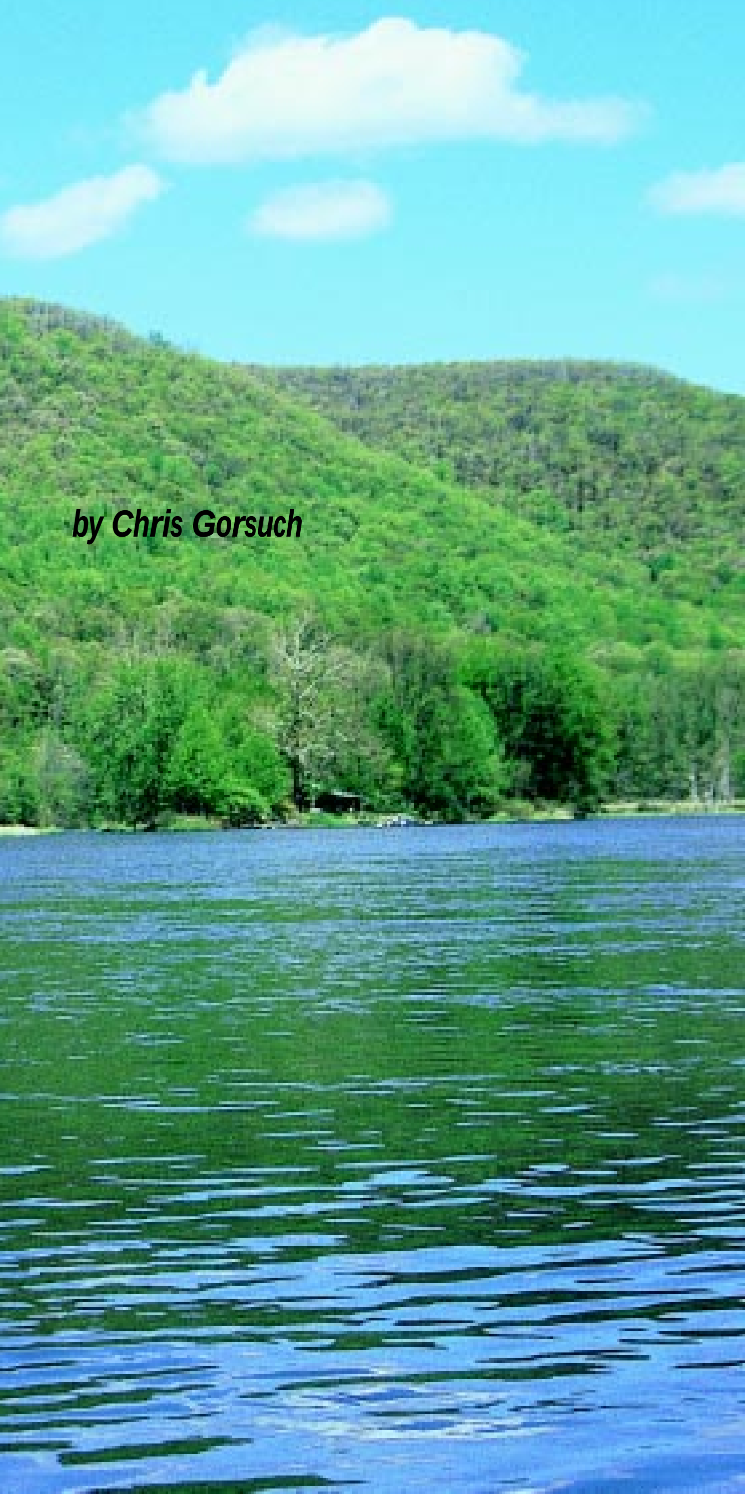
Enhancing Outboard Jet Performance

Note: The article "Jetboat Success," in the May/June 1999 issue, was geared toward people who want to buy their first jetboat, or who want to know more about jetboats. This article is aimed at those who already own an outboard jet. It offers solutions to common jetboat performance problems.

The two most important factors to understand about jetboat performance are bottom width and the weight-to-power requirements for bringing the craft on plane. These fundamentals are derived from physical laws of water displacement and force.



by Chris Gorsuch

photo-Mike Bleech, graphic-Ted Walke

If you view these ideas with an open mind and are willing to set aside some of the unquestionable ideas you may have heard, you may learn something new in enhancing the performance of your outboard jet, as I have learned in gathering this information.

Cavitation problems

Outboard jets work best on flat-bottomed boats with a bottom width of 48 inches or more. This is a frequently used axiom, and has led to a lot of misconceptions. The shape of the hull cannot be easily defined. Fact is, when it comes to bottom width, the wider the bottom, the more water it displaces. Because a shallow draft is important, the wider the boat, the better the draft. A wider hull sits higher in the water, so it exhibits less drag when jumping on plane. Conclusion: Wider is better.

The rest of this statement, however, is not entirely true, even if the vast majority of the boats I see on Pennsylvania rivers are flat-bottomed boats. The shape of the hull helps direct the flow of water. Flat hulls tend to cause more cavitation.

It doesn't matter which outboard you purchase–if it has a jet attached to the lower unit, it was manufactured by Outboard Jet, a division of Specialty Manufacturing. Outboard Jet publishes a guideline for selecting a boat powered by an outboard jet. The company suggests that a boat hull offering a slight deadrise (6 to 10 degrees) increases the overall performance. The hull maneuvers better and cavitates less than a flat-bottomed boat.

Many aluminum hull manufacturers have introduced a whole new line of extra-wide modified john boats that offer a consistent line of 4 to 6 degrees of deadrise from bow to transom. It is important that the deadrise falls all along the hull because the "V" provides a smoother ride and splits off air-filled water before it reaches the jet intake.

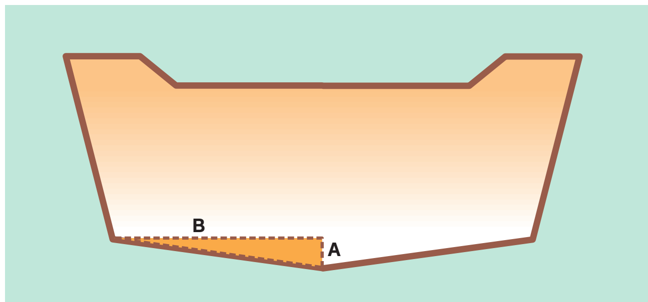


Figure 1. ***Calculating a hull's deadrise. The deadrise is the tangent value of A divided by B.***

For those interested in calculating the deadrise of a hull, the easiest location to do so is at the transom. Measure the bottom width of your hull at the transom and divide this number by 2. The value of a 64-inch bottom would be 32. Then measure the drop at the center of the transom. This is value (A) in the diagram above. With a scientific calculator, figuring the deadrise is easy. Divide the drop (A) by half the bottom width (B), and then toggle the key labeled TAN-1. The answer is your deadrise. Perhaps this is taking things a bit too far–all most of us really need to know is that a 3-inch drop in a bottom range of 68 to 58 inches equals a deadrise of 5 to 6 degrees (See Figure 1).

Eliminating cavitation

All this information is great if you have not selected your outboard jet hull yet. But how do those who already have a jetboat handle cavitation? As outboard jet standards go, all the hull types cavitate under those extreme conditions.

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photo-Mike Bleech

However, cavitation under normal running conditions should not be tolerated, and should be eliminated to maintain the life of your outboard. If your outboard jet is cavitating, the jet pump is pulling more air than water. It will not allow the pump to produce adequate water pressure to bring the boat on plane. The engine works hard and erratically and this could cause damage if let go for too long. This type of cavitation is likely to be a result of improper mounting height of the outboard or the hull bottom characteristics causing a poor flow of clean water to the jet intake. There are several solutions to enhance performance.

Install intake fins

Some companies offer an intake fin kit as an accessory designed to reduce cavitation. This kit is easy to install and offers the advantage of directing a larger volume of water into the jet intake. The increased volume of water reduces the amount of ingested air, allowing the pump to operate efficiently. The added set of fins even enhances the grip in maneuvering and assists in reduced cavitation in tight turns and rough water. The cost for a set of intake fins is around $50 (See Figure 2).

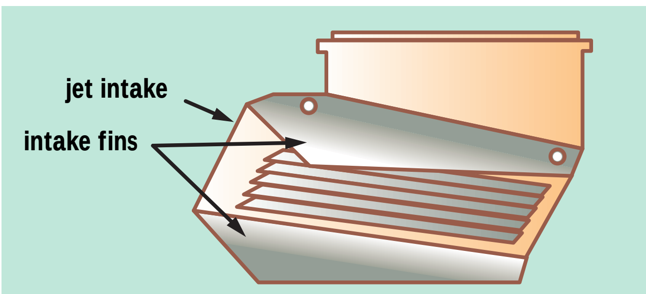

Figure 2. ***Intake fins are designed to reduce cavitation. They are easy to install and offer the advantage of directing a larger volume of water into the jet intake.***

Installing a transom jack

A short while back, I was approached by a fellow outboard jet owner whose 16-foot modified "V" john boat developed cavitation problems in water that had any amount of light chop. The rig performed great the majority of the trips out, but one day he had to limp the whole way back to the ramp because it was cavitating so much. Our guess at the time was that the engine was mounted about 1/4-inch too high. When the water had a light chop, the hull bounced just enough to ingest high levels of air into the intake foot. With the outboard already bolted to the transom, the best option was installing a transom jack.

Placing the motor just 1/4-inch to 1/2-inch above the optimum setting will result in cavitation and power loss. Setting it too low results in increased drag and excessive water spray off the foot and pump/bell housing.

Transom jacks come in a variety of sizes and styles from manual adjustable to powered hydraulic models. They are easy to install, but you may have trouble moving the outboard unit off the transom. Your local marine dealer can install a transom jack for you with very little effort and take any concern of managing the 200-pound weight of the outboard.

Beyond the ability to adjust the height on the fly, if needed, the transom jack extends the intake foot about six to eight inches farther back from the transom. The water flow there is more likely to be clean, providing better intake efficiency. Many of today's fiberglass bass boat hulls are designed with a step transom that places the engine farther out to take advantage of the power increase that results in faster lift.

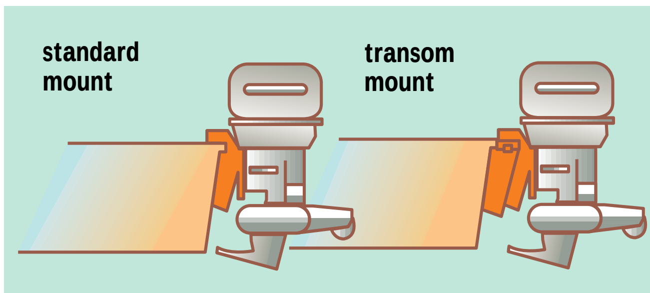

illustration-Ted Walke

Figure 3. ***A transom jack helps eliminate cavitation. Transom jacks come in a variety of sizes and styles from manual adjustable to powered hydraulic models.***

On the negative side, the transom now acts more as a fulcrum because the outboard weight is shifted farther back. This might require minor adjustments to your payload placement. This mounting placement also adds more torque to the transom.

Even though modern hull transoms offer multiple knee braces for additional support, be sure to check with the hull manufacturer first, before adding a transom jack mount. A transom saver, which is not often associated with an outboard jet, may also be a smart choice if you travel rough roads or launch accesses (See Figure 3).

Removing center keel aft

The jet intake requires a clean flow of water free of air bubbles to allow the pump to operate at peak efficiency. Flat-bottom john boats tend to carry these air bubbles straight back into the intake. Keels can also aid in increasing this effect because they introduce even more air into the intake. The center keel can be removed two to three feet from the transom forward. The goal is to produce an apron of clean, air-free water just wider than the intake.

Doing this requires some special equipment and no doubt voids most, if not all, hull warranties. So unless your hull is a few seasons old, you may want to seek the other alternatives mentioned here (See Figure 4).

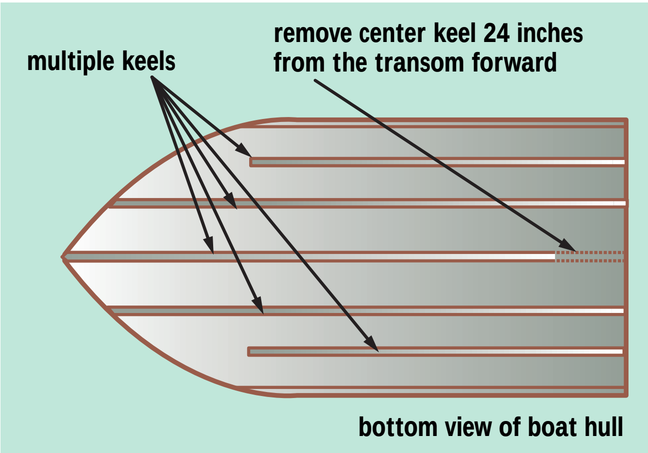

Figure 4. ***The center keel can be removed two to three feet from the transom forward. The goal is to produce an apron of clean, air-free water just wider than the intake.***

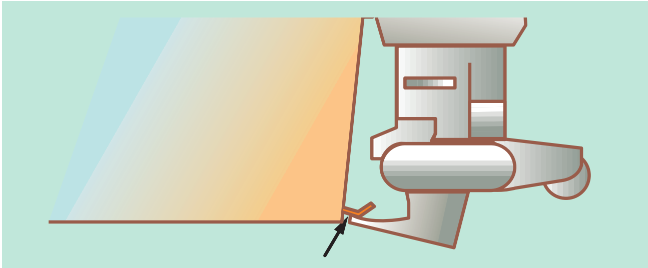

illustration-Ted Walke

Figure 5. ***Spray deflection plate. In this example, a 1/16-inch to 1/32-inch aluminum plate is bent as shown and welded or screwed in place along the bottom of the hull. The required length needs to be only a few inches wider than the intake foot on each side.***

Reducing excessive spray

I was a passenger on a jet-powered outboard that produced so much back spray, it was coming into the boat–just enough to soak the back few feet of the carpet to the point where no one wanted to sit near the stern. I had not seen this as bad on other boats, but it is a problem that can plague outboard jet-powered hulls. Water deflects off the transom and the intake foot below the bell housing, and sprays into the back of the boat. While annoying, it can also cause some cavitation, and should be resolved. In searching through various jet installation manuals, I found a few ways to fix this problem.

One example is where a 1/16-inch to 1/32-inch aluminum plate is bent as shown and welded or screwed in place along the bottom of the hull. The required length needs to be only a few inches wider than the intake foot on each side.

Even though for some the idea of adding a spray deflection plate to the transom is not appealing, I have seen some splash plates mounted higher and directly to the outboard. This keeps the water from spraying into the boat, but it doesn't do much to direct water or prevent any cavitation. However, it is an option (See Figure 5).

It is also worth mentioning that some hulls made exclusively for jet outboards even have a spray deflection plate

photo-Mike Bleech

welded to the bottom of the transom. Most, but not all, that I have seen were associated with tunnel hulls.

30 percent power loss

Usually, one of the first jetboat drawbacks you hear is the 25 to 30 percent power loss from that of a standard propeller unit with the same powerhead rating. Propulsion supplied by an impeller instead of a standard propeller causes the power loss. The impeller draws water into the jet intake and pressurizes it in the bell, or pump housing, accelerating it at an advanced rate through the discharges nozzle, which propels the boat (See Figure 6).

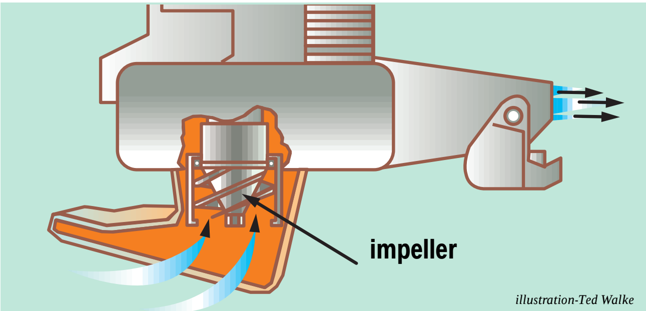

Figure 6. ***Jet outboard water flow. One of the first jetboat drawbacks you hear is the 25 to 30 percent power loss from that of a standard propeller unit with the same powerhead rating. Propulsion supplied by an impeller instead of a standard propeller causes the power loss.***

This is why payload is so crucial when considering an outboard jet. With an outboard powered by a standard propeller, as payload is increased, there is a point at which the engine cannot reach the optimum RPM range to turn the propeller and bring the boat on plane. The solution is to install a lower-pitched propeller. This reduced cup in the propeller blades offers slightly less resistance and allows the engine to reach the manufacturer's optimum RPM range.

The temptation to add payload is an issue for many of us anglers. Consider a bow-mounted trolling motor, a deep-cycle battery or two, gear, extra gas can, anchors, cooler, an extra fishing buddy, and the gear weight can add up fast. The effect this added payload has on your jet outboard results in added time to reach plane and slower speeds. Unlike propeller-driven outboards, you cannot change to a more efficient impeller style to increase load capacity–or can you?

The stock impeller on all outboard jets is a lightweight three-blade design that is easy to machine because it is made of aluminum. Because it's aluminum, it is soft and prone to dulling and nicks. After time, this wear can cause significant loss in performance. Proper maintenance requires that the impeller be removed, sharpened, and have a shim(s) removed to ensure that the proper clearance between the impeller blades and intake housing is met.

A newer design is a stainless steel impeller that offers four thinner but stronger blades. This design feature enhances payload capabilities in two ways. First, the area is increased because of the extra blade. This added area increases the traction and improves the water flow to the pump. Second,

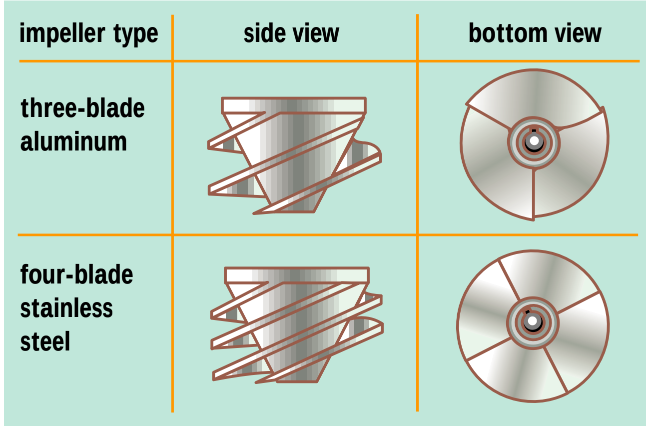

Figure 7. ***A newly designed stainless steel impeller offers four thinner but stronger blades instead of a standard three-blade design. This design feature enhances payload capabilities.***

the blades are thinner, so they cut through the water with less resistance, even though there is more blade area.

The stainless steel impeller also features better tolerances. The aluminum impeller calls for .03 inches of clearance between its blade edge and the housing liner. The stainless steel impeller calls for only .015 inches of clearance. This alone helps to reduce cavitation and increase performance (See Figure 7).

Because the stainless steel impeller weighs about 5 pounds more than the aluminum impeller, I was interested if this extra weight would cause any negative effect on the bearing. Actually, the extra weight is a benefit and should add to the life of the bearing. The load on the bearing from the water pressure alone is several hundred pounds. The added 5 pounds is insignificant to the total weight, but it tends to work more as a flywheel to regulate the speed. Less work on the drive shaft means longer potential life.

Increased load capacity is how this impeller advantage should be evaluated. There are those who run a standard no-frills aluminum hull with nominal payload and have no issue with time to reach plane. For them, there is little to gain by replacing the stock impeller. Those on the other side of the coin, who have the extra decking and storage built into the hull, a trolling motor, deep cycle battery, and a number of extras–they may be pushing an overall payload weight where the stainless impeller can offer the enhanced performance.

In the tests I ran, the performance gained with the installation of the stainless steel impeller was an additional 16 percent in payload and 25 percent reduction in time to reach plane.

I hope some of this information helps you improve your outboard jet performance. These innovative solutions for enhancing your outboard jet may not resolve all the known limitations. But they do open what had seemed to be a closed door on jet propulsion. Who knows what new application or improvement will be around the next bend!