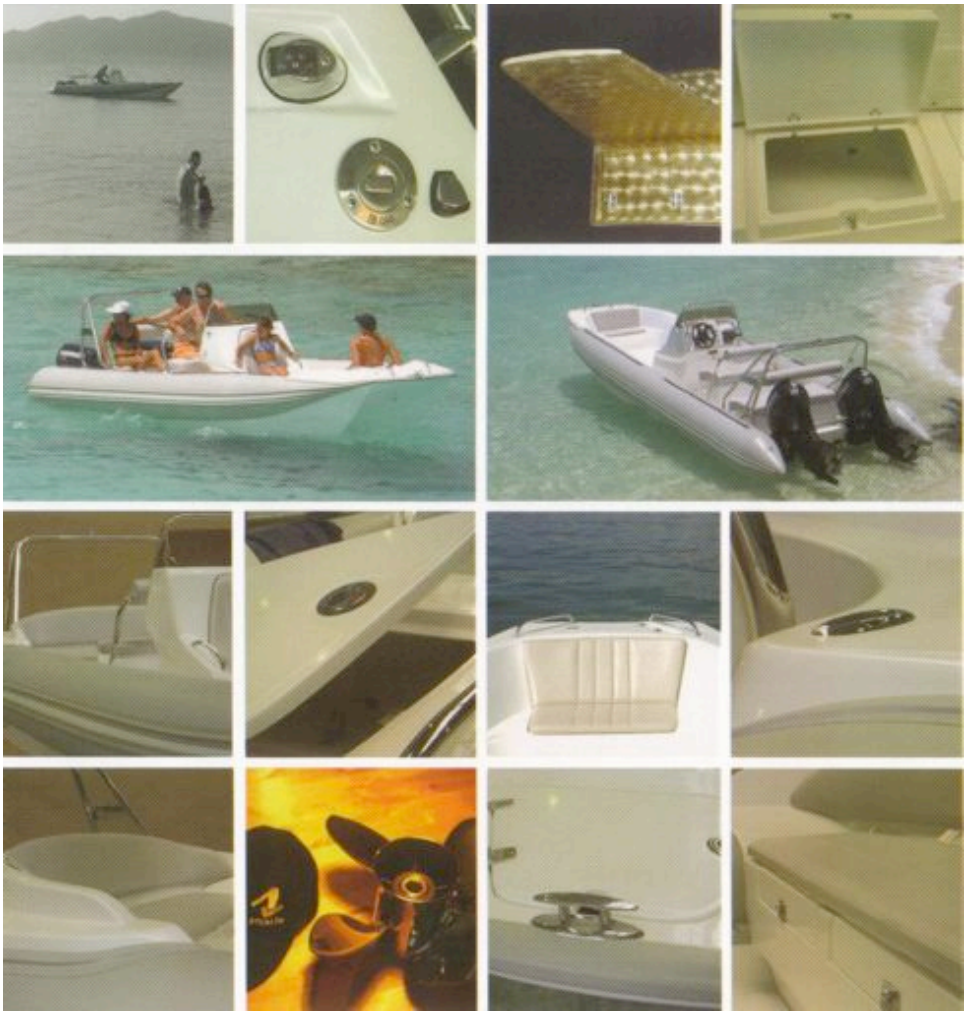
Power Katamaran Stealth „Hysucat Technics“

Data and Facts



Overall length	6,5 m
Waterline length	5,8 m
Width (filled pontoons)	2,48 m
Width on the water	2,0 m
Pontoon diameter	0,5 m
Dry weight without engine (basic)	585 Kg
Dry weight without engine (leisure)	685 Kg
Max. permitted total weight	1.500 Kg
Max. number of passengers	12
Number of pontoon chambers	6
Minimum single engine power	67KW (90PS)
Maximum single engine power	112KW (150PS) *)

*) Under spezial circumstances are engines up to 250PS possible.

„Hysucat Principles “

The abbreviation Hysucat stands for Hydrofoil-Supported-Catamaran which describes a hybrid type of Boat consisting of a planning type catamaran equipped with a hydrofoil system. A typical example is shown in the sketch of Figure 1.

Figure 1

A hydrofoil is a wing like structure which is installed under water and which is similar to an aircraft wing. **Figure** 2.

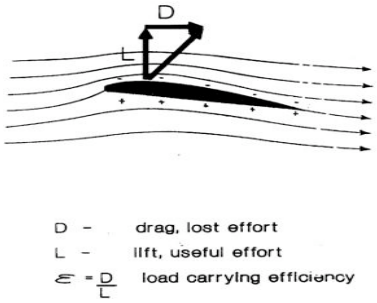


Figure 2

It has a characteristic streamlined profile form which creates pressure differences on the upper and lower surfaces as schematically indicated in Figure 2 when it runs in a parallel flow. The pressure forces are negative on the top surface and positive on the lower foil surface. The summation of all the pressure elements on both surfaces results in a lift force L , (called “Lift”) vertical to the inflow and a dragforce D (called “Drag”), parallel to the inflow.

Such wings are used on aircraft wings, propeller blades, pump blades and fan and turbine blades and Hydrofoil Craft. In most technical applications the Lift L is a desired force (lifting-up force!) and the drag D is an undesirable force component opposite the flow vector because to overcome the resistance or drag force considerable energy has to be fed in by the engines and propellers which leads to fuel consumption with continuous costs.

The ratio of the drag D over the lift force L can therefore be considered as a kind of efficiency indicator: **e = D/L** and is known as the drag-lift-ratio.

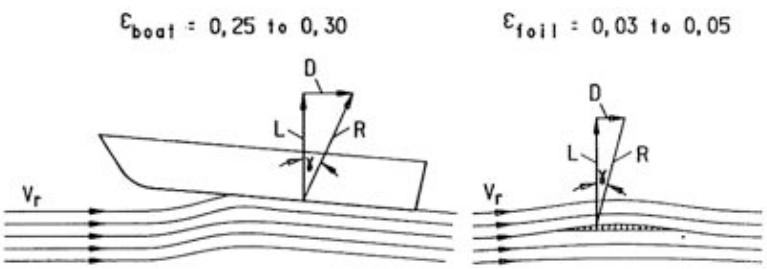


Figure 3

A planing craft running with high speed along the water surface maintains the attitude and trim due to dynamic uplifting forces, so called planing forces and therefore can be considered in a similar way as the above hydrofoil wing.

A comparison of the planing craft with the hydrofoil wing is schematically presented in Figure 3.

The drag-lift ratio of the boat is much higher than the one of the hydrofoil wing. Experience values show that the drag-lift-ratio of the foil is about 10 times smaller than the one of the boat.
In short it means that the load carrying efficiency of the foil is much better than the one of the boat.

The basic principle of the Hysucat uses an efficient hydrofoil system in the tunnel between the two demi-hulls where it does not disturb view or operation of the craft. The hydrofoil system consists of a mainfoil in height of the keels and slightly forward of the centre of gravity of the craft and two smaller strut foils in the tunnel near the transom as indicated in Figure 1.

At speed the hydrofoils create dynamic lifting forces which keep the catamaran partly above the water level. This way the demi-hulls of the catamaran are moving less deeply submerged through the water which results in smaller buoyancy and lift forces which means that the hull resistance is smaller. As the efficiency of the hydrofoils is considerably better than the one of the hulls the total craft resistance of the Hysucat is much smaller than the one of the catamaran.

At speed the remaining hull parts in the water create sufficient transverse and course stability.

The arrangement of the foils is important to achieve sufficient longitudinal stability and requires that all the force components of hulls, mainfoil and trim foils are in balance around the centre of gravity at all speeds.

A special characteristic of the hydrofoil which is known as the foil-surface-effect and which means that the lift and drag reduce gradually when the foil approaches the water surface from beneath. This effect is used in the Hysucat for an automatic trim stabilisation.

For example, if the rearfoils approach the water level their lift reduces which means that the craft's trim is enhanced which is desired as the planing hulls reduce the trim at high speeds. At very high speed the rearfoils may surface with their lift capability switched off.

In short the Hysucat maintains an efficient trim angle at all speeds which results in smaller wetted hull area with corresponding lower resistance.

To use the trim-controlling capability of the trim foils efficiently they have to be arranged somewhat higher on the inner tunnel wall near the transom as indicated in Figure 4 which means they run similar deeply submerged as the mainfoil.

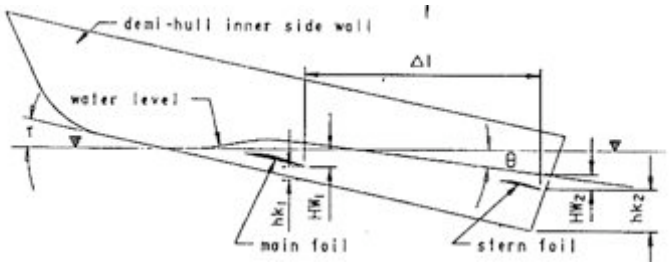


Figure 4

The mainfoil lift results in a down-wash with angle T and this also has to be considered for the rearfoil setting.

For the right arrangement with the corresponding foil submergences HW2 an automatic trim effect is created which gives the Hysucat a favourable and efficient craft attack angle in the whole speed range. Adjustable foils are not necessary.

The resistance of the Hysucat is much smaller than for the comparable catamaran and especially at high speeds. Around the year 1980 some tests on a Hysucat model were conducted in the towing tank at the University of Stelllenbosch, South Africa and the very first test showed a resistance reduction due to the foils of 40%. This unbelievable improvement led immediately to the creation of the Research Project “Hysucat” which now is active for more than 25 years and which has produced many more improvements by systematical optimisation.

As the resistance of the craft is directly proportional to the required propulsion power the Hysucat needs only smaller engines than the catamaran and is more economical in fuel consumption, even than usual deep-V-planing craft.

Further improvements of the Hysucat were observed on it’s sea-keeping and rough water behaviour.

The foil system gives a strong damping effect of the vertical and pitch motions which gives it a most friendly sea-keeping in rough water which does not exist on usual mono-hulls or catamarans.

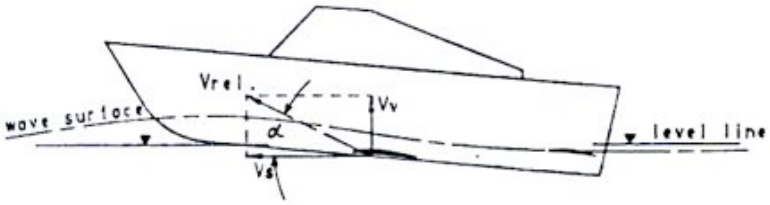


Figure. 5

Figure 5 the damping effect is demonstrated. If the Hysucat runs into a wave crest head-on the demi-hulls will be submerged deeper with a larger uplift force which pushes the forward part of the craft up.

This creates a change of the relative inflow angle towards the mainfoil with a smaller or even negative attack angle a which reduces the foil forces momentarily. In other words, by running into waves the hull forces are increased but the foil forces reduced.

When running through a wave trough similar force variations result, so that the total wave running behaviour gives much softer water in-and out motions. The extreme and hard pitch motions of fast planing craft in rough water are absent for the Hysucat.

The Hydrofoil System means 40% faster, 40% higher range and 40% less fuel consumption compared to equivalent monohull boats.

Tests with different engines showed that a strong engine (e.g. 250PS egine) saves even more gas. The boat starts to glide on the water at low RPM (around 2000) and high speed can be reach at approximately 4.5000 RPM.

The best MPG (Miles Per Gallon) ratio was reached with a 150PS engine and middle range RPM.

Impressions of a Stealth 6.50 basic:

Purpose/Field of Use

The Power Katamaran can be used in multiple locations and for various purposes. From lakes to rivers to oceans, its dynamic driving characteristics are perfect for the high waves of the open sea. The pontoons make this boat nearly insubmersible.

The Power Katamaran is perfect for diving stations and can hold up to 12 passengers. Its high speed assures you reach the diving zone in a short amount of time. Its speed also makes this boat ideal for rescue missions when diving accidents occur. Additionally, the boat can be converted into a yawl and used for short trips.

Another realm for Power Katamaran usage is that of the fun sport arena. With the Power Katamaran, you can waterski, wakeboard, and attempt all kinds of other water sport activities! Because of its open sea capabilities, as well as its enormous power, this boat can be an asset for hosts of private and commercial events. Tests show that 4 people can waterski at once with the Power Katamaran! With a minimal gas consumption you could only dream of until now, innumerable activites can be accomplished via the Power Katamaran.

A unique facet is that the Power Katamaran can be used in addition to a yacht. The yacht remains in the harbor as the catamaran is taken for short trips. Its safety features and limited space requirements make the catamaran an addition nobody wants to miss.

Furthermore it can be used as rescue boat. Institutions such as coast guard units can make use of the fast and reliable technique of the Power Katamaran. In a field such as this, security standards, effectiveness, and economics all play a critical role; the Power Katamaran meets these high criterion and beyond!

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