**Mouette**

Dear Charter Guests:

*Mouette* arrived in the Pacific Northwest from her birthplace in France on August 15, 2013. She was commissioned and underwent sea trials in Anacortes before being delivered, bright and sparkling new, to San Juan Sailing.

*Mouette* is a 2014 Jeanneau Sun Odyssey 469. Her features include:

- Overnight accommodation for up to eight in three 2-berth cabins and the main cabin. (Occupancy by more than 6 requires approval from SJS.)

- Forward master cabin with queen-sized bed on the centerline, ample storage, vanity table and its own large head with shower. The forward cabin has an aftermarket latex foam mattress that we decided we had to have about three seconds after lying on one in the showroom.

- Two comfortable rear cabins with ample bed and storage space and separated by an insulated equipment tunnel. These cabins share a head/shower.

- Galley with 3-burner stove, oven and microwave plus top and side opening refrigerator and separate freezer.

- Electric flush fresh water heads.

- Upgraded house electrical system with 660 Ah capacity and smart charging functions.

- Electric sheet and halyard winches, a roller furling headsail and a conventional, fully-battened main with lazy bag. Main and headsail sheets are led aft to electric winches located beside the dual helms. A bow-thruster makes docking easy even under challenging conditions. Anchoring is facilitated by an electric windlass with controls at the bow and in the cockpit where there is also a chain counter.

- Chartplotters at both helms are integrated with all navigation electronics, including autopilot and AIS. The display is viewable on the main cabin

television screen and can be remoted to common devices such as laptops, tablets (or even smartphones) with free software download.

- Fully enclosable cockpit for added comfort on those occasional rainy or chilly evenings or passages.

- Very large sail locker forward that can accommodate bags and other stuff that would otherwise have to be stowed in one of the cabins.

- Crane for the dinghy outboard.

- DVD/MP3 video and Pioneer/Bose sound system with docking and cockpit speakers.

There are sure to be lots of little tips we could use to help make *Mouette* more convenient to charter. If you think of anything during your charter, please be sure to let us know. We look forward to hearing all about your adventures aboard *Mouette*!

Questions or feedback? Give us a call: 503-297-5777 (home) 503-939-5527 (cell), or send us an email: hallejj@gmail.com

The name? "*Mouette*" is the French name for a small gull. Large gulls, like herring gulls, are called "*goélands*". John grew up in Geneva where the black-headed gulls (as well as the little boats that operate as taxis around the lake) are called *mouettes*.

Happy sailing!

John and Barb Halle
Mouette, LLC

## Specifications

CONSTRUCTION

Model.....SUN ODYSSEY 469
Architect / Interior design.....Philippe BRIAND / Jeanneau Design
Builder ..... SPBI S.A
Principal means of propulsion ..... Sail
Hull construction material .....Single skin laminated fibreglass / Polyester
Deck construction material..... Laminated sandwich glass / Polyester / Balsa wood
Application: Deck.....Injection
Hull..... Wet laid fiber
Keel construction material .....Cast iron
Ballast weight ..... 6,823 lbs.
Displacement (light)…… 23,830 lbs.

GENERAL DIMENSIONS

L.O.A (Lmax) (Transom upright) ..... 46'11"
(Including removable parts that can be dismantled (bow roller, pulpit, bowsprit), without affecting the structure of the boat)
Hull Length (Lh).....44'9"
(Excluding: removable parts that can be dismantled, without affecting the structure of the boat)
Overall width (Bmax)..... 14'9"
(Including: removable parts that can be dismantled, without affecting the structure of the boat)
Beam(Bh)..... 14'9"
(Excluding: removable parts that can be dismantled, without affecting the structure of the boat)
Air draught (Empty vessel not including mast top accessories)…….. 66'7"
Draught - Boat fully laden …… 7'4"
Wetted surface area ..... Approximately 540 sq.ft.

ENGINE

Engine…….. Yanmar 4JH5CE
Engine horsepower…… 54 hp
Nominal maximum propulsion power ..... 55.2 Kw

ELECTRICITY

Circuit type - Direct current.....12v
Circuit type - AC.....110v

CAPACITIES

Total mass of the liquid content of fixed tanks when they are full.....2,372 lbs
Fuel capacity: Tank 1.....63g
Fresh water capacity:
Tank 1.....106g
Tank 2.....62g
Sewage water capacity (WC):
Tank 1.....21g
Tank 2 .....21g

It may not be possible to use these capacities fully depending on the trim and load of the boat. It is recommended to keep a reserve of 20% in the fuel tanks.

SAILS

Mainsail.....534 sq.ft.
Headsail ..... 501 sq.ft.

MISCELLANEOUS

FCC Call Sign: WDG 9395
(For normal, non-emergency transmission, use "*Mouette*". The FCC call sign will give the Coast Guard access to information about the boat in an emergency.)

MMSI Number: 367587330
(This is the number broadcast through the AIS transmitter and is linked to data about the boat. It gives other boats with AIS receivers, including the Coast Guard, access to this data.)

Coast Guard Official Number: 1250069
(*Mouette* is Coast Guard documented. The Certificate of Documentation is included with the ship's papers and may need to be presented to various authorities, including the Coast Guard, assorted Sheriffs and miscellaneous customs and border officials. You should not be asked but *Mouette* is exempt from Washington registration because it is documented and a charter vessel.)

Maintenance Professionals:
We use Pacific Marine Electronics for maintenance on *Mouette*. In addition to providing general maintenance, Pacific Marine Electronics specializes in marine electrical and electronic systems. They installed all of the aftermarket electrical systems on *Mouette* and are familiar with them. If you are confused by an electrical issue, they will likely have the answer.

ADDITIONAL INFORMATION: Additional information about *Mouette* and its systems can be found in the Jeanneau Owners Manual, a copy of which (3-ring

binder) is on board, as well as numerous component and system manuals located in a grey bag located under the forward main cabin seat. In particular, the Yanmar engine manual has detailed information about the engine and its maintenance.

## Nuances

Here are some things that we think apply particularly to *Mouette* and therefore might not be obvious even to an experienced sailor.

*Electrical Power Management*

*Mouette's* house battery system, assuming it is working properly, has enough storage capacity to last for two days and one overnight almost without reference to the demands made on it. As a result, and as long as there is no system problem, you can pretty much forget about power management if you either run the engine under load (motor or motor sail) for at least three hours each day after the first or alternate nights at anchor with nights at a marina on shore power. If you plan consecutive nights at anchor and do not meet the motoring requirement, by the second night you will need to monitor the available electrical instruments to determine your remaining capacity and you may need to limit unnecessary use of electrical equipment. Beyond two days, the motoring requirement will become mandatory. The various electrical systems are described in these Notes, which used also to have a considerable amount of background theory to explain power management. Since many of our guests already know the theory, and since explaining it actually requires quite a bit of space, we have now moved the theory to a separate Supplement that appears at the end of these Notes. The supplement is a bit long but we hope it will be useful for those who find the subject confusing and would like to dig into it a bit more deeply. Since it is geared to those who are, as we were five years ago, totally confused about batteries and battery meters, some of the material is a bit basic. More informed readers can skip over these parts.

*Upgraded Electrical System*

We have replaced the house electrical system with new equipment and, while this has made a significant improvement in function and capacity, it has also created a couple of idiosyncrasies. The main electrical panel is set up to function with the standard system and is not reconfigurable to support the new system. Accordingly, the "Battery Charger" switch on the A/C side of the panel is inoperative (and unnecessary.) It can be left in the off position. Also, the alarm system in the main panel is hard wired to go off at parameters that made sense in the old setup but not in the new setup. (Since the new system is a lot "smarter" than the old one, it can support higher charge rates than would have been prudent with the old system.) In order to avoid being driven crazy by unnecessary alarms, we have turned off the main panel alarms and replaced them with an alarm system on our Blue Sea monitor, which can be appropriately programmed. If someone has inadvertently turned the panel alarms back on and they are driving you crazy, pressing the center button to get to "Menu", toggling right to the "Bell" icon and selecting "off" will restore peace aboard. If the Blue Sea alarm should go off, pressing any button twice

seems to turn the alarm off. For whatever it is worth, the old charger and inverter are still on board and could be reactivated by a competent marine electrician.

*Nav Table*

The nav table is attached to rails in the starboard wall of the main cabin and can be lowered to form a single berth (along with the seats in front of and behind it.) It is not supported on its inboard side in the up position and is therefore unsuitable for impromptu tap dance demonstrations or other forms of downward pressure applied to it including sitting or leaning hard on it, except in the down position with the legs extended (See "Berths" below.) So far, the nav table has been broken three times while on charter and we are hoping to go a couple years before the fourth occurrence. Please do not sit, lean or otherwise exert significant pressure on the inboard side of the nav table.

*Where Everything Is*

When we first put *Mouette* in charter, we took seriously the need to provide a detailed equipment inventory and to say where everything is located. After a few years of actual charter experience, we have given up. Charter guests have a way of rearranging things to suit their personal preferences and expectations and it is simply not possible to find it all and put it back during the turn process. In one case early on, the guest rearranged pretty much everything on board that was movable. It had to have taken hours and his arrangement was, in fact, much better than the one we had before. We haven't had a repeat of that experience but every time we climb back on board, there is a mandatory "where is it now" hunt. The good news is that most of it is there somewhere, although a utensil or two may come up missing. For stuff that you would normally expect to find inside, the places to look (in addition to the obvious storage spaces) are under the seats, behind the seat backs and, as a last resort, in the bilge. For outside stuff, try the two underseat lazarettes, the three storage areas under the cockpit sole and the sail locker forward. If something is really missing, please report it to San Juan Sailing so it can be replaced.

*Using Electric Winches*

This is our first boat with electric winches and we have discovered that, while they are wonderful if you aren't fond of ruining your hands and back and getting winded and sore while pulling lines, they also need to be approached with caution. If you have not used electric winches before, please keep in mind that they are awesomely powerful and, because they replace human effort with electric power, they limit the feedback that you would otherwise expect if things are not right.

If you use the electric winches and something gets jammed up (for instance, you try to haul the traveler upwind and forget to open the downwind clutch) the system may grind to a halt. If you keep trying to do whatever you are doing, the winch circuit breaker will probably trip and you will have to reset it. That is if you are

lucky. If not, something will break from the stress that you are putting on it. The first indication you may have that something is amiss is the sound of the gear breaking.

It is helpful to be alert to an unusual strain in the system and to stop and investigate if there seems to be one. For example, the cabintop winch is powerful enough to hoist the main, although it is working pretty hard for the last couple feet. If it starts laboring halfway up or comes to a halt short of the masthead, you may have a jammed reef line or some other hang-up. Figure it out first and then proceed with the hoist.

*Flushing Marine Heads*

Some of our guests have reported waste backup in one or both heads, particularly during passages in strong conditions. *Mouette's* holding tanks use the electric head pump to move waste from the bowl to the holding tank and then use gravity to dump the tank (which, we hasten to remind you, is illegal in US waters.) In order to make the gravity dump work, the holding tanks are located as high as possible within the hull and waste is pumped a considerable distance uphill from the bowl. To prevent whatever is left in the hose between the bowl and the tank from freely flowing back into the bowl, Jenneau has installed two different valves, a normal "duck bill" valve and, further up the line, an additional backflow valve. These valves reduce backflow into the bowl but no backflow valve functions perfectly. As a result, over time, waste can leak through both valves and back into the bowl. This is particularly true when the boat is bouncing around in high seas or healing over to both sides during vigorous sailing.

To address this problem, we "chase the waste" by flushing twice, the first time to pump the waste out of the bowl and as far as possible toward the holding tank and the second time, after introducing clean water to the bowl, to ensure that the hose fills with clean water and all of the waste is pumped into the tank. We do this on every boat we sail in and it has worked flawlessly for us, both on *Mouette* and on other boats. Because *Mouette* has a "fresh water" system, this does use additional water from the tanks but we think it a small price to pay for the result. If you are going to a remote area where fresh water will be hard to come by, this may not work well for you (noting that, once the tanks are empty, the heads do not work at all) but in most circumstances, it just means that you may have to refill a bit earlier. Although this technique should solve the problem, if you are getting what you believe to be excessive backflow into the bowl (whatever the content) it is possible that a valve has failed and needs to be replaced. If you think that is happening, please report it to the SJS staff so they can investigate.

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**Emergency/Safety Equipment and Procedures**

*First Aid Kit.* A complete first aid kit is located in the aft head upper storage compartment.

*Flares.* Visual day/night distress signals are located in the spares box under the forward dinette seat.

*Fire Extinguishers*. There are four fire extinguishers located:

- in the main cabin under the aft inboard dinette seat lid,
- in the owner's cabin,
- in the cockpit table,
- free floating (usually kept with the spares).

*Emergency Tiller*. It looks like a metal pipe with a T-end and is located in one of the cockpit storage compartments. The rudder post attachment point is under a silver cover in the deck between the two helms. Use a winch handle to unscrew the cover, insert the pipe vertically and feel it engage with the steering post below. Travel at reduced speed when using the emergency tiller. You can also steer the boat using the bow thruster, which may be your only option if the rudder is jammed.

*Inflatable Life Raft.* There is an inflatable 6-person life raft on board in a yellow cloth cover. It is located in one of the cockpit storage compartments and looks like a really big, heavy packed parachute. Follow the directions on the cover to automatically inflate. Use only if the dinghy is damaged or inadequate for the number of people on board or in very heavy seas (which you should not experience in the cruising area.)

*Getting Help.* If you have a serious emergency the first thing to do is deal with the emergency as best you can. If, after doing that, you still need help, pick up the VHF radio microphone, make sure you are on channel 16 and call the Coast Guard. You can use the term "mayday" (life threatening) or "pan" (serious but not life threatening), in each case repeated three times, to indicate the nature of your transmission. At a minimum, it should get some attention and clear the frequency of less serious traffic. You can also push the red distress button on the VHF radio. It will broadcast an alert but direct communication with assistance providers is far more effective, if it is possible.

Depending on where you are, you may get the Canadians or the Americans. Either way, they will need two things urgently: what the nature of the emergency is and where you are. They will ask these questions but you can shorten the process by answering them up front. If AIS is still working and you tell them so, they will be

able to pinpoint and track your location as soon as you identify yourself. What they will most likely do is alert other vessels to your plight and hope that someone can and will respond. If lives appear to be at stake, they can deploy helicopters and send their own boats but be aware that that takes time and may well not be an adequate solution. You may also be able to get prompt assistance from one of the Vessel Assist services in the area. The best and easiest way to set that up is to call San Juan Sailing and ask that they contact the right service.

If things look like they are headed downhill in a hurry, remember that *Mouette* is replaceable but you are not. If you are anywhere in the normal cruising area, you will almost certainly be close to some shoreline and you should not experience the really big seas that you can find in more open areas. Using the inflatable life raft, the dinghy or both depending on how many people you need to transport, it should be relatively safe to head for the nearest shoreline with the dinghy towing the life raft if you need the space.

In anything less than an immediate emergency (or once you have alerted the Coast Guard) if you have cell coverage, you can call San Juan Sailing, our maintenance professionals at Pacific Marine Electronics or us. If you are out of cell coverage, you can broadcast on channel 16 and ask someone to relay a message. If you get hold of any of us, we can coordinate things on shore. Depending on the problem, any of these sources may be able to help talk you through the problem and either San Juan Sailing or Pacific Marine Electronics can direct you to a source of assistance near where you are or come out to provide assistance. The larger ports and marinas in the area generally have local professionals that can help. If you use them for anything significant, please keep San Juan Sailing in the loop so they are aware of what is going on.

Contact phone numbers for San Juan Sailing and Pacific Marine Electronics are listed below and should also have been provided to you or posted on board:
SJS office at 800-677-7245

SJS's owner, Roger Van Dyken, at 360-224-4300 on cell or 360-354-5770 at home
Pacific Marine Electronics: Matt at 360-631-3731, Shawn at 360-296-6605 or Jason at 360-303-6171.

**Anchors and Anchoring**

Deploying:

- Ease anchor forward with short pulses on the control to prevent the anchor from swinging into the bow (a nudge with your foot will probably be needed to get it moving – always wear shoes), until it is off the bow roller.
- Lower anchor into the water fending off with a boat hook if it swings with the swell.

- set and snub the anchor.

Raising:

- Use engine to motor slowly in direction of anchor while using windlass to haul in chain. Do not allow the windlass to pull the boat forward.
- Don't over run the chain. If you do, stop the windlass immediately, and reverse the boat until chain is clear of hull.
- Stop anchor in sight but below water level to make sure it is not swinging.
- Raise anchor to roller, and if needed, use a boat hook to fend it off if it swings.
- Use short pulses on the control to bring the anchor carefully on to the roller, point down (use boat hook to turn the anchor if needed).
- Tie down the anchor from the first link in the chain to the starboard cleat using a standard cleat hitch.

Primary anchor in the bow: Delta anchor on 300' of 3/8" HT chain. There is a chain counter at the aft end of the cockpit table.

Snubber line for chain: located in bow anchor locker.

Secondary anchor (located in a cockpit locker): Fortress anchor on 50' chain and 200' nylon rode.

Stern tie line is a 600 foot line located in the center cockpit undersole storage. Please do not cut the line; it is all needed for certain places in Desolation Sound. When possible, select an anchorage that is described in one of the several excellent books describing the area. In high season, some of these can be crowded. The SJS staff can be helpful about what you can expect at any given time.

*Anchor Windlass*. The windlass runs off the start battery. Please do not use the windlass without the engine running as it will very quickly drain the battery and you will have a problem starting the engine. The forward control will work even if the engine is turned off, which is fine for making minor adjustments in the snubber setup but not for any serious use. The chain counter controls will not work with the engine off. The "on" and "off" breaker for the windlass circuit is located in the aft cabin beside the battery breakers. The yellow lever is "on" when down and "off" when up.

The windlass can be operated from a control located in the anchor locker of from the chain counter. Never operate the windlass without a crew member posted at the bow to ensure that the operation is proceeding properly. The person at the helm can usually see the chain being paid out or hauled in over the roller and adjust heading to keep it in the center but only a person at the bow can determine whether the boat is being pulled forward by the windlass or overrunning the chain and can prevent anchor swings into the bow. The operation is most easily controlled by the

person at the bow but, whoever is in control, coordination between the bow and the helm is essential. There must be a clear understanding of the signals that will be used to communicate. (Shouting is unreliable and annoys other boaters.)

Turn the windlass breaker on (yellow switch on the breaker panel in the port aft cabin) only when you need to use it; otherwise keep it turned off.

An up-down controller for the windlass is located inside the bow chain locker. A repeater and length counter is located at the aft end of the cockpit table. The chain counter shows chain paid out in feet. The chain itself is also marked at 50 foot intervals (starting at 100 feet) with colored plastic inserts in the chain links.

CAUTION: It is possible, if unlikely, that the anchor chain can jump the windlass cogs causing the anchor to free fall to the bottom. If that happens, DO NOT attempt to arrest the fall. You will not be able to do it and you will risk serious injury. Just let the anchor go where it is going and reset the chain on the windlass when it has got there. The non-anchor end of the chain is secured with a line to the hull so the whole thing will not go down.

*Deploying the Anchor*. Mouette, like many of the new generation of cruising boats, has an almost plumb bow. This is good for performance but makes it much easier to impale the anchor in the boat. Prevent the anchor swinging into the bow by using short, controlled pulses to move the anchor up or down at any time while it is in the air and by having the boathook handy to fend off impending disaster. Using the windless, slacken the chain just enough so that the anchor drops, or can be nudged, off the roller. After carefully letting the anchor down to water level, lower the anchor to the expected depth plus a little bit to be sure the anchor can lie loose on the bottom. Dumping the entire scope on top of the anchor does not help it to set so, before deploying more scope, it is helpful to ensure that the boat is moving away from the anchor in the direction set by wind and current. Depending on the strength of the wind/current, it may be possible to allow the boat to drift away from the anchor, slowly letting out more rode as it drifts. In most circumstances, reverse idle works well to get the rode out efficiently.

When the anchor is fully deployed and set, set the snubber line to take tension off the windlass and provide a bit of slack in the anchor line. Hook the snubber shackle on a link off the bow roller, run the line over the starboard roller, maintaining tension on the line so the shackle doesn't fall off the chain, and tie to the starboard cleat, then let enough chain out to put tension on the snubber line and slack the chain. The snubber line should be at least one foot over the bow roller as shown in the following picture.


In really strong conditions, tie on more line to the snubber line so as to create a 20-30' snubber, which will provide more elasticity to take up any shock. Once the boat is at anchor, remember to turn off the windlass breaker.

*Retrieving the Anchor*. When retrieving the anchor, motor the boat slowly toward the anchor while using the windlass to take up the slack in the chain. In dead calm/no current conditions, very little power will be required. Conversely, in strong conditions, power may have to be more than idle. Don't overrun the chain, as this will place the chain against the hull. If that happens, stop the windlass and reverse the boat until the chain runs clear of the hull. In light conditions, you will discover that the chain snakes around on the bottom quite a bit before getting to the anchor. You can usually see from the cockpit if the chain is going off the roller to one side or the other but crew forward can also let you know. The bow thruster is a great tool for realigning the chain.

Never use a windlass to pull the boat forward against any significant wind or current to where the anchor is set. The windlass is not designed for it and it would be a large draw on the batteries. If the chain is coming up ahead of the bow just short of vertical, things are in good shape.

Retrieve the anchor to where you can see it about one foot below the water to buffer any possible "pendulum" action if the anchor were just out of the water. Then, using short, controlled pulses, retrieve the anchor from just below the water onto the bow roller making sure the anchor point is toward the boat and fending it off the plumb bow with a boat hook, if needed. Bringing the anchor onto the roller too fast can cause it to swing violently and damage the boat. If the anchor gets hung up on the bow roller, stop the windlass immediately and sort out the problem.

Once the anchor is on the bow roller, secure it with the "keeper" line. Tie the line through a link in the chain nearest the anchor, then lead the line straight back to the starboard bow cleat. Secure tightly with a standard cleat knot. The chain on the gypsy on the windlass should not be the only thing keeping the anchor from unexpectedly returning to the sea bottom! After securing the anchor with a line, switch the windlass breaker "off" to prevent draining the engine start battery should the windlass system decide to short out.

**TIP**: Anchoring Technique:

*1. Where to Drop.* If you approach your anchor drop position headed into the wind/current, you will be well set up to drift back as you deploy rode. You can usually tell what the drift is by looking at other boats at anchor. If the other boats are facing every which way, it is likely that there is little or no drift or a lot of localized eddies. If you are first in, just coming to a stop and seeing what happens works well. You should begin the drop some distance in front of the spot you want to end up in, the distance depending on the length of chain you plan to deploy (generally a bit more than ¾ of the deployed chain length.) If your anchor drags for a bit before setting, you will end up further back than you wanted to be and may have to do it over.

*2. Setting the Anchor:* When anchoring in calm conditions, use a scope of 4-to-1 for the greatest water depth you'll encounter in the spot where you drop anchor. Check your tide table to know how much water depth you may lose and gain as the tide ebbs and floods during your stay and don't forget to add your freeboard (5ft., close enough) to the water depth. Since most coves are 15'-30' deep, expect to pay out about 80'-140' of chain while moving slowly backward once you have enough chain out to have dropped the anchor to the bottom. After you have paid out the chain, it is a good idea to do nothing for a few minutes to allow the boat to align itself to whatever wind/current forces are going on. Once the boat seems stabilized, 2 minutes of reverse (in idle speed) sets the anchor and tests its holding power. Note other boats and points of reference on land. Are you moving? If not, you've set you anchor. If you wish to sleep even better, throttle up to about 1200 RPM in reverse for another 30 seconds to prove to yourself that the anchor is set well (you will go a few feet further aft as the chain tightens but come back forward when power is turned off.) For storm conditions (sustained winds of 25+ knots),

extend your scope as much as possible. Otherwise, set two bow anchors (using the secondary anchor, chain and rode) in a v-pattern for extra holding power.

*3. Conflicts and How to Avoid Them:* When you can, anchor well away from other boats. (Rafting is prohibited by the charter agreement.) When the anchorage is crowded, it is necessary to ensure that you will not swing into another boat when the wind/tide changes, which it will for sure do. All boats on a single anchor swing but they are not all equally affected by wind/tide shifts so they do not swing the same way. Especially if you are anchored next to a cabin cruiser or a catamaran, do not expect to perform formation pirouettes in perfect unison. Most important, if the boats you are anywhere near to are stern tied to the shore, you must be too. It is generally a good idea to avoid dropping on someone else's anchor or crossing rode. If all the boats around you are facing the same way, and especially if their rode drops at an angle and not vertically into the water, you can be pretty sure that their rode extends in a more or less straight line in front of them. In other circumstances, it is hard to know where the other boat's rode is. You can ask the boat crew but they may have little or no idea if they have been there through a significant wind or tide shift. If you are really unlucky, when you try to raise your anchor, you will discover that another boat is floating right over your chain. In that case, you can wait for a change or ask the boat crew if they can maneuver so as to let you raise your anchor. If you have to, you can also try to drag the chain sideways but, if you do that, please snub the chain off to one of the bow cleats so as to avoid placing the strain on the windlass.

**Audio Visual System**

*Mouette* has a Pioneer radio/dvd/bluetooth/usb/speakerphone/God knows what else sound system with Bose speakers in the main cabin and cockpit. It will do stuff we can't even imagine. If you have a teenager on board, we suggest that you relinquish control of this device (but not what it plays) to him or her. From our stone age perspective, it will:

Play radio stations within range.
Play DVDs.
Play content from your iWhatever or similar device through a Bluetooth pairing or direct USB connection.

The Pioneer unit has both a touchscreen and hard keys. We have generally been able to figure out how to do whatever we are trying to do by pushing keys until it happens. One thing to figure out fairly promptly is how to control volume both in the main cabin and in the cockpit. Volume is fairly straightforward but fade (the balance between the inside and outside speakers) requires some trial and error. We

generally set the fade so that only the inside speakers produce sound. If you are miles from the nearest human, you can blast the cockpit speakers but, if you do, please reset the fade when you are done. The people in the slip next to you may not share your enthusiasm for baroque motets. Also, sound carries an amazingly long way over water.

There is also a television viewer. Actually, it's a complete television but it has no cable or other access to broadcast channels. It comes with a remote that we use only to turn it on or off and to select source (Pioneer or Chartplotter.) Other functions are controlled from the Pioneer unit. You can watch DVDs or other content that you bring with you. (There are a few "house DVDs on board as well.)

## Barbecue

The BBQ is plumbed to the propane tank. Make sure the tank valve is open first and that the solenoid switch on the stove is on. After that, the BBQ's valve is the control. Turn the control a quarter turn counterclockwise, and with the lid open, light the burner. With the lid closed, the BBQ tends to be hot and cook quickly, so tend your food often. As a courtesy to the next guest, please use the wire BBQ brush to clean it after use. Please remember to close the tank valve and turn the solenoid off after use.

## Batteries and Charging and Power Management

*Charging*

The engine-driven charging system is automatic and works whenever the engine is running. To plug into shore power, please follow these steps:

Disconnecting:

- Check that shoreside breaker or switch (typically near shoreside plug) is off.
- Unplug cable onshore.
- Unplug boat connection.
- Screw in the boatside receptacle cover.
- Roll and stow the cable.

Connecting:

- Make sure shoreside breaker or switch is off.
- Unscrew the boatside receptacle cover.
- Connect cable between boat and a 30A shore power source.

- Turn on shoreside breaker or switch. Most sources will have a 30A connection but they may offer a choice, in which case, it is important to pick the right one.
- Check polarity indicator LED on the electrical panel; proceed if OK. If not, turn off the shoreside breaker or switch and investigate.

> **TIP**: Reverse polarity means that the hot and neutral wires in the circuit have been reversed. Unless you messed around with the wiring on *Mouette*, the problem, if it exists, almost has to be improper wiring of the dockside circuit. AC appliances will continue to work under reverse polarity but the condition is dangerous because the switches or breakers that would normally prevent electricity from reaching the appliances will now be on the neutral side of the circuit and the appliance itself will be "hot". If you touch a wire in the appliance, or if there is an internal short, you may complete the circuit, much to your discomfort. That said, actual reverse polarity is rare and is indicated by a steady, bright reverse polarity LED. For reasons that you don't really want to know about, but can find out about at www.jamestowndistributors.com/userportal/document.do?docId=96 if you do, the wiring of the LED circuit can, in some circumstances, cause the LED to glow faintly. This does not mean that there is reverse polarity and the circuitry is safe (although it can indicate higher than normal resistance in the shoreside circuit.)

This process assumes that the shoreside plug also has a switch that can be turned on or off. Never connect or disconnect a live line by plugging or unplugging it because this can create a dangerous spark and also tends to fry the plug circuitry. In the rare case where the shoreside plug does not have a switch, you can create a line break by opening the boatside main a/c circuit breaker located in the port cockpit undersole storage area. Close the circuit again only after all cords are connected or disconnected.

> **TIP**: If you think you have properly plugged the shorepower cord into both the boatside and dockside receptacles and the AC power light is not on, the first things to check are the shoreside power switch and the boatside AC circuit breaker. If the latter is in the off position, this could be the result of an overvoltage or of someone turning it off. Turn it back on but monitor it and if it goes back off on its own, there is a wiring problem that needs to be addressed. Next thing to check is the power cable (by using the other one if you can.) If none of that works, and the system worked at the last marina, there is probably a shoreside problem. Try a different receptacle if you can or contact the marina staff.

*Electrical Systems*

We have upgraded *Mouette's* battery and charging systems, including the AC Charger/Inverter, the alternator and the batteries. As a result, most of the information in the Manual is inapplicable to the current system and the main panel switches for these components should not be used. The main panel display will continue to provide battery status information. The old charger and inverter are still on board and could be reconnected in an emergency but this would require an experienced marine electrician.

*AC Charger/Inverter System*


The control panel for the AC charger/inverter is located on the port cabin wall next to the sound system panel. Here are some operating highlights:

- Pressing the Select button will light up the display. Most menu selections are made by rotating it and pressing.

- The inverter is turned on and off by pushing the inverter button. If the inverter is switched on but shore power is connected, the inverter will only function if there is an interruption in shore power. The rest of the time, AC

will be supplied directly from shore power. The inverter consumes some power even when it is not inverting so you may want to turn it off manually if you are not on shore power and are not using AC. The green LED light will be on if the inverter is enabled. A flashing green light indicates that the inverter is enabled but has not detected any AC load requiring power.

- The battery charge function will be available whenever shore power is available unless the charger has been manually switched off after shore power was connected. When shore power is not connected, the charge function will not operate. The charge button allows the user to manually place the charge function on standby (or reactivate it) whenever shore power is connected. There should not normally be any reason to manually disable charging so the button can normally be ignored. If the charge function is manually switched to standby, the LED light will flash until it is turned back on by pressing the button or disconnecting and reconnecting shore power.

- The remote control unit will provide a considerable amount of information about what is going on with the electrical system. Some of this information appears automatically in the LCD display. Other information is available using the "Meters" button. If you need to know this information, you are probably trying to figure out why something seems wrong. In that case, a considerable amount of support is available by contacting SJS or our maintenance pro who can guide you through various diagnostic and remedial procedures.

- The other buttons along the bottom of the unit control various setup and display functions. They should ordinarily not be used except on instruction from a qualified marine electrician if something is not working. PLEASE DO NOT CHANGE ANY SETTINGS UNLESS INSTRUCTED TO DO SO BECAUSE THE PROPER FUNCTION OF THE ELECTRICAL SYSTEM DEPENDS ON THESE SETTINGS BEING CORRECT. CHANGING THEM CAN IMPAIR FUNCTION AND EVEN DAMAGE THE SYSTEM OR CAUSE A SAFETY ISSUE.

*Inverter*

The inverter converts house 12v DC battery power to 110v AC and is used only when not connected to shore power and when a 110v appliance must be used (e.g., microwave). Turn on the unit with a switch located on the panel next to the stereo control unit. Once finished using the 110v appliance, turn off the inverter to save battery power. Even if not in use, the inverter draws current and depletes the batteries. The inverter will support up to 2000w of AC power, which is more than enough to run any system that it is hooked up to but may not be enough to run multiple high-draw devices. The hot water heater cannot be run through the

inverter so, when not on shore power, the only source of hot water is from the engine heat exchanger.

*Power Systems*. DC power is provided to the boat by six 6v deep cycle "house" batteries located under the rear cabin berths and a separate 12v battery reserved for engine start and located in the engine compartment. There are also dedicated 24v batteries for the bow thruster located under the front cabin berth. The 6v batteries are arranged in three pairs of two, each pair wired in series to produce the equivalent of a single 12v battery.

The main electrical system breakers and switches are located on a panel at the forward end of the port rear berth. The engine and house circuits can be interrupted using three t-handles. The switches are closed when the t-handles are in the horizontal position and open when they are vertical. The black t-handle breaks the circuit on the ground side for both the start and house batteries so turning it vertical will interrupt all 12v electrical power to the boat. Except in the case of an electrical fire or while performing system repairs, there should be no reason to move this t-handle out of the horizontal position. The red t-handles break the circuit on the hot side for the house batteries and the start battery as marked. The yellow breakers for the winches can normally be left on but the windlass breaker should be turned off when the windlass is not in use to prevent an inadvertent draw down on the start battery.

For normal operations, leave the house battery switch "on" (in the horizontal position) all the time. A battery combiner isolates the start battery, assuring all batteries are charged, while protecting the engine start battery from draw-down by house usage. In an emergency, the isolator can be manually overridden allowing the engine to be started using power from the house bank by pressing in and rotating the yellow button on the combiner control located under the aft port berth. Please do not activate this function except in an emergency as a draw down on the house system will then draw down the start battery as well.

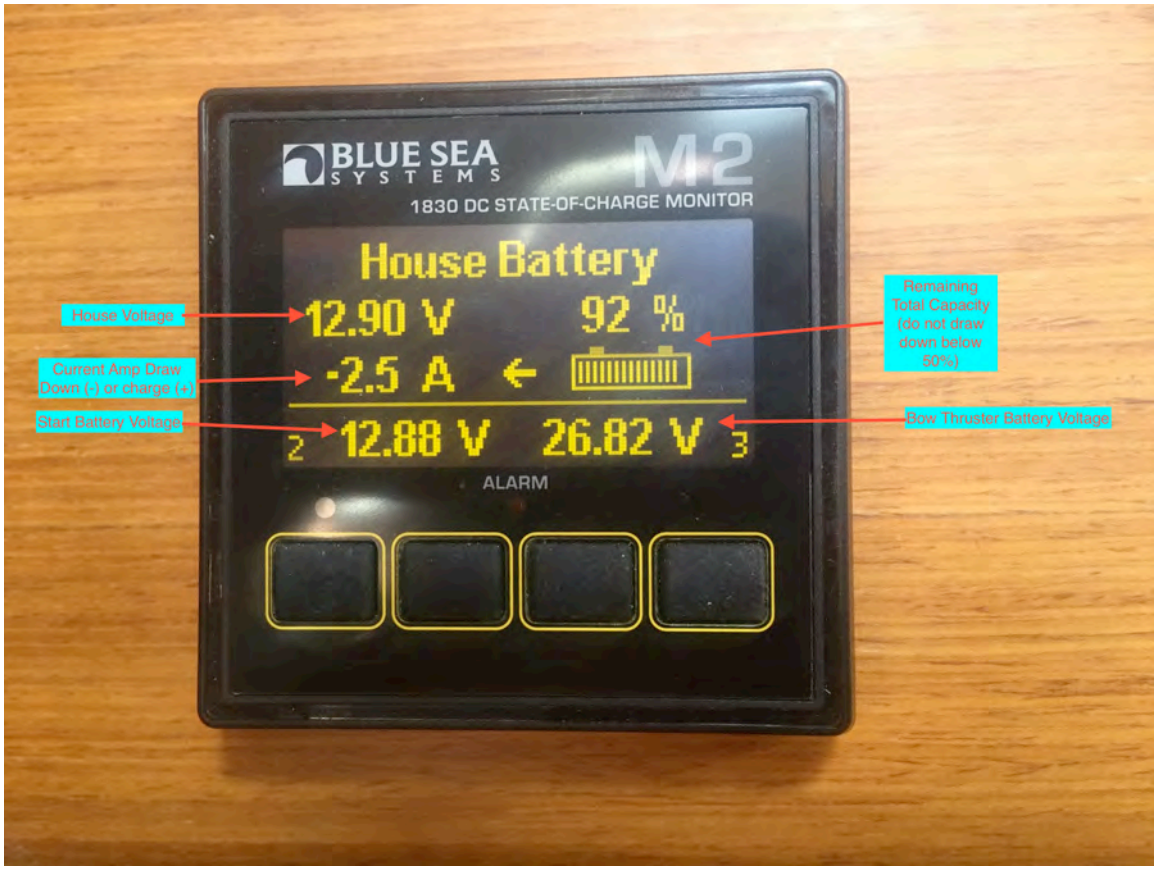
The engine start battery is specifically designed for starting diesel engines. Turn it off (t-handle in the vertical position) before leaving the boat as this is the only security against theft (there is no ignition key). It is also not a bad idea to turn it off when the engine is not running to prevent a short from running down the battery and preventing engine start. *That said, do NOT turn the T-handle off while the engine is running because it may blow the alternator diodes and the alternator will no longer charge the batteries.*

The batteries can be charged in one of two ways: with shore power connected, a battery charger will charge the batteries if the shore power light on the AC side of the main electrical panel is on. When the engine is running, the batteries will be charged from an engine-driven alternator. This is an automatic function and is controlled by a smart voltage regulator. The regulator is set to work in the current system. Please do not change any of its settings. A spare alternator is on board but

changing alternators requires tools and knowhow so it will probably require a local mechanic.

The six house batteries have a theoretical capacity of 660 Ah. Battery state information is provided on the display in the main electrical panel and on the charger/inverter control panel. We have also installed a Blue Sea electrical use gauge below and left of the main electrical panel that can display various battery state functions including, percentage depletion. The percentage number is based on total Ah (660) and is a good indication of remaining capacity bearing in mind that reducing capacity below about 50% can shorten battery life. Allowing voltage to drop below 11.8 for any length of time may cause electrical problems.

The following photo shows what we have found to be the most useful display for monitoring battery state on our Blue Sea monitor:




Battery state information is also available on the main panel and the Charger/Inverter controller.

There is no easy way to test a battery for capacity and it is not done routinely. If one or more of the batteries is getting weak, the system will still show a full charge but will deplete faster. If you think that the house batteries are depleting faster than they should be, please let SJS know on your return.

*Power Consumption*. As a general aid to predicting power requirements, here is a table showing the kinds of draw required by various electrical devices. It was put together for a different boat and does not reflect the actual equipment on board *Mouette* so it should be used as a general reference. For more precise information as to actual current draw and remaining power availability, check the Blue Seas gauge. If you want to know what the draw is from device on board *Mouette*, you can turn it on and off while monitoring total amp draw on the Blue Seas gauge. The difference will be the draw of that device (assuming nothing else went on or offline at the same time.)

| Appliance | Current draw | Underway | | | | At anchor | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (amp-hours) | day (hrs) | amps | night (hrs) | amps | day (hrs) | amps | night (hrs) | amps |
| Anchor light | 0.9 | | | | | | | 10 | 9 |
| Anchor windlass | 150 | | | | | 0.1 | 15 | | |
| Autopilot | 4 | 12 | 48 | 12 | 48 | | | | |
| Bilge pump | 5 | | | | | | | | |
| Cabin lights (say 3 @ .6Ah) | 1.8 | | | 1 | 1.8 | | | 4 | 7.2 |
| Chart Plotter/GPS | 0.8 | 12 | 9.6 | 12 | 9.6 | | | | |
| Chart table light | 0.3 | | | 2 | 0.6 | | | | |
| Cockpit instruments | 0.3 | 12 | 3.6 | 12 | 3.6 | | | | |
| Cockpit light | 1 | | | | | | | 4 | 4 |
| Compass light | 0.2 | | | 10 | 2 | | | | |
| Deck lights | 1.7 | | | 1 | 1.7 | | | | |
| Distribution panel & DCM | 0.1 | 12 | 1.2 | 12 | 1.2 | 12 | 1.2 | 12 | 1.2 |
| Freshwater pump | 4 | 1 | 4 | 1 | 4 | 1 | 4 | 1 | 4 |
| Fridge (say 50% cut-in) | 4 | 6 | 24 | 6 | 24 | 6 | 24 | 6 | 24 |
| Gas alarm | 0.6 | 12 | 7.2 | 12 | 7.2 | 12 | 7.2 | 12 | 7.2 |
| Laptop computer | 8 | | | | | 2 | 16 | | |
| Masthead (steaming) light | 0.9 | | | 1 | 0.9 | | | | |
| Navigation lights | 3.7 | | | 1 | 3.7 | | | | |
| Navtex | 0.4 | 12 | 4.8 | 12 | 4.8 | 12 | 4.8 | 12 | 4.8 |
| Radar (standby) | 1 | | | 10 | 10 | | | | |
| Radar (transmit) | 2.5 | | | 3 | 7.5 | | | | |
| Shower pump | 6.5 | | | | | 0.2 | 1.3 | | |
| SSB (standby) | 1 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| SSB (transmit) | 25 | 1 | 25 | | | 1 | 25 | | |
| Stereo | 1 | | | | | 1 | 1 | | |
| Tricolour | 2.2 | | | 10 | 22 | | | | |
| Ventilation fans | 1 | | | | | 2 | 2 | 2 | 2 |
| VHF (Standby) | 0.3 | 12 | 3.6 | 12 | 3.6 | 12 | 3.6 | 12 | 3.6 |
| VHF (Transmit) | 1.2 | 0.5 | 0.6 | 0.5 | 0.6 | 0.5 | 0.6 | 0.5 | 0.6 |
| Watermaker | 6 | 1 | 6 | 1 | 6 | 2 | 12 | | |
| **Total requirement:** | | | **149.6** | | **174.8** | | **129.7** | | **79.6** |

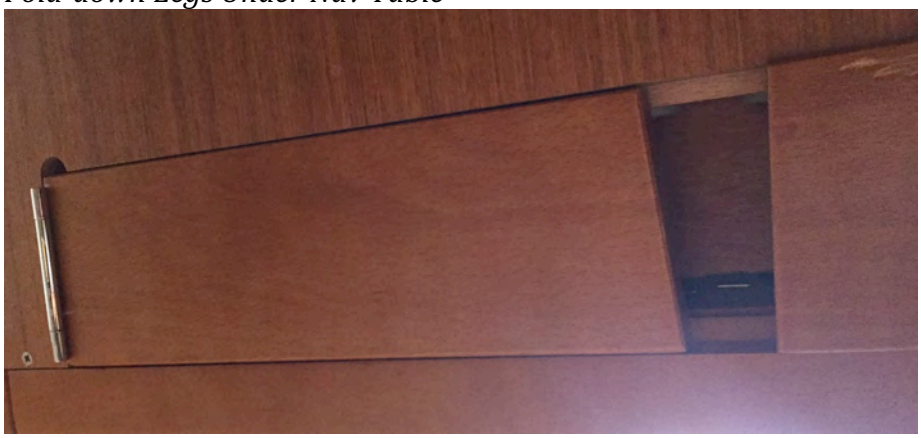
## Berths

*Mouette* is ideal for up to 6 people, but she'll sleep a maximum of 8 - two in the forward cabin, two in each of the rear cabins, and two people in the main cabin. Each of the cabins will comfortably accommodate two adults and the two rear cabins are separated by an insulated space rather than the sheet of ¼" plywood common on many other boats. Additional sleeping area is available on both sides of the main cabin, on the starboard side by lowering the nav table and filling in with a cushion. The main cabin table is not convertible into a sleeping area.

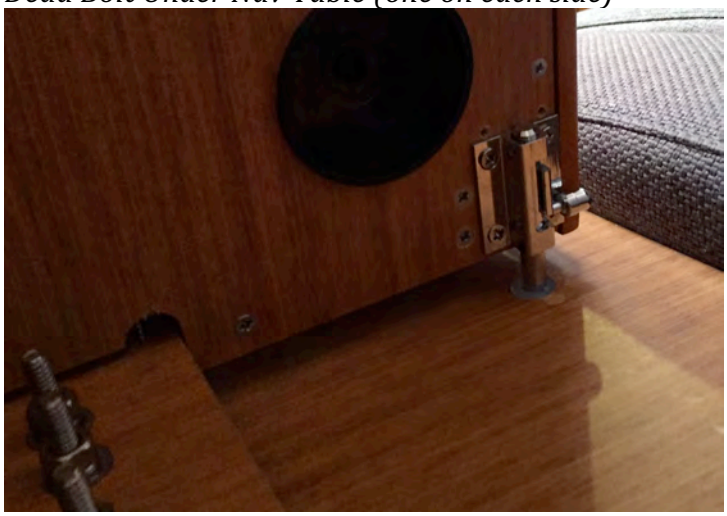
To lower the nav table, fold down the wooden legs underneath on the inboard side and pull out the two deadbolts. The table will then slide down the rails until the legs touch the sole. A cushion can then be placed on top of the nav table to create a

single berth with the seats immediately in front of and behind the table. To raise the table, reverse the process.

*Fold-down Legs Under Nav Table*



*Dead Bolt Under Nav Table (one on each side)*



**Bilge Pumps**

Please check the bilge every day, morning and evening. It is accessed by lifting the floorboard in the forward part of the main cabin. Since everything that is supposed to discharge water has a dedicated drain port, there should theoretically be little or no water in the bilge but there will be anyway. This is not a problem unless the water is accumulating fast enough that the bilge pump has to operate frequently. If so, there is probably a leak somewhere.

There are one manual and two electric bilge pumps: the electric on-demand bilge pumps are located at the bilge low point under the main cabin floor and in the sail locker. Both are controlled at the electrical panel through a single switch that can be

set to off, on or auto. Turn the panel switch to "Auto" and leave it on always. The "on" light glows green only when a bilge pump is operating. If the environment is quiet, the pump noise in operation is audible.

For those of you used to the traditional "float" valve pumps, the main bilge pump is a bit different. It is programmed to go on at regular intervals for very brief periods but to turn off again almost immediately unless the pump senses water resistance, in which case the pump will stay on until the water is pumped out. You should only notice the bilge pump working if it is actually pumping water. Noticeable bilge pump activity once or twice a day is normal but, if it occurs more regularly, there may be a problem.

If you think there is a leak, the first thing to do is to determine its general source, which can be easily done by determining whether the water accumulating in the bilge is fresh, salt or what the Manual charmingly refers to as "black". (If it is black you will know right away.) If the water is not salt, there is an internal leak in the boat (unless it's raining cats and dogs and you left a hatch open.) The good news is that all that stuff was on board in the first place and it just changed locations so there is not immediate safety issue. Check the fittings to see if you can find the leak and call SJS if you can't. If the water is salt, there are two possibilities (well, unless you just crashed the boat, in which case please refer to the section on dinghy operation): either you have been sailing in fresh conditions and left a hatch open or there is a thru-hull leak. The latter could be serious if the leak is bad enough.

The manual has diagrams showing all of the holes in the boat, starting on page 43. There are a lot of them. Some are there to take in water, others to discharge it. A few allow sensors to operate. For holes associated with a head, please make sure you refer to the diagram for the 2-head version. Wooden plugs are stored with the spares and can be used to plug leaks by jamming them in the valve or the hole itself.

The manual emergency bilge pump is located on the port side of the cockpit. The pump handle is clipped inside the propane locker. Insert the handle in the hole and pump away.

You can test the electric bilge pumps by turning them on briefly to on at the switch. You should hear the sound of the motor or you can check visually that the water level is dropping in the bilge.

**Bow Thruster**

The bow thruster is not necessary for docking in a slip with an open approach in benign conditions. It can be very useful in tight spaces or when wind or current conditions are adverse. It can help to salvage a bad approach but a far better technique is to go back out and try again. To use it for any purpose, make sure it is turned on and working. Once it is turned on, a push on either button will produce a

sound and movement that should indicate that the drive is operating. To be completely sure, try both buttons. Expect a delay of about a second when switching from one button to the other.

The bow thruster is operated from the starboard helm and can only be operated with the engine running. Turn on or off by pressing the red and green buttons together for at least one second. While on, the bow thruster will push the bow to port or starboard when the port or starboard button is pushed. To be absolutely precise, the thruster will cause the boat to rotate around the keel with the bow going in the chosen direction. If you plan to use the bow thruster to get the bow off the dock, make sure you have a fender as far aft as possible because the stern will turn into the dock. A green light in the port button flashes when the engine is on and the bow thruster is off and is steady when the bow thruster is actually on. In addition to moving the bow to port or starboard, the bow thruster can be used in conjunction with the engine in idle to crab the boat sideways. In forward idle, turn the wheel in the opposite direction of desired travel and simultaneously use the bow thruster in the direction of travel. E.g., the boat is against a dock to starboard and you want to move the whole boat off the dock to port. Turn the wheel as if turning to starboard, put the throttle into idle forward, and press the port bow thruster; the boat will crab to port and forward.

The bow thruster will turn off automatically if it has not been used for several minutes. It beeps when it does this so a beep that you hear shortly after clearing the harbor is not necessarily cause for alarm. On the other hand, if you hear a single beep just when you are reaching the critical point in your approach to the dock, a quick check of the bow thruster would be in order.

**Cushions**

*Cockpit*. The 10 cockpit cushions are made with cloth covers over a foam core. They are sturdy but can be damaged. Please store them flat when they are not installed in the cockpit. Clean with a damp sponge or cloth; don't use solvents. If the cushions are subject to seriously wet conditions over an extended period, the water will eventually seep through the cover and into the foam core, which will ruin the core. Minor rain showers are not a problem but if it's going to be cats and dogs for a long time, please bring the cushions inside or rig the cockpit enclosure gear.

*Main cabin*. When removing the main cabin cushions, slide your fingers between the Velcro tabs to separate the two parts before pulling the cushion out. Just pulling the cushion without separating the Velcro first will tear the cushion covers. Please note that some of the main cabin seat back cushions are in three parts (2-tone color pattern) and that only the center part of some (but not all) of these cushions is detachable. If you pull hard on the side cushions that are hard mounted, you will pull the screws with which they are attached out of the wood.

**Dinghy**

*Mouette* has an inflatable 4-person "Achilles" 10'2" dinghy, one seat, oars and a 6hp Nissan outboard engine. (See "**Outboard**" section). The dinghy was purchased new in July 2015. There is a canvas covered seat cushion/storage bag that wraps around the seat and attaches to itself with Velcro. The storage bag hangs below the seat and has several pockets for things like flashlights, outboard lanyards etc. that you may want to have on board. When you get back to *Mouette,* you can easily detach this device and bring it on board with you for restocking or to keep it and the gear in it dry.

*Towing*. Remove or secure loose gear (other than the gas tank) in the dinghy before towing. Towing works best when the dinghy is brought close to the boat with only 4 or 5 feet of painter line from the stern cleat to the front of the bridle. This lifts the bow slightly out of the water and reduces drag so you go faster, and reduces the chance of wrapping the painter around the propeller. Tie the painter off twice – once at the low, stainless steel handle on the transom, then the bitter end to the stern rail. The oars can be stowed either on top or on the inside of the float tubes. The latter is more prudent for towing because it is less likely that a stray wave will detach an oar. The oars are attached to the locks with a through bolt and a round ball with a nut. The nuts have been known to come loose so it is a good idea to check them every few days. There is also a clamp for the business end of the oars. Any significant jostling can loosen or detach the oar from the clamp so it is also a good idea to check these while towing.

*Beaching*. Please take special care when beaching the dinghy. Most of the beaches you will land on are strewn with sharp barnacle-covered rocks. The dinghy has an aluminum rigid bottom, which holds up better than plastic but can still be pretty badly scraped on sharp rocks. When approaching the shore, raise the outboard drive out of the water, weight the dinghy aft by leaning or moving the crew toward the back of the dinghy. Then offload everyone over the bow. Lift the dinghy above barnacle height using the hand holds on either side, and set it down gently on the beach. Secure the painter or the long yellow line under a rock or to a large driftwood log so your dinghy won't float away when the tide comes in – we have large tidal range. The yellow line is on board because it is often necessary to tie the dinghy to a relatively distant object for which the painter would be too short.

*Managing Dinghy While Reversing*. If you motor in reverse with the dinghy cleated to the stern, you may get the painter snagged in the sail drive. If that happens, the prop will stop turning, the engine will shut off, various annoying buzzers will sound and nothing will work again until you have unsnarled the resulting mess. Having had, on one occasion, to unwrap a line from around a propeller shaft, we can bear witness to what a really unpleasant process that is. Plus, you don't want to lose your engine in the middle of a critical maneuver. Before you come into port or otherwise

are about to be in a situation calling for reverse motoring, either move the dinghy to the front or amidships or tie it up tight to the stern.

*Inflation*: The dinghy should be properly inflated before you leave Squalicum. If it is not, please ask a SJS employee to inflate it properly. If you do this, you should not have to top up the air during your cruise but there is a pump in the canvas seat unit and we recommend that you add air to any section that appears to be seriously deflated. The inflation level will vary some with temperature because of the laws of physics that you knew when you were in 9th grade but have since forgotten but those changes should not be great enough to affect its buoyancy.

**Dodger, Bimini, and Enclosure Panels**

Normal canvas for in-season sailing consists of a dodger, connector and bimini. The weather in the cruising area can be iffy and most sailors find that these elements help ensure comfort. There is excellent forward visibility and ample headroom under the bimini unless you are regularly mistaken for a professional basketball player (our 6'4" friend had no problem) so we recommend that you leave the bimini in place. You can easily remove and reinstall the connector but if you want to remove the bimini canvas (we strongly recommend that you do not remove the dodger) you are likely to find that the system tension requires a specific removal or reinstallation process. The system was custom designed and built by Iverson's Designs (ivorsonsdesign.com) and they have posted videos on their website showing how to remove and reinstall the bimini and dodger. Please review these videos carefully before removing or reinstalling these elements.

Our canvas can enclose the entire cockpit. We usually sail with the side and rear panels removed, and only put them on during inclement weather. There are 8 side panels that are stored off the boat, but can be made available upon request and stored in one of the aft cabins. If the weather is cold, leaving the rear panels on significantly reduces wind chill without interfering with sailing requirements. We have sailed in 20-30 kt. winds with the side panels and the connector off but the rear panels in place and it works fine.

> **TIP**: The dodger's plastic "glass" is vulnerable to scratching from dirt and salt crystals. When salt spray dries on the glass, tiny salt deposits are left behind and tend to obscure your vision. Please avoid directly touching the glass with a damp rag or sponge. Salt does dissolve in water, but not as fast as you might think. The salt crystals remain un-dissolved for several seconds. It's like rubbing the glass with sand paper! To clean, use generous amounts of fresh water from a pan from the galley or dock hose and "flood" the glass to dissolve the salt crystals away. If the dodger glass is really clear, you can thank previous guests for their diligence. And we thank you too!

When not in use, store side panels rolled or flat, never folded, and place a sheet or other suitable buffer between panels to avoid glass-on-glass contact. Creasing damages the glass.

CAUTION: Most spray-on sunscreens react chemically with the Plexiglas. So please inform your crew to spray sunscreen downwind of the dodger glass. And please don't lean against the dodger with sunscreen on your back and shoulders. Once that chemical reaction takes place, the glass is ruined.

**Electrical Panel**


| | |
|---|---|
| Anchor Light | On at night when at anchor |
| Refrigerator/Freezer switches | Refrigerator always on (unless conserving power); freezer (labeled Aux) on when needed |
| Bilge Pump | Always on Auto. You can check pump function by switching it on momentarily and listening for the pump sound |

| | |
|---|---|
| Navigation Instruments Switch | On while underway or otherwise when needed |
| Water Pressure Pump Switch | Off except when in use or sitting quietly at anchor or in dock when you can hear the pump working |
| Water Heater | On when on shore power |

The electrical panel contains several switches that turn various systems on or off as a single unit. Most switches on the panel board are self-explanatory, but some circuits are unique and described below. The AC switches also function as circuit breakers. DC Breakers are located behind the audio visual panel on the port side of the cabin. Access the DC breakers only when one needs to be reset. Turn each of the silver-headed screws on the panel a ¼ turn and tilt the panel back towards you. Breakers pop-out when they trip, so pushing in resets a breaker. If a breaker fails repeatedly, it is trying to tell you that something else is wrong. A quick call to SJS or our maintenance pro might be in order if this happens.

To the right side of the electrical panel is a multifunction display controlled by a central button surrounded by four peripheral buttons. Pressing the central button will light up the display, which will provide status information for the system indicated on the button most recently pressed. You can toggle between systems by pressing the appropriate peripheral button and between devices within a system by pressing the central button. For example, if you are checking battery voltage, pressing the central button toggles between engine, house and bow-thruster batteries.

*AC 110v Power*. The AC outlets will function while connected to shore power OR, when not connected to shore power and the inverter is turned "on" (converting 12v DC house battery to 110v AC). AC outlets will only work when the "AC Plugs" switches on the panel are turned on. There are two AC circuits controlled by two panel switches. The forward plug above the nav table is on one AC circuit and all of the other outlets are on the other. The forward plug has a typical U.S. GFCI breaker with two buttons, one to test and the other to reset. The aft AC outlet above the nav table and the adjacent grey rocker switch constitute the French version of the same system. The plug itself has the test button and the rocker switch is the breaker. If the circuit fails, or you decide to test it with the test button, reset the rocker switch to on and the circuit should work again. Obviously, if either circuit keeps failing, there is a system fault and the circuit should not be used.

> **TIP**: Running most 110v appliances (including the microwave and any hairdryer you may have brought along) consumes a relatively large amount of electricity. With shore power hooked up, you can run most installed or

plug-in appliances without worrying too much about power consumption. If you are away from the marina and using the inverter, be aware that sustained use of 110v appliances will draw down the house batteries quickly and may require you to recharge from engine power. By way of illustration, a 500w demand on a 12v system requires close to 42a, and the inverter itself consumes power.

*Alarms*. The primary electrical alarm system is based in the Blue Seas monitor. The main panel-based system should be turned off. See note in "Nuances", above.

*Battery Charger/Inverter*. The control panel is located next to the stereo control unit. The charger should function automatically whenever shore power is connected. If switched on at the panel, the inverter should kick in automatically if shore power is not available. Either or both functions can be enabled or disabled using the appropriate buttons on the control panel. If you are trying to save power, you may want to switch the inverter off when you are not on shore power and you do not need AC because the inverter itself requires some power.

*Autopilot, Chartplotter*. The circuit breaker for "Nav Instruments" is located on the electrical panel. This switch powers the chartplotters at the helm and all other navigation instruments.

CAUTION: Never switch off the Nav Instruments switch on the electrical panel without first depowering the chart-plotters by holding down the power button on the chartplotter until the system powers down. This shuts down the software prior to cutting power.

*Lights*. Once you have turned the circuit on at the electrical panel labeled "cabin lights," an on/off switch for all recessed overhead main cabin/galley lighting is controlled by two rocker switches located on the ceiling next to the companionway entrance above the starboard aft cabin door. Silver button switches for overhead and floor recessed lights are located on the forward side of the sink cabinet and, for overhead lights only, immediately outside the owner's cabin door. Lights in the heads and bunk cabin are turned on by rocker switches on the ceiling and silver buttons for cabin recessed lights. All other cabin and navigation station lighting locations have individual on/off switches on the fixtures. We have a removable cockpit table lamp that fits into a fixture at the back of the table. If it is not in place, we normally store it in the center cockpit table locker. It, and two cute little pinpoint lights on the table itself, are controlled by a switch on the aft starboard of the table.

*Water Pressure*. This pump pressurizes a small tank and it shuts down when the tank is at working pressure. If you don't hear the pump start up when you turn it on at the panel board, it means that the system is at working pressure – you should hear the pump start again after you use some fresh water.

When no one is below decks, while motoring or sailing, turn off the water pressure pump. Should you run a tank dry, the pump would continue to run until it burns out and you'd never hear it running.

Water tank selection valves are located behind the starboard settee forward cushion. Tank-1 is the forward tank, located under the v-berth. Tank-2 is the aft tank, located under the aft cabin bed (starboard), and beside the diesel fuel tank (port). It's a good strategy to open the valve to tank-1 first to lighten the bow first, and keep the weight distribution balanced aft until the last of the water is in use. When tank-1 is near empty, switch to tank-2 using the selection valve. Water tank level can be read on the LCD panel on the electrical panel.

*Shore Power AC Circuit Breaker*. This breaker is located in the cockpit locker beside the port helm, near the shore power socket. You can leave it closed unless there is no shoreside switch for the power source that you want to connect to or disconnect from. If there is no shoreside switch, you must open the boatside breaker before connecting or disconnecting the cables. Creating or interrupting an electrical circuit by plugging or unplugging can cause a dangerous spark and also tends to fry the plug circuitry. When connecting shore power, make sure that the circuit is broken by ensuring that either the shoreside switch or the boatside breaker is open. Plug the cable into the shore socket first, then into the boat, turn on the switch or breaker as appropriate. Check that the circuit is live by looking at the voltmeter on the electrical panel, and below it the red AC Power light will glow. Also check that the "Reverse Polarity" light on the electrical panel is not lit. If it is, immediately disconnect and investigate. When disconnecting, break the circuit at the shoreside switch or the boatside breaker before unplugging any cables.

*Navigation (under sail) and Steaming (under power) Lights*. Night passage making is not permitted under terms of your charter agreement with SJS. Only use these lights in case of reduced visibility, like fog or on the rare days in the Pacific Northwest when there's heavy overcast.

*Anchor Light*. Should be on all night in an anchorage. It won't significantly deplete the batteries.

## Electronics

*Chartplotter*. *Mouette* is equipped with two Raymarine E95 touch-screen chartplotters, one installed at each helm. Each works independently so, barring a complete electrical failure, you should always have at least one. When both are working, one of them is the master unit. If the other unit is turned on when the master unit is not, it will object until you reset it as the master or turn the master unit on (the preferred solution if both are functional.) The chartplotter, radar, GPS, autopilot, depth sounder, and wind instruments, are all Raymarine products and

fully integrated. They are fairly intuitive provided you spend some time working through the various touch screens and options.

**TIP** : During the 2015 Volvo Ocean Race, one of the boats, with a professional crew including a professional navigator, went hard aground on a reef. The reef was 25 miles long and clearly marked on every paper chart of the area. It was also accurately detailed in the chart software that the crew was using. The reason for the disaster was that the software was zoomed way out and no one bothered to check for local hazards by zooming in. Substantially all of the information on the standard marine charts can be displayed on the chartplotter but to avoid clutter, small, localized items are not shown when the chart is zoomed out. The more the view is zoomed out, the less detail is displayed. If you are using the chartplotter to identify and avoid local hazards, make sure that the view is zoomed in to close range. You can then zoom back out for navigational purposes but remember that the hazards are there, even if they are no longer displayed. More than one mariner in the cruising area has been surprised to get up close and personal with a hazard that was not on the display he was viewing at the time.

**TIP**: A chartplotter displays your position using a GPS receiver. As everyone knows, GPS is now accurate to the point where further accuracy would not be very helpful. To fully use even existing normal accuracy, you would have to know where the GPS antenna is on the boat. (There is one in each chartplotter but, if you need to know this, you're too close to something.) Geolocation technology was not always so accurate and, when the charts on which your position is displayed were being generated as a computer program, it was not what it now is. As a result, while the boat will almost always be very close to where the chartplotter says it is, the shoreline may not be. You may prove this to yourself at some point in your cruise by observing that you are now, according to the chartplotter, ashore, even though you don't remember a sharp jolt and all signs indicate that you are still afloat. When a few feet actually matter, please make sure that you have determined your position using multiple references and not just the chartplotter.

The chartplotter displays can be seen and functions controlled remotely on tablet or laptop computers (and even smart phones) that have downloaded the required software (which is free from Raymarine.) If you have an appropriate device and would like to use it in this way, go to the Raymarine website (or iTunes if you do Apple) and download the software. You can do this in most places in the San Juans but it is best to do it in advance of your trip. The TV can also be set up to display, but not to control, chartplotter data. We hasten to add that the availability of this information below decks is not a substitute for maintaining a watch above decks at all times when underway.

*Radar. Mouette* is equipped with radar that can be displayed on the chartplotters on a separate screen or overlaid on the chart display. Night passages are prohibited by the charter agreement but radar is essential for safe passage at night or otherwise in restricted visibility. Morning fog is a regular occurrence in parts of the cruising area in all seasons and while, in the cruising season, it typically burns off during the day, that is not always the case. Fog is often a local phenomenon and it is not uncommon to find areas bathed in brilliant sunlight while, less than a mile away, the area is enveloped in dense fog. We recommend listening to or downloading the weather forecast each morning. If the intended passage is through areas of predicted fog, brew up another cup of coffee and wait. Chances are good that you will do the trip in the sunshine. On the other hand, if there is a possibility of fog on the planned route, we fire up and test the radar before we leave the moorage and keep it on standby during the passage. Radar when in active mode, consumes quite a bit of electricity so we leave it in standby if we are not actually using it.

Radar will not detect (with any reliability) logs or other random floating objects or crab pot floats (both common hazards in the cruising area.) If you are navigating in reduced visibility a visual lookout is an essential adjunct to monitoring the radar display.

Radar can be complicated both to set up and to interpret. The place to learn how to use radar is in clear weather. If you are experienced with radar and want to transition through a zone of reduced visibility, that could be a viable option in the right circumstances. If you are not experienced with radar, we strongly recommend that you do not navigate in reduced visibility. If the visibility is truly outrageous, we choose (assuming we have the choice) not to proceed until it improves and we recommend that you do likewise.

*Autopilot*. The autopilot is integrated with the chartplotter. It can be activated either at the center cockpit console or on either chartplotter.

*AIS*. *Mouette* is equipped with an Automatic Identification System transceiver. This system will show all large (including all Washington State ferries) and many smaller commercial and recreational vessels on the chartplotter screen as triangles. The triangle points in the direction that vessel is moving or last moved and, if you move the cursor to the triangle and click, the system will give you additional information (such as name, size, speed, etc.) about the vessel. Unlike radar, AIS information is not limited to line of sight. It is therefore particularly useful if you are about to round a point and want to know what is on the other side. AIS only displays data from vessels that are AIS equipped. Large ships are required to carry AIS but smaller commercial and recreational vessels are not. Although AIS is increasing rapidly in popularity, most recreational and many commercial vessels are not AIS equipped and therefore will not register on an AIS display.

In addition to allowing you to see other AIS equipped boats, AIS will allow other AIS boats (and the Coast Guard) to see you and your related information. This is

generally a good thing (we once received a radio call from a very large freighter that was quite close but hidden in a fog bank and who just wanted to make sure we were on the same page about the next five minutes) but, for whatever it is worth, it limits your privacy. This is particularly true because a number of internet sites track and display AIS equipped boats in coastal waters, including the San Juans, so anyone can track *Mouette* whenever the instruments are turned on just by logging onto one of these sites. If you want, you can let your friends and relatives know and they can follow your journey in cyberspace.

*Siren*. In the interest of full disclosure, *Mouette* is also equipped with Siren, a system that allows us and our maintenance professional to monitor various functions through our cell phones. It gives us information about things like battery voltage, inside temperatures, location etc. and we have it mostly to monitor *Mouette* during the Winter months when temperatures get critical and the boat can be unobserved for days at a time. We can query the system any time and the system will let us know if, for example, battery voltage goes too low or there is too much water in the bilge. Normally, if *Mouette* is on a charter, we will not do anything in response to any information we get from the system, although we may get a bit anxious if it appears that the cabin sole is afloat or battery voltage is below 10 and falling. In any case, for better or worse, you should be aware that we have access to this information. Unlike AIS, Siren information is available only to us and our maintenance professional.

*Depth Information*. Depth information is viewable on the chartplotters or on the repeater devices. The depth readings reflect depth below the waterline. When you see a depth number less than 7'4" you can reasonably conclude that you are aground or soon will be. If you believe that you are in dangerously shallow waters, the one area where you can reasonably be sure that you have enough depth is where you just came from. A prompt shift into hard reverse may be the best way to prevent an actual grounding (and it helps if you were not going too fast in the first place.)

The depth sounder provides depth information directly below the sensor and no information about depth ahead. Depth in the cruising area can vary by hundreds of feet over a very short distance so an accurate assessment of positioning relative to charted hazards is essential. Most of the time, with the proper planning and situation awareness, it is possible to proceed in water deep enough to pose no immediate hazard. There are times, however, when you may need to navigate in or close to shallow water (for example, when coming in to Squalicum at low tide.) We recommend that you navigate with extreme caution (i.e. slow down, have the paper charts open at the helm and at least two crew paying attention) any time you have or expect to have less than 10' of depth below the keel (i.e. 18' indicated depth.)

One way to minimize the risk of grounding is to give a wide berth to areas in which the water may be shallow. There are, in the cruising area, some generally shallow areas that should be avoided. There are also a small number of individual hazards

out in open water more than 500 yards from a shoreline. All of these are marked on the charts, most of them with a red circle drawn around them. It is not usually necessary to round a point thirty yards offshore or follow a straight course past a curving coastline or close to a marked hazard to shorten the trip by a hundred yards or so. It's a stunningly beautiful area. If you stay well offshore and away from the red circles, you can spend most of your time enjoying the scenery instead of the chartplotter and the depth gauge.

The depth sounder will not give accurate readings beyond about 400'. In deeper water, the sensitivity on the unit increases as the transducer tries to get some reading back. Consequently, you may receive false readings caused by currents, changes in water temperature, fish, and seaweed. If you know you are in deep water and the gauge indicates some bizarre number, you can disregard it. Generally, when the depth gauge is unsure of the data it is putting out, it flashes.

We do not recommend using the depth sounder's alarm at night. Besides a fairly high battery drain, it's likely to sound at inappropriate times such as late at night while fish are passing beneath the transducer. Instead, consult the onboard tide table to determine whether you're anchored in a safe location, considering how shallow your depth will become when the tide ebbs out of your anchorage in the middle of the night.

*Speed*. Speed over the ground (SOG) is provided by the GPS. Speed through the water is provided by a sensor in the hull. Either or both can be displayed on the chartplotters or the repeaters. The difference between the two can give you useful information about current drift. You should note, however, that, SOG, while very accurate at the sensor level, reflects historical rate of change in position and therefore is always behind the actual speed at the time of reading. Speed through the water is current but inherently less accurate. If speed through the water is showing zero or a ridiculously low number while underway, the impeller is most likely clogged with a piece of eelgrass. Sometimes it will float off overnight. You can try removing it by traveling for a short distance in reverse.

*VHF Radio*. The remote access microphone (RAM) plugged into the outlet under the cockpit table pedestal at the aft end controls all radio functions of the unit mounted above the nav table.

The VHF at the nav station is turned on by holding down the "PWR" button for a second. There is also a "PWR" switch on the RAM to turn on the system at the helm. We find this very convenient to use while entering and leaving moorings.

> **TIP**: A current weather forecast should be obtained each morning and updated whenever weather appears to be a potential issue. These days, current, detailed weather information is available over the internet so, if you

have a connection, it may be easiest to use that method to obtain current weather. An excellent source is www.atmos.washington.edu/data/marine_report.html. To listen to the weather reports, push the "WX" button on the radio. Scan the weather channels for the one with the best reception before sailing in the morning and prior to anchoring for the evening. This is generally a light wind region in the cruising season but weather changes can be sudden. Listen for the report on "Inland waters of western Washington" which covers the San Juan Islands and the Canadian Gulf Islands. You will also hear "Strait of Juan de Fuca" (south of the San Juans), "Georgia Strait" (north), and "Rosario Strait" (runs through the eastern part of the San Juans). In Canadian waters, listen to the Canadian weather station which also transmits warnings of military area activity, such as area Whiskey Golf (WG) outside of Nanaimo.

You are required by law to monitor channel 16 (the hailing and distress channel) while underway during your cruise. You may hail vessels on channel 16, but after establishing contact on channel 16, ask the skipper of the other boat to switch to working channels 78, 79 or 80.

SJS monitors channel 80 during office hours (closed Sundays) but reception is likely only in Bellingham Bay. If you need to contact them from anywhere else telephone or email will work better. If you need a review of VHF radio protocol, you'll find information located in the onboard Charter Guest Reference Notebook.

In case of a distress where you can no longer stand by the radio to pass your Mayday, use the red distress button on the radio. First flip up the cover, then press the button. GPS input, if available, is automatically coded into your signal.

*Wind Instruments*. Wind speed and direction (true or apparent) can be displayed on the chartplotters or repeater.

*Cellular Telephones*. Cellular coverage, including data, is generally good in the cruising area but there are areas (for example, most of Eastsound) in which it is spotty or nonexistent and specific coverage depends on the carrier. You may wish to alert your friends, business associates and relatives of this fact and advise them that their failure to reach you may not be due to your new abode in Davy Jones' Locker.

If you are sailing north or west of the main island group, it is likely that default coverage will be from Canada. As they will very likely tell you by text message if your phone is so equipped, your phone contract may not include foreign coverage and prices for the service may therefore be greater than you might otherwise expect. In these areas you may wish, at a minimum, to disable data roaming to prevent unwanted downloads at high prices.

Cell phones and other 12vDC devices can be recharged using one of the cigarette lighter plugs (located in each cabin and in the electrical panel) or any of the AC plugs if shore power or the inverter is on. There are a couple of USB ports below the main electrical panel and one on the cockpit table. You can also recharge your phone or other device using the USB port on the sound system but the system has to be on for that to work.

**Engine and Drive Train**

Start:

- Check fuel gauge.
- Check oil, coolant, and water strainer on first start of the day.
- Turn on engine battery breaker (under the port aft berth.)
- Check for debris in the water.
- Press ignition button labeled "I" (warning lights will go on.)
- Press crank button; the engine should start immediately.
- Check for water pumping out of coolant port and shut down IMMEDIATELY if you can't see water within 30 seconds.

Stop:

- Allow engine to run in neutral for 5 minutes to cool.
- Press "STOP" button (alarm will sound; this is normal.)
- Then press "I" button until sound stops.
- NEVER press "I" button while engine is running.
- Turn off engine battery breaker.

The engine is a Yanmar 4JH4CE. Maximum RPM is 3000. Cruising RPM is 2800 or less. Idle is around 800 RPM. Upon start, it will take the RPM gauge a few seconds to register so the lack of RPM indication is a subject for concern only if it persists.

*Sail drive*. Propulsion is through a Sail drive which helps eliminate shaft vibration, noise, alignment problems and leakage. It also helps to reduce the chance of snagging the dinghy tether or some other line but a sufficient level of determination will get the prop fouled anyway and it has been done once on charter so far.

*Prop*. *Mouette* has a feathering (Maxprop) propeller to help maximize speed through the water when under sail. After having been told for years that it was ok to leave the engine in reverse while sailing (i.e. engine off) we have received an advisory from Yanmar that this practice can damage the sail drive and any such damage will not be covered by the warranty. We never thought highly of the practice anyway because you can then inadvertently start the engine in reverse but there is now a much better reason to go briefly to reverse (to get the prop folded and you need some way on for that to work) and then promptly back to neutral.

*Engine Compartment Fan*. A fan in the engine compartment vents the area whenever the ignition is on and for a short time after it is turned off. With the engine running it is not audible but you may hear it after you turn the engine off. If it keeps running for any significant time with the ignition off, please report that to SJS.

*Reverse*. *Mouette* "walks to port" very slightly. It's easily overcome with the wheel and rudder when you have a little sternway and with the bow thruster at any time.

Be sure to hang on tightly to the wheel in reverse. If you don't, water pressure on the rudder can slam the rudder over to one side or the other, which is very hard on the steering mechanism and ruins your maneuver.

*Forward*. *Mouette* has a large and deep rudder. So she's very quick to turn, and turns in a narrow radius. Turns generally occur around the keel but a good visual reference is the mast which is more or less directly above the keel. Very small rudder adjustments will easily change course. Because the sail drive/propeller is almost below the engine, the wash from the prop takes a moment to reach the rudder when starting off; anticipate this delay when maneuvering in tight spaces. A short burst of throttle will shoot water at the rudder, which, if already turned, will result in a short, sharp turn with little forward movement…a strategy that can be handy when turning in confined spaces. Or you could use the bow thruster.

*Docking*. *Mouette* is astonishingly maneuverable during docking for a large boat. It is easy to control approach and position. In many respects, *Mouette* is more maneuverable than the 32' boat we owned before her. That said, *Mouette* is of a size that cannot be easily dragged to or from a dock, especially against any significant wind or current so it is important to use her inherent maneuverability to bring her up to the dock and to get her tied up without undue delay. In adverse conditions, we tend to attach a stern or midships line to the nearest dock cleat. After that, it is relatively easy to bring the bow close to the dock using the bow thruster.

*Mouette* carries momentum well, so your final approach and turn in toward your slip can usually be done with the throttle/shifter in neutral; you'll certainly need no more than "idle speed" unless there are high winds or a stiff current. Without the propeller turning you also do not have the complicating effect of prop walk to contend with. (It's minimal anyway.)

Because the throttle is located to starboard, the helmsperson will be to starboard during docking. For this reason, in a double slip (which most of them are in the cruising area), a starboard tie is easier than a port tie, especially if you are not familiar with the boat. You can usually request a starboard tie from the harbormaster or you can make any slip a starboard tie by choosing to moor bow-in or stern-in.

Docking in a slip stern in, in reverse, has some advantages because you can see exactly where you are relative to the dock when you are at the helm. It also brings the stern close to the dock to allow stern access which is much easier than climbing off the side and generally means that you don't have to run shore power all the way to the back of the boat from its source. Stern-in docking is not inherently more challenging than bow-in but it feels weird, especially if you are used to bow in. It is a technique worth learning, especially if you ever want to sail outside the US. If you are not experienced at stern-in docking, we recommend that you practice it with your briefer or take a captain on board for the first day (or stick with bow in.)

Whenever you dock (or at any other time when you may operate the engine in reverse, there is a possibility that the dinghy tether can get fouled in the sail drive. To prevent this, move the dinghy forward or amidships or pull the tether up tight.

Dockside assistance can be a big help, especially in challenging conditions. At Roche Harbor and Rosario, you will likely get help from the staff whether you ask for it or not. Elsewhere, you may have to ask and even then, you may have to wait for staff to show up. Our experience everywhere we have sailed is that people on other boats are happy to assist, especially if asked or if you look like you're in trouble (or just worried.) When coming into the SJS docks in high winds or if you'd just like a little assistance upon arrival, hail "SJS" on VHF channel 80. They'll be glad to offer some "coaching" and/or catch your lines. Asking for docking assistance, especially in windy conditions or with an inexperienced crew, is a sign of prudent seamanship.

Never turn off the engine until the vessel is securely tied at the dock. Remember, you'll need to use your engine to stop the boat's momentum. It's very difficult and often impossible for people holding lines to stop the momentum of a vessel as heavy as a cruising sailboat. Don't use dock lines on a shore cleat to stop movement, as this can result in a sudden swing of the boat and damage to cleats, boat, and/or dock.

*Pre-Start*.

- Check the oil level. The dipstick is on the starboard side of the engine. It can be seen by raising the companionway steps but is best accessed from the starboard aft cabin. Do not overfill. Use the onboard spare oil to add no more than a cup at a time. Then, after waiting about 2 minutes for the oil to trickle down to the pan, check the level again. Overfilling is a bad thing to do to a diesel. The excess oil will escape somehow, perhaps by blowing the head gasket. If the dipstick indicates no oil the first time you check it, reinsert and try again - the correct level will show when the air lock bubble is broken. Expect the oil to be blacker than that of a gasoline powered automobile engine; this is normal for a diesel after only a few hours of operation.

- Check the coolant level; anywhere between the two lines (high and low) on the overflow reservoir is “good”.

- While you have access to the front of the engine, check for belt tightness and leaking fluids.

- Look over the stern for kelp, logs or branches that could foul the propeller.

- Make sure the gearshift is in neutral (12 o'clock position).

*Start*.

- Press the electrical switch labeled “I” until the indicator lights on the RPM gauge light up.

- Press the “crank” button for a moment; the engine normally starts immediately.

- After the engine starts, release the crank button, check for water being discharged from the exhaust port. (The port itself is hard to see but you can generally hear the water and see its impact on the ocean surface.) If you cannot see water coming from the exhaust port within 30 seconds, shut down and investigate. If you don’t do this and water is not pumping, you will probably not get an overheat warning until you are a half mile or so from the dock, at which point, you will probably have to be towed in.

- While the engine warms, check your fuel level on the LCD panel on the electrical panel.

Please allow 5-10 minutes of warm up before placing a load on the engine. It is very hard on a diesel to be placed under load when cold.

*Proceeding in Forward / Reverse*. With the throttle in neutral position, engage forward gear by pushing ahead on the throttle or reverse gear by pulling back on the throttle. To keep the transmission “healthy,” please remember to pause 2 seconds (say “one and two and”) in the 12 o'clock neutral position when shifting from forward to reverse and vice-versa. From neutral, one click forward places the engine in forward idle and one click back places it in reverse idle. Further movement forward or back increases RPM.

You can increase RPM while remaining in idle by moving the throttle out of neutral while pushing on the button on the front of the throttle quadrant. You may want to do this if you absolutely have to charge the batteries while you are at anchor but

please be aware that marine diesel engines do not react well to being operated for extended periods under no load.

*Operation*. 54 HP Yanmar SD series engines are very reliable. Economy cruise speed of 5-7 knots is achieved at about 2000-2500 RPM using about 1 gallon of diesel per hour. Please do not exceed 2800 RPM for more than brief periods because it's hard on the diesel and fuel consumption increases substantially with very little increase in speed.

*Fuel Management*. Fuel is filtered twice before being injected into the engine. The first filter is a Racor fuel/water separator located forward in the engine compartment. It has a transparent bowl and can be visually checked for evidence of water or other contamination. Further downstream, a separate Yanmar filter strains out contaminants. Either or both filters can become clogged, resulting in a rough running engine or engine failure. The Racor filter can be cleaned out and the filter cartridge in either filter replaced but doing so requires some knowledge. After replacement, it may be necessary to bleed air from the fuel system. (Instructions for doing so are in the Engine Manual.) If you are not experienced with this kind of operation, we recommend that you find a local mechanic or contact SJS for advice. If you are in a remote harbor, it is often possible to find experienced crew on other boats who can help you through the process. Spare cartridges are located in the spares box under the forward dinette seat. To avoid the possibility of sucking in air or sludge into the fuel filter when the fuel level approaches ¼ of a tank, refuel after the fuel drops below ½ full but before it reaches ¼ full. It is unlikely that you will encounter really high waves in the cruising area but be aware that the rolling motion that these waves can cause increases the chances of contaminated fuel reaching the fuel filters.

*Engine Overheat*. If the buzzer sounds while the engine is running, IMMEDIATELY shut down the engine and investigate. Prolonged running of the engine with overheated coolant can ultimately cause the oil to break down and the engine to seize. Before that happens, however, if no seawater is being pumped through the cooling system, the wet exhaust system will be dry and it will not take long for the hot exhaust gasses to melt the muffler. That is not as catastrophic as an engine seizure but it will likely end your cruise week while the muffler is replaced.

If the overheat light comes on enroute, the most likely culprit is eelgrass plugging up your raw water strainer. The best upfront solution to this problem is prevention—keep an eye peeled for eelgrass mats, especially along those "soapy" looking tide and eddy lines in the water, and don't run over it. When eelgrass gets sucked into the engine cooling water intake, it collects in the raw water strainer. To clear the eelgrass from the raw water strainer (accessed by lifting the companionway stairs, after which it will be seen portside), twist off the clear screw-top and extract the eelgrass and toss it in the galley garbage can. Replace the lid and tighten by turning it clockwise until the lid is seated firmly on the rubber gasket, making sure that it is tight enough that it will not vibrate loose. Then restart the engine.

If upon restarting the engine overheats again, check the seal between the strainer, the rubber gasket, and the lid. If the strainer is drawing air, it won't draw water. If needed, open and then retighten the lid on the strainer and check to make sure the rubber gasket is in good shape and in place in the lid (not lying in the bilge.)

If the above fails to solve the problem, call SJS for assistance.

There may be other reasons you hear the buzzer. If you lost oil pressure, the oil icon warning light will light up, so check which light is showing red. If it's the oil light, shut down the engine, check the oil level, and contact SJS. The alarm buzzer is more likely to indicate engine overheating, and the temperature icon light will light up. Before you shut down the engine, check for water gurgling out the exhaust. If you have a "wet exhaust", check the coolant level in the overflow reservoir bottle and if none is seen, add enough to reach the top level line on the bottle. ONLY AFTER THE ENGINE COOLS DOWN, you might remove the cap on the engine block and add coolant. And check the bilge for a light green liquid. If found in the bilge, call SJS. If the coolant reservoir bottle is full, check to see if the engine threw a belt. Without a belt on the raw water pump, the coolant won't circulate and cool the engine.

Replacement belts are located in the engine spares kit. One other possibility is that the impeller in the raw water pump has failed. While they are replaced each spring with a new one, it's still possible that a hard object may be drawn in and break off an impeller blade. A replacement impeller is found with the engine spares. Call SJS if you suspect you have an impeller problem.

*Engine Shutdown*. With the engine in idle and the gearshift to neutral, allow the engine 5 minutes to cool down. Then push the fuel cutoff button labeled "STOP". After the engine stops, cut the electrical source by pressing and holding the "I" button until the buzzer stops and the panel lights go out. Never stop the engine by pressing the ignition button first as this can damage the diodes on the alternator, and the batteries will no longer charge.

*Fuel Tank*. *Mouette* has a 63-gallon fuel tank. The engine consumes about 1-1.5 gallons of diesel per hour depending on power setting.

Please be very careful when fueling. Never allow maximum flow from the filler hose. If you do, the fill tube will surge and diesel will spill from the vents onto the side and onto the deck. It takes only a few drops of diesel fuel in the water to cause oil sheen and subject you to a Coast Guard fine. Fill slowly and carefully. Check the side vent and, with dish washing soap, wipe up any excess fuel to avoid yellowing the hull and stern and polluting the water. Also be very careful of drips when removing the hose. Diesel and shoe bottoms are a very slippery and dangerous combination. After wiping, please use soapy water to scrub down any drips so it does not stain the fiberglass.

Put your ear down to the fill hole and listen to the diesel flow. When the pitch changes and gets higher, the tank is likely full and you're now filling the hose between the tank and the fill hole. Avoid a fuel spill – STOP! Check the fuel gauge on the LCD display on the electrical panel. If the gauge does not show Full, continue filling very slowly. When you think you're finished fueling, check the fuel gauge one last time to make sure it's reading "Full." That way, SJS will not charge you a fueling charge plus the cost of fuel.

> **TIP**: Unlike automobile fuel gauges, fuel gauges on boats are notoriously inaccurate, especially on the low end. Therefore, whenever the fuel level drops below ½ full, you should refuel at your next opportunity. NEVER let the fuel level fall below ¼ full or you're in danger of running out of fuel. Towing and the cost of a mechanic to bleed the air from the fuel lines is an expensive proposition for a charter guest.

**Hatches**

*Mouette* has numerous hatches to let in light and air when open. The larger ones also have built in "slide-over" netting or shades. Hatches with lever locks can be locked in either of two positions: one is dogged down tight, which you should always use when under sail or motoring in serious swell; the other is raised slightly (about ¼ inch) to allow a small draft. At anchor or slip, hatches can be raised on the arms and clamped in a raised position using the grey twist handles on the support arms.

> **TIP**: Be sure to loosen the grey twist grips before trying to close the hatches. Forcing them will result in damage. Always close hatches when under sail or motoring in heavy seas. A raised hatch is a magnet for jib sheets and could be seriously damaged if caught. If there is any chance of a wave causing water to land on deck, you may discover how hard it is to dry out a mattress.

Some of the hatches have vents that allow air to enter even when the hatch itself is closed. These vents are controlled by a gray plunger in the center of the hatch that is open when it is up (and looks closed) and closed when it is pulled down (and looks open.) The vents will not allow rain to enter the cabin under most conditions but larger quantities of water, particularly if it arrives other than from directly overhead, can get through the vents. If you are sailing in fresh conditions or high waves, it is very likely that you will take water over the bow. As we discovered by trial and error, that water will get into either or both of the two front cabin hatches if the vents are open and will make an annoying wet spot on the bed directly underneath. There is nothing in the Owner's Manual about this but directions are on the actual units, a fact that we discovered when we tried to figure out why the bedding had become sodden with the hatches firmly closed.

## Heads and Holding Tanks

*Mouette* has push-button, electric flush, fresh-water heads. Wet the bowl before use with the rocker switch pressed one way, then evacuate the bowl by pressing the rocker the other way. Travel with the bowls dry. There are two buttons. The rocker switch wets the bowl (left side) and evacuates the bowl (right side). The single switch does both, in sequence, but uses more water. Use either one.

The heads each have a 20-gallon holding tank, and they will need to be emptied once every two or three days to avoid leaking sewage or, worse yet, an exploded holding tank, a real "vacation ruining" event! SJS staff will discuss holding tanks, overboard discharge and pump-outs upon your arrival.

The holding tanks are located in the cabinet behind each head. To access, pull the top of the panel towards you by 2-3 inches, then lift the panel up to clear the lip at the bottom. Replace the panel by inserting the lip at the bottom first, then, when the whole panel is carefully aligned, push in the top until it holds. The tank is a green color and the waste level inside can be seen by shining a flashlight from the top downwards. It is a gravity discharge system and, when outside US waters, to empty it, or simply pass waste through it directly overboard, open the red-handled large seacock. The forward tank seacock is located outboard of the sink cabinet. It can be seen by shining a flashlight from the space under the wooden shower seat but it can only be reached from a white door under the sink cabinet. The aft seacock is located outboard and under the aft dinette seat. All tank contents will drain overboard in just a few seconds; you'll hear a noticeable "whoosh" as it discharges. Then close the large seacock handle, and all head contents go to and remain in the holding tank once again. Overboard discharge is not allowed in US waters and should not be done in harbors or other flow-restricted areas, so use a pump-out facility instead. If you pump out the holding tank at a shore facility, please fill it with about 5 gallons of fresh water through the deck fitting to rinse, and then pump it out again. Thank you!

Offshore sailors have a rule: "Never put anything down a marine toilet that hasn't been eaten first." And that, of course, includes feminine items. In fact, offshore sailors do not even put soiled toilet tissue down a marine head. They simply deposit soiled toilet tissue (and feminine items) in a receptacle such as a waste basket with a liner bag or a Ziploc baggie, but not down the toilet. SJS highly recommend you follow this rule. And since they've been recommending this, they've had almost no incidents of plugged heads!

Head odors are most commonly caused not by the contents of the holding tank but by organisms and organic waste in stagnant sea water or by waste backflow into the bowls. As *Mouette* is equipped with a fresh water system, there should not be head odors from seawater. See Nuances for how to avoid backflow.

Because the heads use fresh water, your fresh water consumption will be greater than on boats with conventional systems. Monitor water levels frequently because,

once the water tanks are empty, the number of heads on *Mouette* goes from two to zero.

**Headroom**

The headroom on *Mouette* (taken centerline in the main cabin) is 6' 6". Unless you are exceptionally tall, it is more than adequate in most places. On the other hand, it's a boat and we have never sailed on a new boat without bashing our heads a few times while getting used to the layout. Care in this regard is richly rewarded.

**Heater**

The diesel-fired Webasto cabin heater will make the interior "toasty" within 10-15 minutes. The heater control is located on the wall aft of the dinette. Press the power "on" switch and select the fan speed and temperature. A slow fan speed is most efficient, and quieter. It takes a few minutes for the heater to "cycle up" and get hot. Turn the heater off using the same push button switch. The fan will continue to run for about 5 minutes while the unit is cooling down and cycling off. The heat is dry, comfortable, and on those rainy days or cool evenings, makes a huge difference in cruising comfort!

When it's cool, we recommend warming the boat before turning in for the night, with the last person to go to bed instructed to turn the diesel heater off before retiring. Then, the first one up in the morning can simply turn the cabin heater back on. While the heater can run all night, the boat will likely get too hot and the electric fan will drain the house batteries, not to mention being noisy for the people in the aft cabin.

**Holes in the Boat**

There are a lot of them. Some are there to take in water, others to discharge it. A few allow sensors to operate. While it is highly unlikely that one will spring a leak, any of them could do so. Wooden plugs are stored next to each major intake or outflow port and can be used to plug leaks by jamming them in the valve or the hole itself. Unless you just heard a loud crashing sound, if water is getting into the bilge faster than it should, either it is getting in through an open hatch or there is a leak in one of the thru-hulls or in the onboard plumbing. If one of the water tanks is leaking, the good news is that there is not enough water in the tank to pose a hazard. The head storage tanks have their own issues if they leak but also do not threaten the integrity of the boat.

If there is seawater in the bilge (that did not come in through an open hatch), one of the thru-hulls is leaking. The Owner's Manual has diagrams showing the location of all thru-hulls starting on page 43. Those associated with heads should be found on the diagram for the two-head version of the boat.

## Keel Depth

*Mouette* has a deep fin keel and draws 7'4'' so figure on 8 feet to be on the safe side. SJS strongly recommends that you maintain a minimum of 10' under the keel whenever possible, both underway and at low tide on anchor. You should note that depths inside Squalicum harbor can be marginal at low tide levels. The chart shows 1.2 fathoms (exactly keel depth) at the north entrance and 1.5 fathoms at the south entrance. There should be adequate clearance most of the time but, if you are planning to enter or leave at peak low tide, you may want to check the tide tables and proceed with caution. A quick call to SJS couldn't hurt.

## Mooring Buoys

Several of the more popular anchorages have mooring buoys that are available to the public on a first-come basis. If you plan to use a mooring buoy, please read the anchorage description in one of the books describing them for information about where they are, what they cost and any other relevant considerations. Mooring buoys are typically not marked to show ownership, weight bearing capacity or use restrictions. Some of them are privately owned and, should you hook up to one of these while the owner is sailing, you may find your boat adrift when you return.

At least one cruising guide cites a limit for the use of mooring buoys that excludes boats over 45 feet long and there are references to this restriction in the cruising forums. We were unable to find anything about it on a State web site. The length restriction seems a bit arbitrary given that factors such as weight, windage, current and weather conditions would have a greater effect on the buoy's capacity than length. In any case, if a park ranger questions you about this, you can observe (correctly) that *Mouette's* hull length is 44'9". You can also add that Jeanneau's state-of-the-art construction techniques make this a remarkably light boat for its size and class. That said, moorage buoys in the cruising area have broken loose from their anchors or drifted from their original locations. Do not assume that a moorage buoy will hold your boat, be appropriately spaced from other moorage buoys or be placed in water of adequate depth.

Mooring buoys in the cruising area do not have floating tethers. You snag them with the boat hook through the ring on top of the ball and pull the chain up through the buoy. The chain is heavy so expect to have to haul up pretty hard or lean over pretty far to attach your line. To avoid line chafe and facilitate uncoupling, we like to use two lines. The working line is attached at the looped end by running the bitter end through the ring and back through the loop and tying it off to a bow cleat. This attachment minimizes chafe but can be difficult to detach on its own. The lazy line is run from one bow cleat through the ring to the other bow cleat but is let out far enough so it hangs loose. When you want to leave, pull the lazy line tight, which will

make it easy to detach the working line, after which you can simply pull the lazy line through the ring and be on your way.

## Outboard

*Outboard Crane*

Getting the outboard on and off the dinghy has always been relatively easy because the fold-down transom/swim platform supplies a safe, intermediate step between the rail mount and the dinghy. Even so, our choice of a 6hp outboard instead of the standard 2hp means that the outboard is not light and requires some fairly serious manhandling. To make this process easier, we have provided an outboard crane. The crane has a pulley system that will allow the engine to be raised up off the mount and lowered directly onto the dinghy transom, avoiding the "clean and jerk" maneuver that is otherwise required. The crane itself, apart from some mounting hardware, can be easily removed and stored when not in use so, if it is not mounted, you will probably find it in a lazarette or one of the under-sole cockpit storage lockers.

*Mouette* is equipped with a 4-stroke Nissan 6 horsepower outboard. This is not the lightest outboard available (it weighs 57 lbs.) but we prefer it because it has a reverse gear and more power than the 2hp. alternative.

The outboard operates like most small outboards. If you have experience with them, it should be fairly straightforward. If not, please ask a member of the SJS staff to go over outboard operation with you. It does not take long to learn.

The engine has no internal gasoline tank and is fed from an external tank through a hose that clips on the engine intake. Hooking the system up is straightforward but, if you are in doubt, ask a member of the SJS staff to go over it with you as a part of your brief. DO NOT add oil to the gasoline mixture – it uses straight gasoline.

WARNING – Gasoline fumes are explosive and a very dangerous fire hazard if gasoline is stored on a boat. Keep the gasoline tank in the dinghy and tied to the transom so it stays upright. NEVER store the gasoline tank in a locker, lazarette, or any other storage area on your vessel.

In general, the outboard should be removed from the dinghy for all towing operations because, if the dinghy flips over, it is likely that the outboard will either fall completely off or be destroyed by water damage. We were occasionally lax in this regard until we unexpectedly encountered three-foot waves with the motor on the dinghy. All was well but we resolved that we were not going to risk repeating that experience. (Once you get in the waves, it is dangerous to try to move the outboard so all you can do is hope for the best.)

To prevent engine oil from going where it should not go, keep the outboard either upright or horizontal with the control handle down.

We believe in a "belt and suspenders" approach so we tie the outboard to the stern rail or the dinghy transom just in case it wasn't screwed down as tightly as we thought.

*To Start*

- Attach the fuel hose to the engine.
- Open the fuel tank vent (small screw in the center of the fuel cap.)
- Squeeze the bulb in the fuel line until it is hard to squeeze (full of fuel.)
- Make sure gear lever is in neutral. (If you can't pull the start cord, it's not.)
- Pull out the choke knob if starting a cold engine (starboard forward corner of the outboard).
- Make sure the U-shaped kill clip (with the red lanyard) is clipped into the red shut-off knob (forward low on the outboard).
- Turn the throttle handle to "slow".
- Pull the cord until it starts. You shouldn't have to pull it more than 2-3 times.

Once the engine is running, if the choke is out, push it back in as necessary to keep the engine running smoothly. If it is really cold, you may need a half choke setting for a bit. Once the engine is warmed up you can shift into forward or reverse as necessary. The engine must be at idle during any shift changes.

> **Tip:** The kill clip and lanyard are designed to shut the engine down should you happen to go overboard. The water in most of the cruising area is seriously cold and you really do not want to be dog-paddling around in it watching your dinghy leaving the area. The system only works if you attach the lanyard to your wrist or something else that will go overboard with you. While we are on the subject, even if the dinghy sticks around, it will be a challenge to get back aboard. You can try stepping on the cavitation plate on the outboard, tying a loop in the painter or just hauling yourself onto a tube using the handles. Best technique is not to fall in in the first place.

*To Shut Off*

- Shut the outboard off by pushing in the red shut-off knob (where the kill clip is clipped in). Or just pull the red lanyard until the clip pops off.

- To avoid prop damage, shut the outboard off and then raise the shaft out of the water before you reach the shore. Pull the outboard forward and out of the water as far as it will go and then move the stainless steel tilt lever on the starboard side of the shaft into the lock position and let the outboard back down slightly. To put the outboard shaft back in the water, release the tilt lever.

- If the engine is not going to be used for some time, close the air vent on the fuel tank and disconnect the fuel hose from the engine.

*Troubleshooting.* If the engine won't start, review the steps above to make sure you've done all of them. There is a spare spark plug and spark plug wrench in the tool box in case the engine won't start or is running rough. A new spark plug solves myriad outboard problems. If you use the spare spark plug, notify your check-in skipper upon your return so a new one can be placed aboard for future guests.

If the outboard is running and you're heading toward shore, and the engine suddenly quits, it's usually that someone has forgotten to vent the fuel cap.

If the engine is running fine but the propeller isn't moving, the shear pin is probably broken – just take the cotter pin out to remove the propeller and replace the broken shear pin (a spare pin is located forward of the shaft under the handle grip) and put the propeller and new pin back into place.

**Refrigerator and Freezer**

The refrigerator and/or freezer must be turned "on" at the electrical panel. For some reason known only to Jeanneau, the panel switch for the freezer is labeled "Aux". A temperature thermostat control dial (with min through max, max being coldest and will probably freeze your lettuce) is located inside the refrigerator. The refrigerator is quite deep and does not have an air circulation pump so the laws of physics ensure that items stored near the bottom will be colder than those stored near the top. Stuff stored all the way at the bottom seems to get frozen solid at the setting we have been using, which is ok if you expect it. There is a separate freezer with a separate temperature control. We recommend running the refrigerator at all times to avoid it becoming smelly. The freezer can be turned on as needed.

To drain the water from the refrigerator for cleaning or in case of water build-up, pull the small plug in the bottom of the refrigerator. There is a drain pump activated by a silver button to starboard in the compartment immediately below the sink.

**TIP**: If you spill something, like milk, in the refrigerator, rinse with water after draining to prevent rancid organic matter building up in the drain lines.

**Sails**

*Headsail*. The 106% headsail has roller furling. Whether fully or partially deployed, you'll have good sail shape. Slight hand-over-hand tension on opposing lines – furling line and sheets –prevents problems such as a rat's nest on the drum (should the wind catch the sail and unwrap it violently) or a baggy furled sail. The easiest way to unfurl the headsail is to put the working sheet on the leeward winch and use the electric motor to deploy the sail. Once the sail is deployed, it will be on the winch and can be adjusted by electrically or manually reeling it in or manually easing it out. In light winds, the headsail can easily be deployed manually without the winch but you will probably want to put the working sheet on the winch anyway.

Furling or Reefing the Headsail – Simply ease the jib sheets (keeping control of them) while pulling in the jib reefing line until only the amount of sail you desire is deployed. If you are going to reef the headsail, make sure that you keep tension on the furling line both during and after the reef to prevent the reef from coming out. You should not have to use the winch to furl the jib but you can use a winch if you prefer. If you cannot furl by hand, or if the sail seems to hang up using the winch, forcing the process will only exacerbate the problem. Instead, investigate to see why it will not furl and sort out the problem. The most common problem is forgetting to take a jibsheet off the winch or to open the related clutch.

*Mainsail*. The main is conventional and is deployed by winching it up using the main halyard and the electric winch located on the port coachroof. The sail is fully raised when the head is adjacent to the black stripe at the top of the mast. The foot is fully extended when the clew is adjacent to the black stripe on the boom. Sail shape can be adjusted using the main halyard, outhaul, vang, adjustable backstay or, when close hauled, the main sheet. Boom position can be controlled using the traveler or the main sheet. *Mouette* will sail ok if you center the traveler and never use any control other than the sheets but you can improve performance considerably by using the many tools available to control sail shape.

**Tip**: We don't know anyone who has sailed for any period of time on a cruising boat and who has not at some time felt like a fool because they tried to pull the traveler upwind without releasing the downwind clutch. If you are just pulling on the traveler line, a bruised ego is the likely extent of the damage. Even if you have the traveler line on a manual winch, it should not take long to figure out that there is something amiss. *Mouette* has an electric cabintop winch which makes light work of traveler adjustments assuming, of course, that the downwind clutch has been released. If it has not been

released, the line just tightens up until the process grinds to a halt or something breaks. This was empirically demonstrated on *Mouette's* very first charter so it is not a theoretical concern.

To lower the main, unclutch the halyard (or take it off the winch or both) and let the sail drop gradually in stages into the bag while ensuring that it is flaking properly. Because of *Mouette's* size, it is difficult to fix a sail overbalance to one side once the sail has been mostly or completely lowered. It helps if someone is up by the mast helping the sail to flake neatly. It also helps to steer to one side or the other of the wind in order to rectify an imbalance on the downwind side. When the sail is all the way down, zip the bag closed starting at the aft end of the boom and working forward. Use the fold-out steps on the mast for the final stage. This protects the sail from ultraviolet damage and helps prevent rain from collecting at the bottom of the bag. You can also start zipping the bag progressively from the rear as the sail is lowered and this may help keep the sail over the boom.

**Tip**: You can leave the main halyard attached to the sail but, if you do, you will not be able to tighten it because that will just raise the sail. A loose main halyard will bang on the mast in any significant wind, annoying you, your crew and probably the inhabitants of all nearby boats. It can also get blown around a spreader where it can be quite hard to dislodge. (Try climbing up the mast steps with the boathook fully extended.) To avoid such annoyances, you may wish to tie the halyard off to one of the lazy jack lines to keep it away from the mast or to detach the halyard shackle from the sail and move the halyard to a fitting.

For anyone used to a conventional setup in which the jib sheets are led aft and everything else is led to the coachroof, the setup on *Mouette* is a bit different in that both the jib and the main sheets are led aft. The main sheet is a continuous line from one helm, through the boom/traveler mechanism to the other helm. It can be pulled in or let out from either helm, although it can, over time, get to be too long on one side and too short on the other and need to be readjusted. In light conditions, such adjustments can be made manually. In heavier conditions, a winch is desirable or mandatory. Because there is a single winch for each helm, the easiest way to adjust the main sheet on a winch is using the winch on the lazy jib sheet side. It is also possible to clutch the working jib sheet and remove it from the winch while adjusting the main sheet.

When tacking, the most efficient process is to tack over the headsail first and then to make adjustments in the main using the main sheet, if necessary, and the traveler. When gibing, it is safest to bring the main part or all of the way in (depending on conditions) before the jibe and letting it back out after the jibe has been completed. Not a racing maneuver but, if you're the ace of your club, you don't need to be reading this.

*Asymmetric*. We have an asymmetric spinnaker that is available to charter guests upon completion of an additional resume showing proficiency. If you have the necessary experience and would like to use this sail, please contact SJS in advance of your trip. The asymmetric is enclosed in a sock, is hoisted with the spinnaker halyard and attached at the tack to the anchor roller. Sheets are led aft through a block to the main winches. The sail jibes forward of the bow to avoid entanglement with the furled headsail.

*Mouette* will sail comfortably in full rig in apparent wind speeds into the lower twenties using standard depowering techniques at the top end of the range. If you anticipate (or find yourself in) stronger conditions, you may wish to take in a reef or more and to partially furl the headsail. The main has three conventional reefs although we are pretty sure that, in any conditions requiring a third reef, we would be making tracks for the nearest harbor. If the boat develops excessive heel or weather helm, reefing may correct the problem, make your ride more enjoyable, keep loose gear from rocketing around the boat and improve performance. Everyone likes "rail in the water" shots but no sailboat sails efficiently that way.

To reef, partially lower the main so that the selected reef line can be pulled tight. When it is, make sure the reef line clutch is closed and hoist the main as far as it will go, being careful not to overstress the reef grommets by hoisting the head too high. To release the reef, unclutch the reef line and hoist the main.

With a reefed main, you may wish to balance the rig by partially furling in the headsail. Correct balance should result in slight weather helm so that, if the wheel is released, the boat has a tendency to round up into the wind.

There are what seems like several miles of reef lines. When the main is hoisted, they just hang out on the sail and in the cockpit but, when the main is lowered, they tend to flop out all over the place. It may seem a bit disorderly but the best thing to do is just pitch them into the lazy bag and let them lie there. You can pull them into the cockpit, which makes everything neat and tidy but the winch will not hoist the main if all of the reef lines have to be pulled back outthrough all the blocks that they run through. If you (or the last charger guest) was a neatness freak, it will help to pull the reef lines back out at the mast to avoid excessive friction.

**Shower, Hot Water, and Shower Sump Pump**

The shower head works best when hand held and directed at the area requiring wetting or rinsing. When mounted, it can be adjusted for height by sliding it up or down the chrome bar, but it is important to press the push button first. Forcing the head up or down without pressing this button will wear out the resistance gasket, and then it won't stay up at all!

Hot water is stored in the insulated tank. It takes about 30 minutes of running the engine under load to get the water hot. When on shore power, you can heat your water electrically by turning the "water heater" switch on the AC panel to the "on" position. It takes about an hour to heat the water electrically. In the forward shower, it takes some time to pump water from the hot water tank to the shower head. You can just turn the shower on but then you will have to activate the sump pump a few times to drain the cold water. What we do is to hold the shower head so that it sprays into the sink until we can feel the water getting warm. Water is full hot with the handle rotated full clockwise.

CAUTION: The engine heats water to scalding temperatures! So please BE CAREFUL!

The shower "sump pump" is controlled by a toggle switch located on the washbasin stand. Activate the switch to void water from the shower stall. It runs a preset time, so you will have to press it repeatedly. Running the pump while dry is OK.

Experienced cruisers know the sailor's shower: get wet, turn off the water, soap up, rinse off. If the shower basin overflows, you're using too much water.

> **Tip**: The heads on *Mouette* are among the loveliest we have ever seen. This is in part because of the nice paneling on the walls and the shower seat. To keep it looking as lovely as it does now, when you have finished your shower, please towel off the area wherever the water has splashed on it.

On warm, sunny days, an alternative to the below decks shower is the swim platform shower (with hot and cold water) located next to the swim ladder. This is also a good way to rinse off salt after swimming or dirt after going ashore.

**Spares and Tools**

It is our goal and hope that you will not need to make repairs during your trip. That said, we have also provided a good selection of tools and spares in case you need them. *Mouette* is equipped with engine and general spares. They are located in the forward seat locker of the dinette. The tool bag is located in the same place. We also carry a spare alternator, starter motor, house water pump and internal and external engine water pumps. The principal reason for these items is to make it easier or faster to make a repair in a remote location where parts may not be available. Unless you are an experienced mechanic, you should generally try to find a professional to change any of these out for you or, at least to get a pro online to talk you through the process.

If you have any problems that you are not comfortable handling please call SJS or our maintenance.

**Stove, Oven, and Microwave**

The gimbaled propane stove has three burners and an oven with a broiler. Propane is a hazardous gas, and requires caution. For your safety, please follow these procedures:

- Open the valve at the propane tank all the way open.
- Make sure all stove control knobs on the stove are in the "off" position.
- Turn the electric solenoid switch located to the right of the stove to "on" (slide the red safety catch down while pushing the rocker switch). A green light will appear.
- Push in the stove control knob for the burner you want to use and turn to the left to high, while also pressing the electric ignition button (you will hear it sparking). The burner should light immediately, unless the tank has just been renewed, in which case it may take some seconds to push air through the pipe. Hold the knob in for 2-3 seconds (warming a thermocouple) and release. You may then operate the knob like a normal stove.
- When finished with the stove, shut off the burner(s), then shut off the solenoid switch. What little propane remains in the line from the tank to the galley is insignificant, and even if this tiny amount of propane were to leak into the cabin, it would not cause a problem. No need to shut off the propane tank during the day.
- At night, it's recommended that you turn off the propane tank with its hand valve. That way, should the solenoid valve fail, there's no chance that propane will leak into the vessel.

The propane tank is located in the propane locker in the starboard lazarette aft of the helm, which is vented and isolated from the rest of the boat. Any gas leaking there will move down, out, and away from the boat. For propane to actually flow to the stove or the barbecue, the tank valve must be opened at the tank (by twisting the valve counter clockwise) and the solenoid switch on the stove must be turned on.

While the propane tank normally lasts for 4 weeks or more, SJS's staff tops them off every 2 weeks, so you'll have plenty for you cruise!

If cooking underway, unlock the stove by pushing the rod under the oven door to the right, so it is not inserted in the hole in the cabinet (forward). Then, if the boat heels, hot liquids and foods will not readily slide off the stove top. For added security, use the fiddles that hold the pots/pans on the burners. If you have

something in the oven, please lock the oven door so the contents cannot slide out onto the galley sole (or someone's feet). A latching mechanism is located in the upper left of the oven door.

> **TIP**: Never cook in high wave conditions or in strong, gusty winds. Food will definitely go flying!

Except when cooking while underway, lock the stove in position by pushing the rod under the stove to the left and into the hole in the cabinet (forward). That way, if someone leans on the stove or grabs the oven handle, it won't tip and spill pots/pans on the cooktop.
As is common in Europe, oven settings are shown as single digit numbers. For those who prefer the actual temperatures, here is an equivalence chart. It was taken from the Internet and, in any case, oven temperature settings have always, in our experience, been notoriously inaccurate on shore as on board so, if you are entertaining your prospective boss and the chicken needs to be perfect, bring a stick-in thermometer and use it.

| Gas Mark | Fahrenheit | Celsius | Description |
|---|---|---|---|
| 1/4 | 225 | 110 | Very cool/very slow |
| 1/2 | 250 | 130 | --- |
| 1 | 275 | 140 | cool |
| 2 | 300 | 150 | --- |
| 3 | 325 | 170 | very moderate |
| 4 | 350 | 180 | moderate |
| 5 | 375 | 190 | --- |
| 6 | 400 | 200 | moderately hot |
| 7 | 425 | 220 | hot |
| 8 | 450 | 230 | --- |
| 9 | 475 | 240 | very hot |

The microwave operates on AC power only so it requires either shore or inverter power. It consumes quite a bit of power so it is best used when on shore power or otherwise for short bursts. Except for the power issue, it operates like any other microwave.

**Storage**

*Mouette* has loads of storage space in cupboards in each sleeping cabin and the main cabin. There is additional storage under the seats in the main cabin and under the floor boards in the bilge area. The bilge can get wet, so use waterproof plastic boxes to store items under the floor boards.

There is a huge sail locker forward (so huge it has a ladder to climb down into it.) You can use this to store fenders and lines but that won't begin to fill the space up. Unless you brought your Louis Vuitton set along, we suggest you store luggage and other stuff you are not going to use on the cruise in the sail locker so you don't trip over it all week and it doesn't crash around when you sail. Extra drinking water goes pretty well there too.

The magnetic compass for the autopilot is located in the starboard aft cabin locker. If you store a large ferrous object in or near this locker, the magnetic compass will point to it and not to the magnetic north pole. We're not sure how that would affect autopilot but we're pretty sure it's not good. We can't imagine why you would arrive on board with large ferrous objects in your baggage but, if you do, please store them in the sail locker.

At the beginning of the season we stock *Mouette* with various items that, over time, tend to be either consumed or lost and also supply a reasonable number of "spares" that can be used by SJS during the season to replace these items. In particular, we buy twelve full place settings and put eight of them on board but the various components tend to find new homes somewhere, sometimes on the boat in weird places, sometimes in the ocean and sometimes in what is taken off the boat at the end of the charter, either by the guests or by the SJS staff. We and SJS regard these items as "semi-consumables" so we are not fussed by a reasonable amount of "leakage". On the other hand, shortfalls may not always be detected in the rush to get ready for the next charter so we and SJS would appreciate it if you report any loss you know of (or if inventory just seems a bit short) so that the next charter guest gets a full starting allotment. Similarly, if you have to use engine or other mechanical system spares, please let the staff know so they can be replaced.

We apologize in advance if inventory cannot be easily located or if it is not where you would expect or want it to be. At the outset, we tried to be very precise in describing the location of all inventory but found that many, if not most, charter guests tend to reorganize the galley to suit their preferences. Hopefully the arrangement that you encounter will not be too illogical and you will find everything after a reasonable investigation.

## Swim Platform

The center section of the transom lowers to create a large swim platform. The platform itself is electrically operated with a switch located in the port aft lazarette. It makes getting into or out of the dinghy very simple and is also useful if you dock stern-in at a marina. You can leave it up while docking (and either throw lines to helpers on shore or send your crew over the side with the lines) or you can lower it and step off onto the dock. If you do the latter, please rig a fender aft of the platform so you do not inadvertently crunch the platform. Please do not attempt stern-in docking at all if you are not experienced doing it.

In the raised position, the transom is over center. This ensures that it will not fall open if the lines break but it also means that, once the electric motor starts to let the line out, the transom must be pushed outward to allow gravity to lower it the rest of the way. The transom is latched in the up position by a spring loaded deadbolt. When so latched, the transom cannot be lowered so please unlatch it before attempting to lower it. The deadbolt must remain in the open position whenever it is not locked up to prevent its sticking out when the transom is raised, which will bring the raise to a halt and potentially damage the stern gelcoat, the deadbolt or the motor.

There is a remote control for the transom motor in the nav table that can be used to raise the transom from the dock if you are going to leave the boat and don't want an invitation to all and sundry to just step aboard. If you use this, be aware that, if you raise the transom past over center, you will have to borrow someone's boathook to lower it again from the dock. Raising it to just short of vertical gets the message across effectively.

The swim ladder is embedded so you just lift it and push (or pull) it aft. Once in the water, it will telescope out. You can use it if you are going to try swimming but its primary use in the cruising area is to get back on the boat should you happen to fall overboard. If you manage this feat with the transom closed, all is not lost. There is a ring low on the transom. If you pull it out, a rope ladder will emerge that will allow you to climb into the boat.

## Tables

The main cabin table can be extended to its maximum size by folding the top leaf on the forward side to the aft side. For ease of access to the seats, or storage fold the leaf back forward. The main cabin table cannot be lowered.

The nav table can be lowered so as to form a single bench seat or small berth.

The cockpit table has two folding leaves. To raise them, lift the leaf until it clicks into place. To lower them, reach under the leaf and release two (forward and back) catch levers. The leaves can then be lowered.

**VHF Radio**

The main VHF radio can be operated either from the primary console located just outboard of the nav table or from a remote unit that can be plugged in under the aft end of the cockpit table and clipped to the clip provided for that purpose. The radio is not wired through the nav instruments switch and therefore must be turned on and off separately. The radio is the primary source of communication not only by voice but also of related data including AIS and other emergency data. If the radio is not on, you will not be transmitting AIS and, in an emergency, data that would otherwise be available to the Coast Guard or other rescue organizations will not be available. There is a handheld VHF radio located in the cupboards above the nav table but it must be charged to operate and is only useful at relatively short range. It provides voice transmission only and does not receive or transmit data of any kind.

**Water Pressure and Tanks**

*Water pressure*. The fresh "water pressure" switch is located on the electrical panel. It's okay to leave on while someone is below decks. But please turn "off" when motoring or sailing. You could burn out the domestic water pump should one of the tanks run dry as it tries in vain to pump water to build pressure (and you would not hear the pump running continuously over the sound of motoring or sailing).

*Water tanks*. *Mouette* has two water tanks, fore and aft. Tank-1 (forward) holds 106 gallons and tank-2, aft, holds 62 gallons. Selection valves are located behind the forward starboard seat-back cushion in the main cabin.

The water tank levels are indicated on the LCD screen on the electrical panel. When the tanks are full, use the bow tank first (Tank-1). With water tanks heavy with water, *Mouette* is a little bow heavy. Reducing some of the water weight forward first brings the boat into balance.

Water Tank Valves are located behind forward seat-back cushion of starboard settee. With full tanks, open Tank-1 and use first until drained, then close Tank-1 and open Tank-2 to use second. It took us a while but Tank 1 (the forward tank) is labeled in French. The abbreviation "AV" is short for *avant*, meaning forward. "AR" is short for *arrière*, meaning rear (Tank 2). The French are just like that. Tank 1 capacity is greater than Tank 2 so the switch is a good indication that it is time to replenish the water supply. Use one tank at a time to avoid running out inadvertently.

The tank valves are shown below:

1. Supply - Forward tank
2. Supply - Aft tank


Unless you are trying to conserve water as much as possible, it is best to switch tanks when the tank gauge indicates that it is almost empty. If you run a tank dry, water flow will be first intermittent and, if you continue to try to run water, will eventually stop altogether. If the pump is on, it will continue to run and a vain attempt to create pressure. Turn the pump off, switch tanks, turn the pump back on and open a faucet. At first the flow will be mostly air as the line clears but water flow will come back gradually.

Water usage will consist primarily of cooking, dishwashing, personal hygiene showers and head use. We are not fanatical about this but, although we cook, make coffee, brush our teeth etc. with tank water, we tend to use bottled water for drinking. State parks have no pressurized water to refill tanks, but most points of civilization do (although in 2015, there were some drought restrictions.) Depending on how many people you have on board and how they use water, you may have to refill your tanks once or several times in a week's cruise. If your crew does not let the water run continuously while they brush their teeth, shave or shower, you shouldn't need to refill too often. Just bear in mind that, if you run out of tank water, the heads will not flush.

**Winches**

The two sheet winches and the port coachroof winch are 2-speed electric and are controlled by two buttons (one for each speed) nearby. They are protected by circuit breakers found in the port aft cabin. The electric feature only works to haul lines in so lines must be let out manually. The starboard coachroof winch is manual and any of the winches can be operated manually. We advise that you use the slow

speed while you are getting used to the winches and at any time when something could jam up.

The electric winches can also be operated manually using a standard winch handle. To operate manually, it is necessary to use the handle to push the pin down in the receiving end, which disconnects the electrical function until the winch is again used electrically (without the handle installed) at which point the pin will pop back up.


Please be particularly alert when using a winch electrically to any problem that seems to be developing. The electric winches will continue to crank as long as you continue to push the button and can easily exert enough pressure to break gear if something gets jammed or just if the winch is cranked too long. You won't feel a thing if this happens so, if you are not visually alert during the process, your first indication that something is wrong may be a loud bang.

## SUPPLEMENT

## Electrical Power Management

Battery powered marine electrical systems can be confusing to anyone not used to them. Depending on your cruising itinerary, you may not need to pay any attention to how they work or you may need to manage them to avoid running out of power and/or damaging the systems. This attempts to provide a very general description of how these systems work which can, hopefully, assist you both in managing the systems and in feeling confident that you know what you are doing.

*Marine Electrical Systems*. Cruising sailboats use batteries for various functions including, at a minimum, starting the engine and providing a source of electrical power for on-board systems such as lights, refrigeration, electronics etc. There may also be single-purpose batteries for specific functions such as a bow thruster. Because the batteries perform different functions, they tend to be built differently. A start battery is built to deliver large quantities of energy for brief periods of time. Batteries designed to power various other systems (house batteries), in contrast, are built to provide smaller continuous amounts of power over longer periods of time. Single purpose battery construction depends on their function but they are more likely to generally resemble start batteries.[1]

Most cruising sailboats in the US use 12 volt (12v) batteries (their maximum theoretical voltage is actually 12.6 but they are usually referred to as 12v) although some use 24v and different voltages are possible. From the point of view of a charter guest, 12v and 24v systems function identically although the system needs to be designed around a particular voltage so you cannot replace a battery of one voltage with one of another. Most US based cruising sailboats also have 110v alternating current (AC) circuits[2] to run things like microwaves and other plug-in appliances and these can be powered in one of three ways: (i) when connected to shore power, they are powered directly from that source; (ii) they can be powered from the house battery system using a device called an inverter to change the voltage from 12v direct current to 110v AC; or (iii) they can be powered from a gas or diesel driven generator if one is installed.

All non-disposable batteries need to be recharged. On a cruising sailboat, by far the most common sources of recharge power are shore power (which is obviously only available when docked at a marina), an engine-driven alternator (which only works

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[1] We live in the age of batteries so there may be all kinds of low-power batteries driving specific functions. Most of them are typical AAA, AA, C, D or 9v batteries. Since they function in the same way that they do on land, they are not further discussed here. Nor are single purpose batteries, other than start batteries, since their function depends on their purpose.

[2] Some European boats may have 220v systems. They function identically to 110v systems but some plug-in appliances may need a transformer to use them.

if the engine is running) or a generator, if installed.[3] As the energy in a battery is used, the battery becomes depleted and needs to be recharged both to enable it to continue to perform and to avoid damage to the battery.

Most people think of batteries as a kind of gas tank equivalent. If it is "full" the battery has all the "power" it is supposed to have and that power is available for use until the battery is "empty". If you need to know how much power you have left you just look at the gauge and it tells you. Pretty much none of that is true for batteries but, for those of us used to our car batteries (and for the start battery on a cruising sailboat) it is a reasonable working analogy. The batteries used in the house bank are very different and the analogy does not work nearly as well. To manage the house bank effectively, more detailed knowledge is required.

*How Batteries Charge and Discharge.* Cruising sailboats generally use, both for starting and for house systems, batteries known as "lead/acid" because they produce electricity from a chemical reaction between lead and acid as described below. Their basic structure consists of positive and negative "plates" immersed in a liquid or gel "electrolyte". All of the positive plates are connected to the positive battery terminal while all of the negative plates are connected to the negative terminal. Separators between the positive and negative plates cause them not to be connected unless a connection is made between the terminals. Wires connected to the two terminals can form such a connection by creating a circuit to which electrical devices are also connected, most of them with a switch that completes or interrupts the circuit. Closing the switch completes the circuit and powers the device.

When the batteries charge, a chemical reaction between the plates and the electrolyte causes the negative plates to become negatively charged and the positive plates to become positively charged. If a circuit is then made between the positive and negative plates, as, for example, by turning on a light, the plates seek to equalize through the circuit causing a current flow that lights the light. As the plates equalize, a different chemical reaction between the plates and the electrolyte eventually causes the plates to return to their original, uncharged state. A new charge starts the cycle over again.

These chemical reactions occur first of all at the surface of the plates where contact with the electrolyte is easiest and where new electrolyte can quickly replace electrolyte that has already reacted with the plates. During a charge phase, the surfaces react faster than the interior of the plates and build up voltage faster. Voltage buildup in the interior proceeds more slowly as new electrolyte finds its way inside. The same thing happens in reverse during a discharge phase. Charge is drawn first from the surface and only later from the interior.

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[3] Boats that habitually operate away from marinas for long periods of time may have other power sources including solar, wind and water driven systems.

Start batteries have relatively thin plates so the ratio of surface to interior is quite large and the difference in charge and discharge rates is less important. Deep discharge batteries, such as those found in house banks, have much thicker plates and there can be a considerable voltage difference between surface and interior in both the charge and discharge phases as the interior lags behind the surface.

*Voltage and Voltage Measurement.* The voltage of a marine battery results from the difference in charge between its positive and negative plates and can be described as the battery's ability to push current (measured in amps) through a circuit. The higher the resistance (or "load") of the circuit (measured in ohms), the lower the amount of current that a given voltage will push through it. If you create a circuit with little resistance, as, for example, by dropping a wrench so that it lands on the two battery posts, you will produce a current sufficient to melt the wrench. When a circuit is made, it tends over time to equalize the charge difference between the plates at a rate determined by the current flow, thus eventually reducing voltage.

You can measure voltage by placing the two probes of a meter on the positive and negative battery terminals. In most cruising sailboats, that task has been done for you and you can read voltage on at least one and often several onboard displays. Voltage tells you something about state of charge but you need to be careful about understanding what it is telling you. In a nutshell, it is telling you how hard the battery bank can push current through a circuit at the instant of the measurement. It does not tell you how long it can keep that up, which is, of course, what you probably want to know.

A start battery demands a very large current for a very short period of time so what is important is how much current the battery can push at a given point in time. It is less important how long it can keep that up. Since start batteries have a relatively large plate surface area, they can push a lot of current in a short period of time but discharge quickly while they are doing it. That is why, if you crank your engine with the starter motor, after less than a minute the voltage will drop and the engine will crank slower. You can get a little voltage back by stopping and waiting while the electrolyte percolates into the interior areas of the plates but your battery is basically out of juice and needs to be recharged. The good news is that, again because of the large plate surface area, it can be recharged relatively quickly.

House batteries do not typically need to deal with large instantaneous loads but they need to deliver power for long periods of time. This is accomplished by using much thicker plates. Think of the interior of these plates as electrical power long-term storage. When a load is connected, the charge at the surface pushes current through the circuit and is depleted essentially as in a start battery. However, unlike the start battery, if you can wait a while or your power demand is relatively low, additional power is available as the electrolyte percolates into the interior of the plates so the surface discharge is replenished from the interior. The instantaneous loads on the house bank are typically not great in comparison with starting an engine so the surface voltage depletes more slowly and is replenished from the

interior as it does so. In some circumstances, however, the drawdown at the surface will occur faster than it can be replenished and there will be a temporary voltage drop. To test this, run the microwave or other relatively high load device through the inverter and note the almost immediate measured voltage drop. If you then turn off the device and wait, the voltage will come back up and, unless the batteries are already severely depleted, will remain there until further use creates more depletion.

So, with all that in mind, what does a voltage reading tell us? For the start battery, it tells us pretty much everything we need to know since what we are concerned with is short-term voltage. For the house bank, it tells us the same thing but it does not tell us how long the voltage will last and therefore will not tell us the bank's state of charge or give us much of an idea of what we need to do about it.

Let's now go back through the charge/discharge cycle looking at what a voltage reading means at various stages: As the bank charges, the surface comes quite quickly up to full charge both because there is good electrolyte flow over the surface and because, if you have a smart charger,[4] the flow allows charging at a high rate without creating dangerous side effects.[5] Once the surface is charged, the voltmeter will show full charge because that is what the battery can supply at least for an instant. Meanwhile, however, the interior is not up to the surface charge and won't be for some time, both because of the reduced electrolyte flow and because the charge rate needs to be reduced to avoid overcharging hazards. As a result, only a portion of the battery's total capacity is fully charged and it will take as much as several hours on charge before the whole battery reaches that state. On the discharge side, a slow and steady load on a fully charged battery will not initially decrease measured voltage because the depletion at the surface is replaced from the interior, although as noted, a temporary large load can result in a temporary measured voltage drop. Given a steady moderate load, measured voltage will decrease very slowly, if at all, until the interior voltage starts to drop and surface voltage can no longer be fully replenished. As a result, the battery's total capacity can be significantly reduced before a voltage reading will indicate that. Once the metered voltage starts to drop significantly, you can be pretty sure that you are running out of power and need to do something about it. To return to the gas tank analogy, think of a car fuel gauge that reads close to full unless the tank is ¾ or more

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[4] Standard alternators supplied with most marine engines have limited capacity to control rate of charge and are therefore constrained to limit the rate to what is safe in all circumstances. Shore power based chargers will have some kind of regulatory system but its sophistication can vary. "Smart" regulators use information from various sources to regulate charge rate and therefore can charge at the appropriate rate for the conditions.

[5] The way a battery charges is by being linked to a higher voltage source than the voltage of the battery (which causes the voltage in the battery to increase as the battery and the source seek to equalize.) As a result, during actual charge operations, the indicated voltage will read higher than the actual battery voltage (usually between 14 and 15v) reflecting the voltage of the charge source. As soon as the charge ends, the voltmeter will again reflect battery voltage.

empty or you are accelerating rapidly and you will have a good idea of how useful voltage readings are to determine state of charge.

*Current and Current Depletion*. Another approach to determining state of charge is to focus on current. One way of describing a battery's capacity for doing electrical work is to say that a fully charged battery has the capacity to cause a certain amount of cumulative current to flow through whatever circuits are connected to it. The amount of current flowing through a circuit at any time is measured in amps and the total amount of current that has passed through the circuit in a given time is measured in amp hours (a current of one amp for one hour being one amp hour.)

A battery's theoretical capacity to push current through a circuit would be measured by the total current that it could push through at whatever rate until its plates were totally in balance and it could not push any more current through at all. As a practical matter, once the voltage drops below about 11v, the battery will not push enough current to run whatever loads are connected at their rated capacity so lights will dim, motors will run slower etc. Below about 10.5v, most equipment will not run at all and the battery is functionally "dead". By common convention, a battery's functional capacity is generally described as the amount of current that the battery can push through a circuit before the voltage drops below 10.5v. But repeated voltage depletion to 10.5v can cause rapid deterioration of the battery (see *Battery Life and Performance* below) so it is good practice to recharge marine house batteries so as to prevent depletion below 11.8v.[6]

As we have seen, voltage is not a particularly good measure of capacity for house batteries. Fortunately, marine deep discharge batteries used in house systems are rated in terms of total capacity in amp hours that they can deliver from fully charged to functional depletion, which, for a 12v battery, is normally 10.5v. The capacity rating applies to a theoretically perfect battery that starts with a 100% charge. It also assumes a given ambient temperature and a given rate of discharge. As a result, the actual capacity of a battery will be different from its rated capacity and may be less as a result of battery deterioration over time and less than 100% starting charge. On top of that, usable capacity will be less than rated capacity if we follow the rule of not depleting the batteries below 11.8v. Prudently usable capacity will vary from system to system but 50% of rated capacity is a reasonable expectation.

What this means is that, if your battery bank is rated at 600 amp hours and you started the day close to fully charged (usually because you were on shore power the night before) you have something like 300 amp hours available before you have to recharge. But how do you know how many amp hours you have used? The typical cruising sailboat comes from the factory with at least one installed volt meter and, if you are lucky, an ammeter but nothing that measures amp hours. If you have an

[6] Several new technologies, including Lithium Ion and Carbon Enhanced batteries promise to improve these performance limitations, as well as recharge rates, but, at the time of this writing, they are not common on cruising boats.

ammeter, you can determine the current flow at any given point in time and extrapolate that number to estimate amp hours but total boat load varies as electrical equipment goes on or off. For example, electric refrigeration units are controlled by thermostat and cycle on or off as needed. Most built-in heating systems are diesel fueled but the circulation fan is electric and is also thermostat controlled. Autopilots, radar and other devices consume considerable power but are only used some of the time. A modern cruising sailboat with LED lighting lying at anchor overnight with the refrigeration and heater systems turned off might consume current at a rate between 1 and 2 amps. But start turning on a couple higher load devices and the rate can easily go over 10.

A number of aftermarket meters have addressed this problem by continuously measuring current both incoming on charge and outgoing during use and deriving amp hours either consumed or remaining. Some monitors display the number of amp hours consumed so remaining capacity is equal to rated capacity minus amp hours consumed. Others display the number of remaining available amp hours as a percentage of total capacity so remaining capacity is rated capacity divided by the percentage. An accurate amp hour monitor is actually fairly close to the gas gauge equivalence.[7]

*Battery Life and Performance*. Batteries, like anything else, deteriorate over time, generally because the active material in the plates falls off as a result of expansion and contraction of the plate frame during charge and discharge cycles. Physical stress that is put on the batteries in rough conditions can create the same result. The predicted rate of deterioration of deep discharge batteries, such as those used in house banks, is usually measured in cycles, meaning the number of times that a battery can be discharged to a given point and fully recharged before it fails. The number of cycles to failure depends on the original quality of the battery and the conditions in which it is used. The depth of the discharge as a percentage of total capacity affects cycle life, the deeper discharge level resulting in shorter cycle life. As a result, it is good practice to limit discharge to 11.8v even though the battery will continue to perform at lower voltages. A good quality battery used in relatively benign conditions and well managed will have a cycle life in the thousands.

Overcharging can also lead to accelerated deterioration (and can be dangerous.) As long as the system is functioning correctly, there is little that the crew can do to create an overcharge but protection against overcharge in systems with smart regulators is a result of correct regulator settings. Since smart regulators are designed to work in a variety of systems, the settings can be changed at the regulator or a remote display. Changing the settings, which can be done with a few

[7] A really good method of monitoring state of charge is to combine voltage and amp hour data. As the battery depletes from full charge, by far the most useful information comes from the amp hour reading. As that reading falls below 60%, it is time to start monitoring the voltage as it should by now be dropping and you can get a more accurate idea of how close to limit voltage it is.

button pushes and knob twists, can easily cause an overcharge and possibly a fire or other serious problem. Except on instruction from an electrical pro, changing regulator settings is strongly discouraged.

In addition to overall battery life, battery performance deteriorates over time, much more rapidly if the batteries are abused. One of the principal causes of performance deterioration results from what is known as sulfation. The chemical reaction that produces electrical power from a battery recombines lead (Pb) and lead dioxide ($PbO^2$) from the plates and sulfuric acid ($H^2SO^4$) from the electrolyte to form lead sulfate ($PbSO^4$) and water ($H^2O$) plus a bunch of ions that produce the electricity. The lead sulfate is a crystalline powder that coats the plates. When the battery is recharged, the reverse reaction converts the lead sulfate and water back into lead, lead dioxide and sulfuric acid. If, however, the recharge is less than complete, some of the lead sulfate remains attached to the plates where it reduces the lead and lead dioxide available to react on discharge and also impedes contact between the plates and the electrolyte thus reducing capacity. A timely full charge will cure this problem but, if that does not happen, the crystals in the lead sulfate will grow in size, eventually to the point where they cannot be reconverted and simply remain there coating what is left of the plates. In some systems, it is possible to apply an overcharge process known as equalization which may or may not help depending on how advanced the sulfation is but that process can be dangerous and must be very carefully controlled.

Careful battery management will maximize both battery life and capacity. It is hard to do any one thing that will kill a battery that was otherwise in good condition but repeated abuse adds up. Avoiding excessive discharges and ensuring regular complete recharges helps a lot.

*Putting it All Together with a Little Common Sense*. Let's take an imaginary cruise: You begin Saturday morning from Squalicum Marina in Bellingham and head out for Sucia. Your boat was hooked up to shore power since at least Friday morning so, unless you have a damaged electrical system, you can assume that your batteries are fully charged. You are feeling a bit overwhelmed with the new boat and all (or the wind is under ten or over thirty knots) so you decide to motor the whole way. The amp hour monitor confirms what should be obvious anyway: you are still fully charged when you arrive in Echo Bay. You drop the hook, turn off the engine and get down to the serious business of having fun. You keep the fridge and freezer on, turn on the inverter and use the microwave to heat up some of the dinner. Two crewmembers decide that they need to shower and wash their hair so they do that, after which they haul out the drier and use the inverter to run that. It gets a bit chilly that night so you run the heat for a while before turning in. The anchor light stays on overnight but that, the fridge and freezer are about it for power requirements.

When you wake up the next morning, your trusty amp hour gauge tells you that you have used about 100 amp hours. As you have a 600 amp hour system, of which

about 300 are useable, you're still fat. No problem. You have breakfast and squander a few more amp hours, You're feeling more confident now so, just outside Echo bay, you hoist sail, using the electric winch for which there is still plenty of power, and head around the top end of Orcas and down President channel. Noting the favorable current in Spieden Channel (are you an awesome skipper or what?) you keep the sails up and head for Roche Harbor where you promptly hook up to shore power and the cycle starts all over again. For all the power management you had to do, you might as well have been in a motel room.

Now a different agenda: You can't wait to get the sails up, which you do a hundred yards from Squalicum, using the electric winch, of course, after which the engine is turned off. You were told in the orientation brief that you get a prize if you make it all the way through Hale passage under sail so you spend four hours tacking every three minutes to accomplish the task, using the electric winches for the jib sheets on each tack, after which things speed up and you beam reach all the way to Echo bay on autopilot so you can hold your beer with one hand while making gestures in support of whatever you are ranting about with the other. When you get there, your amp hour display lets you know that the trip cost you 50 amp hours so you have a total of 550, or 250 usable, amp hours left. You get down to some serious partying, the microwave gets used along with the hair driers as before, you use the heater during the evening and leave the fridge, freezer and hot water on overnight. The next morning, the monitor is showing 150 amp hours consumed so you have 150 usable amp hours left. You take off for Reid Harbor, sailing all the way but you are starting to eye the amp hour gauge warily (voltmeter is still at 12.3) so you tell the crew it's exercise time and use the winches manually. When you get there, you are looking at 120 remaining usable amp hours so you call a crew meeting. You can start conserving power right now, in which case you might make another day sailing but probably will have to do some motoring to get through the night. No one has much interest in motoring when you can sail so you find some high ground on Stuart Island and use your cell phone to call Poet's Cove to arrange for a slip for tomorrow. Party on! No problem.

Now a third and final agenda: You don't have an amp hour monitor on board or you don't know where it is or what it is telling you. Also you didn't get the memo about voltage indications so you believe in the gas tank equivalence theory. Same itinerary as Agenda 2 all the way through the night at Reid Harbor as you watch the volt meter stay nicely north of 12.4v for most of the trip. (Awesome battery system!) By morning at Reid, however, it is drifting down toward 12.2. Well, 12.2 is only half way from 12.6 to 11.8 (and you didn't notice that almost all of the change happened in the last 12 hours) so the next morning you take off under sail for Montague Harbor on Galiano Island with a brief stop on Pender to clear customs during which you run the engine for a total of 30 minutes bringing the metered voltage back up to 12.6 (hurray, fat city again!) When you get to Montague, you discover that the limited dock space is all taken so you have to anchor. You are now starting to get a little worried about power supply, based in part on the fact that your measured voltage is now, strangely, 12.0, so you run the engine for 45 minutes.

The engine noise is annoying so you leave it at idle. (By the way, running the engine for extended periods under light load is not good for it.) As soon as you shut the engine down voltage is again back up to 12.6 so you're topped off, right? Even so, you are a bit cautious because you think there might now be something amiss with the awesome battery system so you don't turn on the inverter and try to avoid unnecessary power consumption. You turn in, confident in the notion that you have a slip reserved in Ganges for the next night where you can get the system looked at and recharge without all that engine noise. At 3:00 a.m. the battery alarm goes off, waking up everyone on board. Voltage is now 11.8 and you need to decide whether you are going to let it go down even further or start up the engine and wake up the crew of every boat within 200 yards, of which there are nine.

On most boats in the SJS fleet, if you follow the first agenda, you can basically forget about power management. If you follow the second, you are still fine, although you need to adapt your itinerary to your power requirements. If you just hope for the best, or think your voltmeter is a gas gauge equivalent, and if you are super lucky with wind conditions, sometime during the third day, you are very likely to be close to critical on power. If you see this coming, you can address it by being frugal in your use of power or you can make sure that you have enough engine time enroute to do some serious recharging. About three hours at motoring speed per day should to the trick quite nicely, even if it won't result in a full charge. If you do neither, chances are that you are about to prove the old adage that good judgment is the result of experience and experience is the result of bad judgment.