

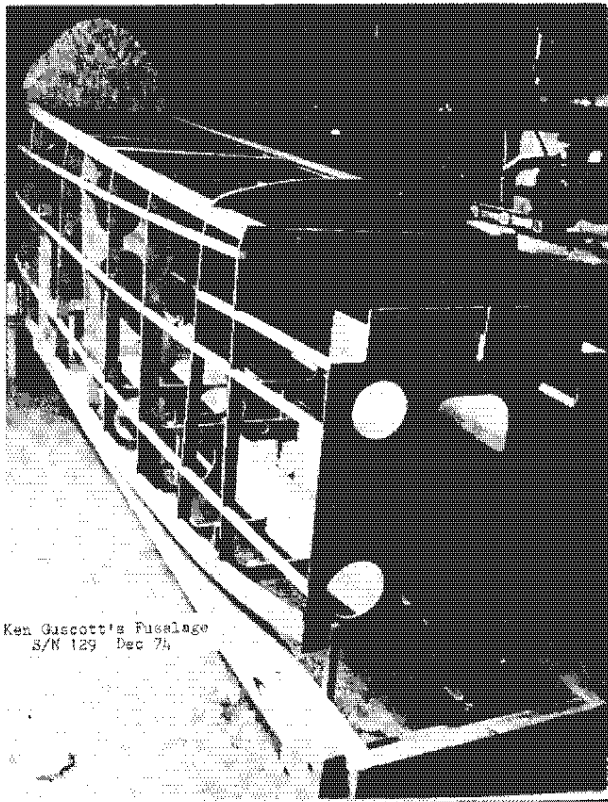
Photos by Don Dwiggins

Published quarterly by
Rutan Aircraft Factory
 Burt & Carolyn Rutan
 Building # 13, Mojave Airport
 P.O. Box 656, Mojave, Ca. 91501
 (805) 834-2645



THE VARIVIGGEN program is now in high gear! We are very pleased to see the great number of excellent projects under construction. As of this writing, we have received the plan's "page two" from 218 builders indicating that they are building or are planning to build. (Those of you with aircraft serial numbers have the updated builders list enclosed with this newsletter.) We estimate that about 150 projects are now in the construction stage.

The following are photos of projects sent to us. We encourage all of you to send photographs for the newsletter (black & white), also, how about everyone with a project underway, sending a photograph and caption to Jack Cox, Editor of "Sport Aviation" (Box 229, Helen Corners, Wl. 53130) for insertion in the "What Our Members Are Building" section of the magazine. Also, "Sport Aviation" periodically prints a list of projects under construction. Send back your name and address and mention you are building a VariViggen. 150 builders on the next list would look real impressive!

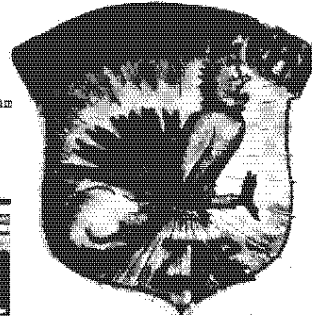


Ken Gascott's Fuselage
 S/N 129 Dec 74

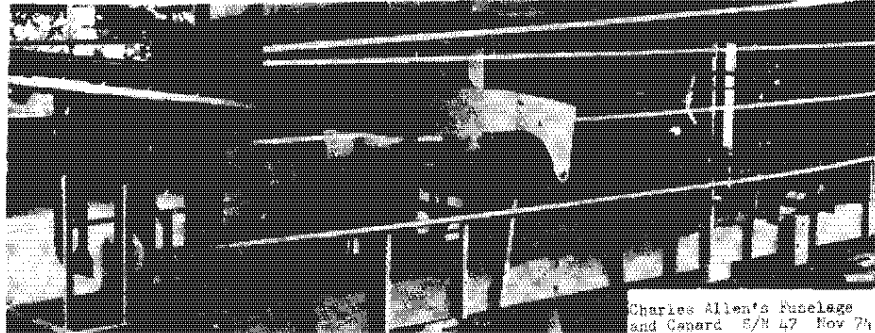


This shot from the back seat shows that the roll-over structure does not block visibility - Photo by Peter Garrison

New emblem on N277V
 Drawn by Jerry Slocum

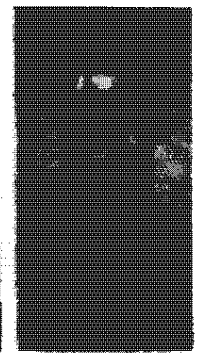
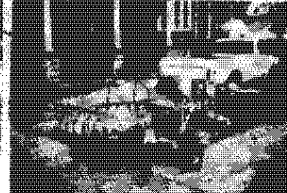


Cerrol Holzworth's
 (S/N 2) canard &
 elevator ready to
 mount on fuselage

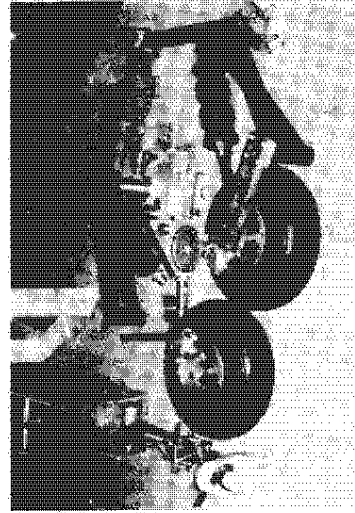
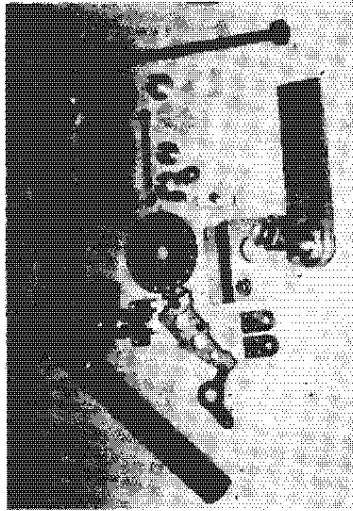
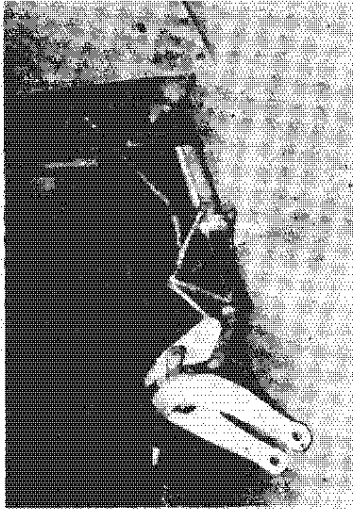


Charles Allen's Fuselage
 and Canard S/N 47 Nov 74

J. Scheibinger (S/N 196)
 just for fun set his
 canard on the nose of
 his Volmer amphib!

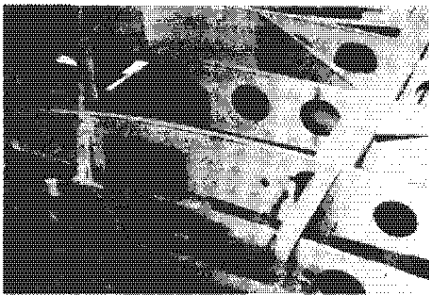


I didn't really think anyone would build the landing gear first, but Mike Melville (S/N 115) did. Excellent work, Mike. He's done with the inboard wing and most of the control system and may be the first to fly!

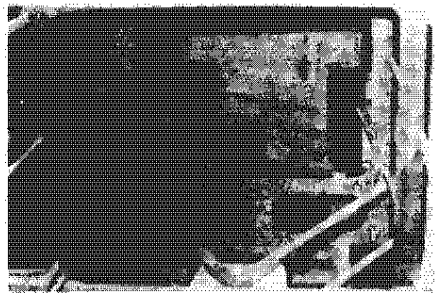


CONSTRUCTION MANUAL For sometime now we have been wanting to provide photographs of the construction details. Since we did not take these during the construction of N27VV, we had been looking for a project on which to begin the photo series. Jim Cavis, S/N 031, has agreed to not only get professional quality detailed photos, but to write a construction manual with detailed information on tools, jigs, materials, construction hints, etc. This will be similar to the type of information on pages 11 and 12 of the plans but very detailed and expanded to about 30 pages, referring to approximately 75 detailed photographs. It will be published in two parts. Part one (fuselage, canard, inboard wing, vertical stabs, control system, and landing gear) should be ready by March or April and will include drawing changes to use the larger AN 220-2 control system pulleys which are much easier to obtain than those shown in the plans. Part two (outboard wings, canopy, engine installation, instruments, electrical system, seats, and fuel system) should be ready by about the end of the year. Price for the manual will be between \$15 and \$25. Complete details will be in the next newsletter. The following is a sample of photos from Jim's project taken in December. He now has the entire control system installed and is working on the landing gear.

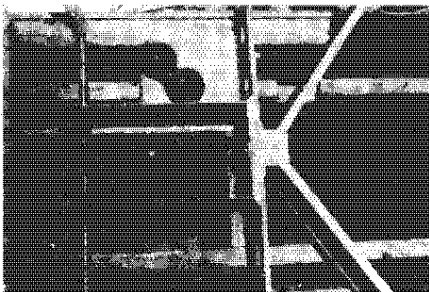
Left Inboard Wing



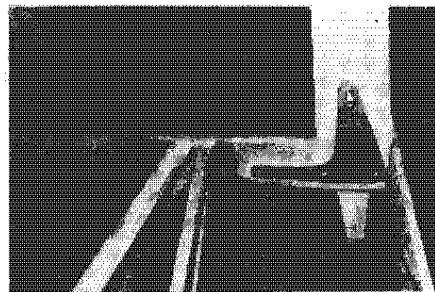
Looking aft in baggage area



Rear Stick Area



Spar G looking aft



ACTIVITY with N27VV has been almost nil for the last two months since we have had it in the shop to develop tooling for the fiberglass parts and exhaust system. Before N27VV was hangered though, Edwards Air Force Base invited us to participate in their open house display last November. The VariViggen blended in well with its red, white and blue, and fighter appearance. Also, writers Bill Cox, Don Driggins, and Peter Garrison did flight evaluations of the VariViggen that month. Keep watching for articles in "Flying," "Plane & Pilot," and "Science and Mechanics."

We are planning to have N27VV flying in time to take it to San Jose, where we are guest speaker at EAA chapter 62 banquet meeting on February 15. We have been giving several presentations to EAA chapters and other interested groups. Then we will be filming a movie sequence for a film which depicts the 1990's. The VariViggen strafes and bombs a futuristic-looking car in a desert canyon area, then crashes - the crash is done with a model, of course!

The airplane will then be inactive again for some improvements (see special performance), then we plan a U.S.A. tour with many stops, including of course, Oshkosh '75. We'll have more information on where and when in a future newsletter.

VariViggen plans have received NASAD approval in AA category.

COMPONENTS

We are behind the schedule we made in October for supplying the machined parts and fiberglass parts. What we thought we could do in a month has taken two or three (kinda like building an airplane!). The good news is that the machined parts for the first 25 airplanes are complete and they are beautiful. All steel parts are cad plated and baked. The nosegear strut is hard chromed and precision ground. Some builders have found it difficult locating the O-rings, backup rings, and scraper for the nose strut, so we have stocked up on these and can supply them with the nosegear housings. We also plan to build the NG36 scissors and NG20 'Y' bracket in machined aluminum with bushings to replace the welded homebuilt. Thus, we will be supplying the complete nosegear with the Scott assembly. We plan to offer this complete nosegear to builders of other aircraft types, but only after VariViggen builders have been supplied. Availability is now for the machined parts shown as "Immed" in the catalog for the first 25 sets. The second production run will be available in one to three months.

The fiberglass parts will all be made in first-class tools being prepared by Fred Jiran, well known in the sailplane crowd for his excellent work with European, glass sailplanes. All tooling was redone from my prototype molds at considerable expense, but the result will be much higher quality parts without the waviness seen in N27VV's parts. All parts will be supplied in primer gel coat-finish. The visor part (F27) has been modified, raising by one inch the portion which connects to the leading edge of the windshield. This results in a better looking, further-aft slanted windshield, more instrument panel space, and a smoother matched mold line to the nosecone. If you have not already cut out the top edge of F41, leave it about 1/4 inch taller than on the plans and trim to fit F27. If it is already cut, it is a simple task to scarf on an extension. F20 can be notched down between the longerons to provide clearance for long radios or instruments to extend out over on top of the canard aft spar. Notching F20 all the way to flush with the canard top will not weaken the structure. While the external fit should not pose a problem, it is suggested that you trial fit F27 before skinning the fuselage sides so any builder tolerances can be trimmed out.

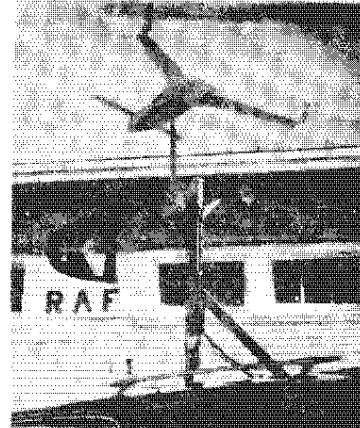
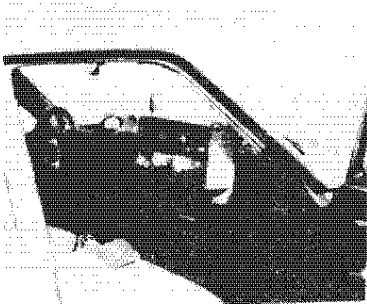
The cowling tooling was a considerably larger task than we had anticipated due to the changed mold lines to enclose the new exhaust system. In the design of the new cowling we made two decisions that will reduce the cost of your aircraft by over \$200. First we are not using a prop extension. I originally thought this would be justified to provide a better looking aft closure. However, after finding that the prop extension now costs over \$100, we modified the cooling outlet to provide a well-streamlined aft mold line without moving the prop aft as shown on the plans. Also, we are not using an expensive aircraft exhaust system. Instead of an expensive aircraft muffler, we used a simple manifold terminating in the center under the prop with the multiple hole outlet. The entire system was made up from stock bends (available at Midas) at a materials cost of less than \$12. It's quiet and located so no exhaust-prop impingement occurs. The cowling is less bulky than it would be with a standard aircraft exhaust system and, best of all, you don't have to buy the exhaust system - have you priced them lately? Full details and pictures will be supplied after all tests are completed.

We could produce cowlings by February 15, but we will not start production until all flight tests on the prototype cowling are completed, thus we expect cowling availability to be in mid to late March. F25, F28, and F27 will be available by March 1. We only plan one master tool per part so all fiberglass parts can be made at a rate of only one set per day.

The following items are still planned, but we cannot schedule their production until we have a better idea of the demand and can afford the investment in tooling: V-MG19, V-MGMA, V-RMA, V-MG14, VVSC, Engine Mount, Fuel Tank, Exhaust System.

The car-top "wind tunnel" manual availability has been delayed until this summer. We built the new prototype system (see photos) but experienced failures with one type of the potentiometers used, after about five hours testing. A redesign is required, plus the demands on our time are preventing us from completing the textbook at this time. We were quite pleased with the new "wind tunnel" system as it gave us very accurate data in developing the aircraft shown in the photographs, which is a design we are building in order to break the existing world records for distance and speed in the under 500 kg weight class.

We are also delaying the Owners Manual, for a different reason, though. FAA is now proposing that homebuilts fall under a new set of regulations for custom built aircraft in which a builder can do his own annual inspections and maintenance if he has a "repairman's certificate," given only to the builder. If you buy your completed homebuilt from someone, you would have to have maintenance done by an A & P mechanic. Also required is a manual. There are several different proposals for the manual format and contents. One by FAA, one by EAA, and still another by NASAD. As soon as it is decided what the regulation will specify, I will arrange the VariViggen Owners Manual to match, including all additional information specified in our catalog, of course. If FAA still has no regs by this summer, we'll publish it anyway, since it has alot of important information for VariViggen operation.

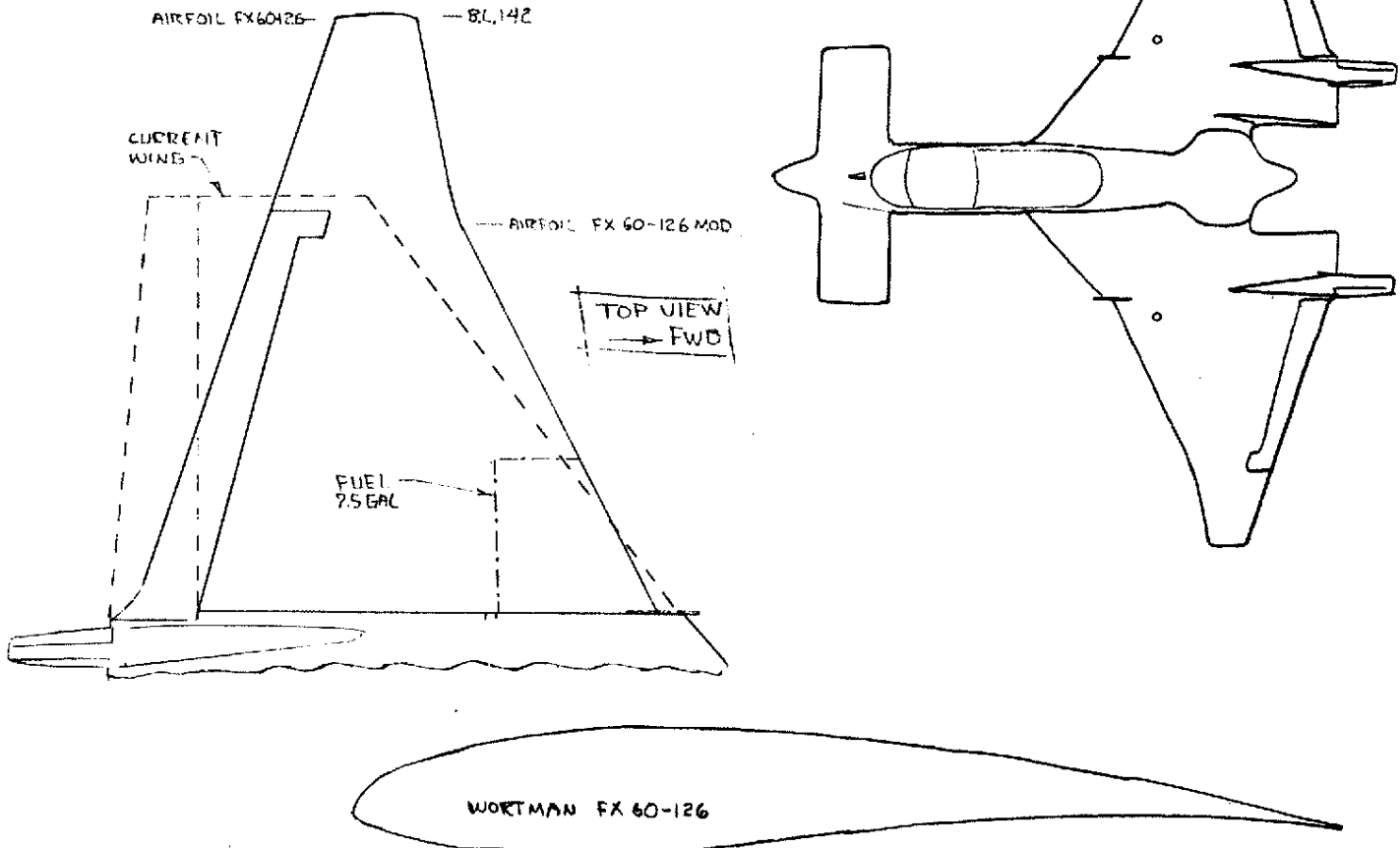
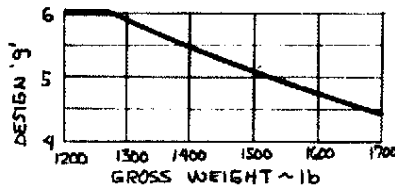


Special Performance Wing

We have started construction on an entirely new outboard wing panel design for testing on N27VV. First, a little background: we have done extensive testing on a new construction method using urethane foam and hand layup unidirectional fiberglass. I do not mean the Rand formulae of wood construction with foam and Dynel surface development. We actually make a tapered spar very easily by laying up layers of unidirectional glass, carve a wing using only three rib/templates, and cover with two crossed layers of thin unidirectional cloth. This method is light, strong, requires no particular skills or tools, and best of all, can be done in about 1/4 of the man-hours required to build the metal wing. If this system meets test expectations, we will supply plans for outboard wings and rudders, thus taking the aluminum construction totally out of the design. A small cost savings is also possible. Since the unidirectional glass with the epoxy surface treatment is somewhat difficult to obtain in partial rolls, we are importing a large quantity from Europe and will make available kits for the outboard wings and rudders. No aircraft-quality wood is required.

Now, for the really big news - the aerodynamic design of the wing panel. The original panel is a very, very conservative design from the stall standpoint, and retains the flat bottom out to the tip for ease of metal construction. Now that I have actual flight test data, I can design out some of the unnecessary stall margin, and reflex and twist the wing for optimum performance. I wouldn't recommend this for a new design, but it can be done with low risk, using actual flight test data. Considering the trim requirements, and designing for best climb and cruise performance without excessively reducing the g-capability, I have arrived at the following design and have started construction:

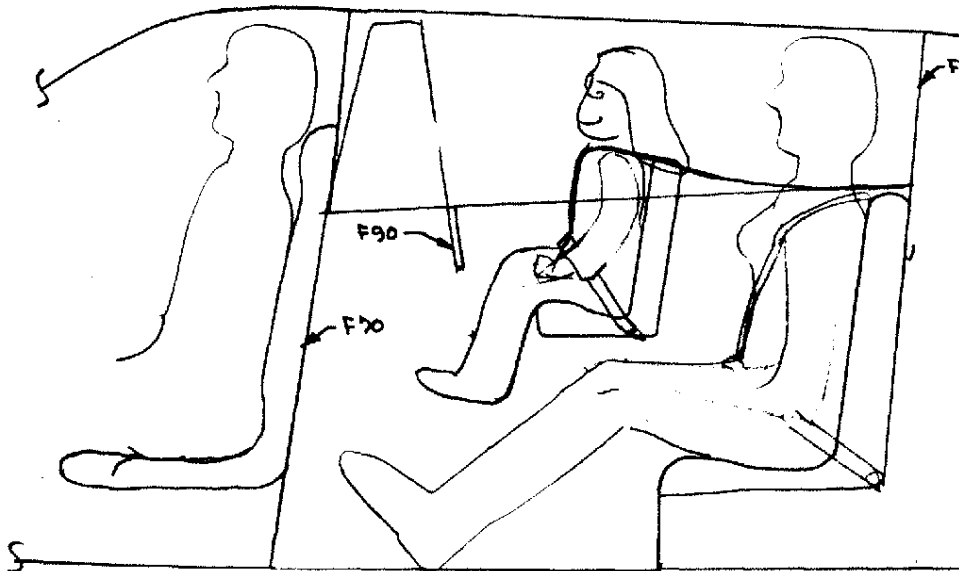
	Original VariViggen	VariViggen SP	Increase
Span ft	19	23.7	25%
Area ft ²	119	125	5%
Aspect Ratio	3.03	4.47	47% !
Span Loading	89.5	71.83	-20%



Conservatively, we estimate a 25% increase in rate-of-climb at gross weight and a five to seven mph increase in cruise speed. That's almost 180 hp performance on the 150 hp engine! As you can see from the sketch, the new wing has a 15 gallon aux. fuel capacity. It will fit the inboard wing built to your plans and uses the same V-WAA (WA2 and WA3) wing atch. assembly as is used on the original outboard wing. It will also tie in directly with the current design AB10 aileron pushrod and should require no other changes.

In addition, we are going to incorporate the recent NASA-developed "winglets" developed by Dr. Whitcomb in an attempt to further increase rate-of-climb. In summary, if the SP works as I think it will and retains the stall safety, we will have a very competitive performance aircraft to go along with our already superior handling characteristics. But that's an if, so please don't bother us alot with further questions now; we should have test data and a decision whether to make plans available by Newsletter #4. I do suggest that you hold off on purchasing materials and building the outboard wing if you have not already done so.

OTHER Modifications - True, the VariViggen is not a 4-place airplane, but it can easily be made into a 2 + 2 configuration with plenty of room and visibility for a 140-lb wife and one or two children, combined weight up to 110 lb. The sketch is self-explanatory. This is the best way to add some family utility without compromising cruise performance. Scaling up the outside dimensions to add more people will result in either slower speeds or higher fuel flow, depending on engine selection.



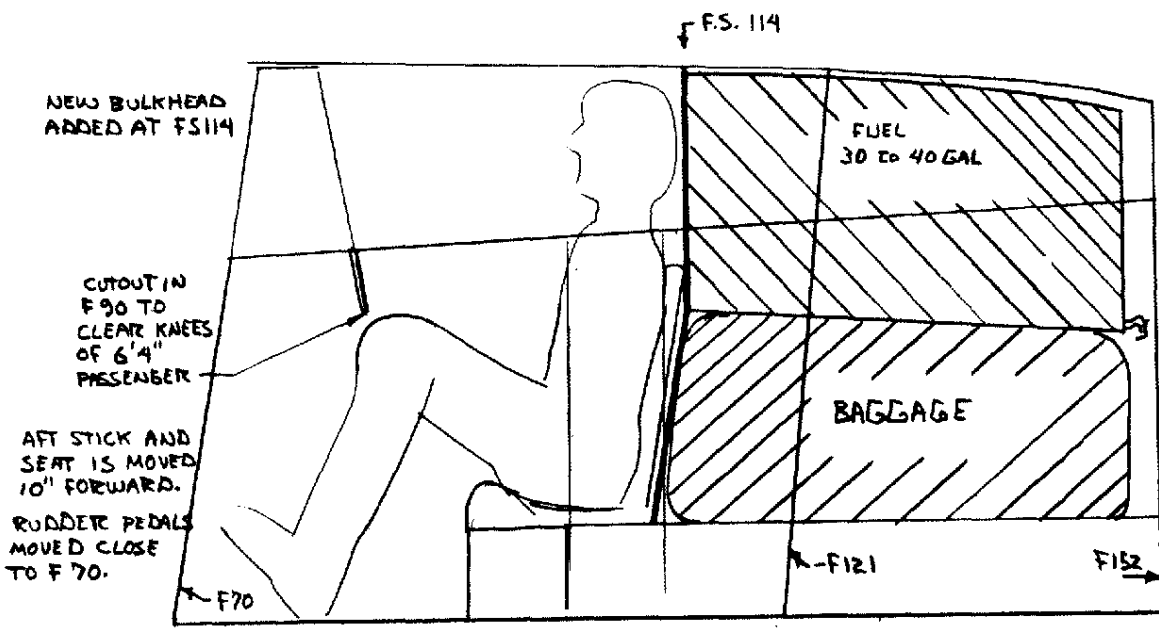
JUMP SEAT CAPACITY -
2 CHILDREN SIDE-BY-
SIDE, TOTAL WEIGHT
110 lb.

CHILDS JUMP SEAT
CAN FOLD FORWARD
OR BE REMOVED TO
ALLOW EASY BACK
SEAT ENTRY AND
ACCESS TO BAGGAGE
COMPARTMENT

CHILDS SEAT BELT
ATTACHES TO F103.
CHILDS SHOULDER
HARNES ATTACHES
TO F8 OR F5.

F90 IS CUTOUT TO
ALLOW CHILDS LEG
CLEARANCE. REAR
STICK IS MADE
REMOVABLE.

As a two-place, the rear seat area is much larger than is usually needed, and a relatively minor modification can be made to increase fuel capacity, baggage capacity, and still hold a 6' 4" back seater in relative comfort. Again, the sketch is self-explanatory. This is probably the best way to increase range, since it does not add any complexity to the simple gravity-feed fuel system.



ADHESIVES I am still hearing about some builders using obsolete wood adhesives and varnish. That was 50 years ago, but inexcusable now that modern epoxies are available. With modern epoxies, the wood structure should last indefinitely. Here are two more very good adhesives: 1. FPL glue 16-A, available from Aircraft Spruce, Bx 424, Fullerton, Ca. 92632, at \$11/qt or \$29.90/gal; 2. West System Epoxy, available from Gougeon Brothers, Bay City, Mi. at \$19.95/gal plus \$5 for hardner (specify 206 hardner for 40 minute pot life). This latter one sounds excellent as it has a relatively fast cure of six hours and can be used as low as 40° F temperature. It's a 5 to 1 mix, has a relatively low viscosity, and can be used directly for painting structure. It provides a 100% molecular bond between coats without surface preparation. For gaps over 1/32", it can be thickened with "401 fibers" (\$1.90 for a bag - enough for the entire aircraft) to fill even large gaps without decreasing strength. Send Gougeon Brothers an extra \$ for their manual on this epoxy system. Pastor Jenkins, S/N 177, is using it on his VariViggen. He completed his fuselage structure and canard in only 12 days!

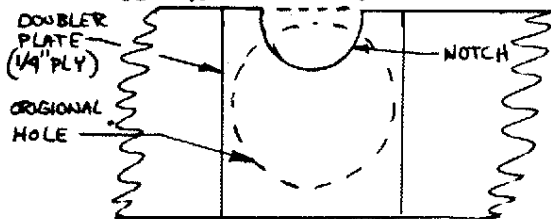
PLANS Changes - Be sure to incorporate these revisions into your plans Now.

- Location - PL - Plans
 TR - Tech Report
 NL - Previous Newsletters
- Category - MEO - Minor error or omission
 OPT - Optional improvement
 DES - Desirous change - Does not effect flight safety but should be incorporated to improve aircraft or correct a fault
 MAN - Mandatory change - Must be incorporated as safety of flight is affected

Category Location

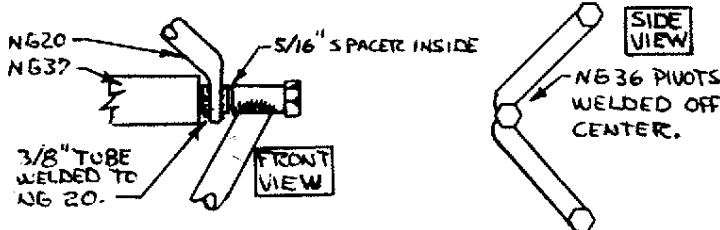
- MEO NL2 pg 2 Change phone # to 824-2645.
 MEO PL pg 11 Center of page, change "W.L.18" to "W.L.22".
 MEO PL pg 4 Purane Plastics has closed their N. J. office.
 MEO PL pg 4 Western Ply & Door Co. no longer uses "Western" in their name.
 MEO NL2 pg 3 Wrong address for Spencer. Use the one on plans pg5, 8410 Dallas, Seattle, Wa. 98108.
 MEO PL pg 50 Newsletter #2 changed the 1.63 and 1.7 dimensions to 1.75 because we found some belcrank bearings (MG7 - MS20218-2) with an outside flange of 1.75. Since then I purchased some MS20218-2's from Arts Surplus (address on plans pg 5) for 75¢ each, that have a flange diameter of 1.67 which is the correct O.D. shown in the mil spec. We are machining the RAF-supplied MG5 & MG4 parts to fit the 1.67" bearings. If you are building your own MG5 & MG4, I suggest you get the MG7 bearing first, and fit the inside diameter to a slip fit on the bearing with a champher to clear the bearing radius. The RAF-supplied parts accomplish this.

MEO PL pg 18,38



Some of you have found interference of the SA1 stick torque tube with F63 bulkhead. F63 should be modified in the center to have a notch rather than a hole to allow the tube to fit higher. If F63 is already fabricated, cut out the top edge and install a doubler plate as shown in the sketch. Also, to provide more clearance, you can move the entire stick assembly down by increasing the .8 dimension on SA12 & SA13 to 1.0 inch (plans pg 38).

- MEO PL pg 25 SPAR G - 2.3" dimension should be 2.5" so spar comes flush with the capstrips that cover rib WR25. This taper on spar G can be trimmed after installation to fit flush with the capstrips.
- MEO PL pg 38 Tube sizes on Detail A are incorrect, change to 3/8 x .063 spacer clamped by bolt & 1/2 x .063 spacer welded to SA2.
- MEO PL pg 42 RB2 - the 1/4" hole callout is wrong - should be drilled to be riveted to belcrank bearing the same as AB4, pg 40. A 7/8" hole & rivet pattern to fit RB5 is required.
- MEO PL pg 5 Cotterpin AN 330-3-3 should be AN 380-3-3.
- MEO PL pg 42 Cleveland Tool Co. no longer makes ball screw actuators. The correct part is RO 308, ask for 1/2 ft of screw and the RO 308 ball-nut assembly (about \$45!) from Los Angeles Rubber Co., 2915 E. Wash., L.A., Ca.
- MEO PL pg 25 Cut holes in WS24 outboard end for the landing gear cables before gluing in. (Notch in about 1" where it butts to WS7).
- MEO PL pg 53 Diode number omitted. Can be # 2761135 from Radio Shack. Also RG58/U can also be RG58/C or RG58/AU.
- MEO PL 2024 T-3 & 2024 T-4 aluminum callouts are reversed in several places in the plans. These are interchangeable in all cases.
- MEO PL pg 11 First column, change "quarter square" to "triangle".
- MEO PL pg 13 Antennae rods are 14.15" long. Don't scale dimension from drawing.
- MEO PL pg 18 F63 outside edge is drawn at B.L. = 12.25. This should be B.L. = 12.4. If you have already cut out F63, just shim out about 1/8" wider with 1/8" ply strips.
- DES PL pg 45 The forward bolt passing through NG37 cannot be tightened down hard without a binding NG20 & NG36. While this has presented no problems on N27VV, it is a poor design practice & I am improving it by providing a spacer for the bolt to tighten on. The spacer can be 5/16 x .035 steel tube drilled out to press onto the 1/4" bolt. Drill out NG36 to 5/16" to fit over the spacer. I also strongly suggest a short length of 3/8" tube welded in the arms of the NG20 "Y" bracket to provide a better bearing surface. Also note that NG36 center pivot must be offset to prevent interference when the strut is deflected. Thanks, Mike Melville, S/N 115, for these suggestions.



SIDE VIEW
 NG36 PIVOTS WELDED OFF CENTER.


BUILDING Hints - Most of these were suggested by builders. If you have suggestions, please get them in for Newsletter #4.

Build the fuselage and/or inboard wing jig at W.L. = -3 instead of W.L. = 0 to facilitate installation and removal of parts without having to notch the jig.

F10 can be bent in place if done in the order stated on pg 11, but it takes alot of clamps since it is relatively stiff. You can saw notches in F10 about 1/2 way through, every 2 inches from F.S.22 to F.S.48 to make it easier to bend. The strength along F10 is not needed. Its primary function is to tie F11 and F15 together.

When permanently installing Spar E, glue in WS2, WS5, WS6, WS7, and WS9. Let dry. Then bend WS1 over to fit and glue in WS1, WS8, WS10, WS3, and WS4. This keeps the bend in WS1 from deforming the flat bottom.

Urethane foam (2 lb/ft³) can be substituted for the balsa everywhere. Cover with one layer of 9 oz fiberglass - go easy on the resin, it's heavy.

PE2, pg 39, can be fabricated easier in two parts and overlapped in the center thus: 

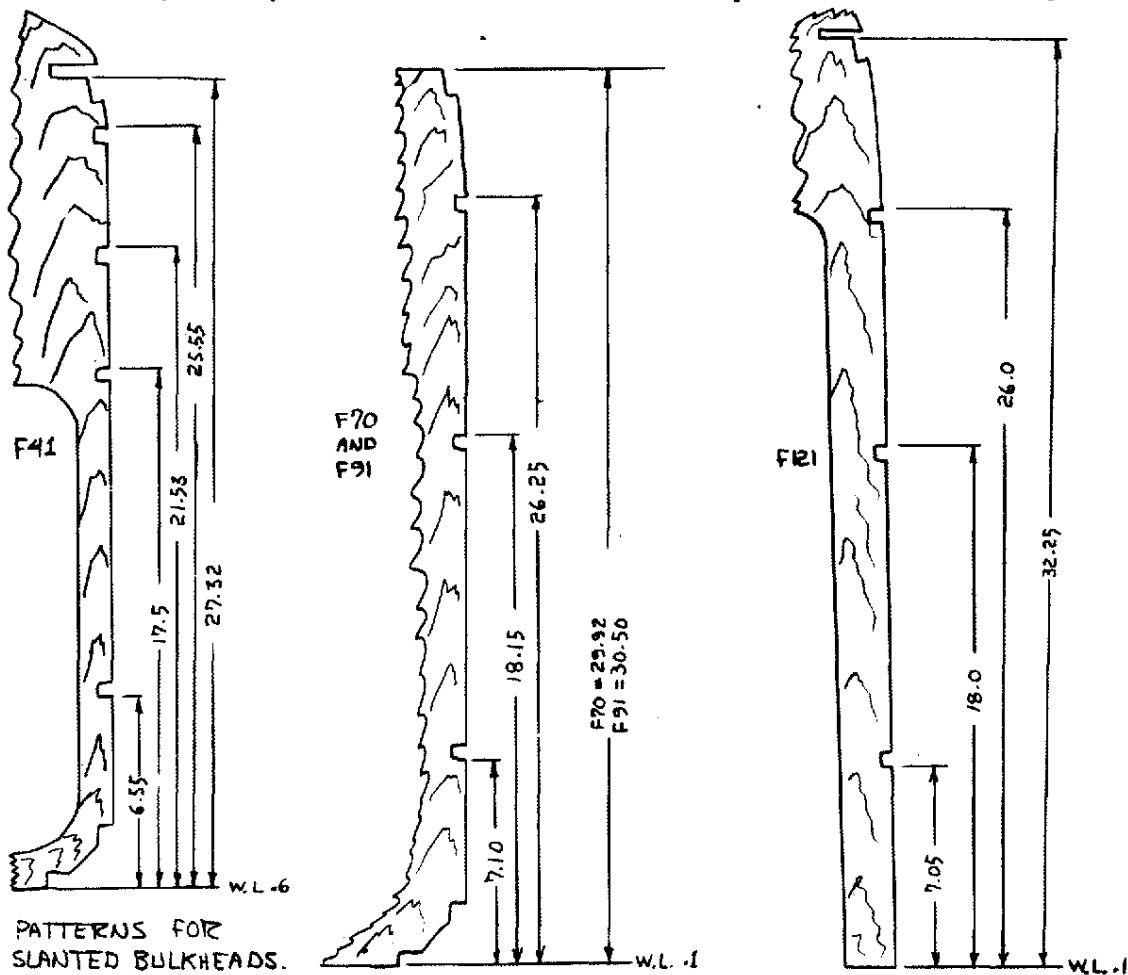
The nutplates for PE2, pg 39, are hard to get at, after installing WS3. Install them on F152 before installing the wing spar.

F5 is cut curved, not bent.

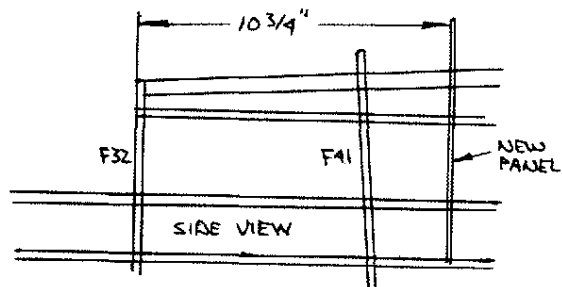
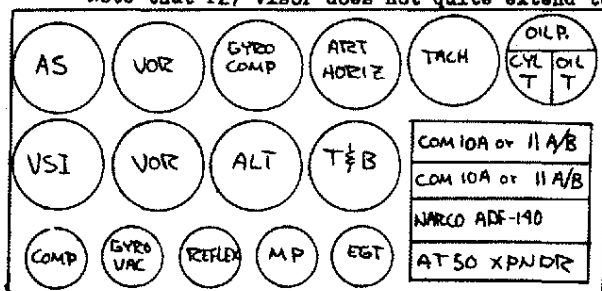
90° or 45° plywood is okay. I used 90° throughout.

A good stapler for skinning is the Aero T50. Use 3/8" long staples. I took a large screwdriver and ground a scoop shape on the blade to use as a scoop to pry the staples out once the glue is set.

Due to their slant, bulkheads F41, F70, F91, and F121 come out short when the waterline drawings on pg 17, 18, and 19 are used as patterns. Some builders have made them short and just adjusted in place by notching up the longeron slots and shimming the top. This is perfectly fine, but if you haven't cut yours out, here are the dimensions for bulkhead patterns which should fit quite well.



Tom Hendricksen, who is building S/N 169 with a "full" IFR instrument panel, sent in his panel layout and a modification to mount the panel further aft, to provide clearance for the longer radios. Note that F27 visor does not quite extend to cover this panel but a small extension could be added.



SHOPPING

Stolp Aircraft, 4301 Twining, Riverside, Ca 92509 has 2024 alum extrusion angles.

Columbia Airmotive, Box 436, Trout Dale, Or 97060, (503) 665-4896, has good prices and stock on hardware and has the 500-5 wheels and brakes for about \$115.

G & J Aircraft, 1115 So. Sultana, Ontario, Ca 91761 (986-6534) has good hardware stock and good "scrounging" prices.

Wicks Organ Co, Highland, Il 62249 will supply spars cut to size and has a complete plywood stock.

J & M Aircraft supply, 1014 Joseph St., Box 7586, Shreveport, La 71107 has a good overall hardware and materials catalog - send for it.

Plywood & Door Co., 1555 Santa Fe, Longbeach, Ca has birch 1/4" plywood 5-ply with outdoor glue for only about 35¢ per sq. feet! This is not aircraft ply because it has some patched imperfections, but is still excellent quality and perfectly adequate. They also have a complete line of all plywood sizes, aircraft and non-aircraft - write for list, or go see them if you can. They deal only in plywood and service is good.

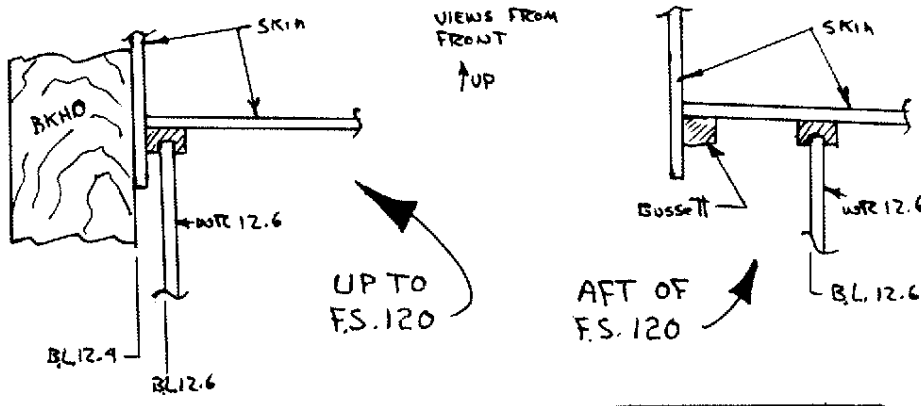
Wiebe Wood Products (Newsletter #1) price per quart of M666 epoxy glue is now \$8.50 plus postage. Mr. Wiebe tells us that the price will probably be going up again, but that he will continue to supply our builders as best he can and will keep the price as low as possible.

FLIGHT

Test Assistance - We are planning to provide a pre-first flight inspection and initial flight test assistance service for our builders. This would involve us visiting your flight test area, giving your aircraft a very complete inspection, and rigging check, prior to first flight and either flying your first flight or checking you out in N27VV to improve your proficiency for your first flight. Providing flight test assistance in expanding the flight envelope of your airplane would also be very beneficial in assuring flight safety. This service will only be provided to those who are building the airplane without major modifications from the plans, and flight envelope expansion on your aircraft will be limited to the envelope shown in the aircraft operating limitations, plans page 3.

We will provide this service to the first three builders who complete their aircraft, free of charge except for transportation costs. Transportation costs may also be eliminated if we can work it to coincide with another trip.

Clarification of placement of WR12.6 with respect to fuselage. It's probably best to install WR12.6 cap-strip after skinning fuselage sides. Fuselage skin should extend about 1/4" to 1/2" below wing top. Fuselage skin is notched to fit over wing spars.



BARTER

Corner - Everyone is welcome to a free ad for this section, after all, it's your newsletter.

Jim Cavis reports he can sell the Pointer portable model 3000 ELT with voice modulation for \$96.00

FOB Phoenix. That model lists for \$160.00. Contact him directly at 8344 E Turney Ave., Scottsdale, Az. 85251.

Charles Allen would like to trade a set of new Cleveland 600x6 wheels and brakes for 500x5, or will sell for \$75.00. Has' also looking for an O-320 and the Scott nose wheel. Write to him at 1022 Hoedel Ct., Lafayette, Ca. 94549.

Jim Brunson, 5225 W. Ave. L-2, Lancaster, Ca. 93537 has an O-320 Lycoming for sale.

Ken Winter, 1538 E. 66th Ct., Tulsa, Ok. 74136, S/N 133, has a partially completed BD-5A for sale.

The following is a copy of a useful "parts locator" prepared and donated by Edwin Hanks (S/N 086). "L" refers to part location & "n" refers to fabrication information.

Table with multiple columns listing part numbers, locations, and fabrication information. Includes parts like PAGE 40 A61, PAGE 40 A62, PAGE 40 A63, etc., up to PAGE 16 F1.