Motors and Motoring

Here are key points to know about **motoring**

Safety:

1. Never drive the skiff without attaching the **red kill switch lanyard** to your wrist
2. Never run a motor with the prop **within 3 feet of a person in the water**
3. Never store gas inside a keelboat, only in the open in the cockpit or the ventilated lazarettes of the Commander keelboats.

Before Use:

1. Check the gas. Make sure the rescue skiff's tank is full. On the keelboats, fill the tank in the cockpit with fresh gas from the club gas locker, and take extra gas for cruises. **How much gas do you need?** gas consumption at full throttle is about half a gallon per hour (gph) for the keelboat motors, and 3 gph for the regular skiffs.

2. On keelboat motors, check the crankcase oil--open the top cover, pull out the dipstick, wipe and stick back in to check level of the crankcase oil, and if needed top up with **four stroke outboard oil**. On skiffs, check the oil tank—tilt the motor down, open the cover, and if you see oil in the tank, it's fine.

3. On keelboat motors, check that the fuel line connectors (to engine, and from tank to fuel line) are solidly attached (especially that they're pushed on all the way).

Correct Start-up:

1. **Squeeze the rubber bulb** on the fuel line to fill it with gas.
2. **Check that kill switch clip** is fully inserted into the red kill switch button.
3. On keelboat motors, twist the throttle to the start position and, if the motor's cold, pull out the choke knob. Pull the rope out slowly to its full extent, then let the rope wind back in all the way. Now yank hard and fast, (a hard punch in reverse). If you can't yank hard and fast, find someone who can. Once the motor starts, slowly push in the choke knob while using the throttle to keep the motor from dying or racing.
4. On **regular skiff**, push top of black on/off switch then push start button.
5. check that engine is **peeing water**—if it doesn't, try clearing the pee hole with a **wire**, and if that doesn't work shut it down for repair

Correct Shutdown

1. Shut off keelboat motors by **pushing the red kill switch button** that the red lanyard attaches to. Don't yank the lanyard off.
2. On **regular skiff**, just push bottom of black on/off switch to stop.

Motor maintenance (sure you can help—manuals are on the club website)

1. On keelboat motors, the **transom clamp screws** need to be unscrewed, have their threads cleaned with a wire brush and then coated with Never-Seize or grease, then screwed back in.
2. Corrosion kills motor wiring—wash off salt accumulation with fresh water, dry with compressed air and **spray down wiring with WD40 or silicone spray**
3. If a keelboat motor won't idle, remove and disassemble, dunk only the metal parts (no rubber gaskets) in acetone, and **blow out the carb** with compressed air, clean out fuel bowl, check fuel tank, line, and filter for water and dirt
4. If keelboat motors won't start, open cover, cut a clear disposable water bottle 1-1/2" from the bottom to make a cup to catch gasoline, then use a flat blade screwdriver to open drain screw bottom of carb to see if a) there's fuel in the bowl and b) if there's any water in the fuel in the bowl (droplets or cloudy gas). If fuel is fine, remove sparkplug with 5/8" spark plug socket, clean plug with wire brush, oil or grease spark plug threads, replace, and find someone to yank the rope harder and faster than you previously did.
5. **Straighten dinged props** with hammer and file; if chunks are missing, replace prop.
6. **Change crankcase oil** (when black, or at least twice a year) and **gear oil** (once a year).

Gas and Oil

Gas for all the motors is regular (87 octane) unleaded. Gas is kept in the locker in the yard, in 6 gallon orange containers. In the J-dock dockbox are gas stabilizer and is crankcase oil labeled "Four-Stroke Outboard Motor Oil" 10-30 weight.

If we're outa gas, remember—

1. Keep receipt from gas station for reimbursement (write name and paypal account email address on receipt)
2. Close all vents on tanks before transporting, pickup truck best, tarp in trunk.

Gas goes bad after a couple of months because it contains oxygenators (an anti-smog additive) that cause the hydrocarbons to chain up into clots of varnish that clog the carburetors. The best plan is to not leave gas around where it will go bad (for example, in the lazarette of a Commander over the winter) but take it back to the club to be used in the skiff—we use about two gallons a day in summer, a quarter of that in winter.

Check the fuel containers for water, since water in gas leads to crap in carb, the major source of motor problems at CSC. Set the tank outdoors in strong light, take off the cap and peer into the lowest point of the tank. Water shows up as a pool of brownish sludge at the bottom. If the tank has water in it, don't use it! Pour the tank's content into a clean bucket, let it settle, and if it's cloudy still, let it settle longer, then pour the top clear part back into the tank, but throw away the water that's pooled at the bottom of the bucket.

On the keelboats, watch out for improper connections and dirt in the fuel line connectors on the keelboat motors that attaches the fuel lines to the tank and to the motor. If a connector isn't on all the way, it won't let fuel go through, and the motor won't run for more than a few minutes. Dirt can cause leaks that will make the motor suck air and die. Dirt in the connector can be flushed out with gas by pushing in the pin inside the connector with a key, and squeezing the rubber bulb. Also watch

out for failing or broken O-rings in the connector. Spare connectors for the keelboats are kept in the parts locker on J-dock.

Avoid storing gas in enclosed locations on the keelboats—lash the tanks in the cockpit if you can, or store it in the lazarette of the Commanders.

CSC Rescue Skiffs and Motors

CSC has two 15' Boston Whaler rescue skiffs with 2 stroke oil-injected Evinrude outboard motors that are kept bolted onto the transoms. The motors have electric lift for shallow water operation.

Skiff Driving

To leave the dock, either push the bow away hard and drive forward, or back away with the motor turned to pull the stern away from the dock.

To dock, 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.

To execute a tight turn when going slow, turn the steering first, then apply full throttle so that the motor pushes the stern around. 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.

Never back the skiff up into waves. The waves will break over the transom and flood the boat.

In shallow water (low tide, or rescues near the rocks), the motor can be tilted up to raise the prop. The electric tilt is controlled by an up/down switch on the side of the gearshift/throttle lever (there's another up/down switch on the side of the motor, which can be convenient when you foul the prop).

With the motor tilted up just enough that the prop is barely submerged, the motor can be safely operated at idling speed in about 1.5 feet of water. Never operate the engine above slow (barely above idle) speed with the motor tilted up. It's best to stand in front of the steering console so you can look back and check that a) the prop is fully submerged b) there's no mud in the wake (shut off the engine and row if you see mud!), and c) there's a clear stream of water pissing from the motor.

CSC Keelboat Motors

CSC has five Mercury 5 hp 4 stroke keelboat motors that are kept locked to the transoms of the three Commanders, and the two Merits. (The J/80 has an electric motor)

Keelboat Motor Installation

If you need to change out a motor, turn the boat around so the stern faces the dock.

Always attach a safety line to the motor when transferring it from the boat to the dock or back.

Snug the mounting clamps on the motor down firmly, but not so tight that the clamp handles are stressed to the point of breaking (you did grease those transom clamp screws, right?).

Keep the motors locked to the boat with a combo lock. Use a hammer and WD-40 to loosen the lock if corrosion sets in. Cut the lock off and replace it if that fails.

Be careful not to strain your back when lifting motors. Using levering techniques across your hip or thighs can reduce stress on your vertebrae.

When removing a motor from the motor mount on the boat, be careful not to back off the clamp screws so far that their washers (which bear against the motor mount) get pushed off the screws.

Keelboat Motoring

Before you even think about starting a motor check that the fuel line connectors are on all the way. Also check that you have the kill switch clip on the red button. Then squeeze the rubber bulb until the fuel line stops gurgling and is solidly filled with gas. Then ask yourself if you can pull that cord really hard and really fast. If you say no, find someone who can.

Pull the cord slowly to its full extent to get the cylinder primed. Twist the throttle to the start position, and if the motor hasn't been running in the last minute or so, pull out the choke knob. Now swear at the engine, pull the cord lightly until the rope grabs the motor, and yank as hard and fast as you can. The motor should start up, or at least make a pop or two. If not go back and do the thing you forgot,

Once the engine starts, push the choke knob back in slowly while twisting the throttle to keep the engine running at a good clip to warm it up, which takes about a minute. After that, you can turn the throttle all the way to the right and the engine should idle nicely.

Don't let the motor race at high r.p.m.'s after starting it. Turn down the motor to idle after it starts to keep its speed fairly low. Warm up the motor for about a minute before you test it. Don't idle the motor for more than a minute or two, idling can cause soot to form on the spark plug and that can cause the motor to not start.

To test the motor at the dock, attach a springline to the boat to prevent it from moving. With the engine running, shift into forward and run the engine at full throttle for at least two minutes.

Always bring the motor speed down to a low idle before shifting the gears.

NEVER let a line dangle in the water next to the motor where it could get wrapped in the propeller.

Use the tiller on the motor to steer the boat in preference to using the rudder. Using the rudder will tweak the motor side to side and strain the motor mount on the boat.

When motoring with a full load of passengers, the motor may sink to an extremely low level in the water. In heavy waves, it may then submerge occasionally. Have your passengers move their weight forward to keep the motor above the water.

In heavy chop, the motor may sometimes rise high enough out of the water for the propeller to expose. One of your crew should then be stationed at the motor to throttle it down whenever rpm's become excessive.

The keelboat motors have adjustment screws for adjustment of friction on the throttle and steering. These help if they are tightened so that the motor can be operated 'no-hands' while used over long distances.

If you have been operating the motor for some time, check your gas tank level before entering hazardous areas, such as shipping lanes, busy marinas, or near rocky shorelines, and refuel, if necessary.

When the motor isn't being used, raise the motor mount and tilt up the motor so the prop is as far out of the water as possible. This is both to reduce drag and to prevent the motor from immersing in the water when the stern dips in wave troughs. (Raising the motor also reduces exposure to salt water corrosion.)

To raise a motor, first raise the boat's motor mount. Set the lever on the boat's motor mount to "raise", then bump the motor down to release the catch in the mount, and the motor should raise up. Then tilt up the motor. Put the motor in forward gear (this is the easiest way to release the latch that holds the motor from tilting up), and pull up on the back of the motor cover (there's a handle built into the cover for this purpose).

To lower the motor, first release the motor tilt lock by pushing aft on the silver rod on the starboard side of the motor. Then set the lever on the boat's motor mount to "lower" and push the motor down.

Motors should be flushed with fresh water and Salt Away whenever you can, in order to reduce the rate of scale buildup. The keelboat motors can be flushed by running them with the lower end immersed in a bucket of fresh water. The water level in the bucket should be about 4" higher than the prop.

Keelboat Maneuvering

If you turn a keelboat while motoring by using the motor tiller, both the bow and stern will swing in wide arcs—the boat turns around an axis located near the middle of the keel (See figure 1.) So if you try to turn the bow away from a dock at which you have just been tied up, the stern will probably hit the dock. If there are no other boats tied up in front of you, you may be able to simply push the boat off at stern and bow and drift away before accelerating and turning.

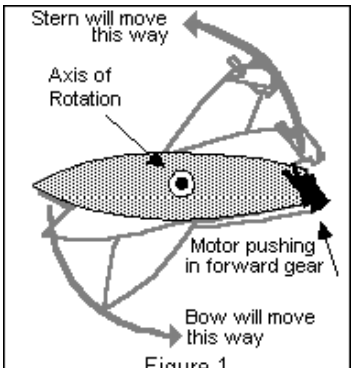

Figure 1

But if there are obstructions around you, the situation becomes more complicated. Sometimes your boat must clear a couple of major obstacles at both bow and stern (figure 2).

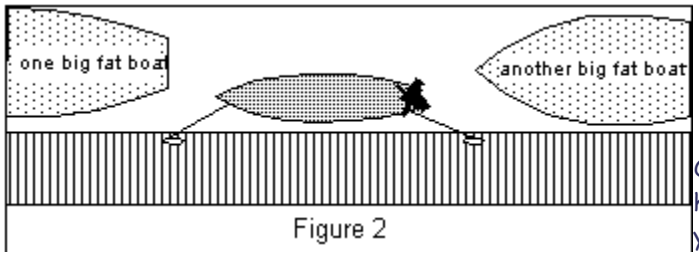

Figure 2

One way to handle this situation is to have someone (your "dock hand") hold your bow painter, while you cast off the stern line, and then operate the motor in reverse, with the motor tiller turned to pull the stern away from the dock (figure 3). Until the boat is at 90° from the dock, the turning action will create a pressure that holds the bow against it, making it easier for the dock hand to hold the bow stationary.

Before the boat is at quite 90°, the dock hand climbs aboard, and the motor is turned to pull the boat straight back, as in figure 4. The boat should be backed off until it is in a position where the bow can be swung around to point in the intended direction of travel, without the stern also swinging around into obstacles.

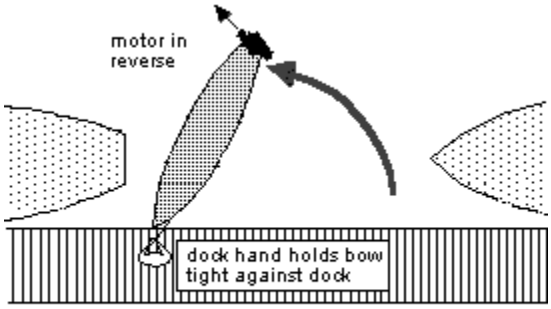

Figure 3

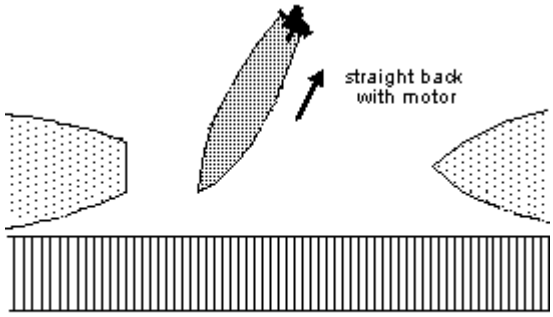

Figure 4

Maintenance

You're encouraged to help out with motor maintenance. If there's a problem you can't fix, bring the motor to the yard and email Treasurer@cal-sailing.org.

Routine stuff that always needs doing is: keep the **transom clamp screws** well-greased, 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 carb air intake!), then **spray down the wiring with WD-40**; straighten out **dings in the props** (use a hammer/pliers/file) or replace prop, and check the gas containers for **water and dirt**.

If a motor **doesn't pee water** when running, **stick a wire** (straightened paper clip is best, or stainless steel rigging wire from toolshed) or twig up the overflow tube to see if the problem isn't just gunk that prevents the stream of water from coming out. Often salt crystals or tiny dirt particles will lodge at the top of the overflow tube. If that doesn't work, the water pump impeller may need replacement.

If a motor **won't idle**, the carb probably needs disassembly, cleaning of the metal (not rubber) parts in acetone, and a **blowout with compressed air**—do this only in a very clean, well-lit location where small parts won't stray. Clear out the water from the fuel tank and filter!

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, change the crankcase oil on the keelboat motors, and finally crank the motor over to evacuate the cylinder while squirting more WD40 through the spark plug holes. Replace all fluids and run the motor for a long time to dry out the last traces of water.

Change spark plugs when they become covered with ash or when the electrodes have been worn down (rounded edges). Spark plugs that are only blackened are not worn out, just fouled from the motor having been flooded. Always use plugs of the model number listed on the sticker inside the motor or in the manual. Spare plugs are kept in in the dock box. To install a new plug, **put oil on its threads, thread it in by hand** until finger tight, then screw in about three quarters of a turn with a wrench to compress the metal gasket washer.

Change gas filters on the hulls of the skiffs and Commanders if there's water in the bowl. There's a drain at the bottom of the clear bowl on the skiffs, cut off the bottom of a gallon bottle to make a clean container into which you can drain the filter bowl. If there's water in the gas, the filter is fouled, and the gas tank needs to be cleared of water by pouring out the whole tank into a clean bucket, where the water will sink to the bottom. Clear out all the lines, drain the carbs on the little motors, drain the vapor separator on the skiff motors, drain the 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 four times a year. **Keelboat motor gas filters** should be changed at least once a year; these are in-line cartridges under the cover. There are also screens in the fuel pump, but these rarely clog.

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 oil again after the next use.

Charles Clausen 11/27/92
revised 6/25 (PKuhn)