSO for specific diver/surface communication procedures.
 - Monitor VHF radio and continue to scan for hazards.
 - Keep any approaching vessels at least 100 ft away from divers. It may be appropriate to issue a ‘Securite’ (say-curitay) warning on VHF Ch. 16 to inform other boaters of your activity. You may also use the VHF radio to hail specific vessels on approach. Sound the danger/doubt signal (five short horn blasts) if necessary and/or use hand gestures to divert an approaching vessel.

- Diver Recall – if a situation arises that requires a recall, employ the previously discussed plan.
- If you lose track of the divers bubbles during the course of a dive it is important to maintain your current position (or course and speed if transecting) and continue scanning. Enlist assistance from other crew members and stay calm. Send someone aloft if possible. Take note of the time relative to expected dive duration and consider recalling divers. If planned dive duration has been exceeded and multiple recall attempts are unsuccessful it may be necessary to summon aid by radio or cell phone. Continue scanning until divers are located.
- Divers should carry safety sausage, or other float and a sound making device in case they can't see the boat when they come up. A safety sausage or float on a line that reaches the surface can help the boat operator keep track of the divers if they are drifting with a current during their safety stop or throughout a drift dive if no obstructions are present.

Recovering Divers

- Record time of surfacing. Look for OK signal from divers and verify that all team members are present. Signal the divers to let them know you see them.
- Divers should swim together as a group to get away from obstacles (kelp, lines, buoys, rocks or the shore line).
- Approach divers by heading into the wind or current. Approach slowly, using only enough speed to maintain steerage (control of the boat's heading) and keep divers up current relative to the vessel.

Do not allow the boat to be blown/drift over divers at the surface!

- Shift to neutral at least one boat length from divers and allow the boat to drift to within easy swimming distance. Call out "neutral."
- In some cases it may be helpful to use a floating line trailing 20 ft to 50ft off the boat for divers to grab onto. Short tag lines (with end clips) secured to the rail are also helpful for tethering inflated BCs.
- Assist with equipment recovery as needed.
- Take diver's weight belts and BCs as needed, to make it easier for them to climb on board.
- Verify physical condition of all participants and monitor thereafter for symptoms of decompression illness (DCI).
- Take down dive flag
- Call shore contact.
- Stow gear for transit.

Upon Returning Dockside

- Rinse all equipment with fresh water before returning to storage.
- Report any lost or damaged equipment to the appropriate staff member.
- Close out the Float Plan and complete the Post Cruise report.

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January 2009