



Ed's Essay - Wing Incidence Change

[Ed Fisher](#)

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Sonerai.net presents the first of several speed enhancement modification articles by Ed Fisher. Ed has been involved in sport aircraft since the 1960s and started building airplanes in 1971. He built and raced a Formula-V Sonerai 1 called Blueberry.

Scott has asked me if I would willing to contribute to the site with writings concerning the many speed modifications and experiments that myself and others have accomplished with the Sonerai's over the years. I fired back a note that I would be happy to, and can think of over ten upgrades/mods that improve the Sonerai 1 flat out speed, and I am sure that 'most' of these mods can improve the overall performance of the Sonerai 2 as well.

Most all of these Ideas are airframe specific, and were tested by myself on 'Blueberry' Sonerai 1, N77KE, which I built in 1978. After I sold the racer to Jim Vliet, he and Charlie Terry teamed up to continue to refine and modify, including installing a real race engine/prop, to the point that the improvements netted close to 25 mph in top speed increases in the 20 year career of that airplane. Today 'Blueberry' resides in the american powersports Museum, in Novi, Michigan, a lasting tribute to this veteran raceplane, which participated in more Formula V air races than any other. I am free and willing to share this information to the Sonerai Pilots and builders who are willing to listen in, and I will refer to #77 and other Vees often. So we begin....

The first topic will be a wing incidence change that we made to #77 in 1978. A bit of background first...

Many of you have met, or seen, John Monnett. As the designer/builder of the very first Sonerai 1, he freely admitted that this basic, no frills Formula V weighed in at about 440 pounds empty. As well, John is a slimmer, lighter person than most of us, so you can imagine that his performance numbers would be very good, based on the fact that he was probably flying at a gross weight of less than 700 pounds. The airplane flew well and straight, and his wing incidence was nil- based on lofting the wing chord line/zero lift lines. The 64 series airfoil worked great for his original gross weights. However, the 'twinkie-effect' takes place with most builders, and usually plans-built examples are never as light or efficient as the original prototypes. Plus- people over 200 pounds are fascinated with tiny airplanes for some reason, I am an excellent case study of this.

Anyway- In the air to air photos of #77, I kept noticing that the fuselage was a couple degrees nose high in otherwise level flight. The airplane originally weighed 517 pounds empty, considerably more than Johns 440 figure, but in later years I realized that 520 pounds is probably the average weight of all the Sonerai 1s ever built. AND...The 'S' mod instituted into the Vee rules added an additional 12 pounds, minimum, to any Sonerai 1 that was to race.

The 'nose high' attitude does not mean that the airplane was tail heavy at all, it merely means that with the higher gross weights, the 64 series airfoil needed more 'bite' to produce the lift required for the gross weight. This nose-high stance drags the fuselage belly around as if it is an air-brake.

My initial fix was to disconnect the rear spar carry-thru angle from the fuselage bushings, drop-and-shim the bushing/angle connection one quarter inch for starters. I also re-adjusted the aileron push pulls. This amount of incidence change at the wingroots noted an immediate 2 to 3 mph speed gain, and I could see better forward as well. Further changes gained a one to two increase again, but that is where I had to stop, as I was now trying to twist the main spar in the spar box more than I desired.

Years after I sold the plane to Jim, he and Charlie actually cut the main spar box attach bushings and dropped the wing trailing edge some more. The airplane now flew 'up on the step' so to speak, with the belly trailing in clean air, and the horizontal stabilizer, re-adjusted, flying at or close to 0 degrees.

All this effort probably gained the racer about 6 mph, which does not sound like much, but it is probably the difference between 3rd and 1st place in a race! Having never done this mod to any Sonerai 2, I cannot comment on how effective it would be, but it certainly works on the Sonerai 1 that may be flying at a gross weight in excess of 750 pounds.

Again, this worked for us on our airplane, and I understand, as a fellow aircraft designer, that this mod, and others are not endorsed by John Monnett. When you are the manufacturer of your own experimental, amateur built aircraft, the designer has little control over modifications undertaken by builders. Everything that I have ever designed or built I have personally tested for safety and reliability.

If you have comments on this or other articles, please post them to the Sonerai.net [Forum](#).