

How Planing Hulls Operate



Displacement Hull

A planing hull, when operated at very slow speeds, will cut through the water like a displacement hull.



Planing Hulls

In speedboat mode, a planing hull will have a raised bow, reducing the resistance of the water and throwing a very large wake. And, maintaining a speed that puts your boat in planing mode.

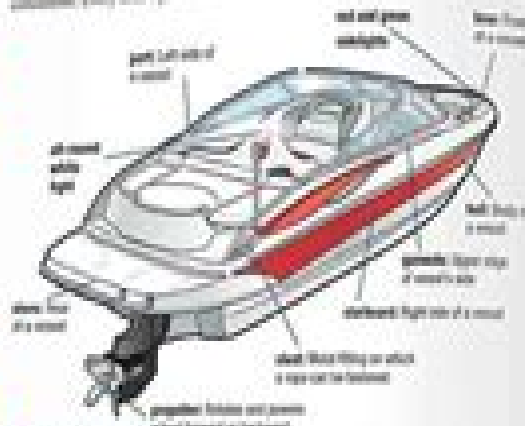


Planing Mode

Your boat is in planing mode when enough power is applied so that the hull glides on top of the water. Different boats reach planing mode at different speeds.

The Many Parts of a Boat

Boats come in many styles and shapes, but the names of the different parts remain consistent. Every boat operator should know the following terms and definitions.



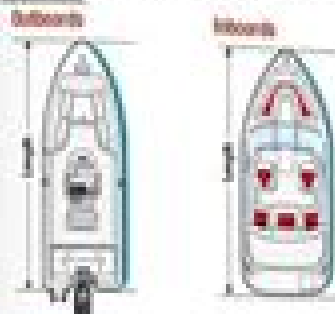
Types of Boat Hulls

There are two basic types of boat hulls—displacement and planing.

- Displacement Hulls** Boats with displacement hulls move through the water by pushing the water aside and are designed to cut through the water with very little propulsion.
 - If you lower a boat into the water, some of the water moves out of the way to adjust for the boat. If you could weigh that displaced water, you would find it equals the weight of the boat. This weight is the boat's displacement.
 - Boats with displacement hulls are limited to slower speeds.
 - A round, tapered hull shape acts as a displacement hull. Most large yachts and most sailboats have displacement hulls, allowing them to move more smoothly through the water.
- Planing Hulls** Boats with planing hulls are designed to rise up and glide on top of the water when enough power is supplied. These boats may operate like displacement hulls when at rest or at slow speeds but climb toward the surface of the water as they move faster.
 - Boats with planing hulls can climb, doing so at high speed, riding almost on top of the water rather than pushing it aside.
 - The horizontal and/or inverted hull shapes act as planing hulls. Most outboard power-driven boats, including personal watercraft (PWCs) and water-ski craft, have planing hulls, allowing them to move more rapidly across the water.

Length of a Vessel

A vessel's **length overall** denotes the equipment the vessel must have to comply with federal and state laws. Length overall is measured from the tip of the bow to a straight line in the stern of the vessel. Some sports vehicles, including motor and power boats, canoes, kayakers and other things, are included, and some are not included in the measurement.



Types of Engines and Drives

Outboards

- An outboard is a portable, self-contained package of an engine, gear case, and propeller that is attached to the **transom** of a boat.
- A growing number of outboard engines are of the sterndrive design, but many are still conventional two-stroke engines that burn oil as a lubricant along with the fuel. New technology two-stroke outboards are direct injection engines and burn over 70% cleaner than conventional two-stroke outboards.
- Turning of outboard boats is controlled by a **tilt** or steering wheel that controls the entire engine to direct propeller thrust.

Inboards

- An inboard is a clean-water, inboard engine designed for marine use. Inboard engines are mounted inside the hull's midsection or in front of the transom.
- The engine runs a drive shaft that runs through the bottom of the hull and is attached to a propeller at the other end.
- Many personal watercraft (PWCs) have two-stroke inboard engines that burn oil as a lubricant along with the fuel. New technology two-stroke PWC engines are direct injection engines and burn cleaner than conventional PWC engines.
- Turning of most inboard vessels, except PWCs and jet drive boats, is controlled by a **rudder** behind the propeller.

Jet Drives

- Jet drives are known also as **inboard/outboards (I/Os)** because they combine features found in both inboard and outboard engines. Jet drive engines are clean-water, inboard engines designed for marine use and are mounted inside the hull.
- A jet drive engine is attached through the transom to a drive unit labeled as "nozzle" that is essentially the lower unit of an outboard. The engine runs a drive shaft that runs out to a propeller at the other end.
- Turning of jet-drive boats is controlled by the nozzle, which works like an outboard engine to direct propeller thrust.

Length Classes

Some states have laws that refer to vessel lengths as "classes."

Class	Length
Class 1	Less than 20 feet
Class 2	20 feet to less than 25 feet
Class 3	25 feet to less than 35 feet
Class 4	35 feet to more than 40 feet

However, the U.S. Coast Guard no longer uses these designations to indicate length.

Length overall (LOA)

Length of the boat including any attachments.

Transom

Vertical surface of the back of the hull.

Tilt

A boat used to turn a rudder to steer a boat.

Water

Working device, usually a wheel of teeth attached to a part of a boat, the stern of the boat.



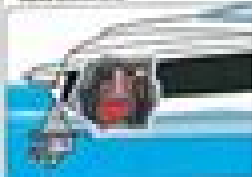
Outboards

Have more power and greater length than inboard engines.



Inboards

Have inboard engines designed to operate in water environments.



Jet Drives

Have greater and more fuel efficient engines.

Boat Ed Study Guide

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