The Latest News from AeroSouth - February 2022

World's Best Sunfish Class Replica Daggerboard is Here!

As described in our January newsletter, AeroSouth has for some months been working on a Sunfish Class Replica daggerboard to address the global shortage of such components. We are happy to announce that we are now taking orders for the **AeroSouth "Classic" Daggerboard.**

Compared to other designs that adhere to the ISCA Specifications, the Classic has a number of **nice benefits:**

- Strong core made from a laminate of Sapele Mahogany, the same wood used in our high-performance **Sabre Daggerboards** and **FS Rudder Blades**. **10% lighter**

than composite boards.

- Available in **epoxy clear coat** to show off the beautiful grain of Sapele, or in one of **40+ bright colors** to liven up the appearance of your sailboat (available March 2022).
- An option for a high-gloss, **very slippery surface**, technology borrowed from surfboard shapers, to guarantee the **lowest possible drag** when sailing (available March 2022).
- A new head design that **eases gripping**

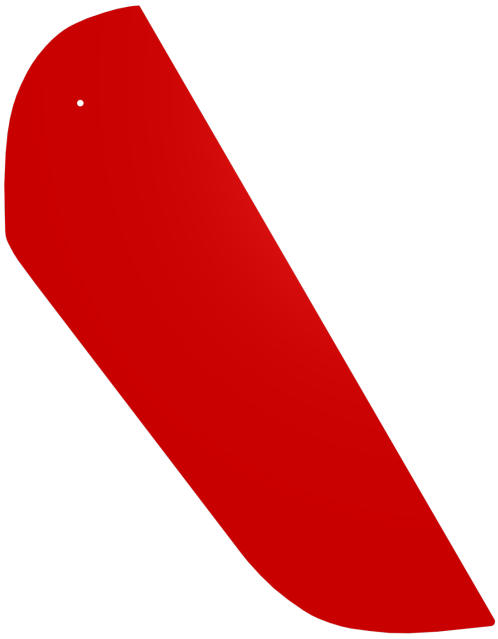
and includes a robust, pre-installed **rubber stop set** at no extra cost.

And, as with all AeroSouth products, the Classic is **100% Engineered and Made in North Carolina, USA,** virtually eliminating supply chain problems caused by overseas production.

The basic price is the same as for our high-performance **Sabre daggerboard**, $300 plus taxes and shipping. Color and high-gloss surface treatments are extra and custom made to order.

AeroSouth thanks **ISCA Chief Measurer John Butine** for his help in confirming that the our new Classic daggerboard adheres to ISCA/USSCA Class specifications and would be allowed in Class competition whenever replicas are permitted.

Order your AeroSouth **Classic Daggerboard** at the **AeroSouth Store** today and be ready for the next sailing season!



Class Replica Rudder Blade under Development

With our new **"Classic" Sunfish Class Replica Daggerboard** now in production, we thought it appropriate to round out our palette of boards and blades for the world's most popular small sailboat by offering our own **Class Replica Rudder Blade.**

As with our new replica daggerboard, the Classic blade will include some nice benefits compared to those offered by others. It will join the world's best-performing **"FS" rudder blade from AeroSouth**, available now at the AeroSouth Store.

Stay tuned in the March newsletter for more news on the AeroSouth Classic rudder blade.

Dinghy Bob helps return an Arizonan to Sailing

Patricia Pearson of Chandler, Arizona recently wrote us to describe why she installed a Dinghy Bob on her nice

Sunfish, shown peeking out of her spar bag in the picture here.

Hi Kent,

We really like supporting small businesses. We will send a picture of our Dinghy Bob after it is installed and maybe we will decorate it or something at some point and send pictures. We will be sailing it out on Tempe town Lake in Arizona and Lake Pleasant.

I am returning to sailing after many years and your product will make me feel more comfortable going out on my own.

Patricia

Thanks Patti - We created Dinghy Bob for reasons just like yours. Smooth Sailing!

AeroSouth - Launches Design/Prototyping Services Division

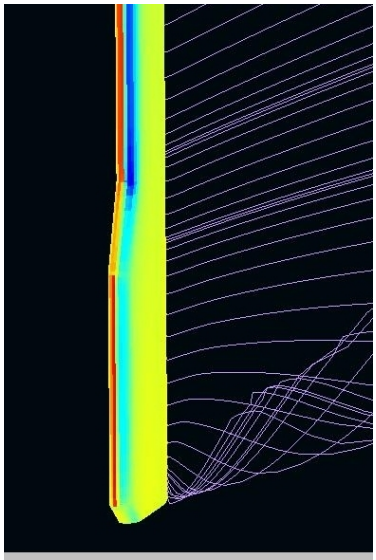
AeroSouth is pleased to announce the creation of a new division focused on design and prototyping services, or **AeroSouth DPS** for short.

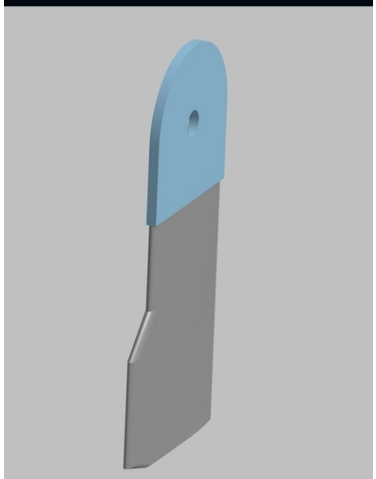
With the motto **"From Challenge to Solution"**, we bring over a half century of experience in engineering design and fabrication with a focus on aerodynamics, hydrodynamics, plastic, composite and metal fabrication related to aircraft, marine craft, sporting equipment, energy production and air-moving equipment.

A simple example is shown to the left, a new rudder for the **Shearwater 28** sailboat. The customer wanted to reduce the high tiller loads (weather helm) and also achieve better overall efficiency similar to our world-leading rudder blades for the Sunfish sailboat. AeroSouth developed new hydrofoils for the thin rudder blade and added an extension to help offload the tiller. A computer rendering of the final shape of the (retracted) rudder blade on the boat's stern is shown in the lower image.

AeroSouth has a strong network of local engineering and fabrication experts that support our work. These include the areas of CAD/CAM/CAE, machining, sheet metal fab, composites, rotational molding, 3D printing, laser cutting, CNC milling, and other areas.

Our staff has experience in a variety of industries including marine, aerospace, defense, large industrial fans and blowers,





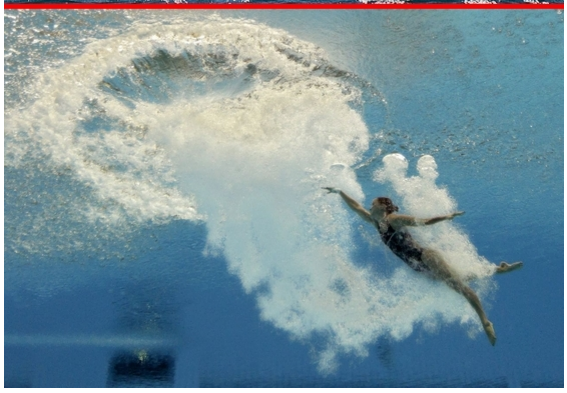
on- and off-road vehicles, and motorsports.

Should you have a challenge that needs a solution, or a product idea you'd like to take to the prototype stage, **please contact us** and let's start a discussion.

P.S. - German Spoken Here. Gern korrespondieren wir auch auf Deutsch!

The Science of Sailing #5 - The Flying Sunfish - Part 2 - Cavitation, Ventilation, and Entrainment

In Part 1 of this mini-series on foiling we gave a very brief history of boats operating



above the water on hydrofoils. We promised in Part 2 to do some basic calculations to see what might be needed to make a Sunfish fly. We're going to postpone that and instead touch on some basic physics that affect all sailboats but are particularly important for "foilers". The focus will be on the terms **cavitation, ventilation and entrainment.**

When a fluid like water flows around an obstruction - or in the case of a sailboat, the obstruction moves through water - it will accelerate until the largest obstruction passes, and then decelerate until it reaches the speed of the surrounding, undisturbed fluid. **Bernoulli's Principle** tells us that the static pressure of the fluid, that is the pressure transferred from the fluid to the object (like a keel, daggerboard, rudder blade, foil, etc) varies with the inverse square of the speed of the fluid just off the surface. Higher speed, lower pressure. Engineers choose or design shapes generally to minimize the drag caused when objects move through the water (but that is another topic for a book or two on the subject!).

If an object is fairly large and / or its speed through the water is more than, say, 10 knots, there is a good chance that the lower pressure on the thicker parts of its surface might drop below the vapor pressure of water, the pressure at which water changes from a liquid to a gas. When this happens, the water is said to **"Cavitate"**. Small water vapor bubbles will appear and grow to create sheets of water vapor where the water pressure falls below the vapor pressure. Since water vapor is far less dense than liquid water, forces exerted on the object will change dramatically where cavitation occurs. The image at the top here shows cavitation on the blade of a boat's propeller.

Even worse, as the object passes, the fluid velocity drops, the pressure increases, and the small water vapor bubbles will collapse into themselves, sending a tiny but powerful jet of fluid shooting out the opposite side of

the collapsing bubble. This can and does cause major erosion on underwater parts, especially on the blades of ship screws. A good designer of sailboats that operate at higher speeds knows the boundaries of flow regimes where cavitation could occur, and he selects shapes that will minimize the potential for it. For foilers, this typically leads to struts and wings with sharp leading and trailing edges and gradual, lens-like thickness distributions. On very high speed sailboats such as the British **Sailrocket 2** or the French **Syroco**, cavitation can not be avoided so engineers strive to take advantage of it.

Ventilation is another phenomenon somewhat related to cavitation. It occurs when underwater parts of the boat pierce the water surface, as on a rudder mounted on the stern of a dinghy such as a Sunfish, Laser, Finn, etc. It will also occur on the strut attached to an underwater foil (as on a so-called T-foil), or a foil that by design pierces the surface under certain circumstances (as on a so-called V-foil, J-foil or similar shape). Ventilation can be clearly seen behind the surface-piercing struts in the 2nd and 3rd images here of a hydrofoil ferry boat and an AC75 sailboat.

Whenever a moving body pierces the water's "Free Surface" its own pressure distribution causes the water's surface to deform. If the surface-piercing object is of any significant thickness, it will cause a reduction of pressure (as in our discussion above concerning cavitation) that is "felt" by the water at its surface. This can be strong enough to pull the free surface down towards the underwater, low-pressure boat surfaces. This is what is known as **Ventilation**, as the surface air is literally pulled underwater and in essence "ventilates" the low-pressure boat surfaces. Just as in the case of cavitation, the forces created by the component now "ventilating" change dramatically, for instance the rudder becomes less effective of the foil produces less lift.

Once the low pressure part has moved on, the force pulling the free surface downwards is lessened and the ventilation ends, with the depressed water surface returning to its normal state. Under extreme conditions, the water surface will shoot upwards in a phenomenon known as a "rooster tail". One sees this for instance on the aft edge of the surface-piercing struts that support the underwater foils on the AC75 boat shown in the image here. Note that cavitation and ventilation can occur simultaneously, but ventilation only occurs when a free water surface is involved.

The last term related to this topic is **Entrainment**. When an object plunges into water, for instance a competitive diver, some of the air is somewhat "stuck" to the moving object and travels with it for awhile into the water, eventually separating through the force of buoyancy and bubbling up to the surface. Watch someone diving off a boat or from a diving board to see this clearly. Entrainment occurs though also on sailboats, especially at the stern, where the flow is generally highly turbulent, unsteady and affected by the large differences in speeds just aft of the stern and around the smoother-flowing regions to the boats' sides. Our surface-piercing rudders on the Sunfish and Laser act in this messy water with extensive entrainment of surrounding air. For this reason, there is little point in trying to improve blade efficiency within, say, the first 10%-20% of its depth. Best is to "minimize the damage" caused by all the turbulent flow in this region and keep the blade as thin and narrow as possible, which can be clearly seen on our world-leading **FS Rudder Blades**.

We hope that this brief explanation of **cavitation, ventilation and entrainment** help clear up any confusion on these topics. They will be important considerations as we look deeper at how one might make a Sunfish fly on water wings.

SAIL FASTER - HAVE MORE FUN

AeroSouth Technology LLC