CHAPTER V: MAINTENANCE AND MAINTENANCE PROCEDURES

Maintenance of your yacht is covered in literally hundreds of books, magazine articles and manufacturers instruction books and manuals. This manual can not even list all of these resources because new and better resources are printed almost daily. It is the responsibility of the owner to search out the technical world and find those specific instructions and procedures with which the owner feels comfortable. This chapter hopefully will provide the basis for proper maintenance procedures and routines that will keep the yacht in good condition.

Few persons today are under any illusion that a fiberglass yacht is "maintenance free". As a matter of fact, from the standpoint of cosmetics alone, a fiberglass hull requires nearly as much time to care for as a wooden hull of similar size. Washing, waxing, and touching up little nicks and scrapes are time consuming and demanding tasks which must be done consistently, if the yacht is to retain its new look.

The advantages of fiberglass lies in areas other than cosmetics - strength, for example. Fiberglass reinforced plastics (FRP) are among the strongest boat building materials ever developed. Even a moderately well built FRP yacht will be stronger and more endurable than the best wooden built a few decades ago. In addition, fiberglass is impervious to most of the ills that can be disastrous in other materials: it doesn't oxidize like steel; it isn't affected by electrolysis like aluminum; it doesn't rot like wood; and it is not affected by a variety of sea life, such as worms. While it can be damaged by physical impact and the resin will burn, neglect of surface damage generally does not result in more serious deterioration, as it would in a steel or wooden hull.

A. Hull

Normal periodic maintenance consists of waxing the hull with any of several good fiberglass or automobile waxes on the market today. Waxing should be done from the shear down to and including the waterline stripe. Wax should not be put over the bottom paint that may be at or above the normal trim waterline of the yacht. If the gelcoat is older and wax doesn't seem to accomplish renewing the appearance, there are some newer fiberglass finish restorers on the market such as "New Glass" or "Polyglas". These products may be a problem if you ever want to paint the fiberglass.

Note: From several of our dealers comes the advice that boats need to be hauled regularly in order that they may dry out. This is especially true of boats in fresh water as it is more soluble.

Generally, if customers purchase a boat with a white hull, little dings and scrapes do not show up as badly as they do on a colored hull and one is not under as much pressure to make immediate repairs. Scrapes and scratches in white gelcoat are relatively easy to repair. There are several gelcoat repair kits on the market which will do a fine job, if the directions are followed closely. TaYang has provided a package of gelcoat when new. Bigger gouges can be filled with either polyester or epoxy putties before the gelcoat repair system is used. Colored gelcoat presents the additional problem of color matching. Again, there are several systems on the market that will

make it possible to match the original gelcoat color. Remember that dark colors tend to be hotter in the tropics.

Blisters are a continuing topic with respect to fiberglass hulls. Whether or not they appear depends on a myriad of variables. But they can and will develop blisters if they remain in the water too long. If they do, deal with them early. One of the vinylester epoxy bottom jobs being performed in the Chesapeake Bay in the early 80s has left hull #107's bottom, baby bottom smooth ever since. When you haul out, keep an eye out for the first little pinhead blisters. These are normally only in the gelcoat. It is easier to deal with these than wait until larger, deeper blisters begin to appear. The softer bottom paints that slough off (Micron, CSC, etc.) are easy to prep for a new paint job when you haul every 1-3 years, depending on where you live and whether you like to race or not. Some of the harder bottom paints (Trinidad types) that accumulate over time do better at repelling heavy barnacle growth in some geographical regions. Ask around before you buy your next choice of paints. Usually three gallons will cover a V-42 bottom with 2 to 2 ½ coats, if you roll it on.

It is a good idea to inspect the bottom periodically. In areas such as the Chesapeake Bay, groundings are generally not serious as the muddy bottom is unlikely to do any serious damage. However, in the Caribbean and Northwest cruising areas, for example, groundings on rock and coral are a different matter. If possible, the hull should be inspected immediately after a hard grounding on rock or coral. If deep scrapes are found or if the fiberglass has actually been crushed or distorted, the yacht should be hauled at your earliest convenience and the damaged fiberglass repaired. While we do not wish to exaggerate the potential for water to soak into the damaged surface, the possibility is there, and immediate repair is very important to limit the area of potential water saturation.

Your Tayana 42 comes with a heavy rub rail which bolted and/or glued to the side with either a bronze or stainless steel striker to protect the sides. It is a thing of beauty when properly maintained and a wise investment that will take a great deal of the abuse which otherwise would have to be absorbed by the hull. The rub rail is very often neglected during cleaning. It should be cleaned, sanded, and preserved in the same manner as other teak on the yacht. (See discussion below.)

B. The Deck and Cabin Top

The deck and cabin top of the Tayana 42 is molded in essentially the same manner as the hull - in a one piece mold following the fiberglass. When the deck is removed from the mold, most of the teak trim is installed before the deck and hull are joined. Teak decks, teak facings on the cabin, and teak in the cockpit are all installed before the deck is joined to the hull.

The fiberglass of the deck and the cabin are cleaned and maintained in the same manner as the hull. Any one of several good cleaners and waxes will tend to help keep colors bright and new looking. The big job will be teak maintenance. In the old days, teak decks were maintained with a holystone and salt water. The holystone was a large piece of pumice rock that was rubbed

across the deck to clean and polish wood. When done regularly, the teak was kept a beautiful silvery color which was quite striking when contrasted with the painted surfaces and natural wood colors. The salt water helped keep the teak in good shape because salt would be left in the wood as the water evaporated. Because the salt was slightly hygroscopic (attracts moisture), the teak did not dry out rapidly. Of course, wetting and cleaning had to be done daily if the deck was to be kept in the best condition. Not many people are going to holystone their teak daily in this day and age, although cleaning would be highly recommended. Most people seem to prefer the deep brown of newly oiled preserved teak. There are several products on the market that make it possible to keep the beautiful brown of teak without a great deal of heavy labor. Cleaners are strong and corrosive and must be used infrequently and with great care. Washing and leaving the decks natural is always an option if its condition is monitored frequently.

When you receive your yacht, the teak will have been cleaned and will be relatively dry. It should be cleaned with common washing soda that one can obtain in the laundry section of any well-stocked grocery store. Washing soda is an excellent cleaner and has a tendency to bleach the wood somewhat. It will not damage paint or gelcoat, unlike some teak cleaning products, although it should be thoroughly cleaned off. Use about one cup of washing soda in a bucket of water (more soda if the deck is really dirty). Scrub the teak with the soda solution using one of the many plastic non-abrasive scrubbing pads or a soft brush <u>across</u> the grain until the wood is thoroughly cleaned. Then rinse thoroughly and let dry. Avoid using deck or scrub brushes, as these tend to damage the softer parts of the grain and leave the teak rough.

The number of teak oils and preservatives on the market is virtually endless. The best are those that contain a minimum of varnish. Such oils do not leave quite as brilliant a finish, but they last almost as long, and they age more gracefully. If one wishes to maintain the brilliant teak brown, he will have to clean and reoil every four to six weeks in tropical areas; somewhat less frequently is higher latitudes. Use a non-skid finish, such as Semco, etc., on areas where standing or gaining a purchase on a line is necessary. Other finishes which are very popular include Cetol and Armada, and those with long lasting eurethanes such as Honey Teak and Bristol Finish.

The polysulfide products that are used to caulk the teak decks merit some special consideration. Certain of the more corrosive teak cleaners and at least one teak oil product can damage polysulfide. As mentioned above, corrosive teak cleaners should be used infrequently and the directions should be very carefully followed. These compounds should be washed off completely and as soon as the directions permit, even if the product is advertised as not hurting caulking compounds. On the other hand, teak oils that can soften polysulfide should never be used. One of these oils is reputed to be a widely advertised two part product.

The polysulfide caulking is relatively easy to maintain and repair. The most common problem is that the caulking pulls away from the teak and breaks the seal. When this happens, it does little good to try to fill the resulting space with more polysulfide because the new material will adhere neither to the old polysulfide nor to the teak. The old polysulfide should be completely removed and then the teak should be primed with the primer recommended by the manufacturer. Once the primer has dried, the space should be filled with fresh polysulfide – leave a bead that is higher than the surrounding wood. It will take several days for the polysulfide to cure. Note that moisture tends to increase the rate of curing, and it is a good idea to keep the caulking damp.

Once cured, the caulking can be sanded off flush leaving a practically invisible repair. When deck screw plugs come off, check the screw for tightness and replace the plugs to inhibit the incursion of moisture.

C. Interior Woodwork

Interior woodwork is generally solid teak staving or teak faced plywood panel. Both of these are maintained in the same manner if they are unvarnished or natural. If you have ordered your yacht with natural wood which you wish to keep light, it is best to finish the teak with a light wax. The process is simple. The wood should be thoroughly cleaned – start with a vacuum cleaner to remove all of the dust and loose dirt; then use a damp cloth with no soap; follow this with a solvent wash to eliminate any excessive surface oils; then spread on the wax according to manufacturer's directions. Any of the light furniture waxes can be used for this application. Some people have had excellent results using bowling alley wax. This wax takes a longer time to apply, but it is tougher than most liquid waxes and requires less maintenance. If you want your interior teak to be a little darker and to take on the patina of fine furniture, one can use oils rather than wax. Cleaning should be accomplished as described above and then the wood should be covered with lemon oil or such commercial products as Scott's Liquid Gold or Sheila Shine. The latter two products have an oil base that soaks into the surface of the wood and a wax that fuses to the surface and provides a protective coating that is almost permanent. The oil does darken the wood somewhat. If your yacht has a varnished interior, you will find that maintenance is much like keeping furniture looking nice. You will clean the surface with water and mild soap solutions and "dust" using one of the many dusting products available at the local supermarket. A lemon oil finish restores luster to both gloss and satin varnished surfaces.

The sole merits special consideration. Obviously, one cannot use ordinary waxes – they would ruin footing. If the sole is left natural, it should be cleaned as described above and covered with Liquid Gold or Sheila Shine. These products protect the surface but do not seem to leave the sole slippery when wet. If the sole is varnished with a satin coating, it will be a little more slippery, but may be all right. If it is too slippery when wet, it can be coated with polyurethane – this product is not at all slippery when wet. The directions for preparing the surface should be followed religiously, as polyurethane is generally not compatible with other types of varnish. Murphy's Oil Soap, now available in spray form, is excellent for cleaning either finished teak or the sole.

Bronze presents a special cleaning problem. Ordinary metal cleaners will not clean or polish bronze. Brass cleaners, for example, will not touch the green corrosion that disfigures bronze ports. An excellent product is Amway metal cleaner. It is an excellent general metal and bronze cleaner to have aboard for both interior and exterior use. In the case of bronze, once the metal is cleaned and polished, it may be coated with a spray wax such as the Amway colorless shoe polish.

D. Spars, Rigging, and Sails

The primary means of propulsion is the sailing rig, yet it is sometimes the most neglected. This is probably because it is very reliable and because most people believe they have an intuitive understanding of it and neglect it through misplaced familiarity. However, maintenance is vital.

Failure of your rig can be far more catastrophic than engine failure – one doesn't merely lose power; he may sustain damage to the yacht and injury to personnel.

1. Spars

The Tayana 42 normally is equipped with an aluminum, deck-stepped mast. The primary advantage of aluminum spars is the reduction in maintenance. One should not conclude, however, that aluminum spars are maintenance free. Like fiberglass, aluminum requires frequent and conscientious care, if its appearance is to be maintained. Again, as with fiberglass, if damage to finished does occur, one is not quite so pressed to get a repair done because further deterioration is not likely.

The aluminum spars with a Tayana 42 may be finished either by anodizing or painting. Anodizing is a process by which a protective coating is formed that is superior to paint. It is done in a special bath before any of the fittings have been installed. Anodizing cannot be renewed by the yacht owner. Generally, painted spars are finished with a polyurethane, a very hard, color-fast paint. Maintenance consists of monitoring the condition of the mast for scrapes and gouges and repainting them when they occur. A small spray can of automobile finish is very handy for this purpose. Simply remove the damaged paint, then sand lightly with about a 300 grit wet or dry sandpaper, and spray on the new finish.

Aside from physical damage owing to impact or scraping, the greatest cause of damage on an aluminum spar is galvanic corrosion. Any non-aluminum fitting that is bolted, screwed, or riveted to an aluminum spar must be bedded to prevent electrolytic corrosion. The bedding acts as an electrical insulator. If dissimilar metals are not isolated from the aluminum, one will soon find that the aluminum pits and forms a fine powder. This is irreversible damage which must be avoided at all costs. If it is discovered, the fitting or fastener around the corroded area should be removed and reinsulated with a bedding compound or a sheet insulation, such as neoprene or rubber. The pitted area may be filled with epoxy or polyester putty before repainting, but this is only cosmetic – the putty will not restore the lost strength in the damaged area.

One must consider that an aluminum mast that has been badly dented is no longer safe. Dents that are half an inch or more in depth and which have a diameter of a third or more of the spar constitute a serious weak point. If the spar is put under serious stress at that point, the chances are that the section may collapse. If you should find a dent that large, contact a professional yacht rigger for advice.

Mast spreaders are particularly critical to the health of your rig. They allow the long upper shrouds to take up the loads that are transmitted to the upper part of the mast during sailing. As a result, they are under tremendous compression. It is particularly critical that they be examined regularly to see that there is no distortion or cracking. The outer tips of the spreaders should be raised above the spreader base so that the compression load is transmitted down the spreader to the mast and not at an angle which would tend to force the spreader to bend under load.

V-42s are rigged with two sets of spreaders. The upper set includes a distinctive semi-circular lightweight aluminum jumper strut that replaces running backstays. When pulling the mast, use caution to not damage this jumper strut. Make sure the fasteners are coated with anti-corrosive compound.

2. Standing Rigging

Standing rigging is made up of stainless steel cable with various attachment fittings of chromed bronze and stainless steel. The wire used is 1/4 or 5/6 inch 1x19 wire. Either size cable is sufficiently strong to bear the rig under winds of hurricane strength. The 1x19 refers to the winding of 19 single strands of wire to make the cable. This winding makes the cable stiff and strong, but it would be unsatisfactory if it were required to run through blocks or go around sharp corners.

Most Tayana 42s are delivered with swaged fittings. Swaging is a process that actually squeezes a hollow cylinder onto the cable. The process was developed for the aircraft industry, and the strength of the joint is nearly as great as the tensile strength of the cable. Watch for cracks in these fittings over time, especially in the tropics.

Some 42s have been delivered with the wedge type fittings that are most often known by the trade names Sta-Lok or Norseman. These fittings get their strength from a conical bronze core that is forced against the cable within the fitting. It too, is stronger than the tensile strength of the cable. It has the added advantage that it can be installed by the owner with two common adjustable wrenches. It must be remembered, however, that the wedging cones are not reusable and extras should be carried at sea.

Turnbuckles are generally chromed-bronze cylindrical type. They are made to be set up with two wrenches – one to hold the cable and one to turn the turnbuckle itself.

Standing rigging should be inspected regularly. And remember, it does one no good to simply inspect the bottom fitting and ignore those up on the mast.

The most common failure is cracked swage fittings. All attachment fittings should be carefully examined at least once a month. Look at them closely. Sometimes the cracks are hard to see. If in doubt, carefully spray the fitting with a dye penetrant. The dye goes into a crack readily and shows it clearly. Such dyes are available at better equipped marine stores and industrial supply houses. If such is not available, carefully spray the fitting with a can of red paint and then wipe the paint off quickly with a hard cloth. If there is a crack, the paint will get into it and show up when the paint on the fitting is removed. Any crack is bad, but not a cause for panic. As a rule of thumb, if a crack is less than the wire diameter, the strength of the swage is probably not yet seriously compromised and replacement can be delayed, but monitor it carefully.

3. Sails

Sails that are delivered with your yacht are very high quality and well cut. The subject of sails is worth a book in itself so the discussion here will be short.

The greatest enemy of your sails is the ultraviolet in sunlight. You have sail covers – use them religiously. Sails that are stored under cover will last three or four times longer than sails that are simply furled on the spars and exposed to the sun.

It is also important to inspect your sails regularly for broken stitching and tears. These should be repaired immediately because they can result in catastrophic sail damage in a short time.

Sails should not be cleaned in a commercial type washer. Rather, it is better to lay them out on a flat surface, like a lawn, and use a soft brush, mild washing detergent, and cool water. Once the dirt is off, rinse with a hose and be sure to get the salt off at the same time. As a matter of fact, it isn't a bad idea to pull your sails up at the dock a few times a year and rinse them off with fresh water. Once in a while you may find some mildew on your sails. This can be cleaned off by a solution of chlorine bleach and water. For example, about two tablespoons of Clorox in a gallon of water will clean up most cases of mildew and if rinsing is done immediately, no harm should be done to the sails.

4. Running Rigging

Tayana 42s generally are equipped with low stretch, dacron running rigging. While wire halyards do not stretch as much as dacron, they are more difficult to maintain and tend to damage the mast finish.

Running rigging is subject to three sources of deterioration – wear, chafing, and ultraviolet light. Care on the part of the owner can minimize these to the extent that the rigging should last three to five years without giving any trouble. Wear can be reduced by making sure that turning blocks and fairleads are kept clean and that the sheaves in blocks turn freely. It is also important that lines be properly coiled and stowed so that crew members are not walking or sitting on them. Chafe requires that the line be protected at chafing points. For example, it is not unusual for the jib sheets to chafe on the upper shrouds. If sheets are against wire for any period of time, cover the sheet at that point with some type of protection such as tape. It will pay off. Protecting the dacron line from ultraviolet is as important as protecting sails. Unfortunately, it is next to impossible to protect halyards, but sheets can be stowed under sail covers or they can be removed and stowed below. Running rigging can be periodically cleaned with fresh water and a mild detergent. Soaking in a bucket with fabric softener, such as Downy, will soften the lines (never use laundry soap).

5. Winches

Winches are among the most important and sophisticated mechanical devices aboard your boat. Without them it would take ten big Swedes to operate a Tayana 42; with them the yacht can be sailed anywhere by husband and wife. Winches are the most handy source of power aboard the yacht – you can set big sails, raise anchor, rescue a man overboard, or lift an engine, all by using your winches properly. When you consider all the things you can do with these wonderful machines, think back on your high school physics classes. Mechanical advantage is the product of the mechanical advantage of the tackle and the mechanical advantage of the winch. Thus if you are lifting the 400 pound engine out of the yacht using your four part vang

and you lead the vang to a winch with a mechanical advantage of 10, you can lift the engine with a force of only 10 pounds!

In spite of the importance of the winch to the proper operation of the yacht, it may be one of the most neglected items aboard. The average sailor seldom takes his winches apart for lubrication and maintenance. How often you take your winch apart and lubricate it in accordance with the manual that has been supplied, will depend on where you live and how you use your boat. And while you have it apart, check the mounting bolts; they should be tight and solid. If you find any sign of corrosion, owing to galvanic action, renew the insulation material.

Tayana 42s come with either Barlow, Barient or Lewmar winches. You will find diagrams and exploded views of both of these in the package of materials that came with the yacht. If your yacht does not have these owners pamphlets, check with another owner and make copies.

6. Blocks

Your yacht may have been delivered with original blocks made with teak cheeks and roller bearings. Under normal sailing conditions they will last five to ten years. Maintenance is easy. They should be washed with fresh water a couple of times a year and the teak should get essentially the same treatment as teak elsewhere on the yacht. The ferrous chloride that tends to develop on the 304 stainless steel should be cleaned off with soap and a plastic scrub pad. Nothing else is required. Most boats are equipped with more modern blocks, such as Harken, Lewmar, Ronstan or Schaefer, follow the maintenance directions provided with them. With any, keeping them clean and lubricated is key.

E. Auxiliary Engines and Related Systems

1. Engine

Your Tayana 42 may have been delivered with a Yanmar series or a Perkins diesel. A very small percentage have some other make engine. The discussion that follows applies to any diesel auxiliary which may be installed. Specific procedures for service and maintenance are found in your engine manufacturer's handbook, and they should be followed religiously.

Remember, your engine is like a dog. It thrives on attention and dies quickly of neglect. A small diesel that is run regularly, serviced faithfully, and cleaned consistently should last thousands of hours before major maintenance is required. Think about that. If you treat your engine right, you may never have to buy a new one! Ignore your engine – think about it only when you need it – and you will find yourself spending from $5,000 to $15,000 to replace it.

a. Installation

Your engine has been installed by highly experienced mechanics using the best materials. The mounts are bolted to a glassed foundation to provide stability and quiet operation. The engine mounts themselves are of the flexible type to help eliminate vibration in the hull. The propeller shaft is 1-1/4 inch stainless steel that is connected to the transmission by a flexible coupling. The shaft goes through a bronze shaft log and gland to a cutlass bearing

mounted in a bronze casting outside of the hull. The standard propeller is a three bladed bronze wheel generally 18 inches in diameter with a 12 to 14 inch pitch.

The exhaust system is of the wet type – that is water is injected into the gas stream and ejected through a muffler and check valve. This system is common on sailing yachts because the water cools the exhaust fumes thus cutting down the heat radiated into the engine spaces and eliminating fire hazards. As can been seen in the figure, a siphoning break must be installed to prevent water from backing through the system and into the engine. Newer Tayana 42s have exhaust systems made primarily from plastic (ABS) mufflers and neoprene reinforced hoses. Older yachts have stainless steel systems composed of an expansion (bellows) exhaust pipe, jacketed pipe, stainless steel water locks and mufflers, neoprene hoses, and a bronze check valve. These latter systems are quite satisfactory, but they are not as durable nor are they as easy to maintain as the new systems. Certainly with the older muffler systems they should be watched carefully for the formation of cracks.

The standard equipped fuel tanks are of black iron construction and are mounted low in the hull, port and starboard, aft of the fresh water tanks. They are baffled and have large manholes for access. Each has a dipstick for checking fuel quantity. Copper fuel lines leading to the engine from each tank have selector/cutoff valves that are tagged and identified. Both tanks may be use simultaneously or as selected. It is an extremely good idea to insure that at least one readily accessible Racor type fuel filter/water separator is installed into the fuel prior to the main engine fuel filter. An electric fuel pump might be another option to consider in order to facilitate bleeding and priming the fuel system.

The relatively large quantity of fuel stored in your V-42's tank and the relatively low consumption rates by the very economical Yanmar type engines today, make it imperative that you pay very close attention to your fuel and fuel system cleanliness. Dirty fuel and clogged filters may cause engine stoppages, which occur in rough conditions when you most count on your normally reliable engine’s output. Keeping tanks full will inhibit the condensation of unwanted water in your tanks which facilitate the growth of slime or fungus; use fungicide additives when refueling. And consider “polishing” your fuel every couple of seasons or replacing it if you do not use your boat often enough to turn over the fuel in your tanks. You may wish to install a fuel filtering system that would accomplish the same purpose, such as a Racor-type. You may need to clean your tanks after a number of years; it could be an inexpensive maintenance job that will help keep your engine running properly.

Raw water for cooling is taken in through a seacock generally located behind the engine. This line and peacock is tagged clearly at the factory as are all other lines, wires, and cables. If not, trace these lines and retag them now. Doing it later in the dark , in rough conditions is not fun. The raw water intake line passes through a large filter prior to the engine. This filter has a see-through type inspection plate and should be checked often, if you are in debris, jelly fish, or other dirty water conditions. Cooling water is led to the heat exchanger and then into the exhaust system for discharge overboard with the engine exhaust. When starting your diesel engine, listen for the splashing exhaust water. The raw

water peacock must be open prior to engine starting!

b. Maintenance

Please consult your engine manuals for detailed procedures concerning operation and maintenance. You should have the basic operations manual which also includes simplified maintenance procedures, however, you should also obtain your particular engine's service manual. This manual typically is a much more detailed description of how the engine operates and includes detailed exploded views of all pertinent parts of your engine to include parts numbers. Yanmar, for example, has a new owner's engine orientation course that lasts two days and you normally go home with a copy of the service manual and a much fuller understanding of how to operate and maintain your boat's diesel engine. The engine manuals must be followed exactly to obtain maximum engine life and to keep your warranty in effect. The following sections summarize the maintenance requirements described in the manual and are intended as general information only.

(1) Break-in Period

During the first fifty hours of operation, the engine should not be run at maximum rpm. Run the engine at a variety of RPMS, but do not let it idle for extended periods. At fifty hours, the following service should be performed.

(a) Change engine oil and filter.
(b) Tighten cylinder head nuts in correct sequence to correct torque.
(c) Re-set valve clearances and check oil feed to rockers.
(d) Check belt tension.
(e) Check all external nuts, set screws, etc. for tightness.
(f) Check shaft coupling alignment.
(g) Check fuel, oil, and coolant levels and look for leaks.
(h) Adjust idle speed, if necessary.

(2) Before Each Outing

(a) Check coolant level.
(b) Check engine oil level.
(c) Check transmission oil level.
(d) Look for evidence of leaks under engine.
(e) Check belts.

(3) Every 150 hours or Three Months (which ever occurs first)

(a) Change engine oil and filter.
(b) Check drive belt tensions.
(c) Clean air intake.
(d) Clean motor trap.
(e) Look for evidence of leaks.

(4) Every 450 hours or 12 Months (which ever occurs first)

(a) All steps under item (3) above.
(b) Change final fuel filter element.
(c) Check hoses and clips.
(d) Drain and clean fuel tank.
(e) Change gear box oil.
(f) Service atomizers.
(g) Flush and change engine coolant.

(5) Every 2400 hours

(a) Have an authorized engine mechanic examine and service proprietary equipment, such as starter, generator, etc.

(b) Adjust valve tip clearances.
(c) Replace heat exchangers when in salt water.

(6) Bleeding the Fuel System

If you are a first time diesel owner, this is not a trivial operation. It is one you should become familiar with. Thus the diesel orientation course!

(a) Check fuel tank shut-off to be ON.

(b) Check fuel filter for sediment or water by opening drain plug on bottom. Replace plug.

(c) Follow routing of hoses from fuel filter to engine lift pump, inspecting hoses as you go. On the engine pump, you will find a lever that allows you to manually operate the diaphragm inside, against spring tension. It may be necessary to turn the engine over with the starter slightly to allow the pump arm to relax against the camshaft. This allows more stroke with the manual lever you are operating.

(d) Follow the fuel line from the pump to the engine fuel filter and locate the vent plug on top. Loosen plug two or three turns.

(e) It is advisable to have some large rags on hand to catch oil that will be expelled from this point in the course of bleeding.

(f) Begin operating the manual lever. This may take several minutes as the filters will need to fill up (as well as the lines). Operate the manual lever until fuel flows freely from the filter plug with no signs of air bubbles.

(g) Loosen the bleed screws on the injection pump.

(h) Operate pump again until fuel flows freely with no air bubbles.

(i) Re-tighten the vents beginning with the lowest point (the filter, the head locking screw, and the governor vent screw). Wipe up any spills at this time.

(j) Slacken the union nut at the injection nozzles.

(k) Move throttle to full rpm and check to see if the "stop" control is in the RUN position.

(l) Crank engine with starter motor until fuel flows from each injector.

NOTE: Do not run starter motor continuously. It normally takes 30 to 60 seconds of cranking to completely bleed the injector lines. 20 seconds of cranking with about a two-minute rest between periods will be easier on the starter, motor, and battery than steady cranking. Cranking the engine for long periods may hydrolock water into the engine cylinders.

(m) Re-tighten injector lines; wipe spills.

(n) Re-set throttle position and proceed with normal start-up.

(o) Allow sufficient running time to recharge battery.

HINT: Very often Yanmar engines can be bled simply by loosening the bleed screw on top of the engine oil filter and the bleed screw on top of the injection pump. Try it.

2. Drive Train

a. Engine Alignment

The propeller shaft of the V-42 is 1-1/4 inch diameter stainless steel. The shaft is checked for accuracy initially at the factory during installation and is carefully aligned to the engine with the hull being properly supported and level. At this time, the shaft log and bearing is bonded to the hull penetration. The coupling to the engine is checked again for alignment by the commissioning team prior to delivery of the boat.

This alignment check should be made periodically, since the action of a rough sea could possibly change the shape of a bolt enough to disturb engine alignment. If, after the first rough water experience, the alignment has not changed, it is usually only necessary to make the check once per season. This is extremely important.

The alignment is considered acceptable if there is a gap less than .005 inches per inch of face diameter of the coupling (.002 for a four inch coupling, .0025 for a five inch coupling). The feeler gauge is inserted between the flanges at four points 90 degrees apart. Then check again keeping the engine coupling stationary and rotating the shaft coupling 90 degrees at a time. This checks the squareness of the coupling face to the shaft centerline. The engine alignment is adjusted by raising and lowering the adjusting nuts at each mount. To make lateral adjustment, loosen the mounting pad screws that anchor the engine to the bed. You will note there are slots in the mount pad which allow a reasonable amount of adjustment side-to-side.

After adjusting and re-tightening all mount screws and lock nuts, double check the alignment.

In the absence of a feeler gauge, the alignment can be checked fairly accurately with a strip of paper. Insert the paper between the two halves of the outer flange and rotate both together 360 degrees. The paper should remain in place through the complete turn.

b. Transmission

Periodically check the oil level in the transmission and inspect the control cables for signs of damage, chafing, corrosion, or loose fasteners. Lubricate the moving parts with spray lubricant or light grease.

c. Stuffing Box

The gland (stuffing box) should be tightened at least once per month to see that no more than one or two drops per minute flow in. If new packing is required, packing materials can be purchased at any marine supply. Repacking requires about ten inches of 3/16 inch material. (There is some discussion about what size and how long - Another said 1/4 inch and three 6" turns.) Remove the nuts from the two retaining bolts that hold the collar in place. Pull the collar up the shaft toward the engine. Water will flow in, but should be easily controlled by your automatic bilge pump or the electric bilge pump. Remove any old packing material with a hooked piece of coat hanger. Wrap the new packing material around the shaft just in front of the gland. Pull the collar down the shaft so that it tends to push the new packing material into the gland. Using the nuts on the retaining bolts, force the packing material evenly into the gland and tighten until there is a water flow of only about one drop per minute. Then install and tighten the locking nuts, as you would tighten the nuts on an auto wheel, tightening nuts on opposite sides a turn at a time after they are finger tight.

Incidentally, the rudder has a packing gland/stuffing box too. It should be checked for leaks as well as the steering quadrant, in general, as long as you have crawled back into that part of the boat! Consider replacing the rudder’s packing every ten years or so. Check and grease the steering quadrant pulleys and cables annually.If you are fortunate, your stuffing box may be of the PYI type which is the accordion rubber appearing shaft seal which

requires much less maintenance. Most boats delivered within the last ten years or so have been fitted with this type. Check your instruction book for details on it.

d. Cutlass Bearing

The cutlass bearing is mounted in a bronze casting which is designed to allow full flow of water throughout the length of the bearing. This is important because the cutlass is water lubricated.

A cutlass bearing should last several years. When the bearing is new, the shaft will be tight and no lateral movement will be apparent when trying to push the shaft side to side. As the bearing wears, one can move the shaft slightly from side to side or up and down. Once that lateral movement is more than about 1/16 inch, the bearing should be changed. This may be caused by engine mount failure.

Changing the bearing is a major maintenance job and might be best left to the professional yacht mechanic. It requires that the boat be hauled. The shaft must be removed by loosening the coupling set screws and pulling the shaft back through the gland. The four nuts on the bearings' casting retaining bolts are removed. The casting itself is threaded to the shaft log. Therefore, one must screw the shaft log out from the casting. Once the casting is removed, it is a simple matter to drive out the cutlass.

It is not always necessary to remove the cutlass bearing casting. After the shaft is removed, the bearing can sometimes be drawn from the casting. One technique is to saw a small section out of the bearing so that it can be compressed and drawn. One must use an unframed hacksaw and be careful to saw only the bearing.

F. Electrical Systems

As mentioned in Section IV, the Tayana 42 has two standard electrical systems , a 12 volt DC system that gets its power from batteries and the engine alternator, and a 110 volt AC system that is powered through the shore power cable or with an outboard generator.

1. The 12 Volt DC System

The primary source of 12 volt power is the battery bank that comes with the yacht. The battery(s) are used both to start the engine and to provide the various electrical equipment on the yacht with power. The battery(s) are charged by the engine-mounted alternator or by a battery charger (converter) that is connected to a 110 volt power source. Cruising yachts may also use wind driven DC generators as well as solar cell panels to keep the house batteries charged without running the engine.

Battery maintenance is simple, but demanding. You should check your battery water at least once a month whether you have sailed the yacht or not. This is particularly important if you

have a 110 volt converter or battery charger in operation. The electrolyte (acid) level should be maintained to cover the plates in the battery. It is best to use distilled water in your battery(s), but that is not totally necessary. Clean, drinkable water can be used, if distilled water is not available, but never use salt water. Excessive need of water is an indication that the charging rate is too high. A check of the charging voltage should not read over 15 volts. Should you spill electrolyte from the battery, it should be neutralized with baking soda. Remember, battery electrolyte is sulfuric acid which is very corrosive. It will eat into your skin, wood, cloth, and some metals. Don't neglect a spill. If it gets on your skin, wash it off immediately with soap and water. One other battery maintenance point is the two poles. Make sure connections are clean and tight. A thin layer of grease will help keep battery connections clear of corrosion.

The use of a hydrometer is an inexpensive and accurate measure of the battery's condition. Specific gravity measurements of the electrolytes should read between 1.275 and 4.280 on a normally charged battery. All cells should read relatively equal; any one cell that has a noticeably low reading is an indication of a bad cell and the battery should be replaced.

a. Electrical Panel

The electrical distribution panel controls all of the 12 volt electrical circuits in your yacht. You will note that it has both a battery condition meter and an ammeter. The battery condition meter tells you the measured state of the charge existing in your batteries; the ammeter tells you how may amperes are being use at any instant of time. The various circuits go through the circuit breakers on the board. These circuit breakers act as both a switch and as an overload protection device.

There is very little maintenance necessary on the panel. Open the door and look at the back of the panel. You will see colored wires, which go to the various electrical devices. The colors allow you to find the same wires throughout the yacht. The panel should be kept dry at all costs. If a circuit breaker trips and cuts the circuit, there is an overload condition. This is usually because there is a short circuit. Always attempt to discover what caused the circuit breaker to trip before depending on that circuit again.

b. Master Battery Switch

All Tayana yachts come with a two position battery switch. This switch allows you to put one battery at a time into the circuit or to use both batteries (banks) at once. It is a make-before-break switch so one can select batteries at will while the engine is running; however, you must not put the switch in or through the OFF position with the engine on, as damage to the alternator may result. Similarly, choke the engine to stop it; then turn off the ignition switch. There is little that the owner can do to maintain the master battery switch other than to keep it clean.

c. Alternator, Engine Mounted

A critical point in the DC electrical system is the alternator. Its job is to maintain the battery's charge and cover the demands on the electrical system while the engine is running. The alternator converts mechanical energy into electrical energy, and the drive belt is its only link. Normally this is the only periodic attention the alternator needs. With the engine stopped, the drive pulley on the alternator should not be able to be turn by hand. Belt tension may seem tight enough, but the pulley may still slip if the belt is glazed or oily. When checking or tightening the alternator and it connections, it is advisable to turn off the battery switch. This prevents accidental "shorting" of the output terminal which is "live" even when the engine is at rest.

NOTE: Many boats will have "upgraded" alternator systems in order to more quickly charge the larger banks of batteries used on cruising boats. These systems will have their own unique wiring diagrams.

d. Electrical Starter

The engine starter motor is the most demanding load that will be placed on the electrical system and is not fused or protected by an overload device. Therefore, it is wise to make periodic checks on the connections at the starter and solenoid switch for tightness and cleanliness. Do not allow tools or other metal objects to come into contact with these connections while the battery is on.

e. Wire Runs

Wiring in your yacht is generally carried through wiring conduits. These conduits protect the wires from wear or impact. The color code used is shown in Table V-1. Where wiring is exposed, it should be checked to see that it is clear of potential harm. Terminal blocks and other exposed wire termination points should be sprayed with WD-40 or similar moisture eliminating product. It is very important to note that you should never, repeat never, disconnect wiring or plumbing for that matter without drawing your own schematic of how they were installed first. Also, make sure each line is tagged using waterproof labels. Trying to reconnect later will be your worst nightmare come true, if you do not! It is very convenient to keep a "smart book" with all these schematics, part numbers, phone numbers, addresses, etc. This book will become increasingly important over the years! For example, when you replace the anchor light bulb, write down the type in your smart book, so you don't have to go up again later just to see what type you have to buy.

2. The 110 Volt AC System

The 110 volt AC electrical system is connected to the shore power system. Its functions are primarily water, heat, battery charge, power outlets, and sometimes refrigeration and air conditioning. The service capacity is thirty amperes and the system is protected to that level. There is little maintenance that the average owner should do. Whenever working on the back of the panel, it is wise to shut down 110 power. Remember, a yacht is a damp environment, and this tends to increase the dangers of electric power. The 110 volt system is grounded in

the yacht and this ground should remain. Remember – AC circuits and electricity can be lethal!

3. Protective Systems

Your yacht is bonded to help prevent galvanic corrosion. All metal parts of the yacht that might come in contact with salt water are bonded by electrical wires with green insulation in order to provide a low resistence electrical path for stray currents. Thus, there is a reduced likelihood of current running through the salt water "electrolyte" and destroying the metal parts. The bonding system should be checked to make sure that all of the connections are good and clean. Incidentally, it appears that this bonding also helps keep your boat a less inviting target for lightning when sitting in the water. A typical electrical bonding system is shown in Figure V - 1.

Sacrificial zincs are or should be bolted onto each side of your keel just forward of the shaft and or on your rudder. These rectangular zincs are unique and referred to as "Tayana" or "Taiwan" zincs. West Marine and other major boat stores sell this type of zinc. A 1-1/4 inch donut zinc is also installed on the propellor shaft.. You should check zincs frequently at first to see how fast the metal is sacrificed. You will then have some ideas of how often they must be replaced. It is not a bad idea to have a separate zinc clipped to a shroud and hung over the side while at the dock. This will save your installed zincs and offer some extra protection. To be effective, of course, it must be clipped to a metal part that is wired into the bonding system. If your boat uses a 'shaft damper', a brush must be installed to arc the engine block to the metal shaft.

It might be well to note here that there may be zincs in the cooling system of your engine. (Many Yanmar's do not, but the Yanmar 3MQ30 does.) Also some refrigeration systems also have zincs in their cooling systems. These also must be checked and replaced as they are sacrificed. Refer to the engine manual for their location.

G. Plumbing and Sanitation Systems

Plumbing and sanitation systems are generally very reliable and require relatively little maintenance. A program of inspections will usually prevent most problems from developing. The critical points in the systems are the pumps; everything else is pretty simple and reliable.

1. The Fresh Water System

The heart of the pressure water-system on the Tayana 42 is the PAR medium duty diaphragm pump. This pump is generally located in a compartment along with the electric bilge pump and the shower sump pump (an option). It can be recognized by the pressure switch located on

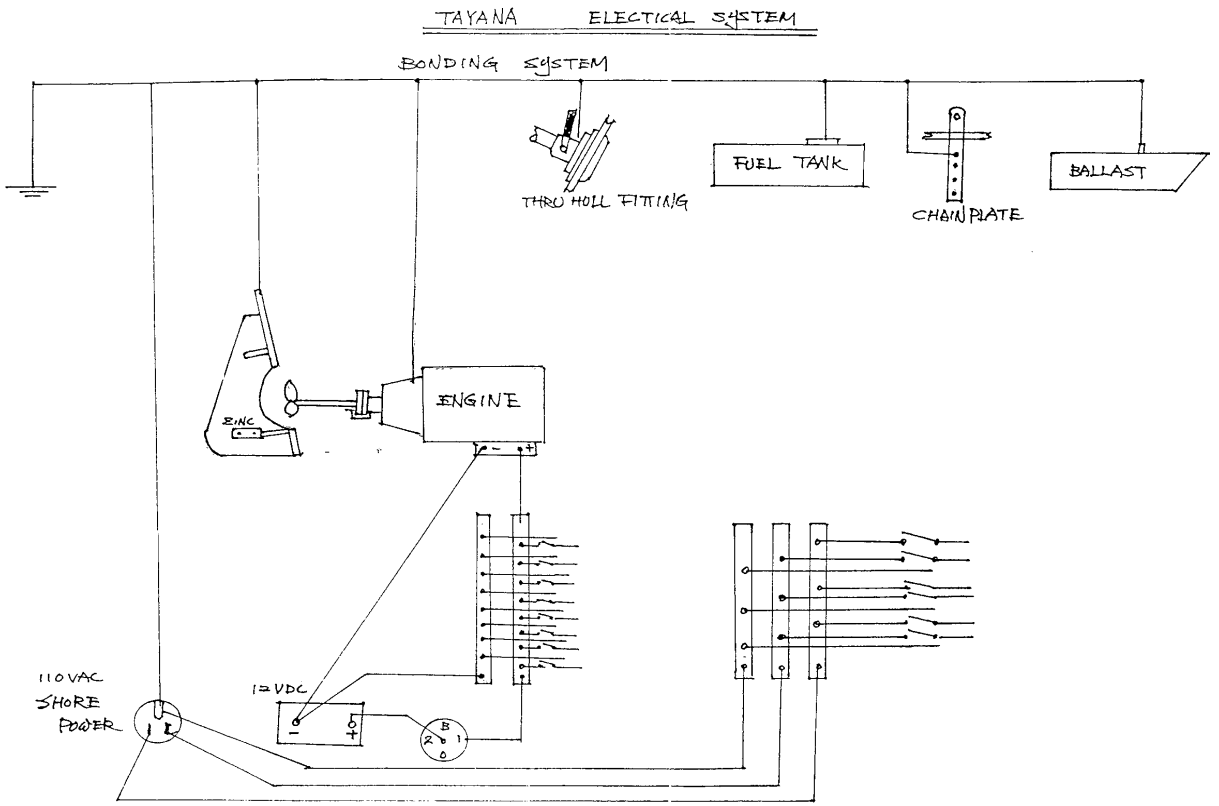

FIGURE V - -1
ELECTRICAL BONDING
SYSTEM

the side. You will find a manufacturer's parts list and a description of the pump among the papers delivered to you with the yacht

These pumps are highly reliable and will operate several years without any real maintenance requirement. If an occasion arises where a pump fails to operate, one should first check the pressure switch. This simple switch can accumulate dirt and not turn the pump on. If this should happen, turn off the power to the pressure water system, remove the pressure switch from the pump, and remove the switch housing. If the switch is dirty, carefully clean out the accumulation, reassemble the switch and try the system. If this does not solve the problem, you probably have a defective switch and it should be replaced. Two other common faults can cause the pump to malfunction – a broken belt, which is immediately obvious, or defective diaphragms. To check the diaphragms, remove the four screws in the top of the pump housing and carefully lift the top off. You will see two diaphragms; examine each. If they are defective, it will be obvious; they will have holes or they will be out of the diaphragm frame. Defective diaphragms should be replaced. PAR does produce rebuild kits for these pumps. While it is not a bad idea to have a rebuild kit, the most common requirement will be for a pressure switch, diaphragms, and belts. Before going on a long cruise, take a spare pump!

Maintenance of the fresh water system requires little more than tightening the hose clamps to prevent leaks. If your pressure pump comes on at intervals when there is no demand, there is almost certainly a leak that is allowing the pressure within the system to drop. Inspection will almost invariably show that there is a loose connection and air is getting into the lines. Again, tightening the clamps will normally solve the problem. Have some extra clamps and hose before going on a long cruise.

Your hot water system is based on a ten gallon hot water heater, usually made by American Appliance, Inc. It has both an electrical heating element and a heat exchanger which gets hot water from the engine. It requires very little maintenance beyond keeping it clean and all connections tight. The hot water heater will last at least five years. The most likely failure is the electrical heating element. If this should happen, a new element may be obtained from almost any camping supply store and it is a simple matter to install.

2. Bilge Pumping System

The Tayana 42 is equipped with a minimum of two bilge pumps – one electrical and one hand operated. Both of these pumps should be checked every day that the yacht is sailed.

The electrical bilge pump is by PAR and is located in the same compartment as the fresh water pump. The intake hose goes down past the engine and into the bilge sump below the engine. The pump outlet is just above the water line on the side of the yacht. The most common problem is a dirty filter next to the pump or a dirty pick-up screen. This may be cleaned simply by cleaning the filter or pulling the suction hose up from the sump and removing the dirt. Any effort to keep the bilge clean and sweet will pay off. The V-42 aft cockpit model has a deep sump and will easily have room for an automatic bilge pump. A top-

of-the-line automatic bilge pump should be your boat's single most important investment. Reliable, dependable automatic bilge pump operation is imperative! If your boat did not come with one, get one installed as soon as practical.
The hand bilge pump is generally located next to the helmsman or may be under the cabin sole. Usually a gusher type, the hand bilge pump serves two purposes – it pumps the bilge and it pumps the holding tank. By following the intake line from the pump aft, one will come to a set of two valves. With one valve closed and the other open, you can see that the pump clears the bilge. By reversing the closure of the valves, the pump clears the holding tank. A little experimenting will show you the proper valve operation.

If equipped with a Yanmar 3QM30, there may be another bilge pump mounted on the engine. This pump is continuously operating when the engine is running. If your engine has such a pump, it is important to remember that the bilge is constantly being cleared and a leak might not be apparent by simply looking into the bilge to see if there is water. We are told that the piping on some of these pumps have been modified to provide cooling water to other auxiliaries such as refrigeration systems.

3. Sanitation System

a. Holding Tank

Your V-42 has a holding tank system which is legal anywhere. The toilet may be pumped either into the holding tank or overboard directly. If the holding tank is used, it may be cleared either through an on-deck fitting or by the use of the bilge pump, as described above.

The holding tank is located forward between the water tanks. It should be kept clean by pumping clear water into it periodically and using any of the deodorizers found on the market. Many boats are installing their own upgraded marine sanitation systems. Add these schematics to your "Smart Book".

b. The Toilet

The toilet is one of the standard U.S. makes using seawater for flushing. The normal maintenance is of the pump. Head manufacturers all produce pump rebuild kits and you should have one aboard at all times. Probably the dirtiest job afloat is cleaning a plugged head outlet line. The toilet may become plugged for a variety of reasons. Most commonly, a toy, tampon, or too much toilet paper is forced into the outlet line; it plugs or jams around one of the sharp bends that is part of the outlet line. There is little to do other than break the line at one of the joints and use a plumbers snake to clear the blockage. This type of blockage is best prevented by a good Captain's briefing to all new guests prior to departure from the dock. A prominent death threat signed by the Captain and taped on the lid of head will remind your guests of the unique nature of the "Marine Head" which is not a common household toilet.

Toilet operation and maintenance in salt water is enhanced by the periodic use (every three months or so) of a cup of Muriatic acid poured down the toilet. The acid chemically removes the calcium deposits that slowly choke off your outlet lines. A cup of cooking oil will lubricate nicely your marine head's seals and allow it to work smoothly. Keep your head clean. Take care of it. I have never seen a business in the yellow pages that does marine head cleaning or fixing....one day....sooner or later....have fun!

c. Sinks

The galley and head sinks work the same. They are drained straight overboard through a check valve and through-hull. If the sinks refuse to drain, it is generally because the check valve is stuck. Look at the drain hose and you will see a bronze cylinder with a hexagonal fitting on top. A sharp tap will usually free the valve. If this fails, remove the hex fitting and clear the valve.