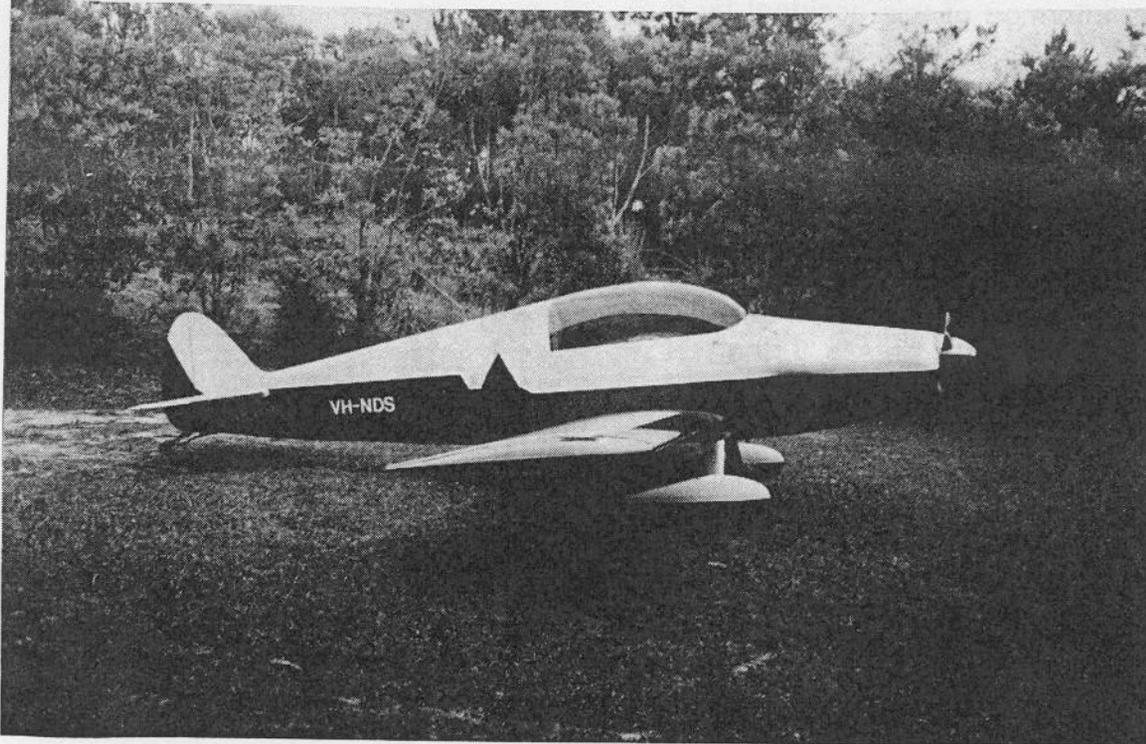


## Sonerai II L of Neil Stevenson from Australia



Welcome to the July issue of the Sonerai Newsletter. This is the Oshkosh special as always, although I have never figured out exactly what that means. What is this Oshkosh thing everyone seems to be talking about?

The first Sonerai Forum is scheduled for Thursday, August 1st at 7:00 PM. Yes, that is right! At night! This year the forums are being given out on an invitation basis, they give you one instead of you asking for it. At first we were not going to have a tent forum at all (after the first phone call), and then the phone rang about a month later and we were given the night patrol. This is still in the Forum tents as in the past, but I am afraid I can't give you the tent number at this time. You will have to check the program or ask at the Great Plains booth. Fred Keip will be handing this affair and Ed and Fred will host the Saturday Noon forum at homebuilders' corner on the flight line. If you go to bed before the sun sets or just can't be there for Thursday night, please try to make the Saturday event. Homebuilders' Corner is on the flight line just south of

the control tower, (unless they moved that too).

Also scheduled for Saturday is the Sonerai and Monnett design Dinner at John and Betty Monnett's fine hanger on the field. Please check at the Great Plains booth to find out the details (cost, location, seating arrangements, etc.). Try to beat the crowd over to the Monnett hanger by arriving before the end of the airshow, it isn't a bad place to watch the few acts anyway. If you fly in, we will try to arrange rides at the noon forum for you.

This month's longest article deals with a non-Volkswagen powered Sonerai and the fatal accident that prompted the writing. Along with the fact that David Wilcox went to great trouble to research and write it, I feel there are some lessons for all of us to be aware of. It is easy to let the complexity and weight of our little Sonerai's get out of hand. Other people have put similar engines into this airplane, but in so doing have accepted the responsibility for their actions in my opinion.

## Discussion of Modified Sonerai Accident, N36AL

4/28/96

I was informed of this accident by a local EAA technical counselor here in Phoenix because of apparent similarities of the modifications of my plane and N36AL. The technical counselor also provided me with a copy of the weight and balance data that appeared to clear the plane for flight. For my own interest, I decided to investigate the details further. I offer my findings here for information only. I cannot assure the accuracy of the information, nor the correctness of my conclusions. As with everything in the experimental aircraft world, you need to draw your own conclusions and make your own decisions.

On November 22, 1995, N36AL took off for its first flight. An eye witness gave the following account. After gaining what seemed to be normal takeoff speed, the aircraft rotated abruptly and jumped into the air at a 45° angle, tipping from side to side in the initial climb. At first it seemed like just a bad takeoff. The plane appeared to level off and regain control. After less than 100 yards of level flight the right wing dropped, attitude recovered, and then the left wing dropped and also recovered. During these maneuvers, the aircraft had turned 180 degrees and finally the left wing dropped again, and the plane went into a spin from 200 - 300 feet of altitude. N36AL was reported as nose high from the moment of takeoff, there was a noted power reduction, and the nose went

higher still. The observed velocity was never regarded as very high after it left the ground.

Prior to this flight the pilot had conducted a minimal amount of high speed taxi tests. The nose wheel had lifted only once and the mains had never lifted off of the runway.

N36AL was a modified Sonerai LTS. The engine was not the specified Volkswagen 2180, but a Continental O-200. The weight and balance sheet that is shown below is constructed from the builder's data to represent the first flight. He had run various weight and balance extremes that indicated that all should be fine. Anyone who has built a Sonerai will quickly notice, the empty weight is high. More than 200 pounds over the plans specification, or 40% over.

| EMPTY POINT | WT     | ARM   | MNTS   |
|-------------|--------|-------|--------|
| NOSE        | 144.5  | -44.4 | -6412  |
| RIGHT       | 302.5  | 19.0  | 5747   |
| LEFT        | 295.5  | 19.0  | 5614   |
| EXTNGHR     | 3.2    | 42.0  | 134    |
| TOW BAR     | 2.2    | 64.0  | 140.8  |
| BALLAST     | 4.5    | 160.0 | 720.0  |
| RESULTS     | 752.4  | 7.9   | 5945.0 |
| 1ST FLIGHT  |        |       |        |
| EMPTY       | 752.4  |       | 5945   |
| OIL         | 11.3   | -45.0 | -506   |
| FUEL        | 60.0   | -22.5 | -1350  |
| PILOT       | 150.0  | 28.0  | 4200   |
| RESULTS     | 973.7  | 8.5   | 8288   |
| PERMISSIBLE | 1150.0 | 8-16  |        |
| MARGIN      | 176.4  | 0.5   |        |

Table 1, N36AL W&B per documentation

The moment arms in this table are based on a datum at the wing leading edge. These records indicated that there was 4.5 pounds of ballast in the tail. From all accounts, the builder was quite preoccupied with the weight and balance.

To begin my investigation I called upon a friend in the product integrity group at my work for help. He referred me to an NTSB investigator in Chicago. I can't say enough praise for the openness and professional attitude the investigator had. He was most interested in answering my questions and explaining any detail of his investigation. The same goes for the FAA investigator in Michigan. I informed the investigator that I already had the weight and balance data for N36AL. The NTSB investigator had traveled to examine the wreckage and reassembled the parts by constructing a sort of mockup of the wreckage. He referred to the 144 pound nose wheel weight listed in the weight and balance spread sheet, and said that was quite impossible. His mockup and calculations indicated that the nose wheel weight was more like 210 pounds. The investigator's calculations indicate that the builder thought the center of gravity for the first flight was at 11 inches, even though the paperwork indicates 8.5 inches.

The Continental O-200 weighed in at about 200 pounds, (no starter was installed). In order to make room for the accessories, the builder had

designed a traditional engine mount that attached to the firewall. Normally the Volkswagen engine bolts directly to the Sonerai firewall using approximately 2 3/8 inch spacers. Reportedly, this engine mount moved the engine out an additional 12 inches. Below I've calculated the amount of ballast that it would take to compensate for this installation and keep an ideal mid-range 12 inch center of gravity.

|           | O-200 cg | vw cg  | tail  |
|-----------|----------|--------|-------|
| datum l/e | -84      | -72    | 134   |
| datum 12" | -96      | -84    | 122   |
| weight    | 200      | 160    | 47.21 |
| moments   | -19200   | -13440 | 5760  |

Table 2, weight necessary to counter balance the O-200 / engine mount installation

It would take 47.21 pounds of ballast to counter act the engine installation and maintain a 12" mid-range center of gravity when compared to a typical Volkswagen installation. The nose wheel would require yet additional ballast. Obviously these numbers are rough order of magnitude.

Most people agree that the Sonerai is somewhat nose heavy even when built per plans in the tail wheel configuration.. The 47 pounds calculated in Table 2 only compensates for the unique engine installation. The NTSB investigator indicated that the tail had a 14 pound battery, about 7 pounds of weight, and the ELT, around 25 pounds all together.

Complicating the situation is one's ability to trust the numbers given.

The investigator was able to locate the scales that the builder had used to weigh the aircraft. All three were different types of bathroom scales. The scale readings were in error by 5, 15, and 20 pounds. It is not known if the builder rotated the scales during the weighing. Also, I cannot determine the logic of using a 160 inch moment arm on the ballast weight as shown in table one. The battery mount is at 134 inches from the wing leading edge, the center of the location of the ballast. The vertical stabilizer post is at 160. I suppose that it is possible that the fuselage was lengthened to compensate for the length on the front end of the aircraft, but I don't know.

The NTSB investigator estimated the actual center of gravity to be at 7 inches. Regardless of all of the previously discussed calculations, this is probably the most accurate information on which to base an analysis. N36AL also had three gallons of fuel in the auxiliary fuel tank behind the pilot.

The center of lift for the Sonera airfoil is unknown to me, but just guessing, I estimate that it is just a bit aft of the rear center of gravity limit of 16 inches. For this discussion I use 18 inches. At the 974 pounds gross takeoff weight of N36AL, there would be a  $10,714$  ( $(18-7)*974$ ) inch pound moment that the horizontal tail plane would have to overcome to maintain level attitude. This moment at the tail results in a required 92 pound downward force. I had speculated

that N36AL had trimmed the horizontal stabilizer to generate this force. I made a second call to NTSB to ask if the stabilizer had been lowered excessively. It had a 3/4 inch spacer below the longeron. This does seem to be excessive.

The most perplexing aspect of this accident was that the investigation findings of forward center of gravity did not match with the eye witness reports of the first flight characteristics. N36AL was reported as nose high from the moment of takeoff, there was a noted power reduction, and the nose went higher still. These conditions sound more like a tail heavy situation than nose heavy.

I have not been able to contribute the cause of this accident to a single item, but controllability seems to be a factor. The pilot probably had the stick almost all of the way back into his gut during the entire flight. The forward center of gravity is certainly a factor. High torque from a 100 hp engine turning much slower than the 80 hp Volkswagen is also a likely factor. Anyway, not many argue that the modifications on the plane were a major factor.

The president of the EAA chapter where the builder was a member now advocates near runway, ground effect flight before committing to the air. I agree with this. I believe that the likelihood of an accident is higher, but so is the survivability. I've tried to work out a plan and welcome comments from any Sonera owner.

The following is my first thoughts on flight testing. Both the EAA and the FAA have published guidelines for flight testing which I plan to obtain before firming up a plan.

It is my intention to master the ground handling of my plane first. I plan to start at idle power and increment in 100 rpm power settings slowly gaining confidence at each step before moving on to the next. As the taxi speed moves into the flight range, I will let the speed build up and slowly rotate with insufficient power to maintain flight. A short hop should occur and it will be necessary to immediately lower the nose to maintain speed. A landing should be possible without a power/torque change. After assuring that the airplane is correctly trimmed and controllable, I will attempt to gain some proficiency in ground effect with the slowest power changes possible. I do not plan to go for broke and get away from the ground as fast as possible, an approach recommended by a number of knowledgeable people. I would not necessarily take this approach in a tail wheel aircraft, nor will I proceed without practice of the procedure in a familiar plane.

I am installing a Continental A80 in my Sonerai LTS. The A80 weighs 170 pounds, less than a well equipped VW 2180. I probably have five to ten pounds of extra structure and firewall and I have a castering nose wheel. My engine bolts directly to the firewall using one inch spacers, similar to the method for mounting the Volkswagen. My

propeller flange is in exactly the same position as intended by the plans. The diagram below shows my general engine installation.

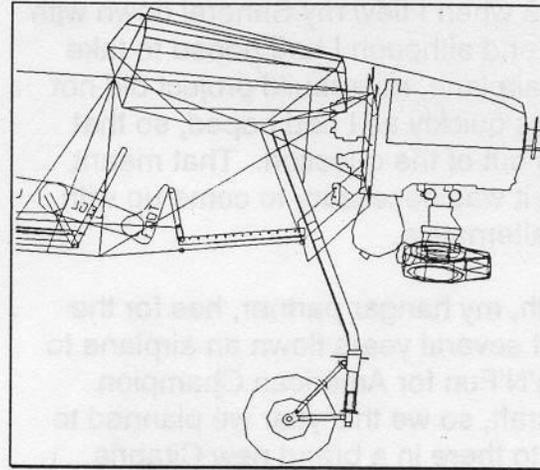


Figure 1, Perspective of the author's A80 installation in the Sonerai LTS.

In conclusion, I do not believe any unknown aspect of the Sonerai design contributed to this accident. The people close to the builder conclude that the control surfaces need to be larger. I do not plan to change mine. I think that the pilot failed to lower the nose long enough after the initial leap off the runway to regain airspeed. In his attempt to gain lateral control, he did not realize that he was in a virtually continuous stall. He had no feel for the aircraft stall characteristics.

Looking into this accident has been very difficult for me. I have questioned the wisdom of my own decisions. By no means, do I recommend anyone deviate from the Sonerai plans, but if you do, consider the weight, balance, aerodynamics, crash worthiness, and maintainability aspects of the

## SUN'N'FUN '96 by Fred Keip

Sun'N'Fun was interesting for me this year because getting there didn't go anything like I had planned. This was the first year I had been there since 1992 when I flew my Sonerai down with Ed, and although I had hoped to take my airplane, my rebuild project did not go as quickly as I had hoped, so that was out of the question. That meant that it was necessary to come up with an alternative.

Keith, my hangar partner, has for the past several years flown an airplane to Sun'N'Fun for American Champion Aircraft, so we this year we planned to get to there in a brand new Citabria. We were even going to use my new handheld GPS, but Mother Nature had other ideas.

Our plan was to leave Wisconsin on Friday morning and get to Florida that night or on Saturday. Well, guess what? Thursday night the weather went into the dumper, and would remain that way until Tuesday. To make a long story short, we decided on Friday night that there was no way the weather was going to let us fly ourselves, so we called ATA and got a round trip air fare to St. Petersburg from Milwaukee for \$220.

Let me tell you, even thought flying the Citabria (or even better, the Sonerai) is a lot more fun, getting there in two and a half hours, and not needing to worry about the weather, sure does make it easy.

Anyway, by noon on Sunday we were at the fly-in, and it was sunny, humid, and 85°. We stayed until Friday, and other

than the rain Monday afternoon, the weather was perfect. Our Sonerai representation on the flight line consisted of one airplane, Fred Flynn's Sonerai II, N86FF. Unfortunately, I did not get a chance to talk to him. (Sorry, Fred.) I was a little disappointed at the turnout, but the weather up north was pretty bad, so I'm not surprised. Hopefully, next year we can have more.

Our Sonerai forum went well. There were about thirty people there, and Steve Bennett and John Monnett kept us entertained for better than an hour. On Wednesday night, we had our traditional dinner at Vito's and Dean McGinnis is right; it is good Italian. There were about ten or eleven of us, and a good time was had by all.

The rest of the fly-in was great as well (except of course, Charlie Hillard's untimely death). I spent a fair amount of time in the ultralight/light plane area, and I'm fascinated by the Team Airbike, but I don't think I can convince my wife to let me build one.

So, in a nut shell, that's it. We're already talking about next year. Hope to see you there. (By the way, the ride home was just as easy as the ride down, and the weather at home was still as crappy.)

## REBUILD FINALE by Fred Keip

She flies, again! On June 10th, just two days after the tenth anniversary of the first flight, I flew my "new" Sonerai for the first time, again, and this time it went without a hitch. (No surprise canopy openings this time.)

change. If you do not have the ability to analyze the change from an engineering design standpoint, you are accepting a great risk. Discuss your ideas with others with an open mind. Discuss them early, before you commit to them, otherwise you will find yourself rationalizing your decisions instead of contemplating the advice.

Both of the investigators commented that the craftsmanship of N36AL was impeccable. People that knew the builder personally still seemed to have some doubt in their minds that the weight and balance was inaccurate. It appears that the builder had gained a reputation for being an expert. He had spent over twelve years on the project, but he did not seem to be the type of person that sought the advice of others.

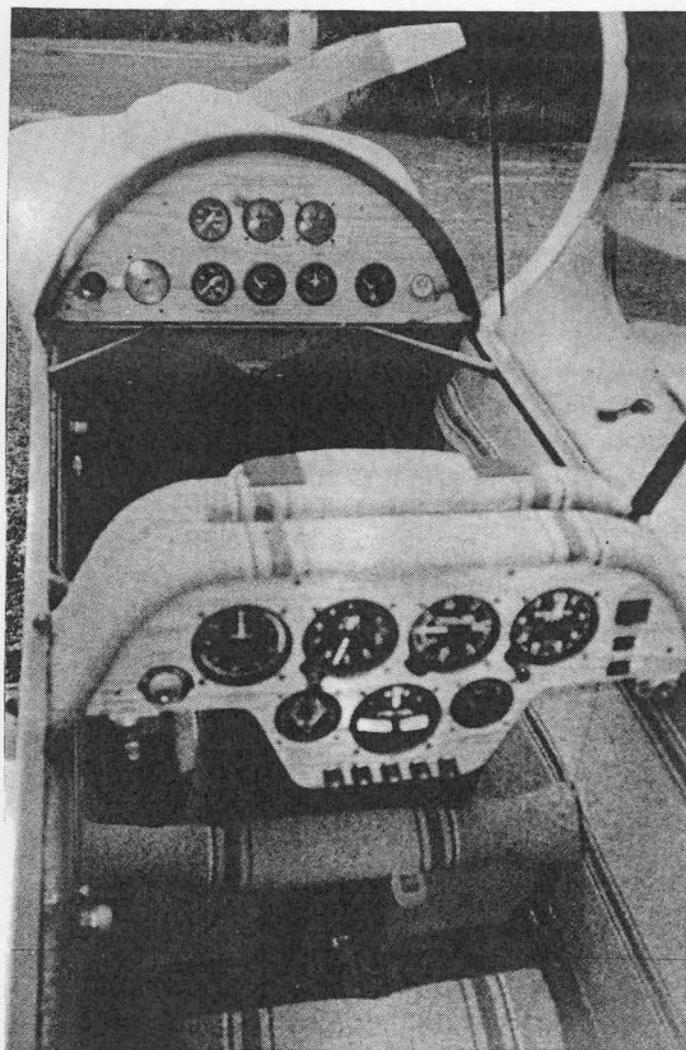
The NTSB accident report number for this incident will be CHI96LA037. It should be available in June or July.

*David E. Wilcox*

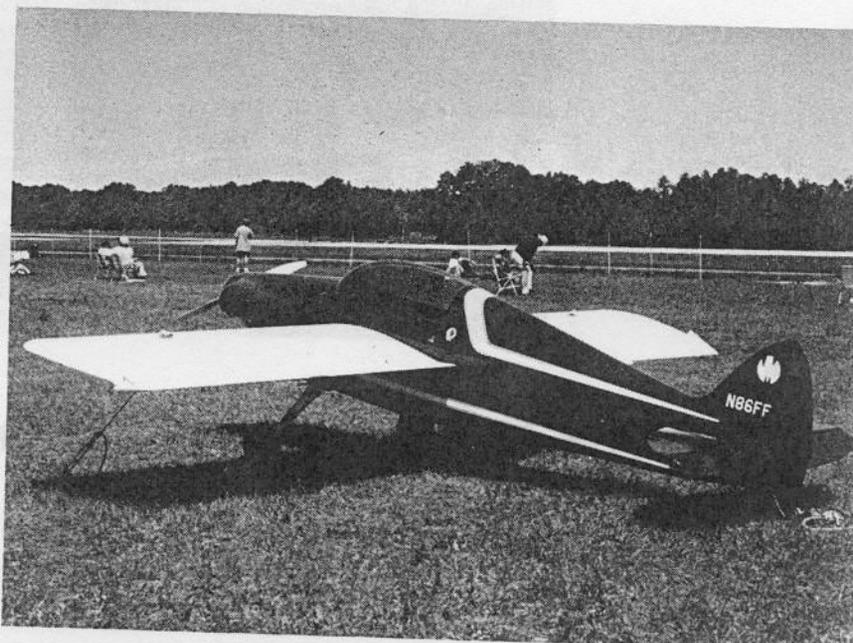
(602) 231-5824

**Fred Flynn's Sonerai II  
at Sun N Fun 1996**

7



**Neil Stevenson's Son IIL interior  
RMB 3201 Wiseman's Ferry Rd.  
Central Mangrove, N.S.W. 2250  
Australia**



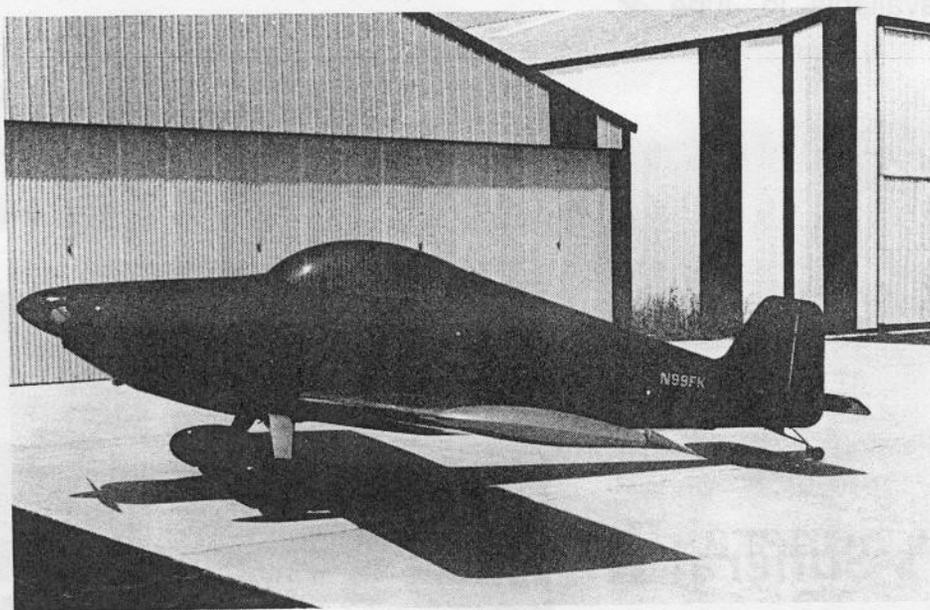
The past three months have been very hectic on the recover/repaint project. The Superflite II covering worked very well, and I'm extremely pleased with the finish. It's very glossy and wet-looking. My hangar partner sprayed the paint while I did all the grunt work. (You know, like gluing and taping fabric, sanding, washing, and so on.) He said that it was the easiest paint he has ever shot, particularly the metallic silver on the wings. The rest is red, by the way. I did the N numbers and the "experimental" placard in vinyl, made by a local sign shop. That's the only way to go. If I decide to put any more trim on it, it will also be vinyl.

The new horizontal stabilizer trim system seems to work well. It does not take a lot of movement to keep things in trim, and it sure makes holding altitude a lot easier. The only problem is that there is more friction in the system than I had anticipated. I need to increase the mechanical advantage at the pulley in the cockpit to fix it.

The new box baffles on the engine also seem to be working well, with the cylinder head temperatures being where they should be. My revised breather set-up, with the breather hoses connected to the valve covers, does not work any better than the crankcase-mounted breather, so I am going to convert it back, so that I have fewer connections and less weight. I guess there is so much oil flying around inside the engine, it doesn't really matter where the breather is.

And finally the new Magellan GPS is the greatest thing since...loran-C. Having the database is really handy, and it updates so fast that its accuracy is phenomenal. The only thing I had to do when I installed it was to mount the antenna on the canopy above the skirt so that it had a clear view to the horizon. I have no excuses for getting lost now.

There's six plus hours on the rebuild now, and I'm looking forward to taking her to Oshkosh. See you there.



**Fred Keip's Sonerai II L and his new fabric and paint job**

# Want Ads

Wanted -- Sonerai parts

John Bauer 14601 SW 272 St.  
Naranja, FL 33032 658-8357 beeper

Wanted -- Son II project or completed aircraft.  
Preferred to have it 70-80% completed.

Dave Valaer 2833 Summit St  
Souix City, IA 51104 712-277-2823

Wanted -- Variety of good used or new Sonerai parts: cowling, canopy, 5/8" landing gear, spinner, S wing kit. Also interested in a Son IIL project.

Mike -- 219-534-2900

For Sale -- Sonerai II LT (easily conv. back to conventional gear) Wing Mod, VFR instr., Cleveland wheels and toe brakes. No engine or prop.

Ivan Haecker 8434 FM 2673  
Canyon Lake, TX 78133  
210-438-3354 weekend 210-899-4824 eve.

Wanted -- Sonerai prewelded or tacked fuselage with tail feathers. Also, landing gear kit.

Joe Burr 4098 Eddystone Dr.  
Cincinnati, OH 45251 317-827-7195

For Sale -- 2 Ray Jeff Lorans, PI-99 w/ self contained battery packs, both w/ new chargers. \$175.00 ea. or both for \$300.00. In cartons w/ manuals.  
Mike 219-534-2900

Wanted -- Complete of nearly completed wings for Sonerai II midwing and canopy  
309-633-2365

For Sale -- Porsche 914 2 liter engine project. Motor ran, mostly converted. 9" prop extension. Ellison carb. 650 Honda alt. Aluminum welded manifold. Potentially best VW conversion yet. Very cheap.  
Roger Durham 1370 Thompson Ave.  
Glendale, CA 91201 818-846-9163

For Sale -- 2 valve covers, 2 dual port int. man., 1 external oil cooler adapter, 1 oil cooler eliminator (bypass). All above are cast aluminum \$65.00 total. Also-- 4 exh. flanges, 2 steel "u" bends for exh. \$25.00 total. Also -- 1 dist. hole rubber plug \$5.00 Everything together \$85.00  
210-899-4824 even. or 210-438-3154 week.

Wanted -- Cont. A65 taper shaft prop hub and professionally welded fuselage for Sonerai (set up for Cont.) Also, I have Bendix mag rotors to correct the S-20 AD.

For Sale -- Cont. A75-8 300 SMOH  
John Mc Laughlin 25839 Tallwood Dr.  
North Olmsted, OH 44070 216-734-5578

For Sale -- Subaru engine 1985 EA82 turbo engine complete with EFI, computer, turbo all access. 5 subaru repair manuals. \$1400 for all. Also, EA82 non-turbo engine TBI injection. Car ran but engine may need work.

Bob Stieg 815-397-1533 days  
815-234-2283 eves.

For Sale -- VW 1835 engine. All new. Hd. lifters, SCAT heads, Hapi access case w/ dual alt., elec. igniton, prop hub installed, Zenith carb. Might separate. Apart for inspection. Can assemble.  
Bob Stieg 815-397-1533 days  
815-234-2283 eves.

For Sale -- Sonerai II midwing, Supervee cowling, Sterba prop, 2100 engine w/ Revmaster prop ext. Also, 4016 Slick mag w/ 100 hrs, and misc. instruments. Eddie Eiland 1350 Thunderbrook  
De Soto, TX ph. 214-230-8475

Wanted -- Son II LTS, LS, or LT w/ 2180, but will consider a taildragger w/ smaller engine. Prefer wing mod already done.  
Bud Aumann 11340 w. 38th Ave. #26  
Wheat Ridge, CO 80033 ph. 303-420-6071

For Sale -- Sonerai I project, Wings complete and ready for paint. Fuselage frame and tail completed and primed. \$1400 Can deliver Eastern US at cost.  
Jim Vliet 80 W. Jericho Turnpike #102  
Syosset, NY 11791 516-364-457

For Sale -- Sonerai II LTS Wings assembled and ready for ailerons and tips. Prof. welded fuse. and tail feathers. On gear, cowling and fuel tank. \$5700  
Paul Schmidt 412-458-5486

For Sale -- Son I No engine, 148 TTAF Fabric and wings OK. Airworthy but disassembled. No damage. \$3600  
Also -- For Sale -- 1600 VW engine 0 TT Disassembled AS 41 case, machined for Great Plains hub \$1900  
Bob Schank 313-697-7075 after 5 PM

For Sale -- Sonerai II bubble canopy -- smoked brown, complete with latches, etc. \$300.00 (U.S.) 613-632-9601 home  
514-437-6129 work

For Sale -- Sonerai II midwing fuselage, nice welding, controls, tailfeathers, spar box, gas tank, seats, on gear with 6X6 Azusa wheels, \$1000 or \$1250 w/ new Slick mag and harness. Might trade for Son I parts, other airplane parts or ?  
Harry Fenton wk: 815-965-4700

Wanted -- 5/8" landing gear for Sonerai II and also fuel tank  
Jerry Campbell 722 N. Main  
Aberdeen, SD 57401 605-225-8675

For Sale -- Sonerai IIL, 275 TT, 1834 HAPI, Aerobatic tested, light damage, must sell \$3750 309-944-2366 wkend

Wanted -- Sonerai engine, instruments, and airframe parts.  
Gene Cook 114 Imperial Ave.  
Friendswood, TX 77546

For Sale -- HAPI motor mt., Bosch starter, Alternator, 3" prop ext., Ignition switch, Tail wheel assy., taper pins, #8 pin reamer  
Greg Jannakos 994 Vineyard Circle  
Stone Mtn, GA 30083

For Sale -- Son IILT Fuselage approx. 85% complete. Sticks, rudder pedals in, tail feathers on. \$850.00  
Bill Waters 770-466-2464

For Sale -- Pitts S-1c 180 hp, full inverted many features. Call for details.  
Joe Norris 715-886-3261

For Sale -- 1 Type 3 Supercase by Claudes Buggies, 1 forged crankshaft w/ hub and prop extension, 2 cyl. heads w/ S.S. valves, 1 set of NPR piston rings. All for \$500.  
217-935-5345 evenings

For Sale -- 1990 Sonerai II L 2180 G.P. engine, Ellison carb, S-wing, Aux fuel tank tinted canopy, white/red sunburst on wings and tail. 250 hrs+ Actively flying.  
\$10,000 Call Vic at 507-282-6647

For Sale -- Sonerai I Kit, welded fuse, wing kit, cowl, canopy, gear, wheels and brakes \$2000.00  
John Dialogue 801-571-3063

