**International Hydrofoil Society Presents...**

**Glossary of Hydrofoil Terms**

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Note: Visitors to this page are invited to help expand the glossary by submitting additional terms and their definitions to webmaster@foils.org. We would also like to include the equivalent terms and their definitions in languages other than English. Please contact the webmaster if you are willing and able to assist in another language, whether with individual terms or with the entire glossary.

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**Airplane Foil Arrangement**

 A foil system in which the main foil assembly is located forward of the vehicle's center of gravity and whose main foil area (lifting surface) represents the major portion (65% or more) of the total foil lifting area. The remaining foil area is provided by a smaller foil located aft of the center of gravity.

**Air Stabilized Foil**

A lifting foil that uses controlled ventilation of air to modulate lift for achieving craft stability and control.

**Aspect Ratio**

The measure of the ratio of a foil's span to its chord. It is defined as span2 / total foil area.

**Base Ventilated Foil**

(1) A system of forced ventilation designed to overcome the reduction in lift/drag ratio of a foil at supercavitating speeds. Air is fed continuously to the upper surface of the foil, unwetting the surface and preventing the formation of critical areas of decreased pressure. Alternatively, the air may be fed into the cavity formed behind a square trailing edge. (2) Air or water jet is used to provide side force forward of the center of gravity of the craft to assist in maneuvering. Thrust vector can be varied.

**Breguet Range**

The approximate range of a craft based upon the average values of propulsion efficiency, specific fuel consumption, the ratio of initial-to-final gross weight, and assuming a constant life-to-drag ratio. Named after L. Brequet, who first suggested the simplified formula applied to airplanes.

**Broach**

The unwetting of a foil with resultant loss of lift due to the foil coming near to or penetrating the air-water interface.

**Bruce Foil**

A low-aspect-ratio foil, inclined at something like 45 degrees, and mounted on an outrigger. When it's to windward, the Bruce foil produces a downward lift due to the leeway of the sailboat, and a positive lift when the foil is to leeward - both are stabilizing.

**Canard Foil Arrangement**

A foil system in which the main foil assembly is located aft of the vehicle's center of gravity and whose foil area (lifting surface) represents the major portion (65% or more) of the total foil lifting area. The remaining area is given to a smaller foil located well forward of the center of gravity.

**Cavitation**

1. the rapid formation and collapse of vapor pockets in a flowing liquid in regions of very low pressure. 2. such a pocket formed. (Webster)

[Photos of Different Types of Cavitation](http://cavity.ce.utexas.edu/kinnas/cavphotos.html)

**Chine, Hard**

Angular intersection of the side and bottom of a craft's hull, as opposed to a round bilge, which is sometimes called a soft chine.

**Continuous Foil**

A main foil system in which the foil area is one continuous section as opposed to being split in the center.

**Contouring**

The motion of a craft when tending to follow the surface wave profile rather than tending to travel horizontally over the waves.

**Conventional Foil Arrangement**

Same as airplane foil arrangement.

**Cresting**

The condition of foilborne operation of a hydrofoil caused by contact of the lower part of a hull and keel with the crests of the larger waves. The contact is brief and does not prevent the craft from remaining foilborne. Also called furrowing.

**Dihedral Foil**

A foil whose span is not parallel to the horizontal (such as the PHM foils).

**Fences**

Small fins placed on struts or foils to prevent ventilation air from migrating down a strut or along a foil. The fences are attached to the strut or foil so as to be parallel to the direction of the fluid flow.

**Flap Control**

A method of controlling the lift of a submerged hydrofoil system by varying the angle of trailing edge flaps on the foils.

**Flying Height**

The distance between the keel and the mean water surface while foilborne. This provides a measure of actual keel clearance.

**Foil**

Lifting surface designed to support all or part of the weight of a waterborne craft at an appropriate forward speed.

**Foilborne**

A hydrofoil craft is said to be foilborne when the hull is raised completely out of the water and wholly supported by lift from its foil system.

**Foil Broaching**

Sudden breaking of the water surface by a foil or part of a foil, resulting in a loss of lift due to air flowing over the foil's upper surface.

**Foil Depth**

The distance between the foil and the mean water surface while foilborne.

**Fully Cavitating**

Refers to the formation of a gaseous cavity in the liquid flow past a body, e.g. a foil, and which terminates downstream behind the body.

**Fully Submerged Foil System**

See Submerged Foil System.

**Hullborne**

Operating condition of a hydrofoil craft or Air Cushion Vehicle (ACV) in which the weight of the craft is supported by the displacement of its hull.

**Hump**

The hump or peak formed on the graph of resistance against speed for planing craft, hydrofoils, or ACVs due primarily to maximum wave-making drag of the hull and induced drag of the foils.

**Hump Speed**

The speed at which the hump occurs.

**Hump Drag**

The drag at hump speed.

**Hydrofoil...** in languages other than English:

* aliscafo, or "Battello ad ali portanti" (Italian)
* BÄRPLANSBÅT (Barplansbat) (Swedish)
* drsina
* hidroala, aerodeslizador (Spanish)
* hidrofólio (Portuguese)
* hidrokrilni
* hydroptère (French)
* snapirit (Hebrew)
* szárnyashajó
* Tragflügelboot, Tragflächenboot (German)
* Vleugelboot, Draagvleugelboot (Dutch)
* wodolot
* Y'pepó (Guarani and Tupi)
* (Chinese)
* (Japanese)

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**Hydrofoil Small Waterplane Area Ship (HYSWAS)**

Hybrid vessel comprising a single submerged hull with fully submerged foil system and an upper hull structure supported by vertical strut or struts. At low speeds, the craft is supported by buoyancy of the submerged hull, the strut, and the lower section of the upper hull. At speed, dynamic lift generated by the foil system raises the upper hull out of the the water with reduction of the waterplane areas of the strut.

**Incidence Control**

The method of controlling the lift of a submerged hydrofoil system by varying the angle of incidence of the foil or foils.

**Ladder Foils**

A surface-piercing hydrofoil system consisting of several small parallel foils such that as speed is increased, fewer foils are required to support the craft. The remaining foils are then above the water surface and contribute no hydrodynamic drag. This is one of the earliest foil arrangements and was used by Forlanini in his 1905 hydro-aeroplane, which was probably the first really successful hydrofoil.

**Pi Foil**

A foil system consisting of a continuous foil connected to the main hull by two vertical struts, the entire assembly thus resembling an inverted Greek letter pi.

**Planing**

Operating mode of a high-speed craft in which most of the vehicle weight is supported by hydrodynamic lift rather than by static buoyant force and which is characterized by a clean flow separation at transom and chine.

**Platforming**

An operating mode of a hydrofoil craft in which the center of gravity of the craft is constrained to travel in straight and level flight with the hull clear of the waves, rather than conforming to the wave profile.

**Seakeeping**

General term describing the performance, controllability, and dynamic response of a vessel in a seaway.

**Seakindliness**

Quality of a craft/ship behavior in waves characterized by easy motions (i.e. low accelerations), dry decks, absence of propeller racing and slamming, and easy steering.

**Slamming or Hull Slamming**

Violent impact between sea waves and a portion of a craft's hull, resulting in large plating loads due to the large relative velocity. This can occur subsequent to a forward foil broach.

**Split Foil**

A main foil system with the foil area divided into two, either to facilitate retraction, or to permit the location of the control surfaces well outboard, where foil control and large rol- correcting moments can be applied for small changes in lift.

**Strut**

Streamlined, column-like appendage or support for foils or components of water propulsion systems.

**Subcavitating Foil**

A general classification given to foils similar in section shape to subsonic airplane wings. These foils are designed to operate effectively (high lift-to-drag ration) in fully-wetted, non-cavitating flow conditions.

**Submerged Foil System**

A foil system employing totally submerged lifting surfaces. The depth of submergence is controlled by mechanical, electronic, or pneumatic systems that alter the angle of incidence of the foils (or flaps attached to the foils) to provide stability and control. Also called Fully Submerged Foil System.

**Supercavitating Foils**

A general classification given to foils designed to operate efficiently at high speeds while fully cavitated. Since at very high speeds foils cannot avoid cavitation, sections are designed to induce the onset of cavitation from the leading edge and cause the cavities to proceed downstream and beyond the trailing edge before collapsing. Lift and drag of these foils is determined by the shapes of the leading edge and undersurface.

**Superventilating Flow**

Cavitating flow, with cavity artificially vented to the atmosphere or a source of pressurized air.

**Surface-Piercing Foil System**

A foil system in which the lifting surfaces are partly submerged at foilborne speed. The system is stabilized by the varying submerged foil area. The lift produced is proportional to the submerged foil area.

**Take Off**

The transition from hullborne operation to foilborne operation.

**Tandem Foil Arrangement**

A foil system in which the area of the forward foil(s) is between 35% to 65% of the total foil area.

**Taxi**

Hydrofoil craft operations with struts down and main engine running, but craft not foilborne. Examples are: proceeding at reduced speed in restricted channels to or from berth; to maintain heading and reduce rolling when operating above design sea states; and, to reduce radar signature by lowering craft to displacement mode.

**Transcavitating Foils**

Foils designed to have no abrupt changes of loading as they pass from the fully wetted flow region through partial cavitation to the fully cavitating flow region at high craft speeds. Also called transiting foil.

**Ventilation**

Process by which a ventilated flow is formed and maintained. "Natural Ventilation" exists when a continuous or intermittent flow of air is created by means of the flow itself, as from the free surface in the case of a surface-piercing, ventilated strut. "Forced Ventilation" exists when the air is continuously supplied into the cavity by auxiliary means such as a pump.

**Waterjet**

A water propulsion system consisting of an inlet, a duct, and an exit nozzle, or combination thereof, with a pump located in the duct for transferring energy from a prime mover to the fluid. The system is used for propelling low-speed craft where low draft is required and for propelling high-speed craft as an alternative to a mechanical transmission and propeller system

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