

The SSS TransPac Return Trip

Tips for making it back

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Archived at <http://sfbaysss.org/shttp/seminars/#KB>

Topics

- Engine Issues- Fuel, Cooling, Drive train
- Electrical Issues- Alternators
- Damage Control

The thoughts and suggestions presented here are the results of my own experiences. Please think these important issues through yourself and make decisions which reflect your own tastes, comfort, and experience levels.

The Return Trip

- The return trip from Kauaii to the mainland is somewhat **more serious** than the sail over to Hawaii. Generally the conditions are reasonable, but the **distance is longer**, the **routing is less obvious**, and there is **no easy downwind escape** to anywhere appealing. The **possibility of very serious weather** exists, and there are the remains of the **Japanese tsunami debris field** to be concerned with. Light airs usually mandate **extended periods of motoring**. This is not a passage to take lightly, although it is often quite enjoyable. In 5 previous passages, I have experienced, and others have experienced, a wide variety of mechanical and electrical difficulties. In this talk I will describe some of the most common of these issues and suggest methods of dealing with them. There are no single correct answers, but learning from the efforts of others may provide a useful starting point should your own passage run into difficulties.

Engine Issues

- Historically, one usually has to motor quite a bit on the return trip.
- Total fuel aboard limits engine hours.
- Take all the fuel you can manage to safely carry. REALLY!!! Also carry enough oil for 2 oil changes.
- Many boats have severe difficulties with fuel related issues on the return trip. These problems are often due to dirty fuel and inadequate methods of handling it, filtering it, and bleeding the engine.
- Other issues arise with the cooling system and the drive train due to the many hours of continuous use.
- **You MUST be comfortable bleeding your engine and have the tools to do it. Practice before departure.**

Fuel System 1

- Most fuel tanks have sediment (algae, debris, etc) and water in them. When fuel is stored for a long time the amount can be substantial.
- Motion at sea dislodges the sediment and mixes it with the fuel. It is then carried into the fuel filter, where it starts to clog the filter, sometimes VERY quickly.
- During the race, this is often not a big problem due to limited engine hours, although it may require a filter change before Hanaleii Bay.
- On the return trip, it can be and often is, a HUGE problem, as most of the fuel aboard will be used motoring through the light stuff. Here are steps you can take to alleviate the problems and to deal with them at sea:

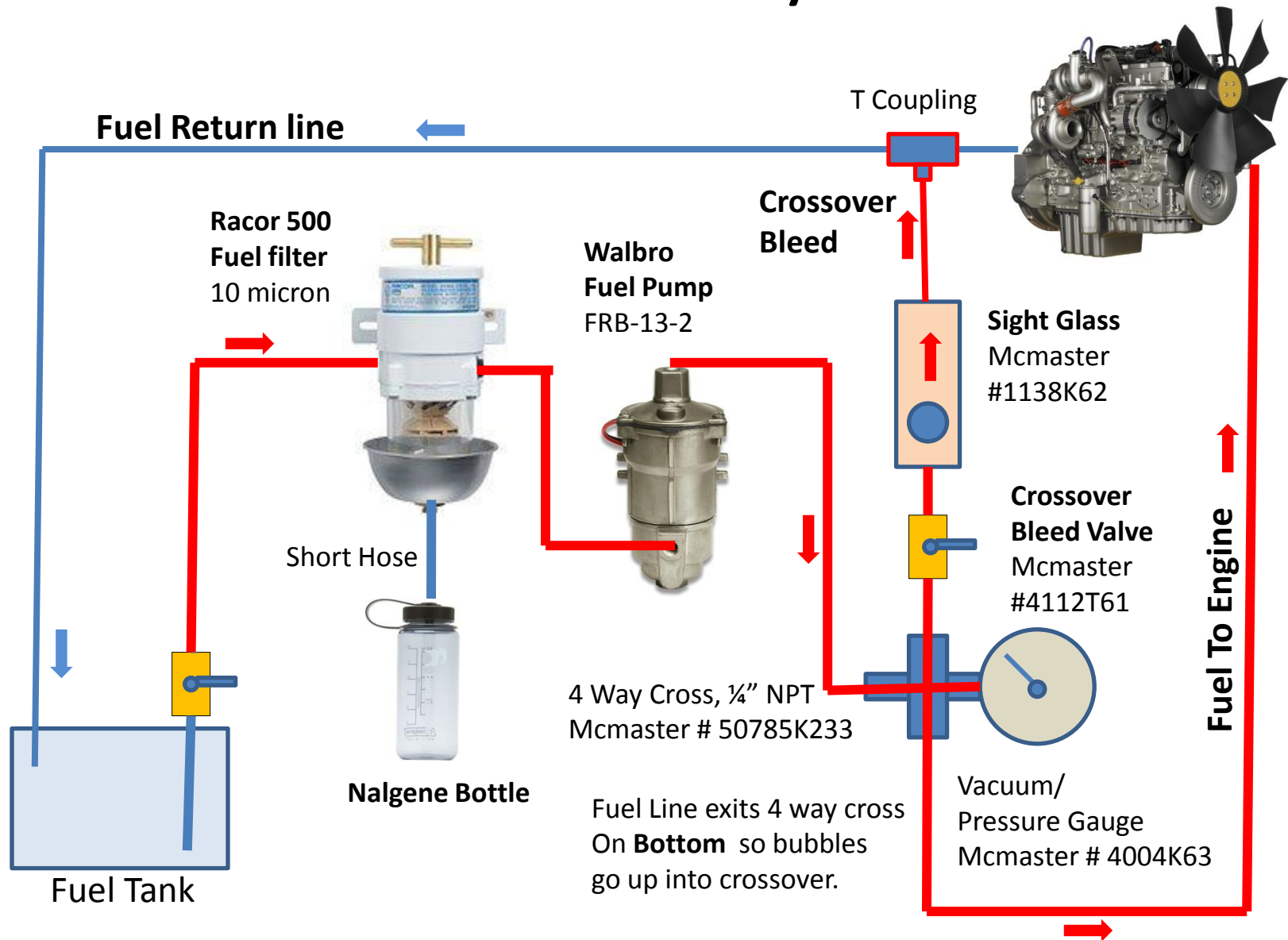
Fuel System 2- At the Dock

- The first step is to **depart with clean fuel**. This is important.
- Empty the fuel tank(s) into jugs or other robust containers and clean the tank thoroughly. Return the fuel through a filter funnel to remove water and sediment.
- Check the fuel port tube to make sure it **DOES NOT** have a screen on the end in the tank. These **ALWAYS** clog. Remove the screen if there is one.
- If emptying is not possible, **have the fuel polished**. It is **essential that the bottom of the tank be scrubbed during the polishing process**, and the fuel stirred to get the contaminants off the bottom and into the filter.
- Refill to a full tank with known clean fuel and **use Biobor algicide** or equivalent.
- Check the condition of all fuel system hoses. Look for leaks. Replace with new USCG thick wall hose and stainless clamps if there are any doubts.
- Replace the fuel filter element with a new one and clean the housing. Consider upgrading to a RACOR 500 filter (the gold standard of fuel filters). Also consider adding the **crossover bleeding system** to be described later.

Fuel System 3-Upgrades

- To avoid almost all issues with fuel at sea, **upgrade the fuel handling system** to incorporate a Racor 500 filter (with 10 micron filters), a Walbro fuel pump (FRB-13-2), a vacuum/pressure gauge, a crossover bleeding valve and sight glass, and flare fittings on the hoses. This makes fuel system maintenance and bleeding very easy and mess free.

Offshore Fuel System



Using the Crossover Bleeding System 1

- Fuel Filter replacement is very easy with a Crossover Bleeding System.
- When engine is shut down, there is no air in the line from the 4 way cross to the engine.
- Crack the filter top and drain fuel from filter into a Nalgene Bottle and remove the old filter. A plastic bag contains the mess. If the filter body is very dirty, clean it. A stiff wire may be helpful to get muck out. Use decanted “clean” fuel from bottle to flush crap out of the filter body. Close drain before flushing from bottle.
- Cap the Nalgene bottle and insert a new 10 micron filter. Close the drain port!!
- Replace the cap (use the new O ring!).

Using the Crossover Bleeding System 2

- Turn on the electric Walbro fuel pump and open the crossover valve.
- The pump will suck fuel from the tank, filling the filter. Soon fuel will be seen running through the sight glass and back into the tank via the fuel return line from the engine. Many bubbles will be seen. Run the fuel pump until no bubbles are visible. Close the crossover valve and turn off the fuel pump.
- Restart the engine and away you go!!! No engine bleeding should ever be required, as air cannot enter the engine fuel supply line during this process. Also, there is very minimal diesel spillage or mess.

Crossover Bleeding System parts List

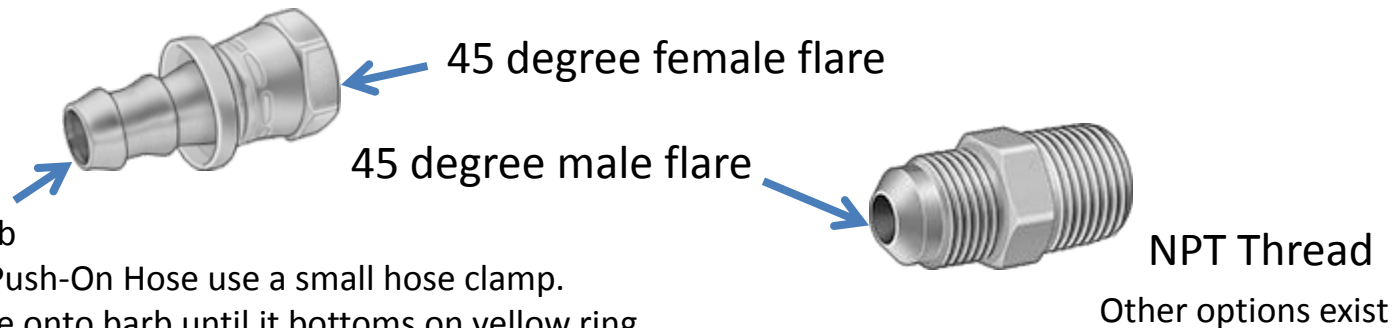
Suggested Parts- use discretion!!!

- Walbro FRB-13-2 Fuel Pump \$149 at www.Fisheriessupply.com
- Racor 500 Fuel Filter \$189-\$230 Google for best deal (Amazon). The manifolded dual Racor 500 is even better.
- Slim-Line Flow Sight, brass, ¼" NPT www.McMaster.com part number 1138K62 at \$30.56
- Valve, brass, ¼" NPT McMaster #4112T61 \$11.61
- Pressure Vacuum Gauge, 30" HG/15 PSI, ¼" NPT, McMaster # 4004K63, \$11.78
- 4 Way Pipe Cross, Brass, ¼" NPT McMaster #50785K233, \$9.57
- To buy a complete system, check out the FilterBoss, system at <http://www.ktisystems.com/single-engine-single-tank>. This is a nicely engineered device, but very expensive. Worth a look.

Fuel System Maintenance

- All my fuel system hoses are terminated with 45 degree “Push-On” flare couplings. I use heavy wall USCG approved Fuel hose and small hose clamps on the hose barbs. These allow leak free, robust, re-usable connections which may be removed instantly with a wrench for maintenance and replaced without struggling.

<http://www.mcmaster.com/#45-degree-hose-fittings/=qliw8h>



Hose Barb

For non Push-On Hose use a small hose clamp.

Push hose onto barb until it bottoms on yellow ring.

Hoses generally must be cut off hose barb.

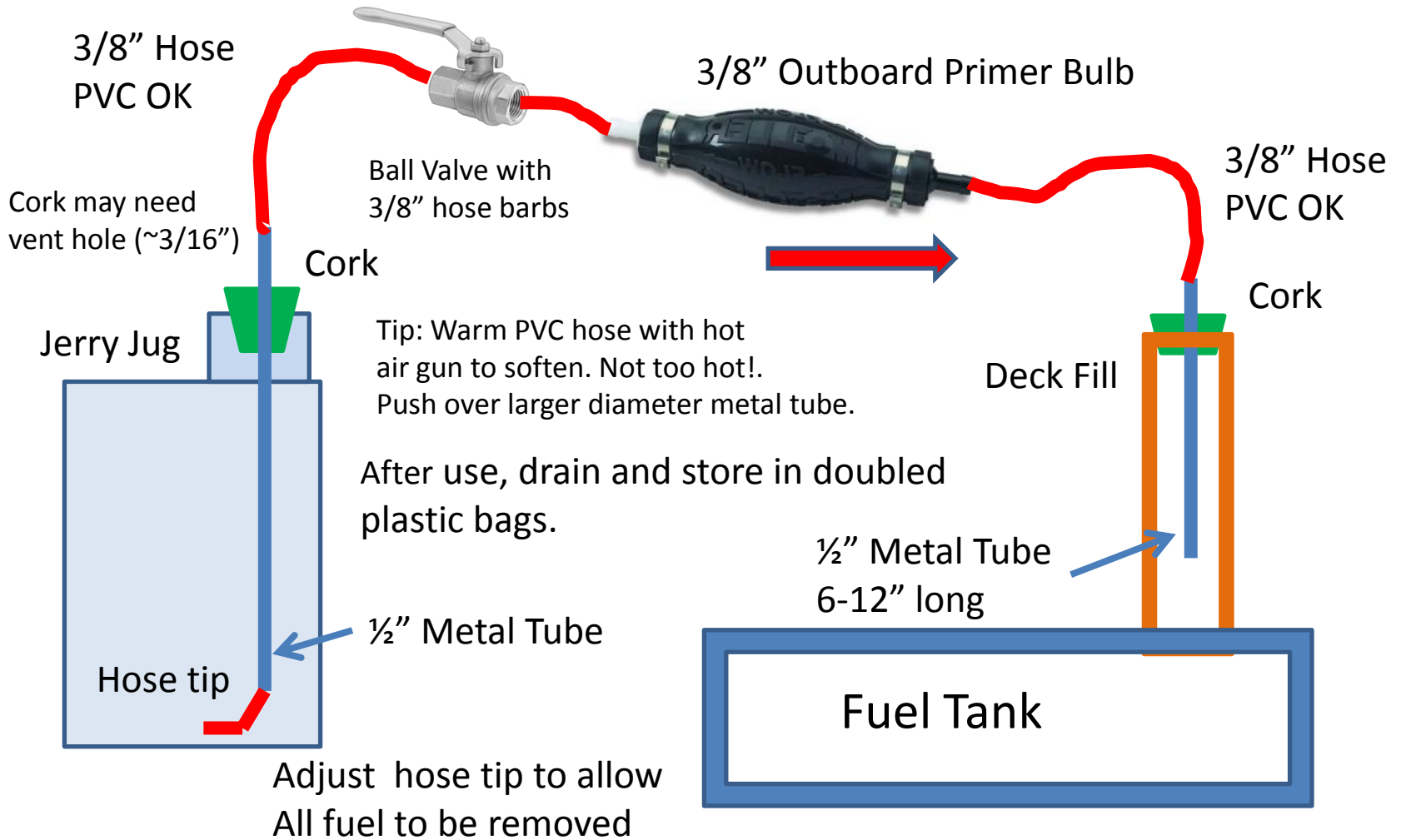
<http://www.mcmaster.com/#45-degree-tube-fittings/=qliv5n>

Re-Fueling Tips

- Many sailors carry fuel in Jerry jugs to supplement their onboard tanks. Filling the tank from jugs at sea can be a nightmare and result in spilled fuel unless the correct funnel or, better, a transfer pump or siphon is used. The siphon is easy to make, inexpensive, versatile, and completely eliminates struggles with heavy jerry cans in a heaving cockpit.
- Carry a good supply of fuel absorbent sheets for spills.
- With no siphon, a massive, deep funnel is essential. Check out <http://shurhold.com/marine/fuel-filter-funnels>

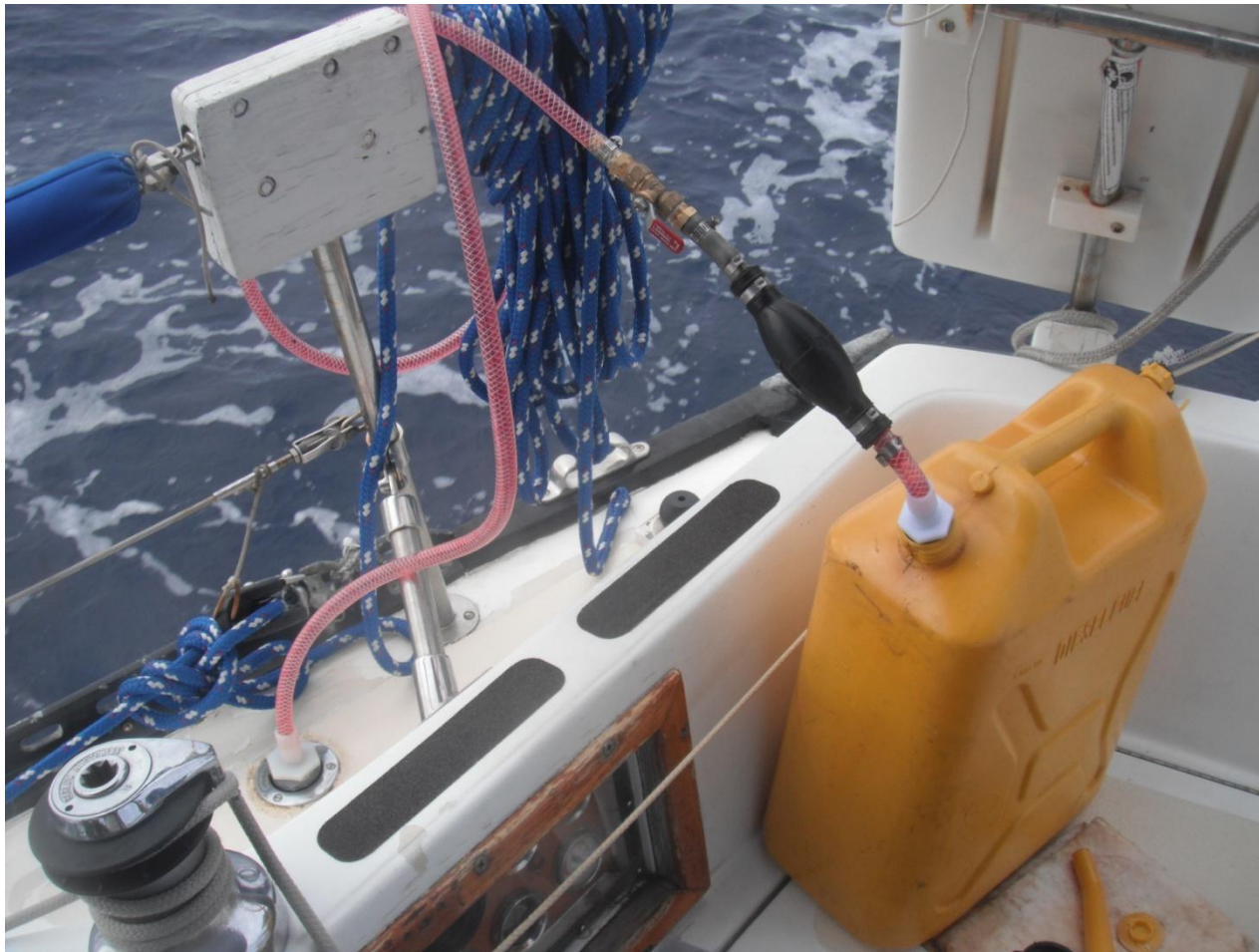


Fuel Transfer Siphon System

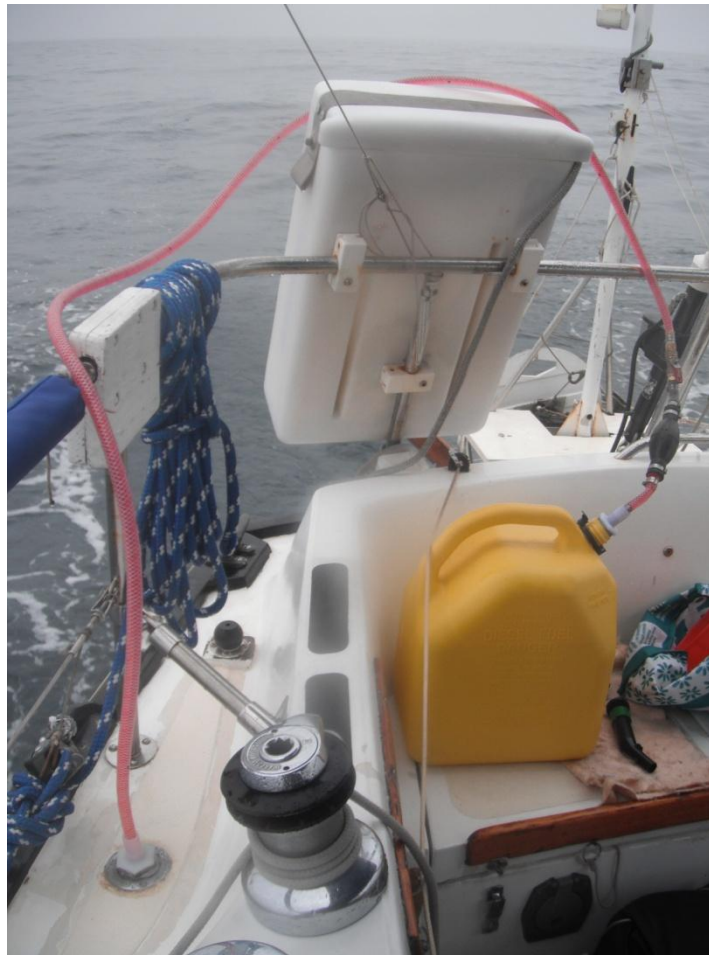


Jerry Jug must be higher than fuel tank!!

Jerrycan Refilling Siphon (Steve Hodges- S/V Frolic)



Jerrycan Refilling Siphon (Steve Hodges- S/V Frolic)



Engine Cooling problems 1

- It is common to motor for periods of over 24 hours to several days on the return trip. Issues with the cooling systems are common. A thorough examination of the state of the engine hoses before departure is a good idea! They can rot and fall apart! Replace any questionable ones.
- First check if the engine is spitting the correct amount of water out the exhaust. If not, then the issue is the raw water system.
- **Raw water impeller goes bad**: replace with spare(s)! Lubricate impeller before using!
- **Water filter clogs**: clean out. If the intake is blocked, you may be able to blow it clean with pressurized air. A dinghy pump on the outlet of the water filter may do the trick. An air leak in the water filter cap or hoses can also prevent raw water pump suction.
- **Raw water hoses break/crack**: replace or hose clamp rubber sheet over the crack.
- Cracked or broken raw water mixing elbow or water lift box. Oh well.. Do what seems feasible....

Engine cooling problems 2

- If the raw water system spits water and the engine overheats, then the engine coolant system is not working correctly.
- **Check coolant level** and top off if low.
- **Check the engine water pump belt.** If it is loose it will reduce the amount of coolant pumped. If there is an alternator using that belt, be careful not to overtighten the belt, as that can destroy the water pump bearings.
- **A bad thermostat may be the problem.** Replace it. Test in boiling water. If bad and no replacement, remove and run without it. The engine will run cold, which carbons up the valves eventually.
- Sometimes the engine gets **an air bubble in the coolant system**, especially in the engine block. Check service manual for fill procedure. There may be a bolt to allow air out of the engine during coolant filling.
- Sometimes **the heat exchanger gets blocked by junk** getting through a bad water filter or broken off impeller blades. You can (carefully) inspect the raw water intake side of the heat exchanger by removing the rubber cap. Do not take off the wrong one and lose the coolant! If the capillary tubes are calcium deposit clogged, you may be able to clean them with a piece of small diameter allthread (such as #8-32), using it as a round file in each capillary.

Transmission/Drive-train problems

- The drive train can have issues. Some are fixable, some are not.
- **Leaking shaft seal**: either ignore it and pump regularly if a nuisance, repack if you have the materials and access, or if really bad, shrink wrap the shaft and packing gland with latex sheet and do without the engine.
- If the **prop is damaged**, don't run the engine. Hitting debris on the return trip is not uncommon. You will ruin the cutlass bearing, strut, and more.
- If the **transmission starts to slip or overheats**, check the fluid level. It often uses special fluids, like ATF. Don't overfill.
- Check the **transmission linkage**. Sometimes it comes apart due to vibration. Same for throttle linkage.
- Check the **transmission flange bolts**. Sometimes they get loose and the flange gets misaligned, causing vibration, damage to the cutlass bearing and shaft coupling, and even the transmission.
- Check that the **shaft is properly secured in the shaft coupling**. If it gets loose, the prop shaft can go right out the back of the boat, leaving a big hole (wooden or foam plug...). A bolt on shaft collar, such as <http://www.mcmaster.com/#shaft-collars/=qmf2on> is cheap insurance.



Alternator Problems

- **Always!!! Carry a good spare alternator and plenty of spare belts, no matter how meager your budget.** They do fail regularly. If working on the alternator, wear safety glasses. Be aware the positive wire from the alternator is running directly to the battery, and a short to ground makes an arc welder. Be really careful. If the engine is running watch loose clothes, wires, your fingers, DVM leads, etc.
- If the alternator does not charge:
 - ❖ First: **Check the engine RPM.** If it is too low, the alternator will not produce a high enough voltage to put current into the battery.
 - ❖ **Inspect the belts.** Replace or tighten. Use the $\frac{1}{4}$ " - $\frac{1}{2}$ " thumb deflection test. Do not over-tighten. A small pry bar or long, stout screwdriver is helpful.
 - ❖ With a Digital Voltmeter (DVM), measure the voltage applied to the field winding. Most alternators require a positive voltage on the field winding (P type) to operate. N type go to ground. If you do not have a reasonable voltage (near 12 volts, **the regulator may be bad.** Check the power fuse to the regulator, and also the fuse in the sense lead to the battery (if using an external regulator).
 - ❖ Check the alternator output voltage from the ground terminal to the output terminal with the DVM. It should be somewhere from 12.5 to 14.5 volts (in any case, greater than the battery voltage in order to charge)

Alternator Problems- Hotwiring it

- If you have field voltage (and thus, hopefully field current inside the alternator), **check all the connections between the alternator and the battery** on both positive and negative sides with the engine off. Also the field wire connector. A loose bolt will create a high resistance contact, and voltage will be dropped across the contact, heating it up. A hot terminal is a sign that the contact is not good. **NEVER, NEVER, NEVER disconnect the alternator** from the battery with the engine running. It will almost certainly kill the alternator.
- If your regulator is bad and you have a P type alternator, you can **hotwire** it to charge at full throttle. To do this, wire a 10 amp fuse and a switch between the battery terminal (or other source of battery voltage) and the field terminal. Use 14 AWG wire or bigger. If the alternator is functional, when the switch is turned on and the engine is running, the alternator will output the maximum voltage (and thus current) that it is capable of. This can easily exceed the proper charging voltage for your batteries if run like this for a long time. The charging voltage, and thus **battery voltage MUST be monitored carefully**.

The proper way to use this system is to allow the batteries to charge until you hit around 14.1 volts. At this point the charging current will be low, less than 20 amps for a big battery bank, or 10 or so for a small one. Then **TURN OFF THE HOTWIRE**. Leave it off until the battery voltage gets low again, typically 12.1 volts to no less than 11.9 volts, turn on the engine, turn on the hotwire, and monitor like a hawk. The battery voltage should rise, and the current should be the maximum for the alternator. **This is an emergency technique**, and should NEVER be used otherwise.

Water in the engine

- Sometimes an engine is hard to start. If the raw water intake seacock is left open, the raw water pump pumps water into the water injection exhaust elbow, and soon fills the waterlift box. It then backs up the exhaust line and floods the engine through the exhaust valves. The engine is then in danger of total ruin, and will not even turn over.
- If this happens, one must get the water out of the cylinders, oil them, change the oil, and run the engine, and then change the oil again.
- To get the water out of the engine, remove the fuel injectors (sounds scary, but is straightforward). The starter may turn the engine over and blast the water out of the injector ports, but turning the engine over slowly by hand is safer.
- Either use a big socket on the crank pulley nut or use a big wrench. It usually takes a fair amount of force to turn, so a ½" socket of the right size and a breaker bar or torque wrench may be needed. Turn the engine the proper direction or the crank pulley nut will unscrew. It is worth getting the right socket/ratchet/breaker bar and keeping it aboard. Engines cost a lot of money to replace. When the water has squirted out, inject some oil (engine oil in a pinch) into the cylinder and flush them by rotating. You need rags to keep things sane. Do this several times, then spin the engine with the starter (raw water intake closed!!!). Replace the injectors and tighten. A service manual will be a help here.
- Replace the engine oil and filter. Do not spin the engine much until you do, as it will push water into the journals and other tight tolerance parts of the engine.

Water in the engine

- Try to start the engine. You may need the glow plugs. If it will not start, bleed the injectors by cracking the fuel pipe nuts and cranking the engine until no bubbles come out. Try to start the engine again.
- If the engine still won't start, squirt a SMALL amount of WD-40 just past the air intake (not directly into it). This may get it to fire.
- When the engine fires up, run it until it comes to temperature. Stop the engine and change the oil and filter again. Run it for a fair time to allow any moisture to evaporate. Change the oil and filter again at the earliest possible time (IMMEDIATELY when you get back!).
- If the engine cannot be started, no matter what, pull the injectors again and repeat the oil in the cylinders/rotating routine several times. Fill the cylinders with oil, put the injectors back in and reconnect the injector pipes, remove the key to the engine, turn off the electrical engine switch, put a note on the engine panel, and have a good mechanic have at it as soon as you return. You should have fresh oil and filter in it when doing this storing procedure. Having several gallon size empty re-sealable bottles to store used oil is a very good idea.

Engine Spares

- Many spare primary fuel filter elements. For Racor 500, minimum would be 6. I carry more.
- Spare copper crush washers for engine fuel system. In a crunch, old crush washers may be reused by heating cherry red and quenching in water.
- Engine Parts Book!!! Engine Service Manual!!!
- Spare engine secondary fuel filters (2 minimum).
- Spare engine oil filters (2 minimum)[*Needed if engine floods with raw water*]
- Engine oil (Delo 400) in quart size. Enough for minimum 2 oil changes [*see above*]
- Spare starter motor
- Spare alternator
- Spare belts. Minimum of 3 for alternator (Heavy duty- Gates, Goodyear, etc),
- Raw water pump impeller kit (2 minimum).
- Spare engine fuel pump.
- Transmission fluid.
- Spare coolant tank cap; a gallon of premixed coolant is prudent.
- Shaft seal service material (packing, packing extractor, etc)
- Special fuses for engine (if any), spare relays (if any)
- Assortment of crimp connectors, heat shrink tubing to fix broken wires.
- Spare injector(s)
- Spare thermostat and several gaskets
- Some spare USCG approved fuel hose (10' or so); diameter as appropriate.

Getting Water out of the Boat !!!

- Boats at sea can get substantial amounts of water inside for many seemingly improbable reasons:
 - ❖ Being pooped or knocked down
 - ❖ Failed Thru Hull or hose clamp/hose
 - ❖ Failed shaft seal
 - ❖ Hull, keel, or topside structure damage
 - ❖ Collision

Getting Water out of the Boat : Homework

- In an emergency, the typical manual pump is useless. It is too small to do much and your hands are needed elsewhere. Most electric bilge pumps are also too small to dewater the boat or keep up with a big leak.
- Have a BIG electric pump (3600gph) or better, TWO of them, with proper wire, connection to battery, and fuse(s) or circuit breaker, with flat discharge hose ready to go.
- Consider having a huge Edson 1 Gal/stroke manual pump also.
- Use Cam-Lock fittings to make versatile intake and discharge hoses for various scenarios. Intake hoses must have reinforcement. Discharge hoses can be lay-flat type.
- Have several robust buckets, including a smaller one, various hand pumps, sponges, and a bunch of towels aboard.

Getting Water out of the Boat 1

- **Installed manual or electric bilge pump**
 - ❖ Fuse problems, corroded wires, bad bilge switch
 - ❖ Clog in strainer, air leak in suction side
 - ❖ Bad ergonomics, fatigue, “one-armed paperhanger” effect
 - ❖ Not enough capacity
- **Strong case for portable bilge pumps**
 - ❖ Easy to put together
 - ❖ Much greater capacity
 - ❖ Flexibility, peace of mind
 - ❖ They do require a financial commitment to getting back alive.

Getting Water out of the Boat 2

- Water in the boat is **VERY SCARY!!!** The first thing is **DO NOT PANIC**. Be calm (hahahaha..) and **THINK!**
- If there is a lot of water in the boat, get the engine started asap. Consider a VHF call to local boats.
- Heave to or drop sails unless this is not a good idea for other reasons.
- Rig emergency pumps and get them going.
- Find the source. This can be hard: bail/pump like hell and inspect everywhere. Don't be dainty- rip out whatever is in the way if necessary.
- Slow down/plug the leak temporarily.
- Dewater boat until dry enough to work on leak issue.

Stopping the Leak

- Use anything you can to slow down the leak.
- Have rubber and wooden plugs for round holes, Forespar Foam plugs (2 minimum) for irregular holes.



<http://www.pajonowoodworks.com/thruhullwoodplugs.htm>



www.forespar.com/pdf/techTips/F35-TruPlug.pdf

Stopping the leak

- For a collision or hull breach, try using a sail (**storm jib with lines tied to corners**) to cover the hole. Water pressure will hold it in place.
- For cracks near the keel or where a sail will not work, a soft pad backed up with something hard and compressed against the crack with a boathook or **PVC pipe/Threaded rod jackscrew** can slow down the leak.
- **Latex rubber strips** (6" wide by 36" long) can be used to shrink wrap leaking shaft seals on either the inside or outside. See <http://www.mcmaster.com/#85995k15/=qlv2le>
- Some soft rubber sheet (MCM#85175K59-soft grade, for example), some bits of ½" plywood, a few pieces of 2X4 can be helpful to press over a hole.

PVC Pipe Jackscrew

- A length of 1 ¼" PVC pipe and some allthread (24" of ½"-13 or ¾"-10) with some nuts and fender washers makes a handy jackscrew that will put a lot of force on a hull patch.

Stainless Fender Washer
\$9.81 per pack of 10
Mcmaster #90313A118

Stainless ½"-13 Hex Nut
\$5.93 per pack of 25
Mcmaster #91845A310



1 ¼" PVC schedule 80 Pipe
Cut to length as needed. Put
PVC end against cabin top or
other hard point to apply force

½"-13 Stainless Allthread
24" long
Mcmaster# 98804A033
\$9.47 each

For a deluxe jackscrew,
Add an acetal leveling pad
MCM#6103K42 \$6.90/ea

Emergency Bilge Pumps 1

Johnson L4000
4000gph 12V pump or similar

MCM= www.Mcmaster.com

#10 AWG Duplex
Heat Shrink seal
Make long, 15' to 25'



Use direct to hose,
Jumper with short hose to cam-lock male,
Or use threaded cam-lock male into pump

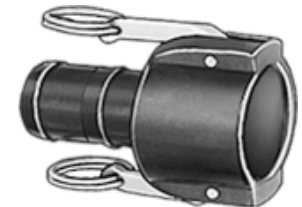
MCM#5535K13
1 1/2" Hose \$2.99/ea



www.Dultmeier.com
#KAIS150 1 1/2" Flat Hose
\$1.17/foot



MCM#5535K11
1 1/2" Hose \$7.68/ea



Marinco 12VCP
Plug and receptacle
West Marine #1422591



To Fuse or Circuit Breaker
Fuse at 25 amps
Must be easily replaced!
Have spare fuses (Slow Blow)

Emergency Bilge Pumps 2

The Edson size 30 manual Bilge pump (in either kit form or separate) is expensive, but you will not complain if you ever need it. It is an awesome tool for getting water out of a boat.

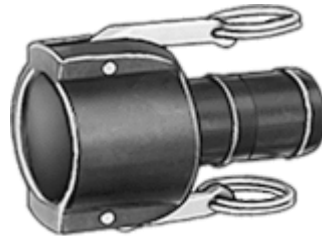


Note Cam-Lock couplings which allow storage in pieces with easy assembly. Lay flat hose may be used on the discharge side. It pumps dirty, solid filled water with impunity.

Portable Bilge Pump Accessories

Polypropylene Cam Lock Fittings (Banjo Corporation)

Cam lock Fittings are inexpensive (\$7-\$10), reliable, and come in both pipe and hose barb versions.



<http://www.mcmaster.com/#cam-lock-fittings/=qluakd>

Lay Flat Discharge Hose (PVC)

Lay Flat Hose is inexpensive (\$1.17/foot for 1 ½' diameter), And stores in a small volume. For discharge only.

<http://www.dultmeier.com/products/0.2006.5608/1695>


More Bilge Pumps I have needed



Royal Blue

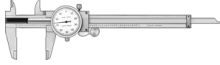



Lines fouled on Prop, Keel, or Rudder

- It is common for boats returning to SF to snare a floating line or net and wind it up on the prop. You will often hear a change in the engine pitch, or note a decrease in speed.
 - **Immediately stop the engine!!!** Severe damage can occur to the strut or transmission otherwise. Sometimes the line can be unwound with gentle, slow application of reverse. Usually not. Be careful!!!
 - If you must go overboard: Remember: **THIS IS DANGEROUS!!**
 - ❖ **Wait for calm conditions**; turn off engine.
 - ❖ Drop sails, lash tiller to one side, stream buoy on line behind boat.
 - ❖ Rig boarding ladder (nylon stepladder works). Wear **Kayak helmet**.
 - ❖ Use **sharp serrated bread knife**; rig lanyard, sheathe. **Kyocera ceramic knife or hacksaw blade** are also good. Full finger gloves may be a good idea. A line wound on the prop can be a big ball of compressed fiber. It can take time and thought to get it cut off and unwound. Be patient; rest if needed; SAFETY FIRST!! Consider a Hol Tite handle WMP#190538.
- 
- ❖ Be careful not to strike head on boat hull when the boat heaves in the swell. Using a safety line gives crew a chance to help if there is a problem.
 - ❖ Having fins, a snorkel, and mask aboard is a good idea.



Essential Tools

- Digital Voltmeter and several double alligator clamp leads, Portasol soldering iron, solder, flux
- 2 Vise grip pliers, large Channel Lock pliers, needle nose pliers, pipe wrench, box cutter/razor knife
- Wire cutters, crimp tool and crimp connectors, wire stripper, heat shrink tubing (Ancor), spare wire
- Assortment of screwdrivers, Phillips #1,2,3, flat blade, jewelers set.
- Rechargeable drill and 12 volt charger, 2 batteries, drill set (to ½”), a few hole saws.
- Tape measure, machinist dial calipers (MCM#2289A45) 
- Bright LED Headlamp and spare batteries (lots)
- Safety Glasses (good at night on deck)
- 2 good hacksaws and minimum 6 bimetal blades (Lenox or Starret), sharp pointed drywall type saw.
- Portable vise, assortment of C clamps, hose clamps
- Band-it tool, clamps, banding.
- Hammer, small pry bar, metal drift punches, chisels, center punch
- Allen head wrench set- both metric and Imperial
- 3/8” Ratchet , extensions, metric and imperial sockets, deep and also regular, cheater bar.
- Box and open end wrenches for engine and deck hardware , Crescent wrenches (small, large).
- Raw water filter spanner
- Oil filter wrench, empty gallon containers, oil change setup, paper towels, plastic bags
- Assorted files (smooth, bastard, half round, round, rasp), assorted sandpaper, including very fine.
- Small mirror, scribe (MCM#6808A12) 
- Pipe tape, duct tape, electrical tape, super glue, fast set epoxy, waterproof epoxy, fast cure 5200, Lifecaulk or other sealant, threadlocker, WD40, Boeshield, Lanacoat, Tef-Gel, silicone spray, acetone, denatured alcohol, paint thinner, Simple Green, Latex gloves, West epoxy and fillers, fiberglass cloth, mixing cups, mixing board, and sticks, assortment of nuts, bolts, washers, screws

Summary

- The return trip can be challenging.
- This passage demands seamanship, patience, and preparation.
- Difficulties with engines and electrical systems, encounters with debris, and extended motoring are common.
- Having extra fuel, spare parts, tools, and emergency equipment already prepared makes the trip safer and more anxiety free.
- It is a **BEAUTIFUL** trip. HAVE FUN!!!

Useful Vendors

- www.mcmaster.com McMaster is one of the most useful vendors I know of. They supply just about anything. The best source for tools (taps, drills, etc), nuts, bolts, raw materials, and so on. Great quality and fast delivery.
- www.dultmeier.com. A supplier of fluid handling stuff; hoses, valves, polypropylene pipe fittings (Banjo Corporation), and a host of other things.
- <http://www.walbro.com/> Maker of exceptional fuel pumps
- <http://www.depcopump.com/> A distributor of an amazing variety of pumps for all marine applications.
- <http://www.edsonpumps.com/>
- http://www.amazon.com/Boatowners-Mechanical-Electrical-Manual-Essential-ebook/dp/B006QA7200/ref=sr_1_1?ie=UTF8&qid=1392234962&sr=8-1&keywords=nigel+calder If you have only one book about boat troubles (other than engine parts and service manuals) this is the one you should have.
- Local metals vendors:
 - ❖ <http://www.alcometals.com/> San Leandro- good prices
 - ❖ Alan Steel, Redwood City. No website. High prices, lots of stuff
 - ❖ <http://www.gorillametals.com/> Hayward, San Jose.
 - ❖ Sims metals, Monterey Highway, San Jose.