

# Outboard motor maintenance tips

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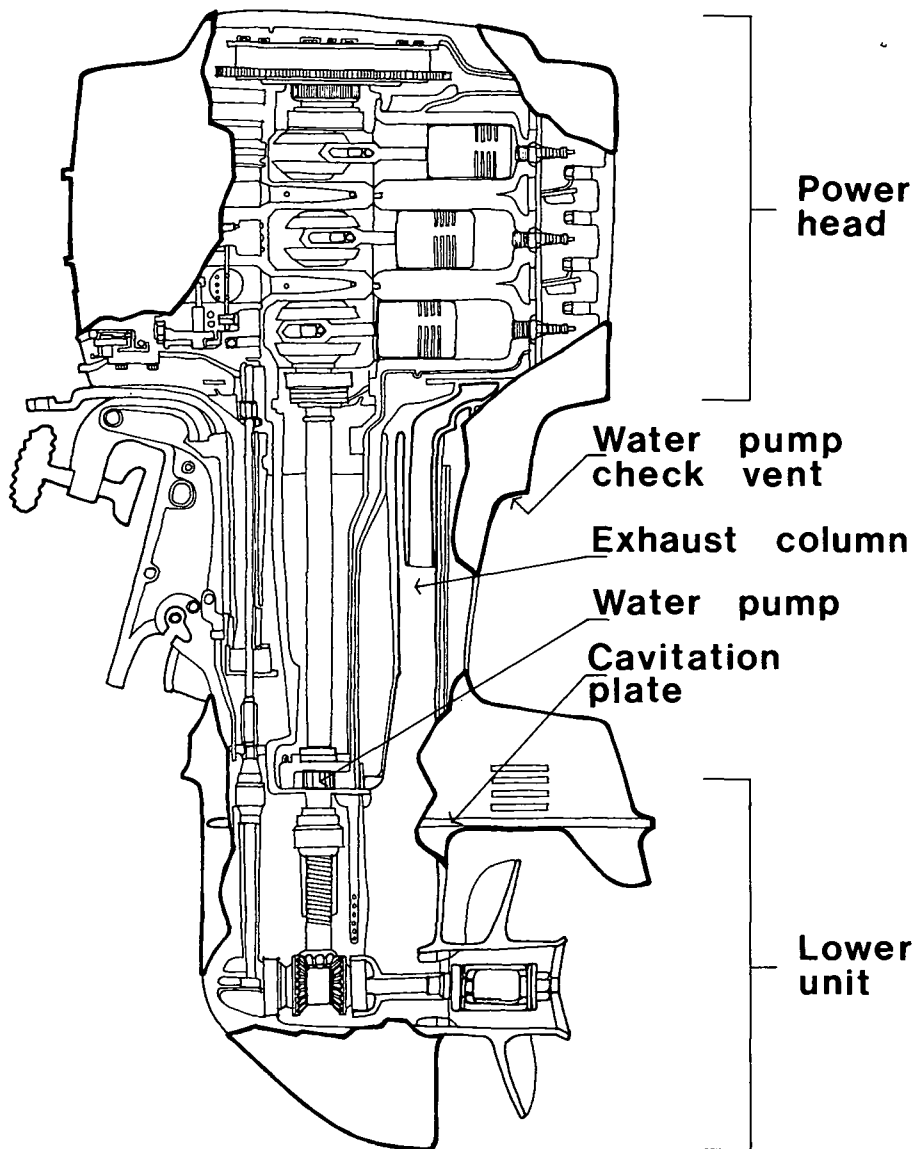


Figure 1.—Cutaway drawing of typical internal combustion, reciprocating outboard engine (Otto Cycle).

Another title in the series

## Marine recreation

### Outboard engines

Most outboards, given proper care, require little service other than periodic maintenance and adjustment. The individual engine owner can handle most of the periodic maintenance. This bulletin was written to aid the individual in basic outboard maintenance skills. Most of the procedures are possible without special tools. If you are in doubt about your motor's service, consult a dealer or, in minor cases, the factory-authorized owner's manual for your particular engine.

### Power source

The power source for all outboard motors is the internal combustion, reciprocating engine (see figure 1). The basic difference in these power sources is the way in which the fuel mixture is ignited. Most outboards have their fuel ignited by an electric spark (Otto Cycle Engine), as opposed to heat-of-compression ignition (Diesel Cycle). In most outboards, one complete crankshaft revolution completes the series of events necessary to make the engine run. This is called a *two-stroke cycle*.

In a two-stroke cycle engine, five events must take place in two strokes of the piston, or in one revolution of the crankshaft. They are: (1) intake (fuel and air), (2) compression, (3) ignition, (4) power, and (5) exhaust. A compressed fuel charge is fired each time the piston reaches the top of the cylinder, and each downward stroke is a power stroke.

In order to accomplish this, the initial pressure of the incoming fuel-air mixture must be raised to a point somewhat higher than the lowest pressure existing in the cylinder; otherwise, a fresh charge of fuel could



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not be admitted and the engine would not run. This elevation of pressure requires the use of an air pump, or compressor, of approximately the same volume as the cylinder itself.

Coincidentally, such an air pump is available with a minimum of additional parts, cost, or frictional losses by utilizing the opposite side of the piston and cylinder as the pump. Such engines, called *crankcase-scavenged*, are almost universally used in the outboard motor industry.

In the crankcase-scavenged engine, most of the frictional parts requiring lubrication are located in the fuel intake system. Lubrication is accomplished by mixing the required amount of oil with the fuel, so that a small amount of oil, in the form of a fine mist, is drawn into the crankcase with each fuel charge.

It should be pointed out that the new oil brought into the crankcase can do little more than supplement the losses; therefore, it is necessary that the frictional parts be well lubricated at the time the engine is started. The use of too much oil in the fuel mixture results in spark plug fouling, excessive carbon buildup, and poor performance, as well as being wasteful. *Too little* oil results in excessive wear and shorter engine life.

### Periodic servicing

Many of the troubles related to outboard motors will be much easier to repair if caught before they do extensive damage. Sometimes the lack of proper servicing is the primary cause of failure. The following list of procedures may help in a regular program of preventive maintenance for your outboard.

*Preservice checkout.* Perhaps the boat has been out of the water and the engine has not been run for a long period—say, several months. Here are a few simple preservice procedures:

1. Remove, clean, inspect, and properly gap spark plugs. Replace defective plugs. (Use new gaskets and tighten the plugs to the manufacturer's recommendations.)
2. Remove oil level plug from gearcase and check for proper oil level.
3. Thoroughly clean and refinish engine surface, as necessary. Undercoat bare metal with anodizing primer (such as zinc chromate), then paint with marine enamel.
4. Check battery for full charge and clean terminals. Clean and inspect battery cables. Cover cable connections with grease to prevent corrosion.
5. If possible, run motor in test tank prior to installing on boat. Check water pump and thermostat operation.

### *Inservice checkout.*

1. Drain and flush gearcase. Refill to correct level, using manufacturer's recommended lubricant.
2. Remove and clean fuel filter bowl. Replace fuel bowl element. Always use new filter bowl gasket.
3. Clean and regap spark plugs to recommended gap. Replace worn, cracked, or burnt spark plugs. (Use new gaskets and tighten plugs to manufacturer's recommendations.)
4. Check propeller for correct pitch. Replace if propeller is badly worn, chipped, or bent.

5. Lubricate all grease fittings, using manufacturer's recommended lubricant.
6. Check remote control box, cables, and wiring harness. Shift lever should move through full range from reverse to forward. Throttle lever should move smoothly from low idle to full open. Lubricate exposed movable lengths of control cables. Adjust lever tension on control box so levers operate smoothly yet remain where positioned when you take your hand off.
7. Check steering controls for smooth movement without slack; lubricate mechanical steering.
8. Lubricate all carburetor and magneto linkages with manufacturer's recommended lubricant.
9. Adjust tension on magneto and/or generator drive belts.
10. Clean and coat battery terminals with grease.
11. Check thermostat and water pump operation. Engine, when in neutral, should pump warm spray of water (not more than 160° F, or 71° C) from hole in exhaust tower.
12. Check breaker points' condition and timing.
13. Check carburetor and ignition synchronization.
14. Check carburetor adjustment. On most models, turn high speed adjustment slowly clockwise until engine loses speed or dies, then counterclockwise (about 1/8 turn) until engine returns to highest speed. Turn low speed adjustment slowly clockwise until engine idles roughly or dies, then counterclockwise until it returns to smooth idle.

### Installation

Proper transom height and engine tilt are critical to good performance. If the motor is mounted too high above the water, the propeller will slip, churn, and cavitate with little useful power. If mounted too close to the water, the motor will drag, kick up excess spray, and tend to submerge in a following sea. Wrong angle or tilt of the motor pushes the bow or stern down, slows the boat, and wastes fuel. Most installations are just right when the lower unit is vertical at full boat speed, but you will probably want to experiment for best performance.

### Propellers

Propeller selection (see figure 2) is generally an easy matter for the outboard owner. If the motor is used on an average runabout, the standard propeller is usually adequate.

For other than average conditions, you may want to change to a different pitch propeller. Pitch is the theoretical distance that the propeller would travel in a solid substance if it made one complete revolution without slippage (figure 3). Increasing the pitch reduces rpm at full throttle, while reducing the pitch will increase rpm at full throttle. If your boat is large and slow, you may do better with a low-pitch propeller; if your boat is light and fast, higher pitch will help. An important point is to use a propeller that allows the engine to spin within rated speed range at full throttle.

### Spark plugs

Regular spark plug service is important because outboards are tough on plugs. Use exactly the recommended plugs, clean and adjust gaps regularly, keep outside porcelain dry, and always carry a spare set of plugs. Remember to use a good gasket when replacing the plugs. The gasket not only prevents loss of compression but is also responsible for keeping the plug electrode at design temperature.

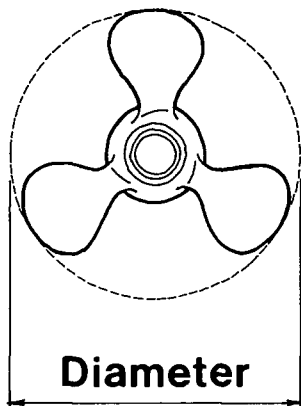
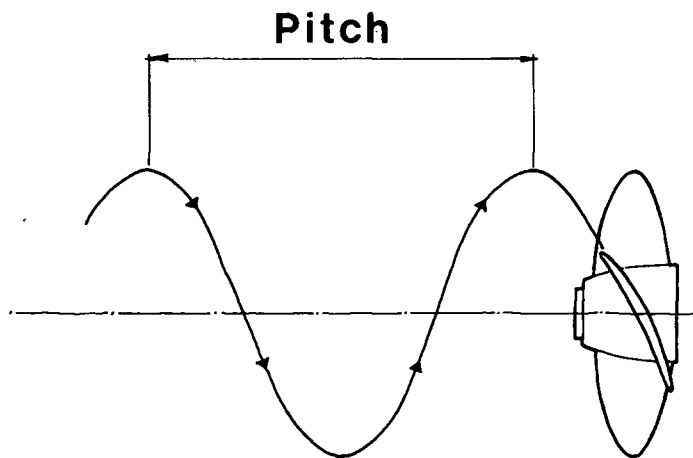


Figure 2.—Propeller diameter, one of two common dimensions used to describe propellers.

Figure 3.—Propeller pitch, the second common dimension used in describing propellers.



**Pitch = distance travelled  
in one revolution**

#### Saltwater care

Motors that are used in saltwater present special problems and require meticulous care. Aluminum alloys used in outboard motors are highly resistant to corrosion by oxidation (breakdown of metal, caused by its combination with oxygen) but very susceptible to galvanic action (electrical process of depositing atoms of one metal, in solution, on the surface of a different metal).

Although oxidation cannot occur under water, it is very prevalent in humid environments. Aluminum parts are protected from galvanization by anodizing (the process of coating metal with a hard shell of aluminum oxide). But this covering is only protective if it remains unbroken. Here are some tips for care of all motors used in saltwater:

1. After each use, tilt the motor out of the water and flush out the entire motor with cool, fresh water. Flush for 1 to 2 minutes and do so within 1 to 2 hours of use to prevent salt buildup inside the motor. A garden hose with a flushing attachment is convenient for rinsing saltwater out of the motor.
2. If possible, periodically flush the motor with fresh water, following manufacturer's recommendations.
3. Be sure the motor is adequately protected with an approved paint. Check regularly for chips and scratches. *NOTE: Do not use antifouling paint, since it contains copper or mercury and can hasten galvanic corrosion, unless the manufacturer states that it is intended for use on aluminum.*

4. Check frequently to be sure that no aluminum parts are left unprotected. Protect bare metal quickly with an anodizing primer and marine enamel topcoat.
5. A small self-sacrificing block of unpainted corrosion-susceptible metal—a "zinc"—mounted near the part to be protected will sometimes spare a valuable part from corrosion. Zincs can be mounted on the flat cavitation plate, after stripping the finish down to bare metal, with stainless steel or hot-dipped galvanized screws. All surfaces around the block must be protected with paint. *NOTE: Consult a dealer before attempting to install such a device.*

#### For further reading

*Chilton's Repair and Tune Up Guide for Outboard Motors 30 Horsepower and Over*, published by Chilton Book Co., Radnor, Pa. 19809.

*Outboard Motor Service Manual*, published by ABOS Marine Publications, 9221 Quivira Rd., Overland Park, Kans. 66212.

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