We also use our radios to good advantage in combating the taking of rabbits at night by the means of automobiles.

The radio is used to check out alibis given by violators when apprehended. Often the alibi can be completely torn down while still in the presence of the violator. This has a demoralizing effect and often results in the plea of guilty and confession from the defendant.

The use of the radio enables us to maintain a closer supervision and control over our field personnel through base station reports. District Supervisors have only to contact our base station dispatcher in order to get an up-to-date report on the activities of his men.

In closing, I might add that there are also some problems associated with the use of the radio. We sometimes feel that there is a waste of time and mileage by officers congregating unnecessarily simply because they are able to communicate with each other so easily. We feel that sometimes an officer will possibly let a violator get away while he is waiting for another officer whom he has called to assist him. This occurs, we believe, because the situation did not warrant the use or need of the second officer in the first place.

I could go on with instance after instance where the radio has proven to be probably the most useful tool we have in Tennessee in actual Game and Fish Law Enforcement work, but, I believe, my allotted time is expired.

In closing, if there are any of you who have questions pertaining to our system and its use, we will do our best to answer them for you. Please bear in mind that as was previously stated, I am not a radio technician and I make no attempt to go into the technical operation of our system. I extend to you all a cordial invitation to visit us and look over our system. At that time, our engineers will be glad to answer any questions you may have and explain any phase of the technical operations to you.

Thank you.

OPERATION, CARE AND MAINTENANCE OF OUTBOARD MOTORS

By BRAXTON SLAPPEY
Johnson Motors

The outboard motor has always been considered a self contained power unit. It has its own ignition, carburetion, cooling, gear shifting and a propeller for propulsion.

However, in the last few years it has grown larger, more powerful and more complicated with alternators, automatic chokes, thermostats, battery ignition on some models, etc. But, basically, it is still a self contained power unit. The general use and maintenance factors remain the same.

Of prime importance is the fuel mixture used. Generally, the outboard is designed to operate on regular gasoline. Higher octanes offer little or no advantages. The less lead in the gasoline, the cleaner it will burn.

We recommend using a reputable outboard oil or a regular SAE #30 grade automotive oil (not heavy duty). Avoid the use of low price, third grade (ML) oil.

The mixing of the gasoline and oil is very important. Do not pour the oil into an empty tank as it will stick to the bottom of the tank and will not mix properly. This will lead to raw oil in the carburetor which will cause failure to start or at least hard starting. Or you may get raw gas in the cylinders which will increase the wear factor and/or cause powerhead failure due to absence of lubrication. The recommended procedure is to put in some gas, then the oil and then finish filling with gas and shake or agitate for blending. Pre-mix fuel, when available, is certainly recommended. (Always the same.)

On most of our motors the ignition is from a flywheel magneto which is in reality two magnetos in one container, the flywheel. We use a coil, condenser and a set of points for each cylinder. On the four-cylinder models we use both

a self contained magneto on some and battery ignition on others. The battery ignition operates through an automotive type distributor.

In all of these systems the place for attention is the breaker points. Due to the labor involved in getting the motor to the shop and then getting to the points, we recommend replacement rather than filing when they are pitted. This also insures full life from a service job. Periodic replacement of the points and condensers is considered normal maintenance.

The area for most attention is generally the spark plugs. They are probably the most critical part of the ignition system as they take the hardest use (beating).

Spark plugs are classified in heat ranges, from hot to cold by number. This is very often misunderstood. The cold plug dissipates heat faster for use with hotter running motors. The hot plug is used on smaller, colder running motors to retain the heat longer for better firing.

Spark plug failures usually fall into four categories. FUEL fouling: the normal build up of residue from burning fuel. OIL fouling: the clogging of the electrode area with unburned oil or additives from the oil choking and shorting the plug. LEAD fouling: the build up of lead on the porcelain insulator until it shorts from the center electrode to the body of the plug. PRE-IGNITION: literally cooking or burning the plug up due to too much heat from too early ignition (this is usually from overload). Severe damage to pistons may also follow.

For years we have used a regular bowl type carburetor but we have fed it from two basic types of gas tank systems, pressurized and non-pressurized.

On earlier models we used some of the crankcase pressures to send pressure down one side of a dual hose to the tank to build up a pressure in the tank which in turn forced fuel up the other hose to the carburetor. On later motors we use the pulsations of the crankcase to operate a diaphram type fuel pump to draw the fuel up a single hose to the carburetor.

In the case of the pressure system, we must maintain a sealed tank and hose to prevent loss of pressure. In the suction or fuel pump system we must again maintain sealed hoses to prevent loss of suction between the tank and the motor but we must also have an air inlet into the tank, either at the filler cap or through a check valve in the tank.

On carburetors with adjustable hi-speed and slow-speed needles, it is necessary that adjustments be made periodically due to changes in fuels, humidity, state of tune, etc.

Start all carburetor adjustments with the motor well warmed up or hot. Run the motor at full throttle (either on the boat or with a test prop) and turn the hi-speed needle clockwise until the motor starts to slow down, then turn it back to a pont a little above top speed. Slow the motor down and turn the slow-speed needle to the right or clockwise (slowly) until the motor coughs (starves), then turn it back until the motor idles smoothly. Both of these adjustments may have to be done twice to get them both correct.

Problems in carburetion are usually due to an empty gas tank, water or foreign material in the fuel system, clogged fuel filter, failure in the fuel pump or fuel lines, incorrect needle valve settings, or possibly old (aged) fuel.

Failures in the powerhead itself, other than the obvious major parts failures, would be due to loss of one of the three basic necessities for operation, ignition, carburetion and compression.

Check for compression by pulling the motor through its cycle by hand and comparing the pressure (pull) of one cylinder to the oher. If there is a noticeable differential it could be a blown head gasket, stuck rings, burnt piston, etc.

Check for carburetion by checking the gas tank for fuel, examine the fuel filter, pump up the fuel to the carburetor, check the spark plugs for wetness. (Lack of fuel could be due to any of the reasons listed under carburetion.)

Check for ignition or fire by removing the spark plugs and while they are still connected to the spark plug wires, hold them against the cylinder head and pull the motor through. Then re-check by inserting a shear pin (or similar object) in the rubber socket on the end of the plug wire and while holding the pin within 1/8 inch of the cylinder head again, pull the motor through and check for spark. Blue spark is good, red spark is poor.

When you decide which is the lost factor, start back-tracking for the exact point of failure.

The water pump operates as a centrifugal pump at high speeds and as a constant displacement pump at low speeds. In the event of loss of water, check for obstructions over the water intakes.

When replacement of the water pump is necessary, it is recommended that due to the labor involved and for the sake of extended use periods between repairs, that you replace all three parts of the pump, the plate, the impeller and the housing as all three are subject to wear. Severe silt conditions require chrome plated pump housings.

Most of the motors that you are using have a gear shift. These motors do not have any type of clutch in the shifting mechanism. They use the fluid factor of the water on the prop as the slip or clutch factor. Shifting within the unit is done by engaging and disengaging a shift dog which is a metal to metal locking lug system. It is recommended that shifting be done with a snap or positive action to avoid grinding the ears or lugs of the dog and gears during engagement. The shift dog is the wear factor in the shift set-up and should be replaced periodically.

Oil in the gearcase should be checked for level and for water at frequent intervals. The gearcase should be drained and refilled with the proper lube at least twice a year, depending on use.

One of the most misunderstood parts of the outboard motor is the propeller. The prop is the controlling factor of performance and motor life. Propeller selection has now become a must.

Our motors have an operating range of full throttle—4000/5000 RPM. We further recommend that for best performance, operation be kept between 4400/4800 RPM, where the motors develop their full horsepower. Operation below this range, with full magneto and throttle advance, puts the motor under strain and brings on pre-ignition, detonation, etc. Operation above 5000 RPM exceeds the safe limits recommended and gains nothing in horsepower.

This demands that each rig be individually balanced out.

Worn props reduce the load on the motor and raise the RPM. Props with damaged blades just churn and defeat themselves. Bent props set up vibrations that will literally tear a motor to pieces. Due to the abuse that a prop is exposed to, we recommend carrying a spare prop of the proper pitch and diameter and in good condition.

Boat design and performance is a very large subject so I will try to speak generally. Generally, the wider the bottom, the better load carrying characteristics; the flatter the bottom, the faster the boat; the deeper the vee, the softer ride but slower the boat, flare forward is for dryness, etc. All boats are a compromise.

Boat performance will be best when the load is adjusted so the boat rides fairly level and the motor is adjusted so that the prop shaft is running parallel to the surface of the water. Boat speed usually will increase as the motor is raised on the transom which raises the gearcase higher and reduces the under water drag but this also reduces maneuverability. It has been established that for all around good load carrying ability and safety, our motors should be operated on a transom height of 15 or 20 inches, give or take ½ inch.

On motors equipped with electric starters there are several basic recommendations. Always have sufficient charge in the battery to spin the motor freely. Stalling the starter motor raises the heat in the starter motor tremendously as we are not allowed to use any air or heat dissipation slots. Cheap, low capacity batteries are susceptible to running out of "juice" early and this brings on starter failures.

The best policy is to use good quality, high capacity batteries and a generator. Our records show the percentage of starter failures on motors equipped with generators to be extremely low.

The most popular questions are how long should the plugs last, the points, the coils, the props, how often should we de-carbon a motor, etc.

These are questions that it is impossible to give direct or concrete answers to (in hours of use), due to the quantity of variables involved. Gasoline, oil, load, operator, prop, climate, water (fresh-salt) are some of the controlling factors. These will vary from area to area and from operator to operator.

In closing I would like to say that the outboard motor of today has come a long way from the "kicker" of a few years ago and if given just half a chance, will give years of dependable service.