

# SONERAI NEWSLETTER

JULY-AUG-SEPT 2009

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## ***RICHARD FOSTER'S SONERAI ILS AT OSH '96***

### **OSHKOSH '09 – IT'S THAT TIME**

In just a couple weeks, it'll be time for that annual aviation extravaganza known as EAA AirVenture 2009, or as most of us oldtimers call it, "Oshkosh". Based on what's been published on the EAA and AirVenture websites, it's going to be another interesting year, with lots of changes to the grounds, and lots of interesting airplanes, including the Airbus A380. I wonder how many Sonerai's

you could park in the shade of the wings of that monster?

As usual, we are planning some things that should be of interest to you Sonerai folk:

- The *Sonerai Builder's Forum*, by your intrepid editor, on Wednesday, 7/29, at 1:00 PM in the 017 Workshop Classroom. This venue is next to the Wood Working Workshop.

- The *VW Engine Building Workshop*, by Steve Bennett. This workshop runs for five days, Monday, 7/27, thru Friday, 7/31, from 2:30 to 3:45 PM each day, in the 020 Engine Workshop. Steve covers a different aspect of engine construction each day. It'll be time well spent.
- The *VW Engines in Homebuilts* forum, by Steve Bennett, on Tuesday, 7/28, at 11:30 AM in the 004 Pavilion.
- The *AeroVee and AeroCarb* forum, by John Monnett, on Thursday, 7/30, at 11:30 AM in the 003 Pavilion.
- The *Sonerai Picnic* hosted again this year by Jeff Lange. It will be on Wednesday evening, 7/29 at his hangar on the Northeast side of Wittman Field after the airshow. If you're coming, please let Jeff know at [jeff@sonic-art.net](mailto:jeff@sonic-art.net). He'll give you directions if you need them. This is always a fun time, and a great opportunity to meet and talk to other Sonerai builders face-to-face.

The Great Plains Aircraft Supply folks, Steve and Linda Bennett, will be there again this year. Their booth will be in the D exhibit building. Since they don't bring a lot of merchandise with them anymore, if you need something specific, give them a call prior to Oshkosh, and place an order. They will bring it with them so you can pick it up at the event.

It looks like I'll be spending most of the week there. I've volunteered to have my IIL in the Affordable Flying Center display again this year, and will be presenting my *Sonerai Stories: 33 Years of Affordable Flying* forum (and hopefully a *Scratch Building a Wag-Aero Wag-A-Bond* forum), but I haven't been given a schedule as of this writing. So check the forum schedules if you are interested. Please stop by and say "Hi".

So, I hope you're coming, and I hope you're bringing your Sonerai. See you there.

## **SUN N FUN 2009** by Bill Evans

*Since I didn't make to Florida this year (although I did drive to Dayton to visit the Air Force Museum), Bill has provided a short story on his adventures at SNF '09.*

Many of you, who were there, will remember that SNF 2008 was the "mud-in". We walked and drove in mud from Sunday until Saturday. This year the weather was brilliant and blue, so the mud turned

to black dust. We arrived on Monday, and it appeared the recession had hit hard the first day. Actually attendance may have been down a tad, but they were all pilots and homebuilders. Several sellers told me that business was good. I checked in at the International Tent, on Wednesday. Europe and South America were just covered in colored pins. I was surprised at how many listed their private aircraft as they way they got to SNF. Argentina is a long way South.

I bought the stuff I needed at the parts tents, but stayed away from used. I'm in the market for a replacement strobe lamp. "Was" is the appropriate term, because someone told me that Great Plains sells them new for \$7.



A Homebuilt Floatplane on Lake Agnes

Tuesday morning I arrived at the forums at 10am, because my forum was to start at 12 noon. Once again the silicon beetles within the tin legs defeated me. Fortunately someone loaned me his Dell laptop, and it ran my PowerPoint presentation like a charm. I recently bought a new laptop primarily for this, so that was a disappointment. I may use transparencies next year. The forum I present is *Aircraft Inspection Techniques for Homebuilders*. This is the first year I received FAA approval for the AI Qualification. There may be 100 Forums. Just 10 are AI Approved. The Canadians are asking me to obtain the comparable Qualifications since one Canadian Inspector has it now for his presentation.

I travel with a friend Mike, now 82. He says that doing this presentation twice is too much, and that I miss too much. I missed the helicopter aerobatics on Tuesday. Next year, either we'll stay longer or present the forum just once. The assigned tent was just half full.

Last year the Motel we stayed in had a work stoppage by cleaning staff for 3 days. Thus I asked



for a \$40/day reduction and got it. So it now pays to bargain, for everything. Tuesday afternoon was a shopping day for me. They had the SPOT beacons on for \$100 and the whole software package for \$100 due to a deal with an owners association. That amounts to a reduction of \$100. But the SPOT does not qualify as an ELT alternative here (Montreal) so I'll wait. I also took a look at the Whelan Strobes using LED's. They look very slick and for say \$500 each they should be. I passed.

The Star of the Antique Aircraft was a 1949 Bucker Bestmann, with the 160 HP Walter LOM engine. I'm told it was the basic trainer used by the Luftwaffe.



The Bucker Bestmann

Wednesday I toured the homebuilts, before the warbirds, and there was a Sonerai II again this year. The same Florida based aircraft as last year. My forum was at 1pm, and it went well for me. Perhaps a dozen pilots asked me to sign their AI Forms. I was able to take in more of the airshow. I attended just 2 forums, the Jabiru forum and the Caribbean Journey forum. The leader is from France and takes out groups of pilots from Miami. The forum I attended was about the journey as far out as the Turks and Caicos Islands. Theoretically, a Sonerai would have the endurance for the legs. IMHO it's not for us.

Thursday is Splash-in day. We did some other things until the Splash-in began, and then spent the day at Lake Agnes. This year Kermit Weeks hosted the event and performed a demonstration flight with his Grumman Duck. There was also a Grumman Goose, Mallard and Widgeon. They were in very nice shape. Perhaps the most expensive aircraft flying was a Turbo-Prop Beaver, immaculately restored in Yellow and black. The PT6 takes the performance from 450 HP to perhaps 750 hp.



The Sea Max

This year there were more new Seaplane designs, than in previous years. The one that caught my eye is the Sea-Max, from Brazil. It has just a Rotax 914 engine. The upshot is that the fuselage is composite but the wings are partly metal. I was told that part of the wings skin is fabric. The "fabric" felt like Mylar to me. The pilot accelerates from the shore downwind and gets on the step. He turns the aircraft quickly and skids sideways across the water. Once he opens the throttle it takes between 3 and 4 seconds to break free from the water. There were six guys there who said they were serious about buying one. I weigh 280 and was not offered a flight. I don't think anyone of us have seen a 3 second takeoff from water. Last year there were 58 aircraft at the splash-in, but 100+ this year. One of the Sea-Max's had been flown in from Brazil for delivery. I expect that perfect weather contributed to the 100 sea & floatplanes in attendance.

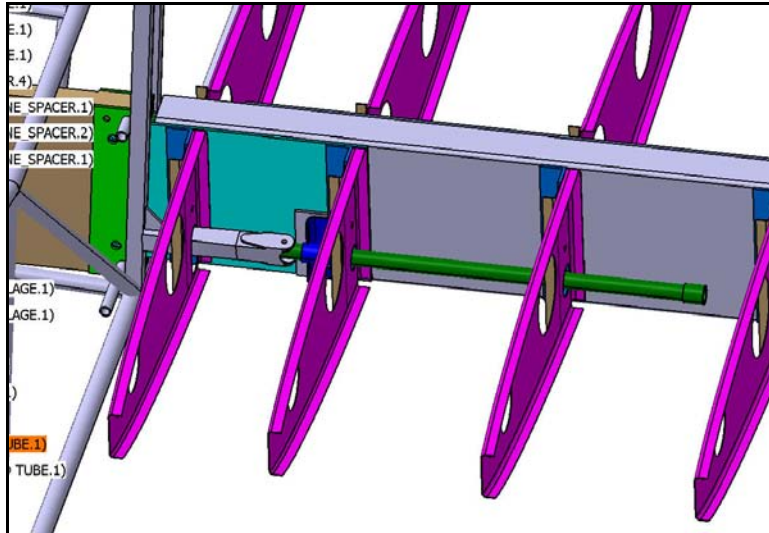
Before departing I toured the antique, homebuilt and parking for new attendees. This is what I found:



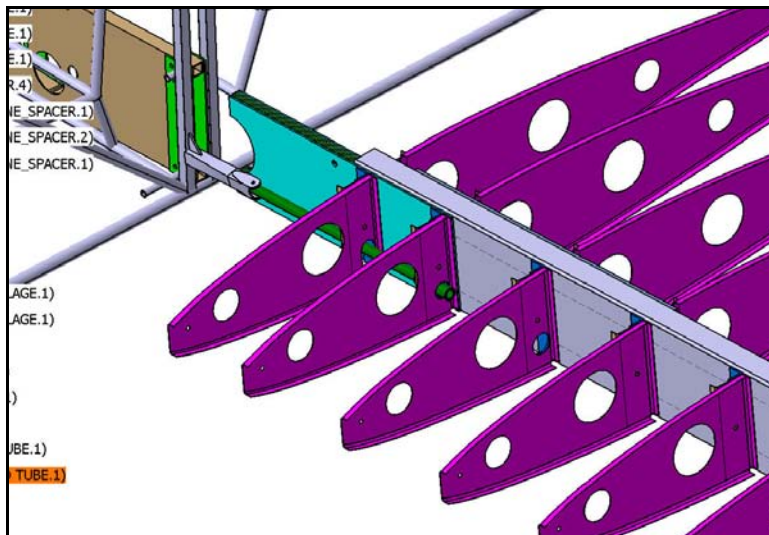
Al Bertelmann's Sonerai II

## HOW DOES THE WING FOLD WORK?

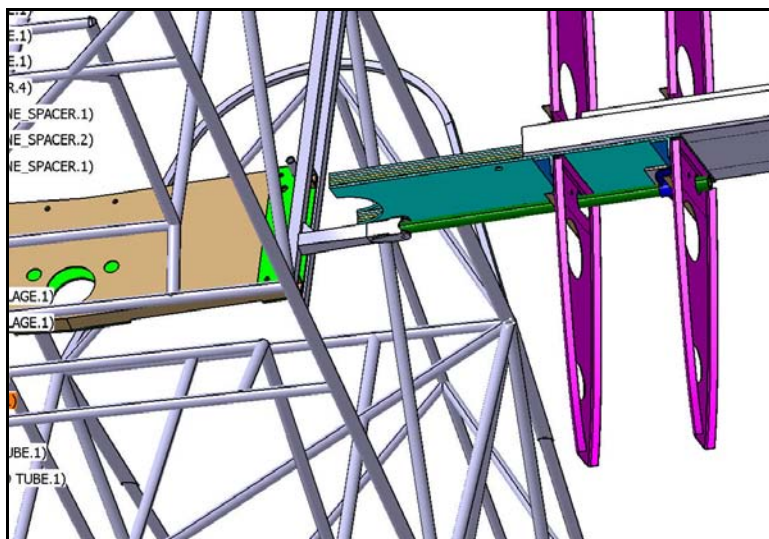
Artwork/CAD Drawings by Dave Wilcox



Wings Mounted in the Fuselage:  
Three of the four fold “mechanism” parts can be seen here: the fuselage bracket, the swivel bracket bolted to the main spar, and the fold/swivel tube that passes thru the swivel bracket and is bolted to the fuselage bracket.

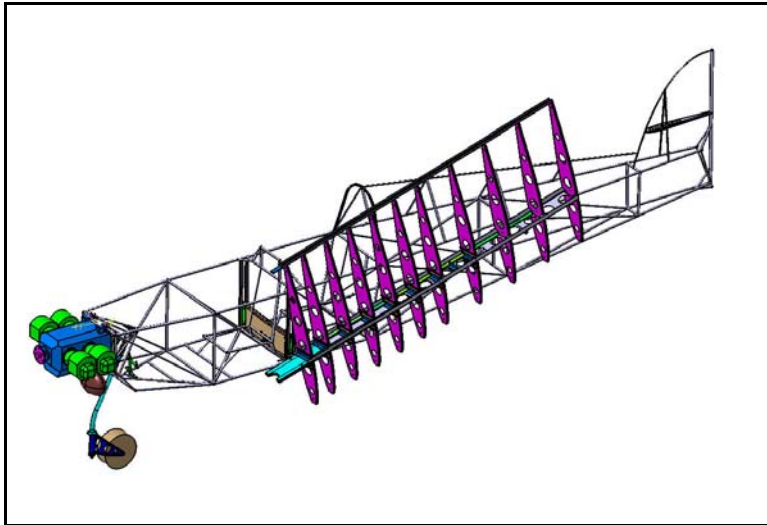


Step 1 – Wing Removal:  
At this point, the three taper pins securing the wing to the fuselage have been removed, and wing has been pulled out of the fuselage to the stop on the fold/swivel tube. The weight of the wing is now supported by the fold mechanism and the person hanging on to the wing tip.



Step 2 – Rotate the Wing 90 Degrees, Leading Edge Down:  
Note how the wing rotates around the fold/swivel tube.

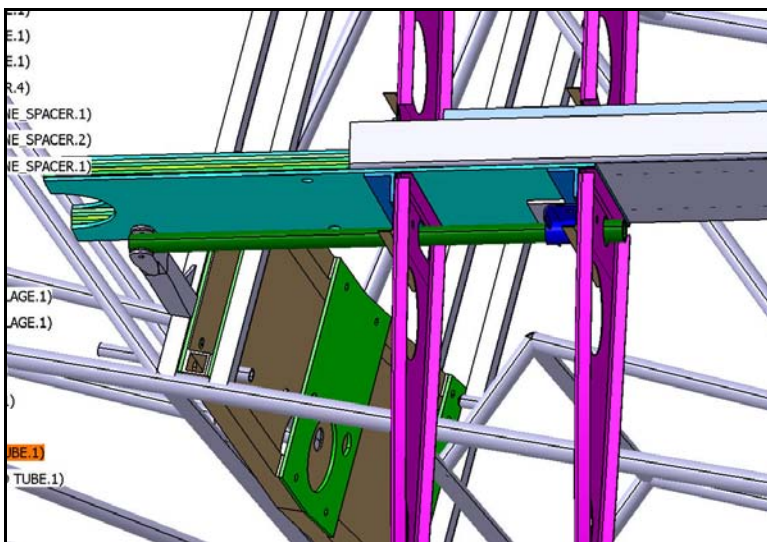




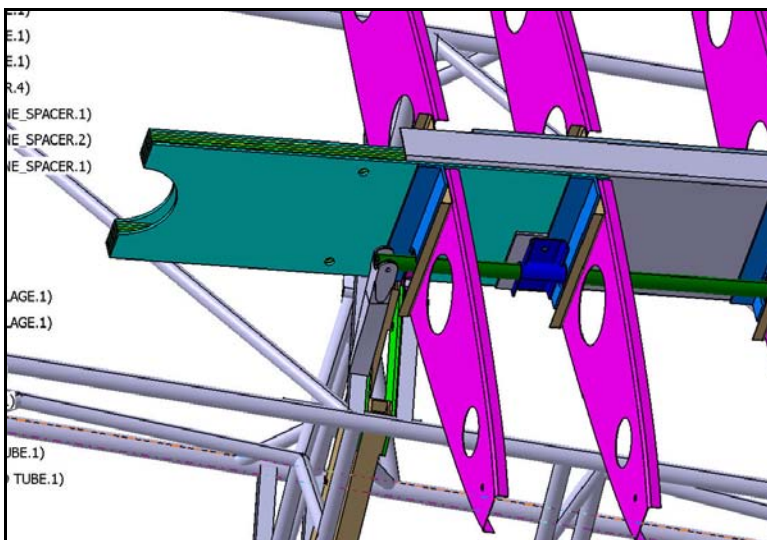
### Step 3 – Rotate the Wing Along Side the fuselage:

The wing is now pivoting on the AN3 bolt that secures the fold/swivel tube to the fuselage bracket.

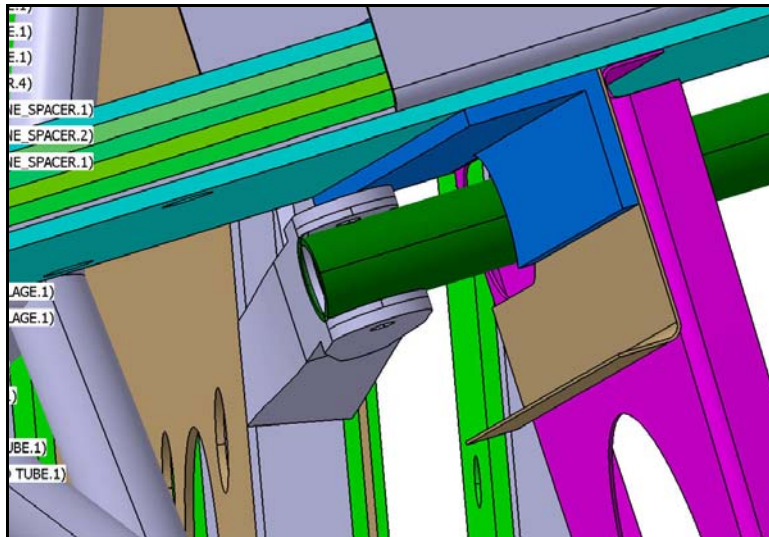
Note how the wing is sloped upward at the tip to allow the fourth wing fold part, the outer support bracket, to align with the mating cross tube welded into the fuselage



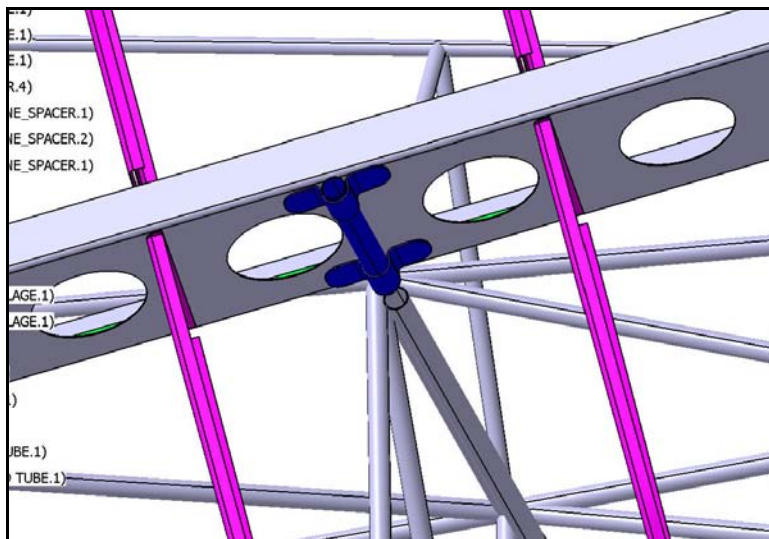
Here's a close-up of the root end of the wing in the folded position with the wing fold bracket still against the stop on the fold/swivel tube.



And here's another close-up showing how the wing has been skid down the fold/swivel tube to allow the outer support bracket to line up with the fuselage cross tube.



And another really close look at the fold/swivel tube-to-fuselage bracket joint. It clearly shows the cutouts required in nose ribs and stiffener angles.



**Step 4 – Insert Wing Support Rod:**

A 5/8" diameter steel rod is now passed thru the outer support bracket and the fuselage tube. The rod must be long enough to engage the outer support bracket on the opposite wing. It's also a good idea to insert a foam donut between the wing and fuselage.



**Step 5 – Install Stabilizer and Aileron Lock:**

A support to lock the ailerons and stabilize the wings is a necessity if the airplane is going to be trailered. This one consists of two brackets machined from aluminum bar stock, and a piece of conduit,

## DO YOU BELIEVE IN THE DRAG BUCKET? by Dave Wilcox

A while ago, on the Sonerai\_Aircraft Yahoo Group, we had an exhaustive discussion about manifold pressure gauges. One member had a situation that seemed to defy my understanding. My experience is that as you climb in altitude, you can expect a decrease in manifold pressure and an increase in RPM. This person was experiencing the opposite response when he descended without moving the throttle. My knee jerk reaction was to think that something was wrong in his indication, but then I started thinking... How often do I change altitude without changing the throttle? Never, not going up, nor coming down. So both he and I agreed to give it a good try. We would fly up to 8000 msl and take readings. Then descend a 1000 ft at a time and take readings in level flight. Then compare notes.

I had to tell you that story to tell you this one. Something very unexpected showed up in my data. There was a step change for the better in my speed at 4000 msl. Please let me make some excuse for my low speed, I've got a tri-gear now with no wheel pants... well, that's not important, but I am a bit embarrassed about the speed, and weight (oh well). Back to the story... The change was close to ten mph.

So I threw the data into an Excel spreadsheet and started playing with it. Looked at true airspeed, no revelation there. The altitude temperature gradient was not very linear, but it also didn't seem to hold the key to a 10 mph change. And then it hit me... could this be the drag bucket?

The drag bucket is why we use laminar flow airfoils for these quick little planes. The flow is only laminar while in the drag bucket. And when it is laminar, the drag on the airfoil is significantly reduced. The Sonerai uses a NACA 64A<sub>2</sub>-212 which is a laminar flow airfoil. The first "2" in the 212 is the design point for the airfoil. It means that you should design your loading so that the wing is developing 0.2 coefficient of lift in cruise flight. Coefficient of Lift is another way of saying Angle of Attack. There is a direct relationship given by the familiar chart that shows the stall point as angle of attack gets too high. The sub2 after the "A" is the plus and minus range either side of the design point. That means that the range of low drag for the Sonerai airfoil is when the wing is developing a lift coefficient of .2-.2 to .2+.2, or from C<sub>L</sub>=0 to C<sub>L</sub>=.4, with some very ragged edges.

That C<sub>L</sub>=0 isn't too useful, since that means that we can generate no lift at all. The Sonerai has a wing area of about 80 square feet. My ramp weight for this flight was about 900 pounds. Lift is simplistically calculated as follows:

$$\text{LIFT} = \text{COEFFICIENT OF LIFT} * \frac{1}{2} * \text{AIR DENSITY} * \text{VELOCITY}^2 * \text{WING AREA}$$

In straight and level flight lift is equal to weight. Velocity is available from the airspeed indicator (must be true). Air density is available from standard tables, and corrected for temperature it is about .0019 slugs per cubic foot at 8000 msl. We have everything but the coefficient of lift. So, one equation, one unknown, we can calculate coefficient of lift.

$$\text{COEFFICIENT OF LIFT} = \frac{\text{WEIGHT}}{(\frac{1}{2} * \text{AIR DENSITY} * \text{VELOCITY}^2 * \text{WING AREA})}$$

The performance of the engine is reacting differently at each altitude point is predictable. A rule of thumb for many Continental and Lycoming engines that red line at 2700 RPM is the rule of 48. Take your manifold pressure and add it to you RPM / 1000. When it equals 48 you are developing 75% power. That can be changed into an equation for my Continental A80.

$$\text{HP} = (\text{MP} + \text{RPM} / 1000) / 48 * 80 * .75$$

This is just to see if the step change is occurring in the power. It was not. The step change in speed seem to come from nowhere. It looks more like an indication error at first. So the Excel spreadsheet was run using these equations with the following results.

As you can see, the air density increases as the altitude decreases. Look at air density in the lift equation. As air density increases, so does lift. But lift must remain constant because the aircraft weight remains constant. So what else can change? Not wing area. That leaves velocity and coefficient of lift. We know how much velocity changes because we have an airspeed indicator. So we can see the change in coefficient of lift as air density changes. And how do you reduce the coefficient of lift? You lower your nose and reduce your angle of attack.

Totally without intent, I crossed this point while performing the manifold pressure test. As you can see, at 8000 feet the coefficient is .4. It remains at .4 until 5000 msl. Then at 4000 msl the coefficient

of lift has dropped to .33, well within the drag bucket range of  $C_L=0-.4$ . Drag reduces, and speed goes up, reducing the required  $C_L$  even further, the pilot lowers the nose and it all balances out to a welcome 10 mph gain.

Try it for yourself. Go up to altitude and reduce your straight and level speed until you have noticeably higher angle of attack. A slow flight angle of attack of about 4 degrees will assure that you are in turbulent, non laminar flow. Then run the same experiment without moving the throttle.

Make sure you have plenty of fuel for two reasons. It takes quite a while to set the points and be sure nothing is changing at each altitude. And secondly, you may be using a lot of slip to descend with the higher power settings, fuel will migrate to one side of the tank.

You should see the speed change step without all of these calculations. If you have a very light plane, it will happen sooner than with mine. If you have a heavier plane, my condolences.

## WANT ADS

*These Ads are provided as a service to you, the subscriber, and are free of charge. I only ask to be informed when the Ad is no longer valid, and needs to be removed. Thanks.*

**SONERAI WING CONSTRUCTION MANUAL:** There are 18 pages of text, 85 photographs, and 12 drawings, as well as a complete materials and a tools list. If you have an older set of plans (The manual is now included with the plans, so you new plans holders already have it.) and would like your own personal copy, send cash, check, money order, or PayPal for \$25.00. Postage is included. Fred Keip, (262) 835-7714, [fredkeip@aol.com](mailto:fredkeip@aol.com)

**BACK ISSUES: Sonerai Newsletter** back issues are available in three forms. The first is a CD which contains all of the complete newsletters published by Ed Sterba from 1987 through 1995 in ".pdf" format. It costs \$40.00. The second is a CD which contains complete copies of all of the newsletters published from 1996 through 2008, also in ".pdf" format. The cost is \$50.00. If you buy both CD's, the package price is \$75.00. And finally, there are also hardcopy back issues. I have the last two issues from 1994, and all of the issues from 1995 thru 2007 (That's 54 issues!). Contact me for pricing, and I'll make you a deal. As usual, I accept cash, check, money order, or PayPal for the correct amount. Postage is included. Fred Keip, (262) 835-7714, [fredkeip@aol.com](mailto:fredkeip@aol.com)

**RACEAIR DESIGNS IS AVAILABLE FOR YOUR FABRICATION AND RESTORATION NEEDS.** Contact Ed Fisher, (330)518-8383, [raceairdesigns@hotmail.com](mailto:raceairdesigns@hotmail.com). Over 30 years experience in dope, fabric, welding, and sheet metal. Numerous

awards including 1991 and 2004 Oshkosh Grand Champion Ultralight. No job is too big or small. Need a fuselage welded? Give Ed a try!!

**FOR SALE:** Sonerai ILS single-place. 200 hr TT, 2180 w/dual electronic ignition, 40 amp alternator, starter, hyd. lifters, and new heads, Sterba prop, extra fuel tank, 5/8" landing gear, Monnett factory-welded fuselage, S-wings, Icom A-20 radio. See the July-Aug-Sept 2007 issue for photos. Asking \$8700. Doug Johnson, Topeka, KS, 785-246-0844 (4/08)

**FOR SALE:** Sonerai IIL project. Engine: 1915cc overhauled w/ new aluminum cases machined by Rimco for 94mm cylinders, cylinder mating surfaces decked, and ALL gallery plugs drilled and tapped. Scat 69mm stroke counterbalanced crank. New std. Oil pump, main, rod, and cam bearings. Scat bolt-on gear cam shaft w/ new steel straight cut cam gears. Monnett shrink-fit prop hub. Scat gland nut w/ new Great Plains mag drive. New piston rings. Std. Dual port heads (Great Plains), drilled and tapped for 10mm spark plugs, later machined by Rimco to give 8.1 to 1 comp. Ratio. Accessories include, Slick mag.w/ new points and condenser, Dyna 5 electronic ign., Monnett Electro-X engine mount w/ alternator and a new voltage regulator/rectifier. All air baffling completed. I have about \$3000.00 tied up in the engine alone. Mag. timer included. Fuselage and empennage: Welded and fabricated by professional weldor (me), see my articles in past issues. Sand blasted and gray epoxy primed.

Mounted on 5/8" main gear w/ Azusa wheels and mech. brakes, Piper Cub hub caps, no wheel pants. Great Planes tail spring and wheel. Rudder cables and elevator push/pull tube connected. Turtle deck, seats, upholstery, harnesses, engine controls, electrical system, fuel system w/alum. tank, canopy, fire-wall, and engine cowl (Great Plains) installed. Instrument panels have Westach gauges, needs only airspeed ind. and compass, TSO'd altimeter included. Most parts were painted before installation w/ Randolph alkylid enamel as required.

Wings: Uncompleted spars only, lightning holes cut, cap strips cut, drilled and counter sunk, ready to rivet, quantity of AD rivets included w/ cutter and rivet sets, alum. angle for stiffeners, all finished parts Alodined and zinc-chromated. I've got 10+ years and lots of \$ invested, steal it from me for \$5000.00USD or best offer, let's negotiate. Builder's logs are included if sold complete. I will consider parting it out; but I'd really like to sell it on to someone who will complete it. Sold as is, where is, in Houston, Texas. No Paypal, or checks, cash only, face to face, after inspection at your leisure. Contact info: James Gay, [jsgiii@att.net](mailto:jsgiii@att.net), or at 713-922-9080. (2/09)

**WANTED:** Sonerai II parts. I'm attempting a Sonerai project as a cancer treatment diversion; please let me know what you have to sell. Call 24/7 Thank you. M.Lee Wachs 707-463-0467. (2/09)