

SONERAI NEWSLETTER

JULY-AUG-SEPT 2007

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DOUG JOHNSON'S SINGLE PLACE SONERAI IILS

Here's Doug and his uniquely configured IILS. The airplane is set up as a single place, with Doug's original canopy treatment. He sent the following letter with the photos:

"I'm sending you some pictures of the Sonerai II "stretch" single seat. I don't think there are that many people who would ride with me, so I added a gas tank, 9 gallons and 7 gallons in the front. The engine has Scat individual heads on a 2180 from Great Plains, which is working very well. The only thing is the front cylinders are getting more fuel than the back ones, and on a cold day, it's hard to keep running for the first few minutes. It has a Revmaster carb with mixture control, and it works very well. I can set the EGT with it. I made an air/oil separator that you can see in one of the pictures. It's very cheap, and works very well (no only on the bottom of the airplane).

It took a little getting used to on the ground, but everything else was easy. It runs very well on a 50° day. It will get 150 mph at 3600 rpm. I fly it at 2900 to 3000 rpm most of the time, and it runs about 105 to 115 mph, which is fast enough for an old man.

Doug Johnson, Topeka, KS

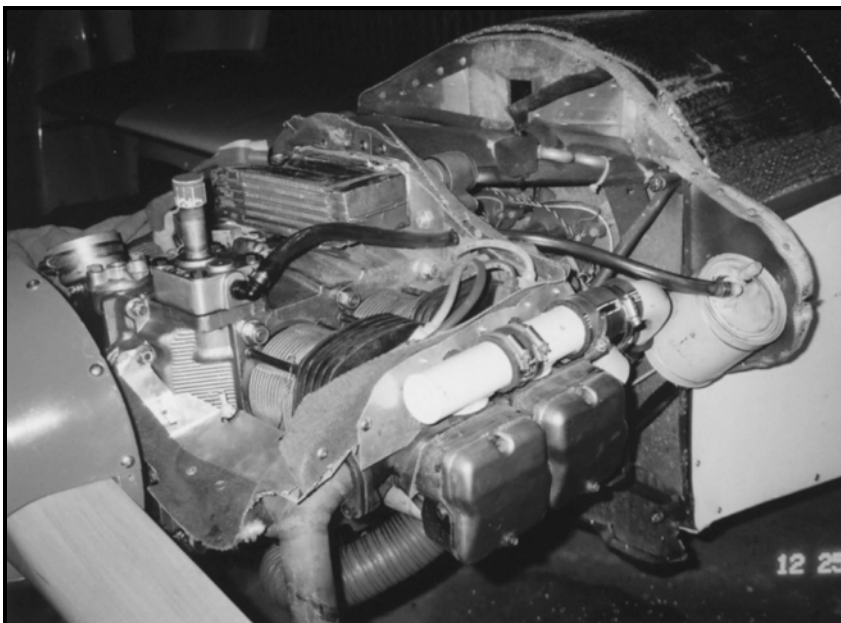


Doug's VFR Panel

Note the GPS on the "console". The lever on the right is for hydraulic brakes. The comm. radio is mounted on the RH side wall.

The GPASC 2180

The SCAT heads are clearly visible here.



The other side of the GPASC 2180

Note the "high-tech" air/oil separator.

SONERAI NEWS

- Great Plains News: Steve and Linda will again have their booth set up in Building D at the 2007 AirVenture Oshkosh. Stop by and say "hi", and see their latest offerings. Steve will be doing his VW Engine Assembly Workshops on Monday, Tuesday and Wednesday, and is presenting his VW Based Engines for Sport Aircraft on Tuesday.
- First Flights: I got the following email from Martin Roy from Chehalis, WA a few days ago: "My first flight went well, I needed to trim the elevator to remove a 2-3 pounds of pull. The big problem was the rear seal. As it turns out I was given a rear bearing that was out of spec so with the end play set up correctly the bearing was sliding in the in the case. I dismantled it had a proper trust cut done and put it back together. It has flown for six hours now and things are going well. I have my crank case vent on the valve cover and at present am experiencing some syphons from the vent. I will reroute the tube to go up to the highest point in the cowling to see if that slows the problem. If not I will fashion some for of a oil recovery type thing. She flies as advertised. I am running a single port 1835 with an Ellison. and at 3300 I am seeing 115kts on 3.5 the prop is a sterba 54x42." Congratulations, Martin! Now we need some photos.
- 2007 Fly-In Schedule:
Here's a list of the big ones this year. Make plans now to go to the one nearest you, and show off your Sonerai:
 - Northwest, Arlington, WA 7/11-15
 - AirVenture OSH, Oshkosh, WI 7/23-29
 - MERFI, Mansfield, OH 8/25-26
 - Virginia, Petersburg, VA 10/6-7
 - SERFI, Evergreen, AL 10/12-14
 - Copperstate, Casa Grande, AZ 10/25-28
- 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 now 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 2006, 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 2006 (That's 50 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.

HERE COMES OSHKOSH

It's less than a couple weeks away, July 23rd thru the 30th. . If you're planning to come, there are several Sonerai and VW engine related happenings that you might want to take in:

- I'll be hosting the *Sonerai Builder's Forum*, Wednesday, 7/25 at 1:00 to 2:15 in Pavilion #5.
- Steve Bennett will be running *VW Engine Assembly Workshops* on Monday, Tuesday, and Wednesday, 7/23, 24 and 25, at 1:00 to 2:15 at the Engine Workshop.
- Steve will also be hosting the *VW Based Engines for Sport Aircraft* forum on Tuesday, 7/24, at 8:30 to 9:45 in Pavilion #4.
- John Monnett will be hosting the *AeroVee and AeroCarb: Sport Pilot Power* forum on Thursday, 7/26, at 11:30 to 12:45 in Pavilion #3.
- Jeff Lange is hosting the 4th Annual Sonerai/VW Builders/Sport Racers Picnic at his hangar on the northeast corner of Wittman Field, Thursday evening after the airshow. The cost is \$5.00. If you haven't already done so, let Jeff know if you're coming at schmleff@gmail.com.

As you know, these aren't the only things to see and do during the convention, and chances are, even if you stay the entire week, you still won't see it all.

Unfortunately, as you will read elsewhere, I probably won't have my IIL there this year. It'll only be the second time in 21 years, but I'm planning to be there from Sunday to Friday. I'm planning to camp in Camp Scholler, with Steve and Linda Bennett, and will probably hang around their booth in Building D from time to time. So, I hope to see you there.

2180 TRANSPLANT, PART 2

OK, so where were we at the end of the last report? Let's see: At the beginning of April, my Sonerai ILL, sans wings, was sitting in my garage with no engine, no firewall, and no fuel system forward of the fuel shutoff valve. The new engine was sitting on the workbench in my basement shop, ready to be installed.

THE NEW FIREWALL:

So, the first task was to build a new firewall. The old one had gotten pretty ratty looking with a bunch of extra holes in it that were no longer needed, and the mag box cutout wasn't large enough to accommodate the new starter. After stripping everything off of the old firewall, it was used as a template to create a new form block out of a piece of $\frac{3}{4}$ " plywood. Once the form block was cut out, I slipped the old firewall over it, and drilled the engine mount holes thru it so that they could be accurately transferred to the new one.



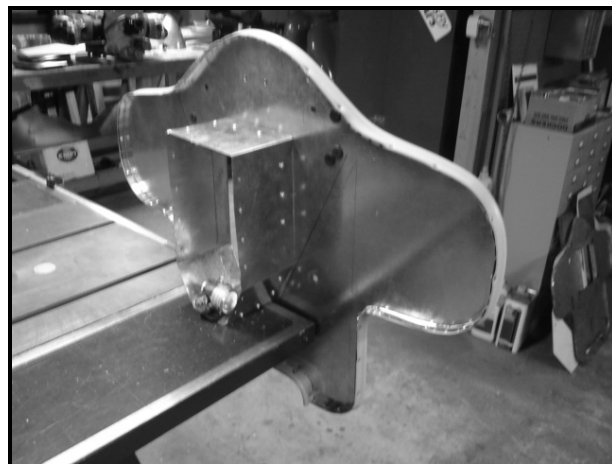
Form Block with the Box Cutout.

Next, the form block was clamped onto the new sheet of 26 ga. galvanized steel sheet, and a Sharpie pen was used to trace around the form block to create the bend line. This was followed by using the same Sharpie to draw a $\frac{1}{2}$ " flange all the way around the original shape. To make that an easy task, I cut a 1" diameter disk out of a piece of $\frac{1}{8}$ " plywood, and drilled a $\frac{1}{8}$ " hole in the center. Then I put the tip of the Sharpie in the hole, and rolled the disk around the edge of the form block.

The form block was removed, and the firewall blank cutout with a pair of aviation snips. To prepare the blank for forming, $\frac{1}{8}$ " holes were drilled at the bend line on $\frac{1}{2}$ " spacing around each of the curves, and slots were cut from the edge of the blank to each of the holes. Then, the blank was clamped onto the form block, and the flange

was formed using a plastic-faced hammer. I bent my flange so that it pointed aft with firewall installed. After the flange was bent, I used the motor mount holes drilled in the form block as drill guides to drill the new firewall. (One of the best new tools I discovered at this point was the Irwin Unibit. It cuts holes ranging in size from $\frac{3}{16}$ " to $\frac{7}{8}$ " in $\frac{1}{16}$ " steps. It makes cutting holes in sheet metal extremely easy. I'm not sure how I got along without it before this.) Of course, at this point, it was test fitted on the fuselage to make sure it fit properly. With a little round file work, it did.

Now, it was time to make the cutout for the mag and the starter. I first made a cardboard dummy of the firewall with the correctly sized cutout. I had already mounted the new Lycoming rubber bushings, washers, spacers, and bolts on the engine, so I test fitted the dummy to the engine and the front of the fuselage to verify proper fit. It was then used to mark the cutout on the form block. After the hole was cut, the firewall was slipped back onto the block and the cutout hole marked. With the firewall removed, the mounting flanges for the box were drawn, and then the hole was cut, leaving the flanges on the firewall. With the firewall back on the form block, I bent the flanges.



Finished firewall with the box.

Fabricating the box came next. I wanted the box to be configured so that it would be relatively easy to access the mag and the starter for maintenance. That meant that some of the pieces had to be held in place with screws. I decided to rivet the left side/bottom piece to the firewall, and make the top piece, RH side pieces, and the two back pieces so that they were secured with #8 B-type sheet metal screws into Tinnerman nut plates. All of the parts were cut from the left over firewall stock, fabbed using my 18" bending brake, drilled, clecoed, test fitted, etc, etc, etc until it all fit. It was the classic

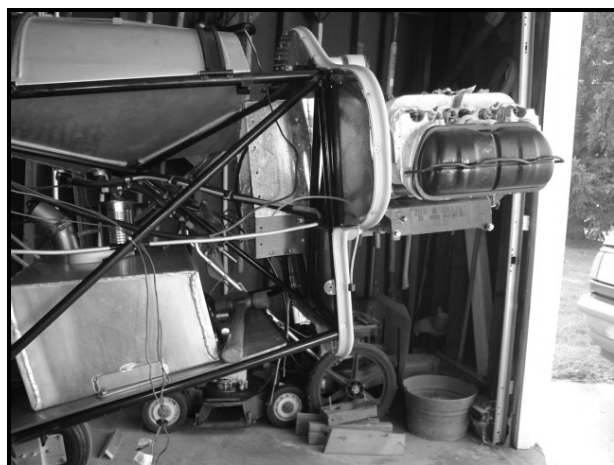
case of fitting ten pounds of "stuff" into the proverbial five pound bag. It is a tight fit,

Finally, the seal was riveted all around the flange to provide the seal between the firewall and the cowling. My firewall is designed so that there is nominally 1/8" clearance between it and the cowling all around. This gap is filled using Ace Hardware #5307822 vinyl and sponge rubber weather strip. It has a 3/8" diameter bulb and a 5/8" flange. I used flush stainless CCC-42 pop rivets (the same as used on the wing skins) spaced about every 3" around the periphery of the firewall to attach the seal flange to the firewall flange.

MOUNTING THE ENGINE

One of the last things that I did before I removed the old engine was to measure the distance from the firewall to the front face of the prop flange on the engine. This was important because the fore/aft location of the engine mount lugs on the X-Diehl case was slightly different than it was on the Monnett Electro-X. I wanted the prop flange to end up in the same location so that I wouldn't have to make any modifications to my cowling. The end result of all the measuring was that I needed to replace my mount spacers with slightly longer ones.

I acquired 12" long piece of 6061-T6 1-1/2" diameter round stock from Aircraft Spruce, and rough cut, machined, and drilled four new spacers.



New Engine Installation, 4/21/07

All of the new parts, along with the engine were then moved from my basement to the garage, and the engine was hung on the fuselage. The mount bolts were torqued and cottered. She was beginning to look like her old self again.

NEW INTAKE MANIFOLD

Because the starter location is at the 6 o'clock location, the new starter sits right about where my

original Y-type intake manifold had gone, so a new lower manifold needed to be fabricated. Again, before I removed the old engine, I measured the location of the manifold inlet relative to the bottom of the engine so that my new manifold would end up in the same place. This is because I decided to use my existing HAPI UltraCarb and it's airbox, to keep the fuel system a simple gravity feed system. The Ellison Throttle-body carb I got with the engine requires the use of an electric fuel pump to provide a stable operating pressure, and I really wanted to try to keep the fuel system as simple as possible. It has worked well up till now, and I didn't want to complicate it.



Intake Manifold Pieces

My new manifold is basically a modified "U" with a perpendicular front side inlet that is used on a lot of VW conversions. I fabricated it out of a pair of 1-1/2" mild steel 90° elbows and a short straight piece that mounts the carb. A hanger bracket was fabricated to support the weight of the carb and manifold off the bottom of the engine, and ports for the primer and manifold pressure gauge were welded to the runner right behind the carb.



Intake Manifold Ready for Welding

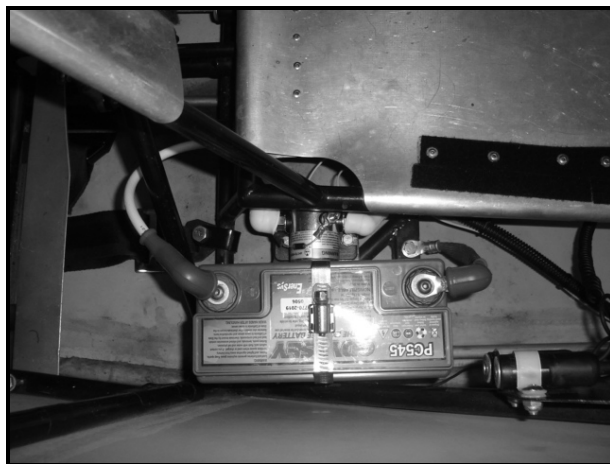
The rest of the manifold assembly came with the engine. There is a 90° elbow on each side along with original Monnett manifold castings bolted to each head. Everything is connected together using 1-1/2" ID radiator hose and hose clamps. The carb is also attached with radiator hose and clamps.

FUEL SYSTEM

One of my goals in reworking the fuel system was to make the line from the valve to the carb as straight as possible by eliminating a pair of 90° elbows. This would help maximize the flow rate to the carb. The second was to eliminate as much of the system from the "hot" side of the firewall as I could to minimize the amount of heat the fuel could absorb before it got to the carb. What I ended up doing was to eliminate a 90° bulkhead fitting, the gascolator, and another 90° at the gascolator outlet. I replaced this stuff with an in-line filter and an aluminum manifold block mounted behind the firewall. The manifold block is drilled so that the fuel flows straight thru it, and is cross drilled so that the primer fitting is mounted on the top and a Curtis drain valve mounted at the front near the bottom. The cross drilled passage provides a small sump to collect any water, although in 20+ years I've probably drained a total of an ounce of water from the system. Now the only part of the fuel system that's ahead of the firewall is one straight fitting and the 1/4" hose to the carb, and it's covered with a fire sleeve.

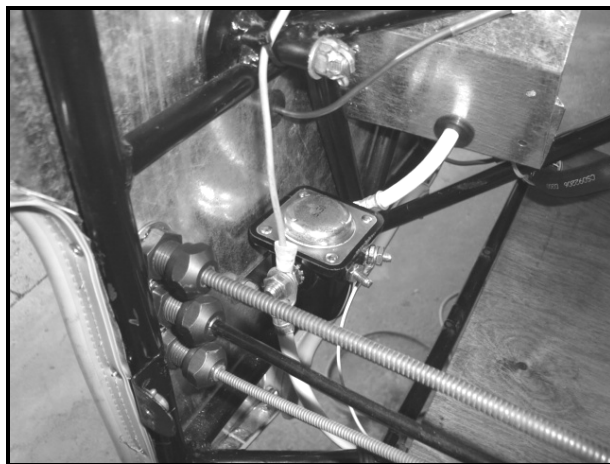
ELECTRICAL SYSTEM

The obvious need in changing the electrical system was to provide a battery large enough to power the starter, and the necessary circuitry to get it there and control it. The quandary with selecting a battery was to find one that would provide the necessary power, but would fit in the airplane, and not increase the weight substantially. My original 7 amp-hour battery weighed about 5 pounds and was located on the right side of the airplane next to the pilot's seat. I considered locating the new battery in the tail to help minimize the CG change due to the added weight of the starter and flywheel, but I didn't like the thought of running the heavy battery cables the entire length of the airplane. So, I decided to try and find a battery that would fit in the same location as the old one. My search led me to the Odyssey batteries that are now being used with great success in a lot of RV's. They are small, and very powerful. I ended up selecting the PC545 model. It is about the same length and width of the old battery, and is only a little more than an inch taller. It's rated at 14 amp-hours, puts out 545 cranking amps for 5 seconds, and has a 185 amp cold cranking rating. And it weighs just 12.6 pounds.



Battery Installation with the Master Solenoid

Before I jumped into designing the changes in the electrical system, I got myself a copy of Bob Nuckoll's book, The AeroElectric Connection (www.aeroelectric.com). I'd strongly recommend this book to anyone getting ready to design and install an electrical system in a homebuilt airplane. The problem I had to deal with was adding additional switches for the starter and alternator control in a switch panel that had no more room for more switches. Bob had the solutions in the book. The first was to use a double pole, double throw switch with one position spring loaded to control both the mag and the starter. The other was to use another double pole, double throw switch to control the master solenoid, and the isolation relay to allow separating the alternator from the system if an over-voltage situation arises.



Starter Solenoid Installation

Before I started making changes, I drew up a new system schematic to make sure that all of the switches got wired correctly and all of the necessary components got installed. This really helped a lot. Other than the new switches, I had to add a master solenoid, a starter solenoid, an alternator control relay, and about 7 feet of #4

gauge starter wire. I also had to juggle a couple of fuses to get the power to the right places. For grounding, the fuselage frame is the main ground with braided ground strap from the battery to the fuselage, and another braided strap from the engine case to the firewall.

When it was all installed, everything worked on the first try, except for a pair of new single pole switches that got wired backwards which meant they were ON when I thought they were OFF. A simple wire swap fixed them. And boy does the starter turn over fast...

COOLING BAFFLING

My original thought when I decided to change the engine was that I would reuse the box baffles that were on the old engine and find a way to provide additional air to my top-mounted oil cooler. I was concerned about oil temperatures with the bigger engine because the cooler air supply that I had was marginal for the smaller engine. To make a long story short, I couldn't come up with a way to get enough additional air to the oil cooler that was acceptable, so I decided to go back to the plenum-style baffles that I had used up until 1996. I knew that the plenum style would maximize the amount of air available to the cooler, plus my new engine had run successfully with that style in its previous life.



Initial Cooling Baffle Fit Up

So, with a long sigh, I decided to take another three weeks to make a completely new set of baffles. Fortunately, I had made a similar set before, and had several photos to guide me. I started out making light cardboard patterns to guarantee the fit to the top cowling. Then these were used as templates to make the actual baffles out of some 0.025" 2024-T3 that I had stored away for just such a need. I ended up with eight major components, including a dam behind the spinner to keep the pressurized air from flowing out from

behind the spinner. And it all fits, although the fit of the top cowling is quite a bit tighter.



Finished Baffles Before the Silicone Seals

SO.....

With everything more or less finished, I moved the fuselage assembly back to the airport on June 16. It took a week or so to get everything reinstalled and connected. Then, she went up on the scales. Surprise, Surprise: she weighs 583 lbs (I was hoping to keep her under 600 lbs, so I was happy).

When I tried starting her for the first time, she fired up on the third try (I decided that priming would help after the second try), and ran very well considering that I had made absolutely no changes to the carb after removing it from the old engine. Subsequent testing has determined that I need a richer needle for cruise and wide-open-throttle operations. I've got a couple of needles ordered. Hopefully, they'll show up soon.

I've also filled out and sent in the paperwork to get a new airworthiness certificate and the new operating limitations. They've been in for a couple of weeks (it's the weekend after July 4th as I write this), so I'm just waiting for the inspection. I've been told that I will need to fly a five hour test period, so as you can probably figure, I will probably not have the airplane at OSH this year.

Anyway, next time I'll let know how the testing goes, and what the performance numbers are.

SEE YOU AT OSH

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.

SPECIALTY WELDING CAN
SUPPLY YOUR COMPLETELY
WELDED SONERAI FUSELAGE AND
OTHER WELDED COMPONENTS.
Contact Greg Klemp at *Specialty
Welding*, W6461 County YY,
Neshkoro, WI 54960, (920)293-8089 or
(920)293-8007 (Fax)

RACEAIR DESIGNS IS AVAILABLE
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RESTORATION NEEDS. Contact Ed
Fisher, (863)655-0361,
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: Monnett Electro-X engine
mount, \$150; alternator for Electro-X
mount, \$25; GPASC Y intake manifold,
\$25. Jordan Klein Sr., 352-288-6060,
jordan.sr@comcast.net(3/06)

FOR SALE: Sonerai I project. Approx
80% finished overall, have most parts
to finish except cover. For more info
write to this address: Dan Maiott,
13152 Washburn Rd., Otterlake, MI
48464 with mailing address and
phone. Would consider trade for Mini-
Max project. Approx value \$3700 -
\$4000 (4/06)

WANTED: Sonerai II mid-wing or low
wing; solid workmanship and
lightweight. Ray Hassman 715-386-
2089 rhassman@pressenter.com
(2/07)

WANTED: Sonerai II mid wing with
Revmaster 2100, 5/8" landing gear, 12
gal fuel tank, \$6000; Also, 1/2" landing
gear with mechanical brakes, axles,
Azusa wheels, and tires. \$150; And
Sonerai II fuel tank, \$50 Robert
Jorgenson, 435-678-3436,
robertjorgenson@yahoo.com (2/07)

FOR SALE: Sonerai IIL wings and
matching carry though box. Have spar
modification, Flown 50 hours. Right
aileron trailing edge bent in hanger
accident. \$ 500. Roger Godfrey
rvgodfrey@earthlink.net (3/07)



Keith Sadler's Sonerai IIL

Keith keeps his "Raven" in Salt Lake City, UT.

The b&w photos don't do justice to the white, orange, black and yellow paint scheme.