# OUTBOARD Outlook

## New technology is led by direct fuel injection and 4-stroke engines.

By Michael Crowley

Lincoln Davis says large-horsepower 4-stroke engines deliver greater power than previously seen in 4-cycle technology.

PHOTO BY CHRIS CORNELL

About a third of all commercial fishing boats are powered with outboard engines. In the past couple of years, outboards have undergone significant changes that increase fuel efficiency, boost power and give fishermen more control.

*National Fisherman* sent **Michael Crowley**, contributing editor, to talk about those innovations with outboard engine expert **Lincoln Davis**.

Davis is a certified Mercury master mechanic and the owner of Stetson & Pinkham Inc. in Waldoboro, Maine. He has conducted seminars on outboard technology and outboard warranties, taught troubleshooting courses for modern and antique outboards and served on focus groups dealing with the future of outboards.

**NF:** ***Pushed by provisions of the Clean Air Act that call for marine hydrocarbon emissions to be cut by 75 percent, there are new technology advances in the outboard industry that are referred to as "exhilarating" and "the most significant advances in outboard technology." What are they talking about?***

**DAVIS:** Large-horsepower 4-stroke engines and direct fuel injection (DFI) are the new technologies. Honda's 90-h.p. 4-stroke is in a category way beyond what we've seen in 4-cycle technology. Back in the 1950s, there was 4-stroke 50-h.p., but now there's more horsepower, and the engine is well made and well engineered.

Direct fuel injection is the promise that 2-stroke engines held 100 years ago. On a standard carbureted 2-stroke outboard, raw fuel and vapors are pushed out the exhaust port in a process called scavenging. (That puts hydrocarbons into the air and increases fuel consumption.) Direct fuel injection puts fuel into the combustion chamber under pressure, and after the intake and exhaust ports have closed. Now fuel isn't mixed with air that leaves through the exhaust port. You have complete combustion and don't lose raw fuel.

Direct fuel injection has very good fuel economy, is very efficient and will deliver the clean, or "green," environmental type of emissions. It will be very competitive with a 4-stroke engine because 2-stroke outboards produce power on every stroke of the piston, as opposed to 4-stroke's every other stroke. Thus, technically, the 2-stroke produces more horsepower for its weight.

**With direct fuel injection, engines have good fuel efficiency and deliver clean emissions.**

Engine manufacturers are talking now about DFI having the emissions of a 4-stroke engine. Mercury is producing DFI outboards; Johnson and Evinrude were supposed to produce theirs two years ago, but it hasn't happened yet.

Fuel consumption with both DFI and 4-stroke technology will benefit the fisherman. Fuel consumption will be on the order of 30 percent to 40 percent less than with a conventional 2-stroke outboard. That's a tremendous advantage in terms of fuel costs.

**NF:** ***What's the difference between direct fuel injection and electronic fuel injection?***

**DAVIS:** Electronic fuel injection (EFI) takes the place of the carburetor and injects the fuel into the air stream in a precise, metered amount. It requires more electrical capability and costs more because it's more complex. Fuel enters the combustion chamber, but the problem is that a lot of the fuel escapes out the exhaust port, so you lose unburned fuel.

Manufacturers claim outboards start better with EFI in all conditions because variables such as temperature and air pressure are measured when injecting the fuel into the air stream. There should be a fuel savings, but there hasn't proved to be any savings. I don't see the need for a fisherman to

spend $1,000 more for electronic fuel injection. It isn't something he needs.

**NF:** ***Is direct fuel injection technology too "new" for commercial fishermen?***

**DAVIS:** Direct fuel injection provides enormous cost savings, but I don't want to recommend any of the DFI-equipped engines because it's such a new technology. I don't feel comfortable in saying to a commercial fisherman, "Go out and buy one and use it." Remember, a pleasure boat operator who uses his outboard a lot puts 50 hours on the engine a year. Commercial fishermen, depending on where they fish, put 800 to 2,500 hours on an outboard. We're talking about an engine that has to have a lot of durability.

I want to wait at least until the second year after new technologies come out. By that time, the engine manufacturers have usually addressed engine problems.

Right now, the carbureted outboard is the least expensive engine and is probably state-of-the-art in terms of reliability. Carbureted engines will probably be with us for 10 more years.

**NF:** ***What about 4-stroke outboards? Is this another case where fishermen should wait until the technology has been proven?***

**DAVIS:** I'd be really hesitant to recommend any of the 4-stroke engines at this point because we haven't seen a 4-stroke engine perform in the 90- to 100-h.p. category, and we don't know what the stresses are. I'm holding my judgment until I see some definite time on these engines, no matter who the manufacturer is.

There are two important concerns with 4-stroke outboards: oil and bearings. Unlike a car, where the engine comes up to temperature and the oil burns off all the moisture it has picked up, oil in an outboard remains in a very damp and cold atmosphere. As a result, manufacturers of 4-stroke outboards have been dealing with severe oil expansion problems, where the oil absorbs water and increases in volume, even to overflowing. In these conditions, oil also loses some of its lubricating power.

We are also dealing with engines that, to the best of my knowledge, have solid bearings — like a car's bearings. These have a finite life and do wear out unless there's very good lubricating. With the 4-cycle's bearing and oil, I think you have an engine that doesn't have the life of a 2-stroke outboard. I may be overreacting, but for a commercial engine, my tendency is to say, "Wait and see."

**NF:** ***Lets have a change of pace and ask some maintenance questions. What outboard system — fuel, ignition, exhaust, propulsion — is most apt to have problems? What maintenance steps can be taken to avoid breakdown?***

**DAVIS:** Fuel is probably the biggest area of concern. What is surprising to a lot of people is that water can be present in fuel without anything leaking. Where you have no water, suddenly you can have water. Alcohol in the fuel absorbs water and precipitates with temperature changes. The gas-alcohol-water mixture is one until the temperature changes or more water or alcohol is introduced to the mixture; then the three separate, and you have water in the fuel.

A fuel-water separator is mandatory for removing water from the fuel. Raycor is the only company making a separator where you can see the water, drain it and still use the separator. Johnson-Evinrude and Mercury all use a non-drainable canister type, and you can't tell if there's water in it until the separator stops working.

But, if you're out in the ocean, and you have a lot of water in the fuel, you might need a number of canisters to get back in. How many do most people carry? With Raycore, you just keep draining the water out until it's all gone.

With the ignition system, water is a concern because it's always getting in the engine, even though outboard companies are doing a better job designing cowl seals.

I tell fishermen to spray the entire ignition system with WD-40 or any of the ignition sprays outboard companies sell — with the exception of plastic coatings. They are worse than nothing because they trap moisture.

Spraying the ignition system prevents shorts in the wires and the shorts that run down the sides of spark plugs. Spray the ignition system every 30 days.

In the exhaust system, carbon is a problem. You should use a very good quality TCW3 oil, which contains a detergent to prevent carbon buildup in the exhaust. Since more people have been using the oil, at our shop we don't see as many ring-coking problems as we had.

**A stainless steel prop is about twice as expensive as an aluminum one. So, if you break more than two wheels a year, stainless steel is worth the money.**

Preventive maintenance for the propulsion system includes greasing the splines, routine maintenance and the use of a good-quality oil. Another thing: If the engine is going to be laid up for any time, it should be fogged out with a paraffin-based fogging oil. Paraffin-fogging oil is important, because if there's water in the engine, it likes to go right for the bearings and crevices, especially on the crankshaft. Paraffin-based fogging oil pushes the water out of those crevices.

**NF:** ***How can a fisherman improve his outboard-powered boat's handling ability and speed?***

**DAVIS:** Make sure the engine is set up properly on the transom. The dealer should provide set-up information. If you choose not to use it, you'll get what you deserve; set an engine too low on the transom by 2" and you'll throw water all over the place, and have terrible fuel economy and speed.

When an outboard is mounted on a wooden boat, consulting a dealer is very important, because he has older installation information that isn't available in the latest installation sheets. For instance, people come to me saying their engine is set up right but it's cavitating. Well, it's an older wooden boat with a 4" skeg running right up to the back of the boat. In the old days, installation instructions would tell you that there couldn't be a skeg for the last foot, and that it had to be tapered for at least 14" from full to zero. Now, you have to go to the dealer for that kind of information.

Propping is very important for proper outboard operation. The prop manuals tend to be very, very optimistic. Some of them are just ridiculous. For instance, they tell you to use a prop with 15" of pitch when 12" or 11" is more appropriate.

Whatever size prop you use, make sure your engine stays within the recommended rpm. That's why a tachometer is very important, especially in engines 50 h.p. and up. The engine needs to be tached at the top end of its recommended rpm. Then it can take a heavy load and not sink below the minimum recommended rpm. A tachometer gives you that information.

**NF:** ***So where do you go for the right prop information?***

**DAVIS:** Take the prop manual, and apply the general rule of thumb: Go down to the next lower pitch size for your engine. That sets you up for the maximum, not the minimum, load and works well in most cases with standard engines, though some of the newer engines like to be heavily propped.

**NF:** ***Do you have any leeway with a prop's diameter?***

**DAVIS:** Diameter is a problem with outboards, because you have a limited space between the cavitation plate and the prop shaft. Still, everyone seems to feel the bigger the diameter the better, but because of

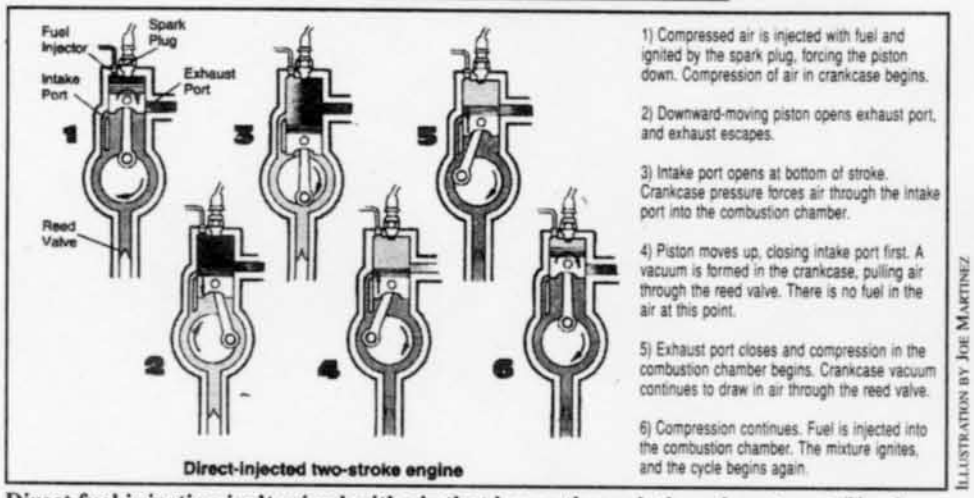


ILLUSTRATION BY JOE MARTINEZ

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the space limitations, outboard technology has gone to more blades — four or five as opposed to the normal three — to get more push area from the prop.

Right now, that technology isn't being applied to greater push for a bigger boat, but for how fast you can get your bass boat out of the hole.

In limited cases, it does work for pushing a bigger boat out of the hole, but, in general, the Daviser 3-blade propellers are a more efficient wheel for slower commercial fishing boat handling big loads or nets.

**NF:** ***Should a fisherman have a stainless steel or an aluminum prop?***

**DAVIS:** A stainless steel prop is about twice as expensive as an aluminum wheel. So, if you're destroying two or more aluminum wheels a year, the stainless wheel is a good idea.

Pot buoys, crab buoys, anything other than rocks, a stainless steel prop won't be bothered by, but with an aluminum wheel, the ends will be bent or broken off.

Stainless steel props are also about 5 percent more efficient in the higher pitch ranges (17 and higher) because they have thinner blade sections and thus less drag in the water.

**NF:** ***What about jack-plating? Does that have any role on a commercial fishing boat.***

**DAVIS:** Jack-plating a boat allows you to adjust an engine vertically on the transom. It's usually used for speed boats, but on a tunnel-hulled fishing boat, where you're not using a jet motor, a jack plate can be very advantageous for vertically positioning the outboard. The position, of course, depends on the depth of water you are in.

**NF:** ***You mention water jets; there's talk of using water jets on outboards, but aren't they limited in their uses?***

**DAVIS:** There's a 30- to 40-percent loss of power with the jet, but they are worth it and perform excellently in very shallow water — 2' or less. And, with a jet, you won't smash up a lower end. The minute you take jets outside in rough water, they cavitate like crazy and are useless. Jets also requires daily maintenance.

**The biggest mistake you can make when repairing your own outboard is not using an engine-repair manual. Spending $150 for electrical components but not buying the $30 manual is a big waste of money.**

**NF:** ***What are the most common mistakes fishermen make when they repair their own outboards?***

**DAVIS:** Probably the biggest mistake is not using a manual for engine repairs. I recommend buying the manufacturer's manual for a particular engine. A lot of times, fishermen don't use a manual and end up replacing things that don't need to be replaced.

To repair your outboard, you need test equipment, the knowledge to use the equipment; it's not very complicated. Radio Shack makes great, inexpensive VOA (volts, ohms, amps) meters that will tell you a lot. And the manual is the most important of all. It's like a compass, if you choose to believe it, it'll tell you the truth.

If you spent $150 for electrical components but don't buy the manual for $30, you're wasting a lot of money. You should buy the manual, read it, do some testing and then buy the parts you need. If you've got the manual, I can't think of any mistakes you'll make. □