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 or a motor with gas in the cabin or under the seat of a keelboat

Before Using a Motor:

1. Peer into the fuel tank and check the clear bowl of the fuel filter for **water and crud**—the most common cause of motors not idling properly. Don't use **stale gas**—if in doubt, pour some into a a clear container and look for telltale streaks and jelly-like blobs and grit that indicate varnish is forming. Gas can go bad after two or three months—return extra fuel to the club, don't leave it on the keelboats or in a dock box.
2. **How much gas do you need?** gas consumption at full throttle is about half a gallon per hour (gph) for the four stroke keelboat motors, and 3 gph for the rescue skiffs. The tank on the sketchmobile motor holds enough for 20 minutes at full throttle, the one on the motor on Pomodoro (the Capri 25) holds enough for 30 minutes.
3. Before you remove or replace a keelboat motor, **tie it to the boat** in case it falls off (and attach the red kill switch lanyard to the boat)
4. 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.** The sketchmobile's motor has a window on side to check the oil, use a squirt top to add oil.
5. Check that the fuel line connector is solidly attached to the motor, when changing lines, clean out the end very carefully. Any leak in the connection will allow fuel to squirt out, then allow air to leak in which will cause the motor to shut down after a few minutes.

Correct Start-up:

1. **Open the fuel tank vent** and **Squeeze the rubber bulb** on the fuel line before trying to start a motor (except Honda 2 hp and Capri keelboat motors, which have tanks on top—just make sure the fuel valve is in the open position, which is back for the sketchmobile, down for the Capri motor)
2. **On keelboat motors** (including Capri)**,** put the throttle full on, if the motor's cold pull the choke out, pull the rope out slightly to engage, and yank hard and fast, (a hard punch in reverse). If you can't yank hard and fast, find someone who can. On the sketchmobile, pull the choke out, twist the throttle part way open, put one hand on top of the motor to steady it, and check that the boat won't run into anyone or anything when the motor starts and kicks the boat forward.
3. When the engine's running it should **pee water**—if it doesn't, try clearing the pee hole with a **wire** (except the sketchmobile motor, which is air cooled)

Shutdown

1. Shut off keelboat motors (and sketchmobile motor) by **pushing the red button** that the red lanyard attaches to. Don't yank the lanyard off.

Motor maintenance (sure you can help—manuals are in the clubhouse)

1. Keep the **transom clamp screws** greased on all keelboat motors so they won't corrode
2. Corrosion kills motor wiring—wash off salt accumulation with water and **spray down wiring with WD40 or Lube-E.**
3. If a motor won't idle, remove 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, use flat blade screwdriver to open drain screw bottom of carb to check that there's fuel in the bowl, remove sparkplug with 5/8" open end wrench, clean plug with wire brush, oil or grease 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 Lubricating Oil

Gas for all the motors is regular (87 octane) unleaded. Gas is kept in the motor locker in the yard, in large orange containers labeled GAS NO OIL. Also in the motor locker are crankcase and gear oil.

If we're outa gas, remember—

1. Keep receipt from gas station for reimbursement (write name on receipt, fill out form in clubhouse)
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. You can add gas preservative, but these tend to attack the seals of the carburetor, so 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 a gallon 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! Water in tanks can be removed by siphoning it out of the bottom of the tank, using an Arkansas credit card (siphon with rubber bulb). Take bad gas to the harbormaster's hazardous waste collection point.

Watch out for dirt and rust in the fuel line connector that attaches to the motor. These can cause the motor to 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 are in the motor locker, or can be easily bought from Wet Marine.

When carrying gas in a car or storing it in the yard, close all the vents on the tanks (but don't close the vents immediately after filling them at the station—gasoline contains plenty of

dissolved gases that boil off when the gas is poured, and the pressure can cause a leak that will stink up your car!).

Never store gas or motors with gas in enclosed and unventilated locations. On the keelboats, lash the tanks in the cockpit if you can. On the Commander, if the lazarette (stern compartment) isn't completely sealed off from the cabin, any fumes or leaks which spill over in wave action will go into the cabin. Occasionally check the tank stored in the lazarette when sailing in heavy waves, as it sometimes overturns and spills. If the lazarette fills with water, bail it out, to assure that water does not seep into the tank.

Crankcase oil is "4 stroke outboard motor oil". Gear oil is 80/90 weight, 90 weight, hypoid, etc. marked as suitable for modern outboard engines.

CSC Rescue Skiffs and Motors

CSC has two 15' Boston Whaler rescue skiffs with 4 stroke Mercury outboard motors that are kept bolted onto the transoms. The motors have electric lift for shallow water operation.

The sketchmobile (low tide rescue skiff) is a Laser with a rig (made of 2x6 and 2x4 lumber) to attach a Honda 2 hp motor to its stern, using the rudder gudgeons. The rig can be detached so the Laser can be sailed. The sketchmobile rig also includes a wood daggerboard and a tiller extension.

Sketchmobile

The sketchmobile is a red Laser hull with a wood motor mount, a Honda 2 hp, aircooled motor, and a short wood centerboard. It has a special sling with 4 strings that should be left on the boat, and it sits on a red dinghy dolly with the nose of the Laser hull slightly ahead of the dolly handle, and under the handle so the hull won't tip back. Tow rope is tied to the motor mount crossbar and kept in the cockpit. No anchor, no paddle, don't need them. Motor safety line is tied to the traveller line.

Fill the tank on the sketchmobile motor (Honda 2 hp, aircooled) with gas (holds enough for 20 minutes motoring at full throttle), check the oil (window on side, no need to take off the motor cover). Tie a small (one or two gallon) tank to the sketchmobile for emergency refuelling.

Tie the boat to the dock with the tow rope, so the motor mount is right next to the dock.

Best windsurfer rescue technique is to get them to sit on the foredeck, either holding mast across lap (for mini-rigs) or towing board and rig (for big sails).

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. In very shallow water, it's best to drive the skiff in reverse so that you can make sure the prop is above the mud, but below the water's surface.

CSC Keelboat Motors

CSC has four 4 stroke keelboat motors that are kept locked to the transoms of the two Commanders, the Capri 25, and the Merit 25. All but the Merit motor were made by Tohatsu and have the same basic engine. The Capri motor has a fuel tank under the motor cover, the Commander motors have fuel tanks and transom-mounted fuel filters in their lazarettes. The Merit motor is a Honda that is very similar to the Tohatsu design.

There is a Yamaha 8 hp two stroke that is kept in the motor locker in the yard as a spare or 4th boat motor, and needs to have oil mixed with its gas. Please don't leave it on a keelboat.

Keelboat Motor Installation

If you need to change out a motor, use a safety line when transferring motors from the cart to the motor mount on the boat. There is usually a safety lanyard attached to the motor -- one convenient way of rigging a safety line is to tie the end of the main sheet to the end of the safety lanyard with a sheet bend.

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?). Tie off the safety lanyard with a bowline knot to the hole at the base of a nearby cleat.

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.

Keep the motors locked to the keelboats using a bicycle cable and a combo lock set to 1066.

Keelboat Motoring

Before you even think about starting a motor, check that the fuel line (hose between tank and motor) is primed full. Squeeze the rubber bulb until the line stops gurgling and is solidly filled with gas.

Make sure that the vent screw in the middle of the fuel tank cap is unscrewed to let in air. Otherwise, you will get a vacuum in the tank after you've motored a few minutes, and your motor will stop dead.

Twist the throttle to the full open position, which is as far as you can twist it to the left. If the motor is cold, pull out the choke. 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 roar to life. Turn down the throttle part way only, not all the way to idle, and push in the choke when the engine starts to sputter. Use 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.

If the motor doesn't start right away, you probably aren't yanking the starter hard or fast enough. Find someone who can punch harder than you can. If it still won't start, check the carb for gas and the spark plug for fouling.

Don't let the motor race at high r.p.m.'s after starting it. Turn down the motor after it starts to keep its speed fairly low. Warm up the motor for about a minute before you use it.

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

Always check that a stream of water is coming out of the bottom of the engine. This indicates that the cooling system is working.

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 crappy 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 or bolts 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—find the lever for the boat's motor mount just ahead of the motor mount plate. Pull this lever up and forward, 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, find the motor tilt handle on the starboard side of the motor's mount. Lift up on the back of the motor and jiggle the lever until the motor tilts back. Now find the lever on the boat's motor mount and pull it forward to release it and lower the motor.

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 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.

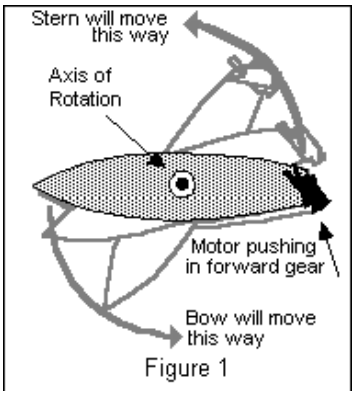

Figure 1

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).

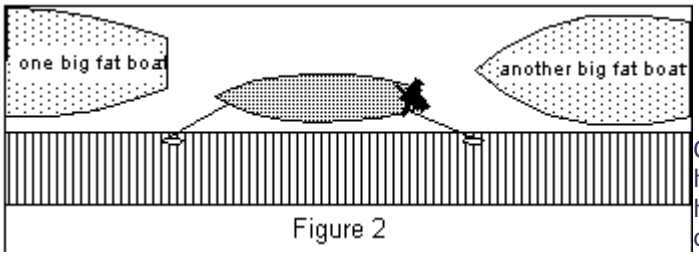

Figure 2

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.

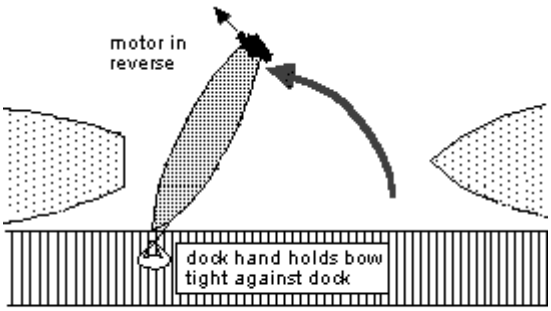

Figure 3

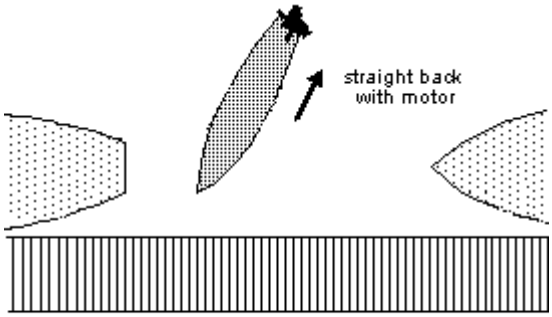

Figure 4

Maintenance

You're encouraged to help out with motor maintenance. If there's a problem you can't fix, label the motor, write a note in the log inside the clubhouse, **and** phone the motor chair (Riley Kuhn) or his helper (Peter Kuhn) at 510-549-9588 (cell 510-517-4026 if not home).

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 (other than the air-cooled sketchmobile 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 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**, remove the spark plugs and crank the motor with the pull-rope to evacuate the cylinder(s), drain all the fluids (including fuel in carb lines filter and tank if that went in), wash off the outside with fresh water, spray down inside the cylinders and exterior with WD-40, squirt more WD40 through the spark plug ports while cranking with sparks out. Replace all fluids and run motor until warm.

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 motor locker (top shelf). 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 skiffs and Commanders if the clear plastic bowls at the bottom show two layers of liquid inside. Normally the bowls contain only gas that looks greenish but clear without a bottom layer. If there's water in the gas, the filter is fouled, and the gas tank needs to be cleared of water by siphoning the gook from the bottom or pouring out the whole tank. Clear out all the lines, drain the carb, then drain the filter (put a container under them when loosening the drain screw) and replace the cartridge—unscrew 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
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