

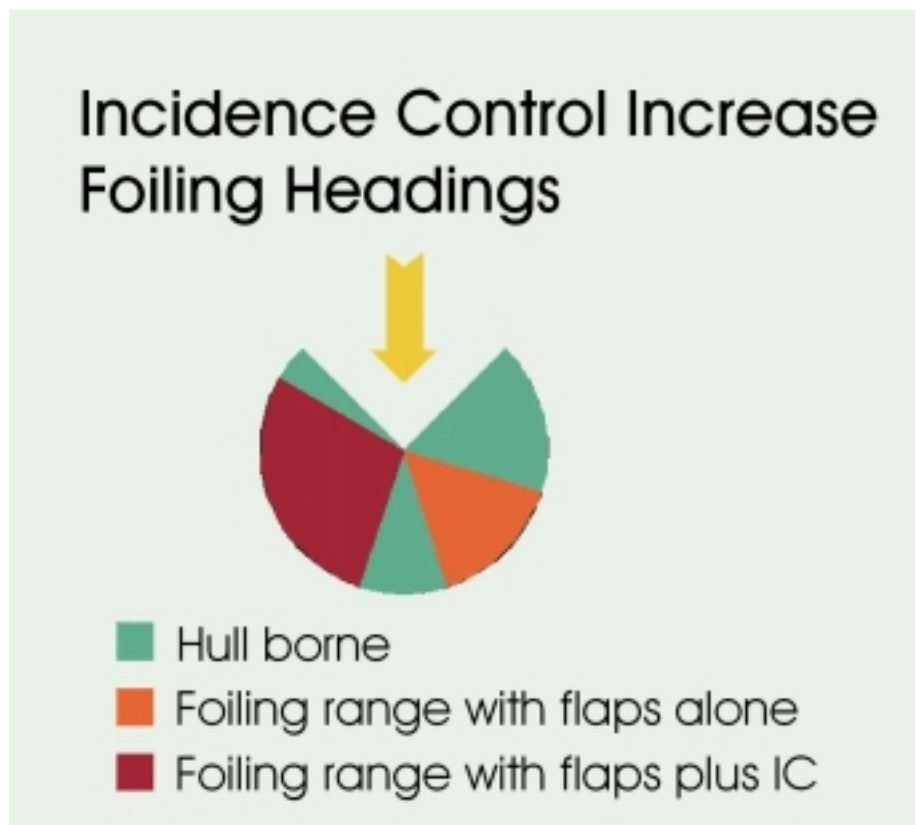
## \$40 Adaptive Incidence Control System for Raves.

I have implemented a variation of the “Take Two” incidence control system described in an earlier article on this website, and now after several weeks of trials and two regattas, I can report that IC makes a substantial improvement in the Rave’s foiling performance. The design described in the article takes special care to constrain the amas from rocking, but I found that the friction in the system made adjustments on the water very difficult. Eventually, I realized that a peculiarity of the Rave design made tight constraints of the ama totally unnecessary. Let me explain.

As every Rave pilot knows, the ama crossbeam tubes slide into the main hull’s crossbeam tube. Bolting the tubes together fixes the foil incidence at about plus 3 degrees. This plus 3 degrees is great when you need extra lift to get the boat to take off, but once on foils, you have to pull hard on the flaps to keep the foils from rising too close to the surface and ventilating. The problem gets worse as you start heading upwind on foils. Eventually, the upwind foil lifts totally out of the water and you crash.

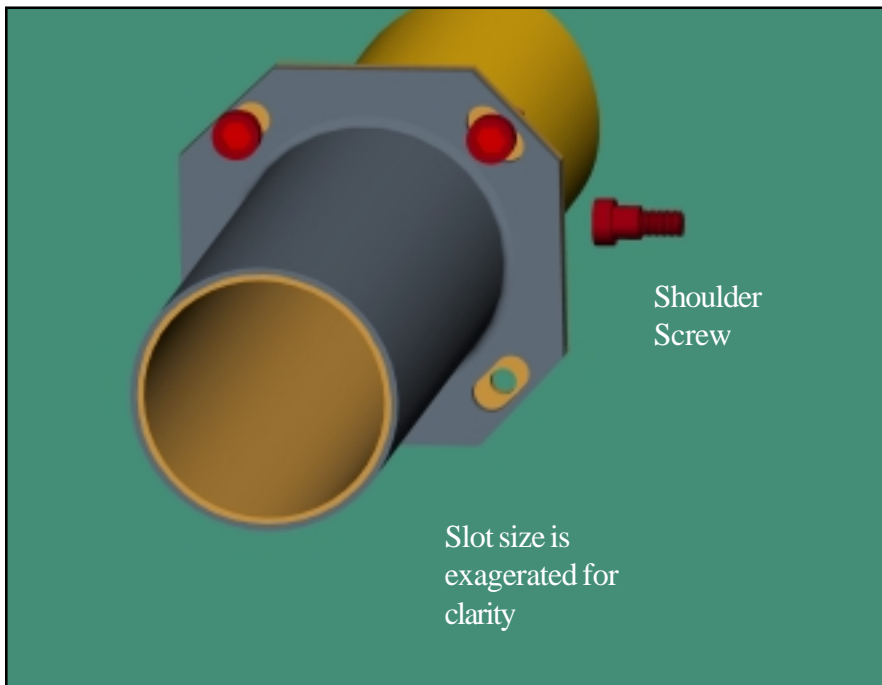
Now imagine that we replace the standard ½-inch bolts holding the crossbeams together with 3/8-inch bolts and that the bolts are only finger tight so that the amas can rock back and forth a few degrees. Here is what I observed. The shrouds holding the mast up are attached on the aft side of the crossbeam, so the upwind shroud pulls with the full force of the sails to rotate the ama bow down reducing the foil’s incidence. This is just what we want. Reducing or eliminating the lift of the upwind foil lets it act like a crewmember hanging out on a trapeze. Now the boat points higher when the boat is foiling and there is less drag when the boat is hull borne.

What about the downwind ama? The shroud is always slack on the downwind side of the boat so it does not affect the ama’s rotation. However, when the boat is moving forward hull borne, the drag of the foil rotates the bow of the ama down reducing the incidence and drag of the foil. As an added bonus, it rotates the ama’s stern out of the water. Perfect!



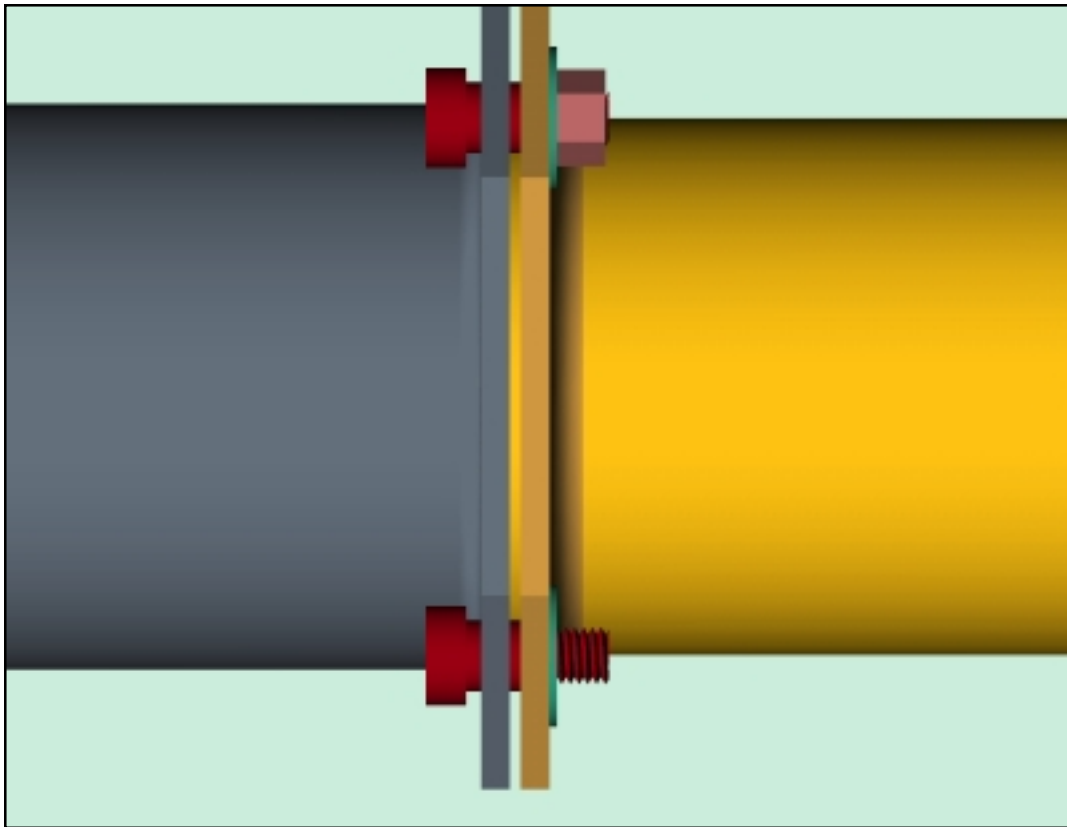
Remember that the foilbox is mounted forward of the ama's cross beam. As the wind picks up and the boat speeds up to about 11 mph, the lift of the foil increases until it eventually forces the bow of the ama to rotate up and forces the foil incidence to maximum. (This may seem a little counter-intuitive at first, but I can demonstrate it on my boat.) Again, this is perfect. The downwind foil is set to maximum lift, and the upwind foil is fixed at minimum lift. For the first time, you can foil to windward. The most amazing thing is that everything reverses automatically when you tack!

Before incidence control, I would foil across the lake in about ten minutes and then spend an hour slugging my way back upwind to the starting point. Now with IC, I foil back and forth across the lake in the same track or make headway to windward. In around-the-buoys racing, standard boats usually foil on one of the reaching legs. With IC, you can foil on both reaching legs. Double your pleasure, double your fun.



I still have the full-blown "Take Two" system on my boat, but it looks like you can build in 95% of the advantages of automatic incidence control with a minor adjustment to your boat. All you need is eight shoulder screws and your tool chest. I am using off-the-shelf stainless-steel 5/8 x 1/2-inch shoulder screws available from Servtronics. The part # is BSHSS5/8X500. My contact's name is Doug Wilson. Phone him at USA.407.677.8191. Here's the best part. The screws only cost \$5.00 each. Mount them with the same nuts and lock washers that come with the Rave.

The only thing you have to do is cut the slots in the main cross beam gusset. My experience suggests that the slot should allow the ama to rotate plus or minus 2 1/2 degrees from the standard Rave setting. Mount your boat on its trailer and lash the cross beams to the trailer. Install the amas and clamp them to the boat in the standard position. Make a mark across the two gussets so that you can use it to realign the gussets later. Let's start with the starboard side. Note the angle of the ama gusset with an inclinometer. If you do not already have one, you can buy an inclinometer at a hardware store for a few bucks. Now rotate the ama bow down 2 1/2 degrees from normal. Clamp the ama in place. Scribe the new positions of the four mounting holes on the main cross beam gusset. Repeat the procedure rotating the bow up 2 1/2 degrees from normal. Pull the starboard ama off the boat. These scribe marks show the maximum rotation of each slot. Now use a compass to mark a 5/8 inch arc centered on the standard mounting holes. Then file out the four slots by hand with a sharp, large diameter rattail file.



Now reassemble the ama and bolt it together with the shoulder screws. Readjust the slots, if necessary, until the ama rocks back and fourth  $2\frac{1}{2}$  degrees from the standard setting. Repeat the procedure on the other ama. Now you are ready to launce your boat and scream over the waves with one ama cocked up and one down.

I use hand controls, but I believe automatic incidence control will work equally well with wands. Of all the suggestions on this website, I believe that this simple modification will improve the speed and fun of your boat the most. Go for it. If you don't like it, you can always put the original  $\frac{1}{2}$ -inch bolts back in and forget it.

Be sure to contact me through the Windrider Phorum before you implement this modification to see if there is an addendum.

Stay tuned,

Doran Oster  
Rave 72  
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