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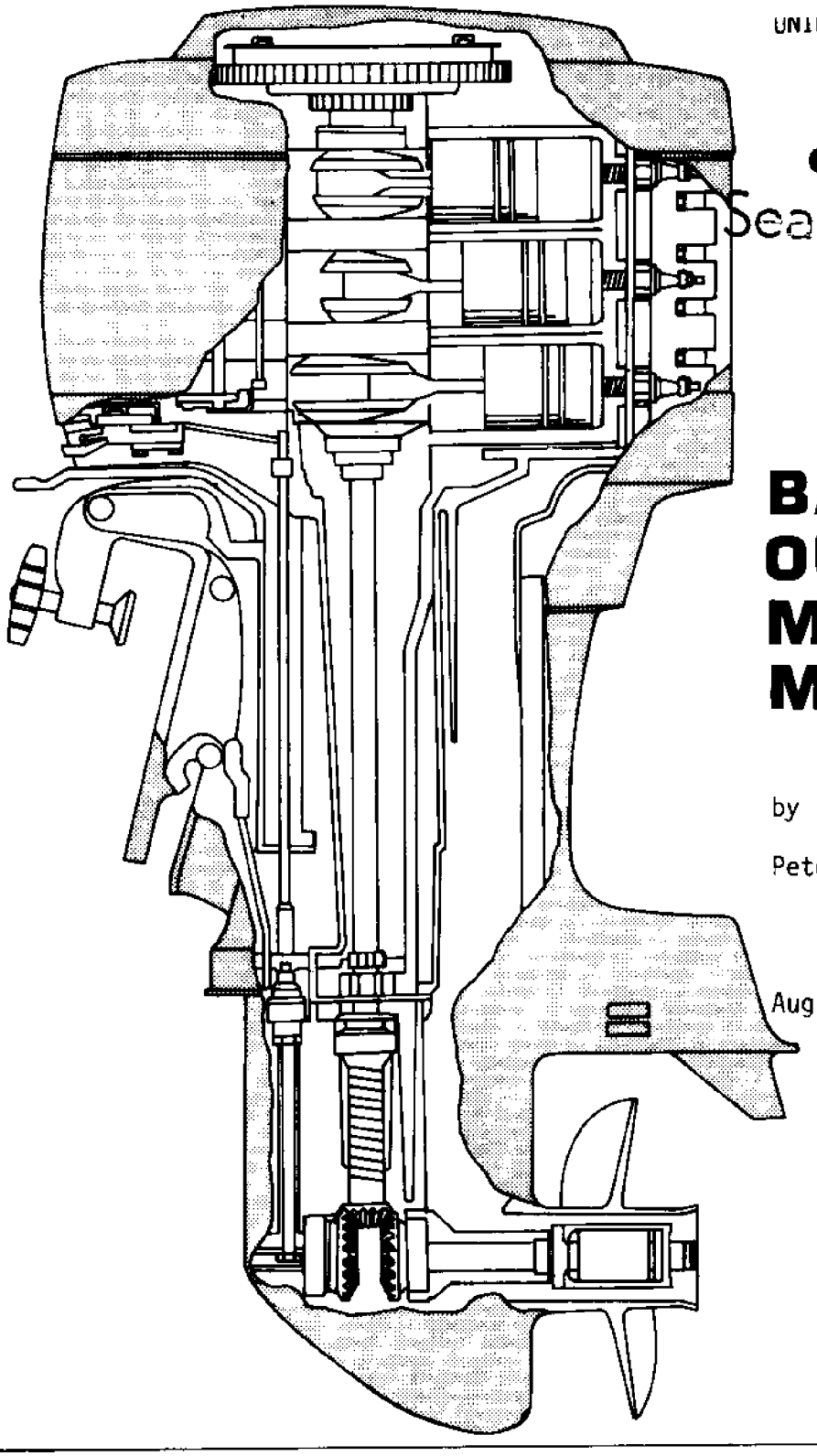

BASIC OUTBOARD MOTOR MAINTENANCE

by

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outboard engines

Most outboards, given proper care, require little service other than periodic maintenance and adjustment. Most of the periodic maintenance can be handled by the individual engine owner. This pamphlet was written to aid the individual in basic outboard maintenance skills. Most of the procedures are possible without special tools. If in doubt concerning the service of a motor, 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. 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 not be admitted and the engine would not run (Figure 1). 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 friction losses by utilizing the opposite side of the piston and cylinder as the pump. Such engines, called "crankcase scavanged," are almost universally used in the outboard motor industry.

In the crankcase scavanged engine, most of the friction 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 friction parts be well lubricated at the time the engine is started. The use of too much oil in the fuel mixture results in plug fouling, excessive carbon, and poor performance, as well as being wasteful. Too little oil results in excessive wear and shorter engine life.

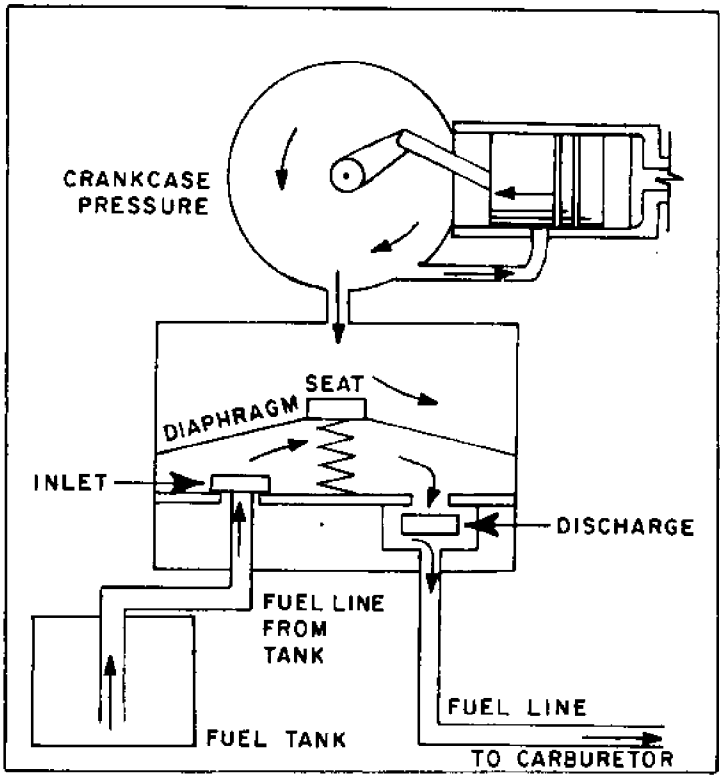

Fig. 1. How an outboard motor's fuel pump is operated by the pulsating pressure from the crankcase.

periodic servicing

Many of the troubles related to outboard motors will be much easier to repair if noticed before they result in extensive damage and 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.

PRE-SERVICE CHECKOUT

Perhaps the boat has been out of the water and the engine idle for a long period, say several months. Here are a few simple pre-service procedures:

1. Remove, clean, inspect, and properly gap spark plugs. Replace defective plugs.

(Use new gaskets and torque plugs to manufacturer's recommendations.)
2. Remove oil level plug from gearcase and check for proper oil level.
3. Thoroughly clean and refinish surface as required.
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.

IN-SERVICE 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 or burnt spark plugs. (Use new gaskets and torque plugs to manufacturer's recommendations.)
4. Check propeller for correct pitch. Replace if propeller is worn, chipped, or badly bent.
5. Lubricate all grease fittings using manufacturer's recommended lubricant.
6. Check remote control box, cables, and wiring harness.
7. Check steering controls; 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 water pump and thermostat operation.
12. Check breaker points' condition and timing.
13. Check carburetor and ignition synchronization.
14. Check carburetor adjustment.

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

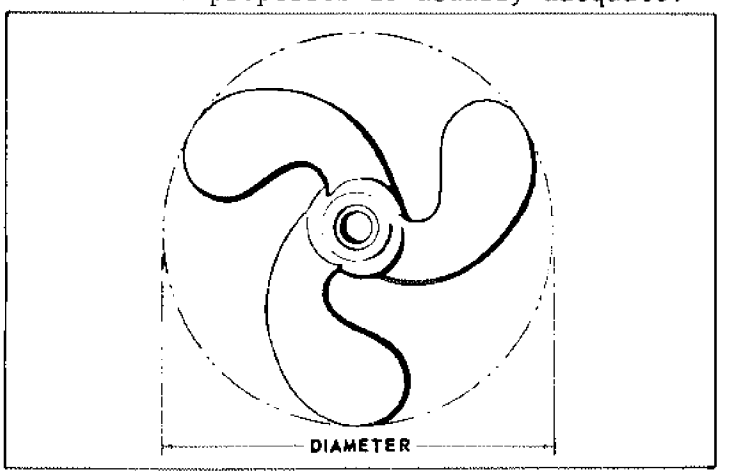

Fig. 2. Propeller diameter

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, more pitch will help. An important point is to use a propeller which allows the engine to spin within rated speed range at full throttle.

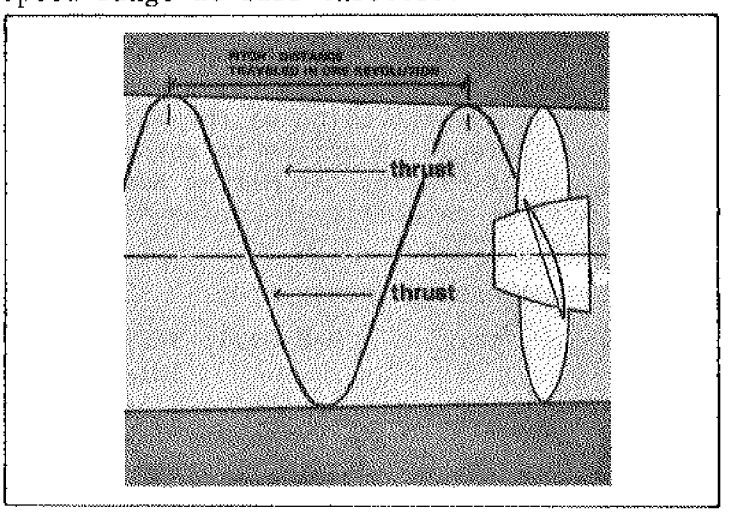

Fig. 3. Propeller pitch

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 responsible for keeping the plug electrode at design temperature.

salt water care

Motors which are used in salt water present special problems and require meticulous care. Aluminum alloys used in outboard motors are highly resistent 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 warm, humid climates, like Hawaii. 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 salt water:

1. After each use, tilt the motor out of the water and flush the entire motor with cool, fresh water.
2. If possible, periodically flush the motor, following manufacturer's recommendations.
3. Be sure the motor is adequately protected with an approved paint.
   NOTE: *Do not use anti-fouling paint, since it contains copper or mercury and can hasten galvanic corrosion.*
4. Check frequently to be sure that no aluminum parts are left unprotected. Bare metal should be protected quickly.
5. A small self-sacrificing block of susceptible metal, placed near the part to be protected, will sometimes spare a valuable part.
   NOTE: *Consult a dealer before attempting to install such a device.*

CREDITS

The text on power source was paraphrased from *Outboard Motor Service Manual*, published by ABOS Marine Publications, 9221 Quivira Road, Overland Park, KS 66212.

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