

# Cal Sailing Club Guide to Motorboat Operation

4/9/17 revised for warning re rain in sketch motor

## Safety:

1. Shut off the engine if the propeller is **within 6 feet of a person in the water**
2. Attach the **red kill switch lanyard** to your PFD, ankle, or wrist when driving
3. **Seat passengers** before proceeding from a stop
4. Never **back up** without looking behind you first
5. Make sure everyone's **fingers and other body parts are inside the boat** when near a dock or another boat or board

## Wind

1. Wind strength increases as the square of the windspeed (measured in knots, 1 knot = 1.1 mph), best source for windspeed info is iWindsurf on wind checking computer, windmeter on wall by door is accurate if wind is from southwest, west, or northwest.
  - a. 10 knots = whitecaps form by restaurant;
  - b. 14 knots = twice as much **Whitecaps by the restaurant indicate strong wind** force as 10 knots, serious trouble for beginners;
  - c. 20 knots = twice as much force as 14 knots, serious trouble for intermediates;
  - d. 28 knots = twice as much force as 20 knots, serious trouble for all but the most skillful
2. Be more proactive as wind increases. Better to go out and get beginners off the water than to have to get them off the rocks.
3. Never go out alone on a rescue in wind over 15 knots. Take someone who can help you do the rescues safely.
4. Launch the second skiff in wind over 20 knots, in case the first skiff needs a rescue.
5. Slow down in waves, especially going upwind, at high speed a motorboat can be flipped end over end by hitting a wave head on, or rolled over by hitting a wave at an angle.

## Tides

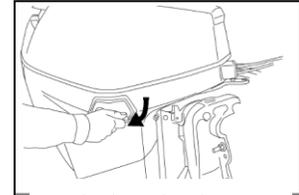
1. **Check the tides** on the club website and post low tide level and docktime.
2. **Regular (Boston Whaler) skiff** operates with engine in the fully lowered position in tides down to +2.0' tide level, and with only one person aboard, engine raised, driving backward to keep engine out of mud but with water intake submerged, down to +1.3'.

3. **In south wind** dinghy sailboats can get damaged on middle dock piling collars due to mishaps when sailing in tides less than +1.5'.
4. **Dinghy sailboats** can't sail back to dock at tides below +0.5', everyone has to get out and walk in mud.
5. **Windsurfers** also have to walk in mud to get in and out in tides below 0.0'
6. **In Low Tide** the sketchmobile (low tide rescue skiff with the Honda 2 hp air-cooled motor) can operate down to 0.0'

**REGULAR SKIFFS**

**Preparing Regular (Boston Whaler) Skiff in Yard:**

1. **Check the clear bowl** underneath the fuel filter in the skiff for **water** (water will sink to bottom of bowl below fuel).
2. **Fill the Fuel Tank.** It holds enough gas for two hours of running at full throttle. Don't run out! Uses 87 octane regular unleaded gas, don't put oil in the gas.
3. **Check the XD100 oil tank**—push down latches on both sides of engine and lift off the engine cover. If latches are sticky, grease the metal channels that protrude below the engine cover (use marine grease or triple guard grease, kept in gas locker). Check the level of oil in the tank on the side of the engine, add Evinrude XD100 two **stroke** oil through the fill cap on top of tank if you can't see 2 inches of oil when the engine is level (tank is translucent). After checking and adding oil if necessary, secure the engine cover carefully, checking that the rubber gasket is in its proper place everywhere. (spray gasket with silicone spray)



**Push down latches on both sides to remove engine cover**



**Checklist for Regular Skiff:**

- Fuel
- Anchor
- Bilge pump working (test by pushing tab down)
- Kill switch lanyard attached to ignition switch
- Tow line
- Extension tow line
- Drain plug for well in transom
- Spare drain plug
- 2 PFDs, large and small
- Battery strapped to boat
- Fuel tank tied to bench seat
- Anchor line stowed neatly, anchor ready to use
- No trash or unnecessary items in boat

**Add XD100 oil if you can't see 2 inches of oil in tank**



**tab for testing pump**



**Kill switch and ignition key**

The kill switch lanyard attaches to the ignition switch **after** you push in on the key to depress the switch button. Use your index finger to push in on the key while pushing the kill switch keeper onto the key switch, holding the keeper with your thumb and middle finger.

If you detach kill switch lanyard, the key switch shuts off. The key will still work to turn the engine back on without replacing the kill switch lanyard. This can be helpful if you accidentally detach the kill switch lanyard when the motor is needed immediately, but reattach the kill switch lanyard as soon as you can.

**kill switch lanyard end must be pushed onto key switch while pushing in key.**

### Be careful of the propeller guard!

The propeller guard can bend or break if you run it into the dock, mud, or rocks.

### Hoisting Regular Skiff Into Water

**Don't let anyone get under hoisted skiff!**

Use large (east) hoist (small west hoist will work, but strains clutch on hoist motor)

Put drain plug in well in transom before hoisting from trailer

Put out fenders (round orange bumpers)

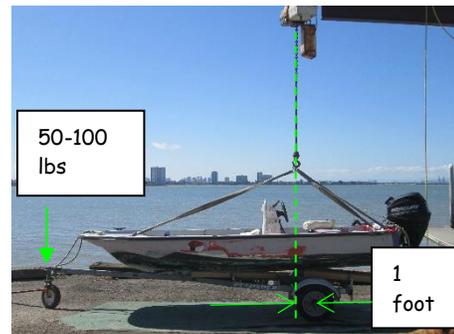
Sling should be in middle of boat, on the side of the steering console opposite the gearshift/throttle lever, not on the same side as the gearshift/throttle lever, which it might catch on!

Have someone hold bow painter if you're going to drop skiff at dock.

Or drop skiff in water next to ladder, use hoist sideways buttons to move skiff close to ladder.

When hoisting back onto trailer, position trailer so that hoist chain comes down about 1 foot forward of the trailer's rear wheel axle.

There should be about 50- 100 pounds (lbs) weight on the front caster wheel. Test by trying to lift the front caster wheel. If the weight is too much, hoist the boat again and move the trailer forward. If it's too little, hoist the boat again and move the trailer backward



### Regular Skiff Engine Start-up:

1. **Lower engine** into water to submerge water intake.
2. **Squeeze the rubber bulb** on the fuel line (see photo)
3. Check that **kill switch lanyard is on ignition switch**
4. **Turn the key** to start



5. Check that **water is flowing from the back of the engine (engine water overflow)**

#### Leaving Dock in Regular Skiff:

1. Either push the bow away hard and drive forward, or
2. Back away with the motor turned to pull the stern away from the dock.

#### Docking Regular Skiff:

Drive the skiff up to the upwind side of the dock, and stop the skiff a few feet from the dock, parallel to the dock. The wind will bring you up against the dock.

#### Tight Turns at Slow Speed (Regular Skiff):

Turn the steering wheel all the way to one side, then apply full throttle. This is especially useful when you're trying to maneuver to bring the skiff next to a boat or windsurfer—drive a short distance away, do tight slow-speed turn, and drive up next to the boat or windsurfer.

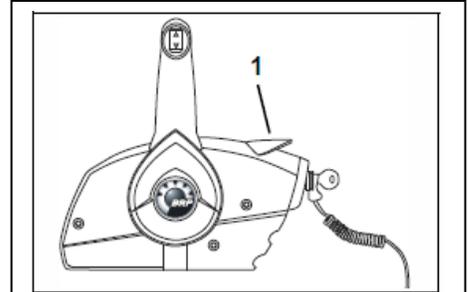
#### Backing Up (Regular Skiff)

**Never back up without looking first!** You could easily run over a windsurfer who came up to the rear of the skiff while you weren't looking.

**Don't back up into waves!** The waves will break over the transom and flood the boat.

#### Operating Regular Skiff in Low Tide Mode (tide below 2.0, 2 feet or less water depth)

1. Tilt motor up so that its cooling water intake is just below the surface—keep an eye on the water overflow on the back of the engine to make sure that the flow doesn't stop. **Note:** There are two electric tilt up/down switches--one on the side of the gearshift/throttle lever, and another on the side of the motor.
2. Don't go faster than idling speed when the motor is tilted up!
3. Don't take any helpers in the boat—they can paddle out on a board with an anchor .
4. Only go very slowly in reverse (back up rather than going forward)
5. Stand in front of the steering console facing backwards (see **photo** for how you should be standing, steering, and working gearshift)
6. Check frequently that clear water is flowing from the water overflow on the back of the engine.
7. Use the sketchmobile if the water depth is less than 1.3 feet.



Don't start the motor with the fast idle lever ("1" in picture above) lifted—it should be all the way down, as shown.

If that lever is partway lifted before the key is turned, the engine computer prevents the engine from speeding up until the fast idle lever is pushed back down.

If that lever is lifted all the way before the key is turned, the engine computer injects a ton of oil while the engine is limited to idle speed.



## Line Wrapped Around Prop

**Don't let it happen!** Never operate an outboard motor near a line in the water, unless it is absolutely necessary, as in use of a tow rope. Once you put the tow rope over the side of the boat, keep your eye on it continuously while driving so that you don't accidentally get the turning propeller near a slack tow line. The propeller's wash of water can suck in the tow line and tangle the line around the prop. If the tow line is taut, it won't get sucked into the prop. But if you put the motor in reverse while the tow line is just floating on the water, or if you just drift backwards into the tow line and then drive forward without looking where the tow line is floating, you can wrap the tow line around the prop and you will be dead in the water, with the prop no longer able to turn.

**Shut the motor off immediately!** A line wrapped around the prop is first indicated by the motor suddenly losing power. Putting on more throttle just wraps the tow line tighter on the prop.

**Raise the motor.** On the regular skiff, there's a switch (up and down, marked with arrows) on the port side of the motor, about a foot and a half below the top of the cowl, as well as the switch on the gearshift/throttle lever. On the sketchmobile, with the tiller pointed straight ahead (i.e., not turned around for reverse), you just lever up the motor.

**If you can't immediately unwrap the tow line from the propeller on the regular skiff, ANCHOR!** You're going to need a tow back to the dock, unless the line comes off easily with the motor raised. Most likely you'll have to hoist the skiff out of the water so that you can disassemble the prop guard (DON'T lose the bolts!) and remove the propeller. When replacing the propeller, use a new cotter pin (in green rolling toolbox), and use new cable ties to reassemble the prop guard.

## Towing Beginner Windsurfers on Regular Skiff

**Get person on boat,** have them sit on the white seat in front of the steering console, clip or tie the tow line to the nose of the board, raise the centerboard, and then you can drive fast to the dock or the sheltered area upwind of CSC's dock. Make sure they know how to paddle and how to go upwind before letting them continue windsurfing. If they don't, or if it's too windy for them, bring them in.

## Towing J, J+, and S windsurf boards on Regular Skiff

**Clip or tie tow rope around universal** since there's no nose handle. Or if the board is floaty enough, the person windsurfing can lay on the board and hold the tow rope at the nose. In any event, you'll have to go slow.

## Towing Dinghy Sailboats with Regular Skiff

1. Have them **lower their sails**
2. Have them **tie tow rope to bow or bow painter**
3. Have them **raise centerboard**
4. Tell them to **steer their boat** so it always points toward the stern of the skiff

If a boat is anchored, the motorboat's tow line can be clipped or tied to make a loop around the anchor line. As you drive away, the loop will slide down the boat's anchor line to lift the anchor and get the boat under tow quickly.

## Rescues from the Rocks with Regular Skiff

1. If someone's on the rocks, don't go out alone to rescue them. Get someone to help, preferably someone in a wetsuit and booties, they may have to go to the person on the rocks.
2. Make sure you have an extension rescue line and a bailing bucket.
3. Make sure your anchor line is ready to go, and not tangled up.
4. Make sure your bilge pump is working, especially if there are large waves
5. Ditto for your tow line
6. Drive to a point about 200 ft directly upwind of the person on the rocks.
7. Drop the anchor and let the skiff drift<sup>1</sup> downwind towards the person on the rocks.
8. Assign one person to mind the anchor line, the other should handle the tow rope and the driving. The driver should always be ready to drive away from the rocks if there's a problem.
9. If at all possible, get the person to swim their gear toward the boat.
10. If not, tie the extension rescue line to the tow line, and throw the line to the person. They may have to swim out to get it, then return to tie it to their gear.
11. Always keep a watch to see if your anchor is holding. You check by **ranging** on two objects, one near and one far, that will stay lined up in your sight if the anchor holds. Usually these are a) one of the University Ave lightpoles, and b) an object on the hills in Richmond.
12. Don't shut off the motor or raise the engine, keep it idling in neutral, always be ready to drive away if the anchor doesn't hold.
13. If the boat gets full of water, because the bilge pump can't keep up, either have your helper bail it with the bucket (you did bring it?) or else drive away, give the pump time to bail out the boat, and return. The boat can roll over if filled with water.
14. Once the person gets the rope, pull them up to the boat.
15. Don't drive away with the tow rope dangling near the prop. If it isn't stretched taut, hold it up in the air.
16. Once you have your rescued windsurfer in the boat, or your sailboat ready to tow, drive forward slowly while your helper pulls in the anchor line.
17. Once you're over the anchor, snub the line on the bow and let the waves lift the bow to free the anchor from the mud.
18. Clean off the big chunks of mud and rocks from the anchor. The anchor compartment is open to the bay to clean the slime off the anchor.

## Flushing the Motor on Regular Skiff

1. **Attach hose muffs over water intake and turn on water.**
2. **Run engine to flush with fresh water for at least one full minute, until the water coming from the hollow center of the prop is warm.**



Flushing clears corrosive salt water from the engine. It's only effective if the engine is warmed up enough so that its thermostat is open. Usually you'll drive the skiff to the hoist, hoist it out, and immediately flush it, so the engine will still be warm. If the engine is cold when you start to flush it, you'll need to run it for several minutes to get it warm.

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<sup>1</sup> Sometimes called "kedging", but to kedge is to pull a boat along using an anchor line, not to drift with a slack anchor line

## Putting away the regular skiff

**Get help early!** It takes at least two moderately strong people to push the skiff back to the yard.

**If you have to park skiff next to gate, block one of the back wheels.**

## LOW TIDE RESCUE SKIFF ("Sketchmobile")

(Standup paddleboards connected to frame with Honda 2 hp air-cooled motor)

### 1. When to Use

Use it as the rescue skiff during low tides 0.0 to 1.3' (0 to 1.3 ft water at dock) and for windsurf lessons as needed.

Here are the times for the remainder of 2018. Red entries mean the tide is expected to fall below 0.0 during the period of use. Black entries mean the tide will stay above 0.0, but below 1.3. Bolded entries indicate it's a lesson day.

**Mon, 4/9 12:23 PM 4:38 PM**

Tue, 4/10 1:20 PM 5:20 PM

Wed, 4/11 2:04 PM 6:02 PM

**Thu, 4/12 2:49 PM 6:33 PM**

Fri, 4/13 3:35 PM 6:59 PM

Sat, 4/14 4:19 PM 7:14 PM

**Sat, 4/21 9:00 AM 2:19 PM**

**Sun, 4/22 9:47 AM 3:16 PM**

**Mon, 4/23 12:00 PM 4:13 PM**

**Tue, 4/24 12:10 PM 5:03 PM**

Wed, 4/25 1:19 PM 5:41 PM

**Thu, 4/26 2:23 PM 6:16 PM**

Fri, 4/27 3:26 PM 6:41 PM

Sat, 4/28 4:37 PM 6:54 PM

**Sat, 5/5 9:00 AM 1:31 PM**

**Sun, 5/6 9:09 AM 2:11 PM**

**Mon, 5/7 12:00 PM 2:56 PM**

Tue, 5/8 12:00 PM 3:32 PM

Wed, 5/9 12:22 PM 4:10 PM

**Thu, 5/10 1:25 PM 4:42 PM**

Fri, 5/11 2:22 PM 5:13 PM

Sat, 5/12 3:25 PM 5:32 PM

Wed, 5/23 12:00 PM 4:04 PM

**Thu, 5/24 1:15 PM 4:32 PM**

Fri, 5/25 2:42 PM 4:47 PM

Tue, 6/5 12:00 PM 2:01 PM

Wed, 6/6 12:00 PM 2:27 PM

**Thu, 6/7 12:00 PM 2:50 PM**

Wed, 6/20 12:00 PM 2:31 PM

Thu, 6/21 12:00 PM 2:48 PM

Sun, 11/4 2:17 PM 4:36 PM

**Mon, 11/19 2:21 PM 4:24 PM**

**Sun, 12/2 1:22 PM 4:02 PM**

**Mon, 12/3 1:39 PM 4:19 PM**

Tue, 12/18 1:33 PM 4:22 PM

Wed, 12/19 1:38 PM 4:22 PM

Mon, 12/31 12:50 PM 4:10 PM

## Before Launch

If the sketchmobile is to be used within the next few days, it should be kept assembled in the yard, sitting on a wheeled axle that is strapped to the SUP boards and frame. The engine should be upright, not tipped up.

Make sure the sketchmobile has:

1. •kill switch lanyard on engine
2. •oil in the engine crankcase
3. •gas tank full of regular gas
4. •spare tank full of gas inside cooler
5. •tow rope tied to skiff
6. •centerboard (from windsurf board, insert in hole in red floor, for steering control in deeper water)
7. •standup paddle tucked in between motor and frame
8. •cooler for sitting on, anchor (optional)
9. •engine clamped to frame and also tied on
10. •sling for hoisting
11. •straps tight around SUP boards, string to tails of SUP boards tied tight to frame

Use the tow rope to tie the sketch to the DOWNWIND side of the dock when not in use, position the sketch so the aluminum frame ends hit the dock, keeping the SUP boards from hitting the dock.

Always START THE ENGINE before you move the sketchmobile. The motor doesn't need water for cooling, it's air cooled. Start the motor right away, before you move the boat, so you can be sure it's running perfectly.

### Before starting the engine

1. •gas on - lever should point backwards (see photo for lever position)
2. •vent on engine gas tank open (twist  $\frac{1}{2}$  turn counterclockwise as seen from top)
3. •kill switch lanyard in place
4. •twist the throttle grip on the steering all the way counterclockwise (full gas)
5. •choke knob pulled out (can skip this if engine was just on)
6. •one hand on top of engine to steady it
7. •pull starting rope with other hand
8. •as soon as engine starts, twist throttle grip clockwise to slow down engine
9. •warm up engine before proceeding
10. •keep lanyard on wrist while driving
11. •shut off engine by pushing the button that lanyard attaches to



### Hoisting into Water

Attach hoist's hook to center loop of sling. Sling should be above cooler, and strap that attaches wheeled axle.

Lift sling until it's just barely taut. Then undo the strap holding the wheeled axle. Leave the axle by the streetlight, where the sailboat dollies are kept.

Hold the tow rope while hoisting into water, and tie sketch to cleat on dock under hoist.

Lower the hoist chain a lot so you can undo the hook without stepping onto the sketch.

Tie the sketch up at the end of the dock, on the downwind side, so it won't bang into the dock. Use the tow rope to tie the sketch up.

### **While driving**

- if engine suddenly speeds up, but boat doesn't, twist throttle grip clockwise to slow down engine, then resume speed (propellor was sucking air)
- OK to run propeller into mud, the engine is air-cooled (won't pee water)
- Make sure tow rope is secured to sketch frame, no strings should dangle in or near water
- raise centerboard by pulling up when approaching shallow areas
- don't let SUP boards strike rocks or dock
- push centerboard down all the way for best steering control in water over 2' deep

### **Rescues**

- tow boats with tow rope, windsurfers can be towed or they can sit on boards holding mast of smaller sails across their lap.
- OK to walk on SUP boards

### **Windsurf lessons**

- use SUP paddle (engine off) to stay alongside student while talking
- switch places with student to demonstrate stance, jibe, tack, etc.

### **Hoisting out of Water and Storage**

Position the wheeled axle under the hoist, with the strap undone and laid outside of the wheels.

Attach hoist's hook to center loop of sling. Sling should be above cooler

Hold the tow rope while hoisting out of water.

Lower the sketch onto the wheeled axle, but keep it slightly above the axle. Position the axle so that it's directly below the chain (center of gravity of the sketch). Attach the

strap around the SUP boards and frame, under the cooler and sling, and tighten the buckle on the strap until it's as tight as you can make it.

**Shut the vent on the gas tank on the motor, and shut off the fuel valve.**

Raise the motor to make it easier to wheel the sketch around.

Lower the sketch until the sling is loose, and disconnect the hoist.

Wheel the sketch back into the yard.

**When the sketch is in the yard, lower the motor** so that the gas won't drip out of the tank.

If sketchmobile will be needed soon, leave the sketch assembled, but if it's not going to be used for some time, and the space is needed for windsurfers or boats, disassemble the sketch.

**=>IF RAIN IS EXPECTED, COVER THE ENGINE WITH A PLASTIC TRASH BAG SO RAIN WON'T GET INTO THE GAS.**

## 2. How to Assemble/Disassemble

SUPs

- 2 SUPs (borrowed from Cal Adventures) on rack next to portapotties, with blue tape on them saying "Do Not Move Do Not Use", fins are removed

Cart axle

- slide wheels onto axle, secure with nuts (red nuts with nails for handles, no need to tighten hard)
- position axle on carpet (chock wheels so they don't roll)
- undo buckle on long strap that will hold cart axle to sketch, lay ends to sides

Sketch frame

- Lay boards on cart axle, wheels chocked, axle should line up an inch or so behind handholes in SUP boards
- Get sketch frame and remove sling string thing and SUP board strap string that are tied loosely to sketch frame, lay these strings to side
- Lay sketch frame over boards and position boards so that the boards' inner edges line up with the sketch frame.

- Bring straps on sketch frame under boards, front and back, insert string ends through eyes (fairleads) and cleat tightly
- SUP board strap string ties to leash loops on rear of SUP boards, then across rear of SUP frame, to keep SUP boards from creeping back while driving.

#### Floor

- Lay floor (red board thing) on top of sketch frame, hole for centerboard should be in front, sticks under floor should rest inside frame front and back

#### Sling

- shorter legs on sling string thing go around rear sketch frame ends, longer legs of sling string thing go around front legs, two little loops are for lifting with hoist

#### Motor

- Motor is locked up by portapotties, combo is 0124
- Check for oil by holding motor absolutely vertical (top horizontal), look in sightglass on port side for evidence of oil. Uses 10-30W engine oil kept in green rolling tool cabinet bench (has red vise) by board hospital. Only add enough oil to bring level to bottom of sightglass when motor is vertical. Don't overfill.
- Fill tank and spare gas tank with regular gas, no oil in gas.
- Clamp motor to sketch frame, tie safety line to frame
- Lift motor up and flip down the little silver tab thingy to hold it up.

#### Accessories

- Tow line tied to sketch frame, secured by snap or tying so it can't dangle
- Spare gas tank tied to sketch frame
- Cooler to sit on
- SUP paddle, stow in back

After attaching hoist, remove cart axle, stow in windsurf board rack.

#### Disassembly

Disassemble the sketchy skiff if it won't be used the next day

- Roll sketch onto carpet
- Remove and stow cooler, SUP paddle, and centerboard
- Remove motor (leave safety line on frame), gas can, take to area near portapotty and lock it to the steel frame. Drain gas can and motor tank into funnel in a jerrycan, don't leave gas in motor or spare gas can.
- Remove and set aside sling string thing and SUP board strap string.
- Remove sketch floor and stow.
- Remove sketch frame and stow
- Tie sling string thing and SUP board strap string loosely to sketch frame
- Remove nuts and wheels from cart axle and stow axle (thread nuts onto axle), wheels
- Put SUPs back in rack by portapotties, apply blue tape and mark "Don Not Use Do Not Move"

## Gas

Gas for all the motors is regular (87 octane) unleaded. Gas is kept in the motor locker in the yard, in 6 gallon orange containers.

If we're outa gas, remember—

1. Person to pay for gas should have paypal account for reimbursement.
2. Screw nozzles tightly shut on jerrycans before transporting, pickup truck best, on on tarp in trunk of car
3. Get receipt from gas station, write paypal account email on receipt, put in safe in clubhouse

## Oil

The gas locker has a gallon jug of Evinrude XD100 oil for the regular skiffs. The rolling toolbox cabinet bench (with red vise) has "4 stroke outboard motor oil", 10-30 Weight, for the sketch motor. DON'T use 80 or 90Weight gear lube in the sketch motor. Don't use any other oil in the regular skiffs.

## Maintenance

Routine stuff that always needs doing is: check the gas containers for **water and dirt**, wash off any salt accumulation on the engine, especially the wiring, with a dribble of fresh water from the hose (don't get water into the air intake!), then **spray down the wiring with WD-40**; straighten out **dings**

**in the props** (use a hammer/pliers/file) or replace prop (lots of grease on the shaft and thrust washer, and check for water in the clear filter bowl on the gas lines for the regular skiffs.

If a motor should be **accidentally immersed in salt water**, drain all the fluids (including fuel in the lines and filter(s) on the motor, as well as the tank if it got submerged), wash off the outside of the motor with fresh water (be sure to get all the wiring, salt water will short sensors and switches), dry off the wiring with compressed air, undo all the connectors and blow out any salt water with compressed air, remove the spark plugs, spray WD40 through the spark plug holes, and finally crank the motor over to evacuate the cylinder while squirting more WD40 through the spark plug holes. The Honda 2 hp motors have to a) have all the water and oil drained from the crankcase and b) be disassembled to get all the salt water out of the clutch. Replace all fluids and run the motor for a long time to dry out the last traces of water.

If there's water in the clear bowl below the **water separating fuel filters** in the regular skiffs: cut off the bottom of a clear plastic water bottle to make a clean container into which you can drain the filter bowl. The gas tank will also need to be cleared of water by siphoning the gook from the bottom or pouring out the whole tank into a clean bucket. Clear out all the lines, drain the vapor separator and filters on the engine, and replace the filter element. The skiff gas filter cartridges are best unscrewed with a band-type filter wrench, take off the filter bowl with a large slip joint pliers. Spare filter cartridges are in the motor locker; the cartridges should be changed at least twice a year.

**Gear oil** should be changed at least once a year, using outboard motor gear oil (80 or 90 weight). The gear case has two oil screws, a drain screw at the bottom and a vent screw at the top. Unscrew the vent screw completely, and close it off with a finger as you remove the drain screw to stop the oil from getting all over your hands. If the gear oil comes out milky-white, something's leaking—hopefully just the rubber washers on the drain and vent screws. Replace oil, tighten screws carefully, and check gear oil again after the next use.