



IMPROVING SMALL BOAT PERFORMANCE

Selecting the best device to maximize boat performance can be confusing, especially when all of the marketing claims point to “their” trim tabs, hydrofoils (stabilizers), or propellers as ‘the best’ solution. To help clarify the choices, we have prepared the following brief explanation of each of these devices.

KEEP IN MIND

Since getting on plane is one of the top priorities for performance enhancements, let’s start there. To minimize confusion it is helpful to think about aircraft designs and the similarity to boats. Boats and airplanes have rudders, elevators, trim tabs, and flaps to control the hull surface and modify the hull design. Keep in mind the design of a boat dictates performance more than engine size or horsepower. For example, if you want to carry 100 tons of iron ore you build a barge; however, no one will ever ski behind it regardless of horsepower. Therefore, choose a design that addresses your needs and desires, then choose the device that serves you best. It is helpful to make a check list of the issues you want to improve or correct and do some research. Examples of common issues are listed below:

Check List:

- Getting on plane easier
- Reduce bow rise
- Reduce minimum “on plane” speed (ie; from 20 MPH to 15 MPH)
- Eliminate porpoising (constant bouncing)
- Improve ride and handling in rough sea conditions
- Eliminate listing (most often leaning to port)
- Improve boat balance port-to-starboard
- Improve fuel economy



Aftermarket options for solving these problems and improving overall performance include planing devices (hydrofoils), stabilizer systems (trim tabs), and propellers. Many brands and models are available in each category for a wide range of price points and levels of installation complexity.

DEVICES FOR IMPROVING BOAT PERFORMANCE

PLANING DEVICE

Planing is another word for hydrodynamic lift (water pressure), which occurs when the boat achieves a velocity that allows it to skim over the surface of the water instead of plowing through it. Since less of the hull is in the water, the boat goes faster than the theoretical maximum hull speed.

A planing device is a boat accessory designed to improve time to plane; in other words, decreasing the time it takes to lift the hull out of the water and achieve a level attitude (running angle). A hydrofoil is an example of a planing device. Hydrofoils are also marketed for improvements in handling and stability, which may not be correct.

STABILIZER SYSTEM

The goal of a stabilizer system is to improve balance. Placing the engine toward the stern, installing an additional outboard motor (ie; trolling motor) on the transom, installing extra batteries on one side or adding a swim platform to the boat all create imbalance. Balance is key to the overall performance of any planing hull power boat.

Boats operate in liquid and constantly rotate on an axis (front to back, side to side, and corner to corner). Controlling and maintaining balance is essential to all aspects of performance from acceleration and top speed to ride and handling. The most common problems related to stability, or balance, are boats that are slow to plane, chine walking (rapid listing from port to starboard) and porpoising (repeated oscillations pitching bow to stern).

COMMON REMEDIES FOR POOR BOAT PERFORMANCE

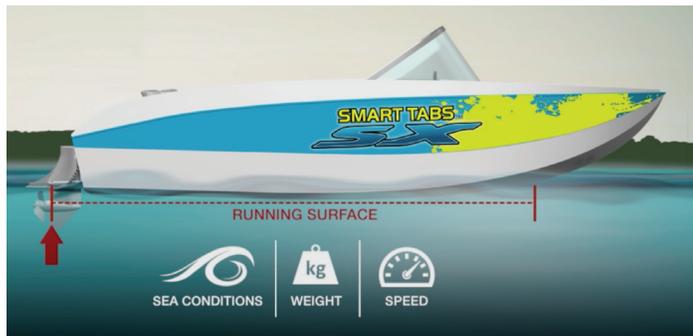
Motor Trim (Adjustment)

“Trim” is a term used to describe an adjustment made to the motor position that changes the boat’s attitude. When the motor is properly trimmed, the boat is running at maximum efficiency and parallel with the at-rest waterline. Trimming a small-to-medium size boat is commonly done by changing the angle of thrust on outboard or stern drive motor. Tilting the propeller “in” (negative trim) or “out” (positive trim) in relation to the transom will change the attitude of the boat at cruising speeds. Trimming “in” will reduce bow rise, and trimming “out” will increase bow rise.

The effect of power tilt and trim during acceleration to plane is noticeable, but inefficient because the prop has reduced thrust when trimmed beyond perpendicular to the water line. Therefore, it is best to trim the motor to perpendicular as soon as possible (on plane).

Propeller Change

The diameter and pitch of the propeller is determined by the engine type, size, hull design, and weight, among other factors. The boat manufacturer will recommend a propeller according to make and model test results. Every boat will be somewhat different, and propeller choice is ultimately based on the personal preferences of the owner.



If the owner's desire is to improve the planing time and load carrying capability, a lower pitch may be a good choice. If top speed is most important, a higher pitch may be better. To put this into perspective, a lower pitch prop will make it easier to get on plane; however, similar to a car, reducing the pitch is like downshifting to second gear. Acceleration is faster and easier, but fuel consumption and top speed will suffer.

Hydrofoils

A hydrofoil is a permanently fixed planing device attached to the outboard motor cavitation flange. Hydrofoils are often marketed as "stabilizer systems," which is an inaccurate description. Hydrofoils provide extra lift, but not the side-to-side balance of a boat since this extra lift is positioned in the center of the boat. It is often shaped like a wing. Hydrofoils provide additional stern lift to aid in planing; however, they are rigid and not adjustable, so the lift increases as the boat speed increases. This often causes excessive stern lift at cruising speeds, driving the bow down into the water. The excessive bow pressure often leads to reduced top speed and fuel economy. The result can cause instability

in turns, and a propensity for a torque list to port. The center mounting position of a hydrofoil can actually create imbalance and produce a 'teeter-totter' effect.



Hydrofoils are available in various sizes and colors. They are not adjustable, but are relatively easy to install. Some motor manufacturers caution that installing a hydrofoil will void the motor's warranty, so this is an important consideration before making a purchase decision.

Trim Tabs – Helm-Controlled, Self-Adjusting, Self-Leveling

Trim tabs are installed on both sides of the transom flush with the bottom of the boat hull. How do tabs work? They function in the same manner as flaps on an airplane wing. They are angled down at slow speeds and adjusted up at cruising speeds.

Traditional helm-controlled trim tabs have been used on larger cruising vessels (26 feet and up) for many years as a means of assisting the boat to plane, and adjusting attitude port-to-starboard. Trim tabs operate by modifying the hull design to compensate for changing conditions such as boat speed, waves, weight, load, etc. Trim tabs extend the running surface of the hull and are adjustable, producing more stability.

The operative component of all types of trim tabs is the actuator. Helm-controlled trim tabs use electric or hydraulic power. Self-adjusting trim tabs use either nitrogen gas or a coil spring.



Trim tabs for small boats are also available, and highly effective for performance enhancement. These self-adjusting trim tabs work independently and require no operator interface. Automatic trim tabs are available from Nauticus with nitrogen gas-filled actuators. Nauticus trim tabs (SMART TABS®) are available in seven different models

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depending on boat size, weight, and engine power. They can also be specifically adjusted with five mechanical settings after installation. Bennett SLT self leveling trim tabs use an actuator with a coil spring inside of a cylinder, and come in two sizes. Both types are significantly less expensive, easier to install and require less maintenance than hydraulic or electric trim tabs.

SMART TABS – NAUTICUS TRIM TABS



SMART TABS are self-regulated trim tabs that automatically adjust, as required, to maximize boat performance. The system is constantly active. SMART TABS use a nitrogen gas actuator encased in an air- and water-tight neoprene rubber boot. The actuator reacts to boat speed and water pressure to adjust the trim plate angle and control the amount of lift.



Actuator pressure and plate size can be selected based on boat and engine configuration. SMART TABS systems offer up to 35 adjustments and seven (7) trim plate sizes to achieve the best performance results. The trim plates are available in both stainless steel and composite material. Stainless steel plates require the use of zinc anodes in saltwater applications, whereas the nylon composite material is maintenance-free in both fresh and saltwater. SMART TABS can be installed in less than an hour using common tools. The trim tab actuator is an inexpensive, easily replaceable wear item available separately.

Automatic trim tabs are available from Nauticus with nitrogen gas-filled actuators.

SMART TABS
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