

# SONERAI NEWSLETTER

JULY-AUG-SEPT 2008

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## **AL BERTELMANN'S SONERAI II AT SNF 2008**

*Al's classic Sonerai II mid-wing was the only Sonerai to show up at Sun-N-Fun this year. Since no Sonerai's taxied across the airport to park with Al, we were forced to give him the "Shortest Distance Flown" award this year. You see, Al bases his airplane at the South Lakeland Airport which is about 5 miles due south of Sun-N-Fun. He told me that his flight home on Saturday was a bit less than 10 minutes long. He departed off runway 27, and after flying west a little ways, he turned left, which set him up on a long crosswind leg for downwind at South Lakeland. This airplane has a 2180 cc VW with the Monnett Electro-X conversion, box-type cooling baffles, and a pair of two-into-one exhausts that exit at the bottom of the cowl. The prop is a modified Warnke "almost constant speed" (if my memory is correct). Otherwise, the airplane is pretty much stock Sonerai II, with the ½" gear, and mechanical brakes. The one exception is the jackscrew pitch trim system mounted on the leading edge of the horizontal stabilizer. See more photos inside.*

## MORE PHOTOS OF AL'S SONERAI II



A Rear Quartering View  
Showing Off the Classic  
Lines.



The Prop and Cowling  
Treatment



To deal with the heat from the two two-into-one exhaust pipes, Al lined the inside of the cowling. The first layer is Fiberfrax glued directly to the cowling. Then, a layer of heavy-duty aluminum foil is glued over the top. The foil helps reflect some of the heat, as well as prevents oil from soaking into the Fiberfrax.



## COMING TO OSHKOSH?

EAA AirVenture Oshkosh 2008 is just a few weeks away, so if you haven't made up your mind yet, it's time to make that decision, and join us for all the fun. The official dates are Monday, July 28, thru Sunday, August 3. I'm planning to bring my camping gear up on Saturday, the 26<sup>th</sup>, and fly the Sonerai up on Sunday, the 27<sup>th</sup>. As usual, there will be everything from the Boeing Model 40 bi-plane to the F-22 Raptor, and hopefully, several Sonerai's.

There are several Sonerai and VW engine related events that you might want to consider participating in:

- I'll be presenting my annual *Sonerai Builder's Forum* on Wednesday, July 30, at 1:00 PM in Pavilion #5.
- Steve Bennett will be presenting his *VW Based Engines for Sport Aircraft* forum on Tuesday, July 29, at 11:30 AM in Pavilion #4
- Steve will also be running his *VW Engine Assembly Workshop* from Monday, July 28, thru Friday, August 1, at 1:00 to 2:15 PM each day at the Engine Workshop 20. He goes through a different portion of the assembly process each day, starting with the build-up of the bottom end, and finishing with installation of the accessories, and mounting it on the airplane.
- John Monnett will be hosting his *AeroVee and AeroCarb: Sport Pilot Power* forum on Thursday, July 31, at 11:30 AM in Pavilion #3.
- Jeff Lange will be hosting his Annual Sonerai/VW Builders/Sport Racers Picnic at his hangar on the northeast corner of Wittman Field, Thursday evening, July 31, after the airshow. This year the food is being provided by Ed Fisher in appreciation for all the help he was given after his house fire. If you'd like an adult beverage or two, you'll have to bring them yourself. See you there!

At the present time, it looks like I'll have my Sonerai on display at the new Affordable Flying Center (the old NASA building, north of the old control tower), so don't look for me out on the flight line. Related to that, I'll be presenting two additional forums tentatively titled *Sonerai Stories: 32 years of Affordable Flying*. The first one will be on Monday, July 28, at 2:30 PM, and the second one will be on Thursday, July 31, at 11:30 PM. Both are at the Affordable Flying Center.

So, there you have it. Bring your Sonerai if it's flying. The more we have, the more fun it is. And remember, this year signifies the 35<sup>th</sup> anniversary of the Sonerai II design. It would be nice to have a bunch of them there.

## SONERAI NEWS

- Great Plains News: Look for Steve and Linda in their usual place in Commercial Building D. Stop by, and say "Hi", and check out their latest goodies. Also, check out Steve's forum and workshops, noted elsewhere. He's got a ton of information that you need to know.
- 2008 Fly-In Schedule: Here's a list of the major fly-in's for 2008. Make plans now to go to the one nearest you, and show off your Sonerai:
  - Northwest, Arlington, WA 7/9-13
  - AirVenture, Oshkosh, WI 7/28-8/3
  - MERFI, Mansfield, OH 8/25-26
  - Copperstate, Casa Grande, AZ 10/23-26
- 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, sent me cash, check, money order, or PayPal (at the email address on the front page) for \$25.00. Postage is included.
- 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 2007, 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.

## ELECTRONIC NEWSLETTER?

For the past eleven and a half years, I've been producing and sending out this little newsletter the old-fashioned way: print, fold, staple, stuff in

envelopes, and mail. A few days later you get it in the mail, hopefully unaltered by the postal service.

Over the past few years, I've had several requests to send out the newsletter electronically. The advantages, of course, are many. First, you'd get the **Sonerai Newsletter** almost instantly, unaltered by the USPS. Secondly, it would be in color. No more black-and-white photos. And thirdly, since there will be no printing or postage costs, the subscription cost would be reduced. I'm thinking it would be in the neighborhood of \$10.00 to \$12.00 per year instead of \$15.00.

If you are interested in receiving the electronic version of the **Sonerai Newsletter**, all you need to do is email me your current email address. Once I get the addresses (perhaps a few weeks from now), I'll send this issue for your review. It'll be in .pdf format, so you'll need Adobe Acrobat to read it.

Assuming everything works, I'll send the Oct-Nov-Dec issue both ways, and then for 2009 you'll have a choice as which version you want, standard or electronic.

## THE WILCOX NOSEWHEEL by Dave Wilcox

*Back in 2004, Dave copied me on this letter that he sent to Dave Bubolz in Michigan related to his redesign of his Sonerai IILTS nosewheel assembly. (Dave: Sorry it took so long to get this published.) The basic change in the design was to convert it from a steerable nosewheel to a swiveling nosewheel similar to that used on the RV's and Cirrus airplanes. The new gear uses the same mounting points, and requires the use of individual brakes to provide the ability to steer. Hopefully, the letter and photos will detail Dave's work.*

I've got the nose wheel installed, but not flown yet. The configuration change will require me to re-enter a restricted period of 5 hours per my operating limitations. But obviously it's landings not hours that's important here, so I'm going to complete 100 landings in those five hours.

Unfortunately the plane is still in my garage instead of at the airport. I should have left the wings at the airport. I forgot that the wing folding system doesn't work with the mains in the aft location. Now I have a problem getting the wings back to the airport. But, I'm sure they'll make it there by this

weekend sometime. The 100 landings may take a few weeks.

The design is not ideal, but should reveal if there are any deficiencies. The caster design and truck have over 1200 landings from the previous installation with a rigid strut. The shimmy dampener is set to a drag load at the axle of 7 pounds. It never had a shimmy. But now there is a bit more looseness in the system caused by the anti torque slide. It's not much, about 1/8 inch FIR at the axle. My theory is that is not enough to allow a shimmy, and the weight force on the strut interface with the airframe is more than sufficient dampening for that strut rotational freedom.

The Sonex spring works great. Right now I have it set so it is sprung a bit at 1g. I may preload the spring so there is no suspension at 1g, but not at first. One weakness of my system that you won't want to duplicate is the lack of non-ferrous slide bearings at the strut to airframe interfaces. I expect to see rapid wear there, another reason to un-spring the gear as much as possible during taxi... to minimize movement and wear of my steel on steel bearings.

Both the weight and drag on the nose wheel tend to center the leading strut. There is no significant force trying to rotate the strut, so I did not create a complicated and heavy torque link. Anti rotation of the sliding strut in the airframe is through a simple slot in the top of the moving strut, and the upper static attaching bolt. That's where the slight rotational free play is.

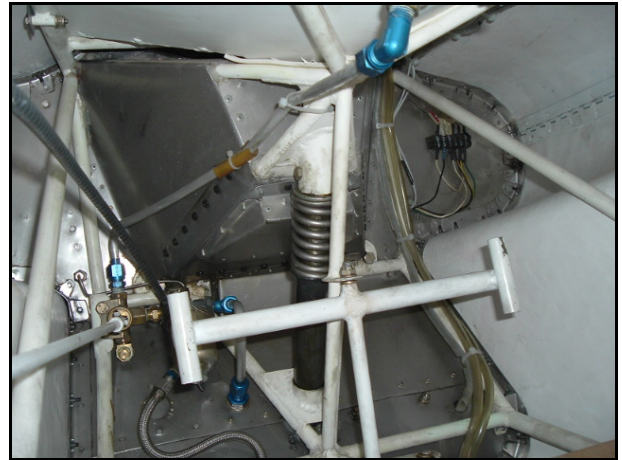
I'm going to do the 100 landings and re-inspect. At that time I'll feel better about furnishing you exact details of the design. Meanwhile, here are a few photos. My Sonerai firewall has a 6 inch chamfer on the bottom to make room for the Continental oil tank. The passenger rudder pedals are non-conforming as well, as is the magneto area firewall. Your setup will be different. Just locate the strut the same as the steerable nose wheel in the plans.

*Dave then followed up with the following letter:*

I've completed 102 landings on the nose wheel now, no issues what so ever. Actually, the landings really only check out the shimmy dampener. There's more exercise of the suspension spring by just punching the brakes on taxi. The shimmy dampener is set to 7 pounds drag at the axle. No hint of a shimmy has occurred. This is the same caster truck that I have about 1000 landings on before I converted to tail wheel.

I've done a 3D layout of a standard Sonerai with the same system. Pictures attached. My firewall area is altered to allow room for the Continental oil tank. That changed the geometry of my installation to put the top of the nose strut at the pyramid intersection under the fuel tank. That's a very strong point in the vertical direction, which allows me to take the thrust load from the nose wheel at that point. This allow me to move the spring inside, above the lower mount. But a plans built plane will not allow this. The bracket at the top of the strut will not take the thrust load, so it will be necessary to locate your spring external to the fuselage, exactly where the rubber donuts are placed in the plans version.

The good news is that you already have the plans for the nose wheel attachment to the fuselage. Just build your mounts exactly as shown in the plans. I've modeled the whole plans built system and it works better than mine. The steering system in the plans may be omitted of course. It will be replaced with a simple torque link at the top.



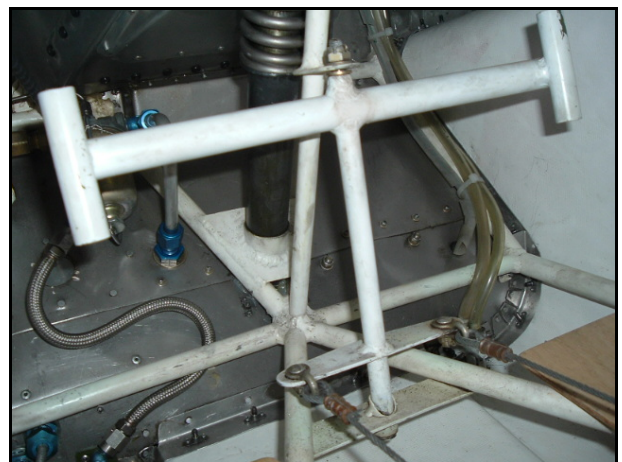
An Interior View



A Close-up of the Spring



Dave's Nosewheel

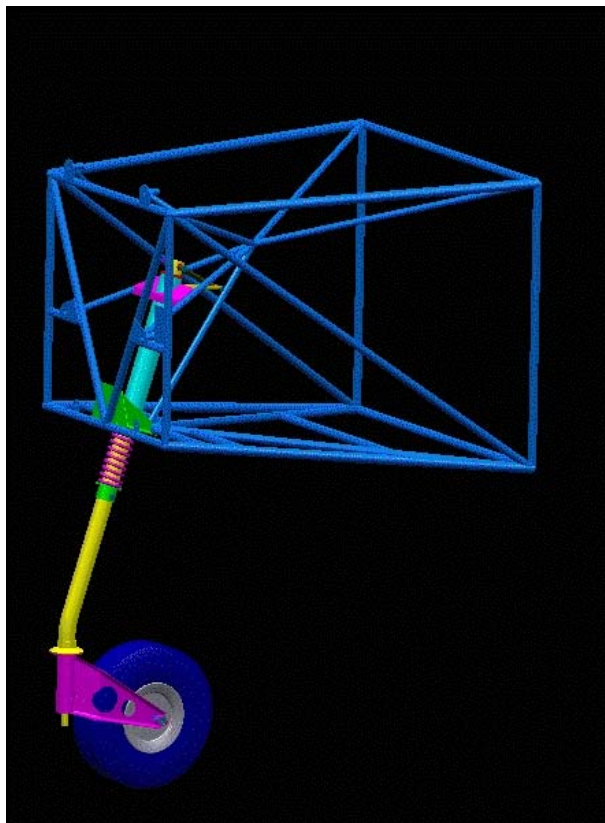


A Close-up of the Lower Support  
(Interesting front rudder pedal treatment)

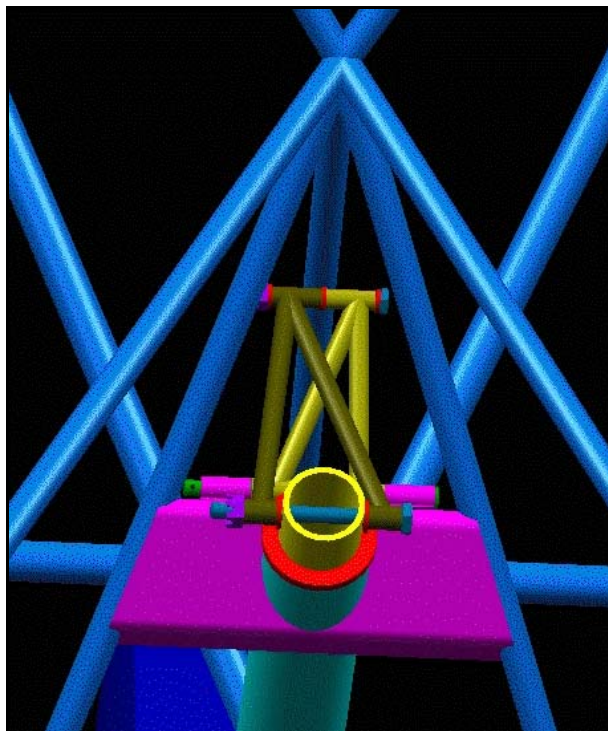


A Close-up of the Swivel

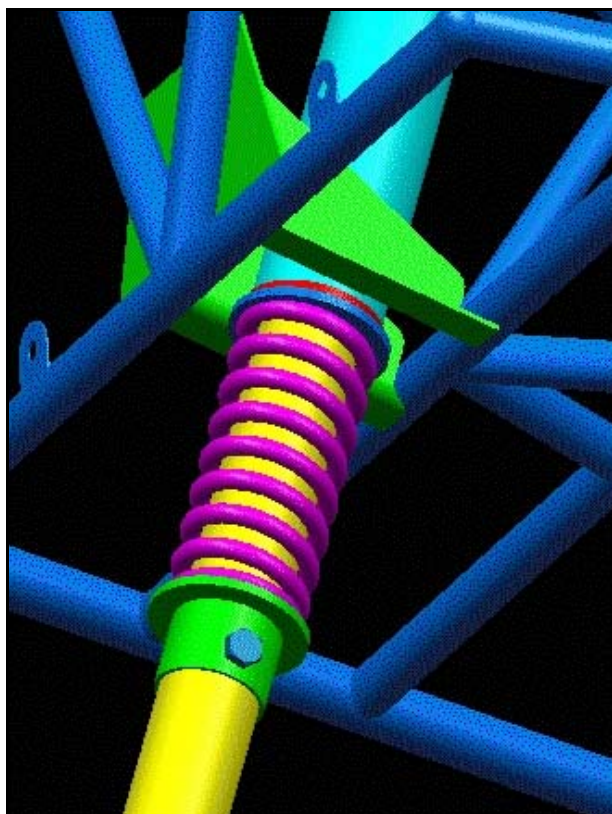




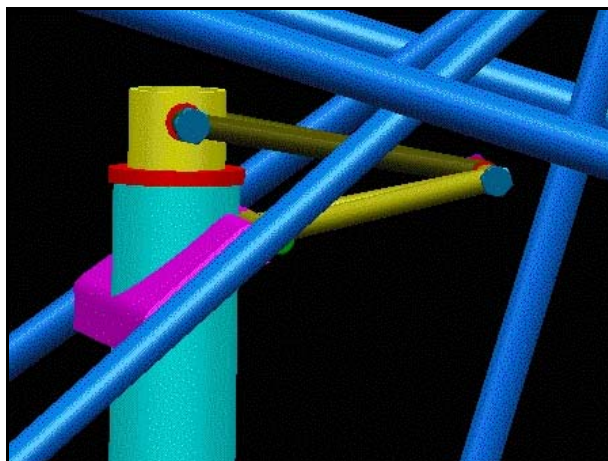
A CAD picture of the Installation  
in a Stock Sonerai



A Top View of the Scissors



A Close-up of the Spring Mount



A Side View of the Scissors

## TDC FINDER

One the tasks that you have to do when you build up the VW engine for your Sonerai is to put timing marks on the prop hub so that you can properly time the ignition system. The first step is determining the top-dead-center (TDC) position of the number one cylinder. The most accurate way to determine TDC that I've found, is to use the tool shown in the photo below.

This tool is easy to make. You'll need an old 14 mm automotive spark plug. (This assumes that your heads use 14 mm plugs. The AeroVee 2180 uses CB Performance 044 heads that use 12 mm,

long-reach plugs. In that case, you can use an M12 x 60 mm long bolt.) Take that old plug, break the ceramic portion and the outer electrode off, and drive the remaining portion of the plug out of the outer housing. Next, find a bolt to fit the inside diameter of the plug housing, and cut the bolt off so that about 1" of the bolt sticks out of the housing. Be sure to round the corners of the bolt. Finally, glue the bolt into the housing with a bit of JB Weld.



To determine the true TDC position, do the following:

1. Remove the spark plug from the #1.
2. Turn the crankshaft to bring the #1 piston to near TDC, and then reverse the direction of the crank so that the piston moves down the cylinder an inch or so.
3. Thread the TDC finder into the spark plug bore, and snug it down.
4. Turn the crank shaft slowly until it stops (the piston will be touching the finder).
5. Using a straightedge aligned with the crankcase split line and touching the outside diameter of the prop flange, and make a pencil mark on the prop flange.
6. Slowly rotate the crankshaft in the opposite direction until it stops.
7. Make another pencil mark on the prop flange.
8. Measure the distance between the marks. TDC is exactly half way between the marks. Use a hammer and cold chisel to permanently mark the prop flange.
9. Repeat steps 1 thru 8 on the #2 cylinder.

You now have TDC marks that you can use to determine the location of the ignition timing mark, plus you have marks that allow you to properly position the crankshaft to adjust the valves

## BREGUET RANGE EQUATION by Bob Barton

A French mathematician named Breguet developed a method of predicting the range of an airplane from its physical characteristics: its lift-to-drag ratio (L/D), propeller efficiency ( $\eta$ ), engine specific fuel consumption ( $c$ ), and the initial and final cruise weights ( $W1$  and  $W2$ ).

For our purposes, most of these parameters can be lumped into one constant; "k". That is we can assume that for a given cruise speed, the product of L/D,  $\eta$  and  $1/c$  will be constant. So that:

$$\text{Range} = k (\ln W1 - \ln W2)$$

Now what you need to do is pick a calm afternoon and a destination about 150 nm away to fly to. Top off your tank and jot down your best estimate of your initial weight ( $W1$ ). Fly out at your normal cruise speed, land and see how much fuel you burned getting there (by topping off again). Fly back and again record your fuel burn. Average these two figures (canceling head/tail winds). Now you know what your final weight was ( $W2$ ).

Using the above formula calculate k for your plane (under those cruise rules). I flew from Winder, GA up to Hickory, NC. That's a distance of 155 nm. My  $W1$  was 750 lb. and my fuel burn (both ways) totaled 10.4 gal. This gave me an average  $W2$  of about 719 lb.

$$\begin{aligned} \text{So: } 155 &= k (\ln 750 - \ln 719) \\ k &= 155 / (6.6201 - 6.5779) \\ k &= 155 / 0.0422 \\ k &= 3672 \end{aligned}$$

Now I can estimate my range for a given fuel burn and assume other take off weights, etc. using the formula:

$$R = 3672 (\ln W1 - \ln W2)$$

One last example: Suppose I want to take off at my max weight (925 lb) and land with 3 gallons reserve. How far can I go?

$$\begin{aligned} W1 &= 925, \quad W2 = 925 - 7 \times 6, \text{ or } W2 = 883 \\ \text{Then: } R &= 3672 (\ln 925 - \ln 883) \\ R &= 3672 (6.8298 - 6.7833) \\ R &= 171 \text{ nm.} \end{aligned}$$

I might just look for an airport a few miles short of that, but I was able to run the exercise on paper without crashing or burning any gas.



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1/2", 5/8", and 3/4" thick. Also, some  
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