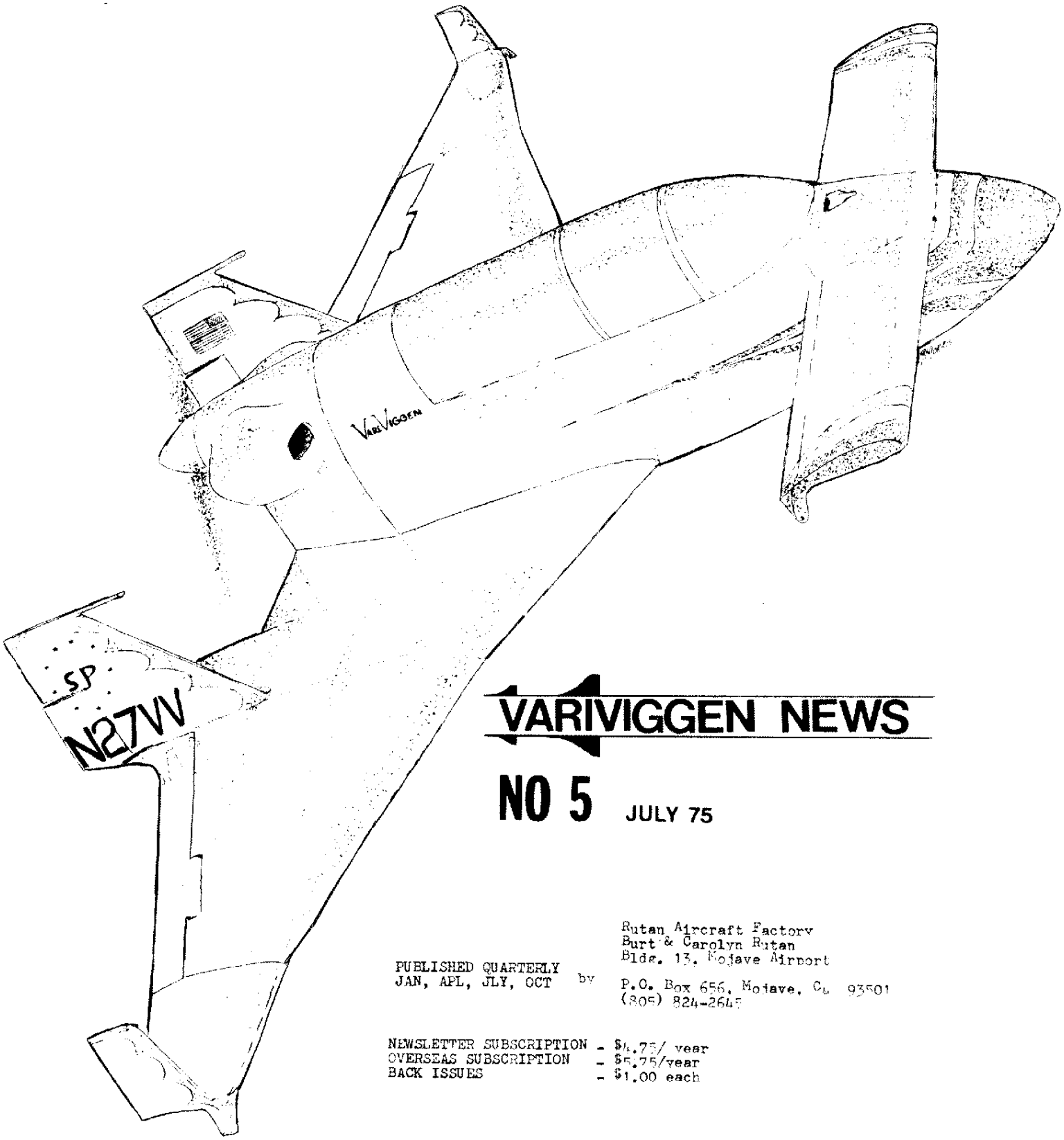

VARIVIGGEN NEWS

NO 5 JULY 75

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JAN, APL, JLY, OCT by

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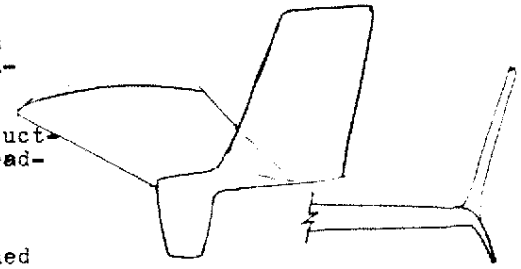
THIS NEWSLETTER is being written in the last few days of hustling around, completing all the preparations for Oshkosh '75. The last few months we have really been busy with our new airplane's first flight only eight weeks ago and the new SP wings for the VariViggen being flown only a week ago. So, I hope you excuse us if the newsletter is a little short and somewhat disorganized.

We need a name for the newsletter! Now that the newsletter is being expanded to include the VariEze as well as VariViggen, our old name is no longer good. Please send in your suggestions, possibly a name using the word canard?

VARIVIGGEN SPECIAL PERFORMANCE WINGS

The new all-glass special performance wings for the VariViggen (see Newsletter #3) were flown for the first time on July 16. The performance improvment has been as expected: rate of climb at sea level, 1600-lb weight, is just over 1000 fpm! For rate of climb at altitude, add about 150 fpm to the curve shown in the VariViggen Technical Report. Cruise performance is higher, also. With the new wings and the new RAF-supplied cowling, the cruise speed at 8000 feet is 159 mph using the O-320 engine at 75% power. The SP wings were flown both clean and with winglets. The winglets add directional stability, help the rate of climb at low speeds, and have no effect on the cruise speed.



What are winglets? Winglets are two vertical fins on each wing tip. They were designed by Dr. Whitcomb from NASA who previously developed the transonic area rule principle and the supercritical and GA(W) airfoils. VariEze, N7EZ, was the first aircraft to fly with winglets although hundreds of hours of windtunnel tests were previously conducted by NASA. The lower surface winglet extends from the leading edge back to 33% of the tip chord. This surface is cambered inward and is inclined 30° out from vertical. The upper surface winglet extends from 33% of the tip chord aft. This surface is cambered outward and is inclined 15° out from vertical. Winglets are optimized to unwind the tip vortex to the greatest extent possible. This reduces induced drag, resulting in a 6% fuel saving. In addition, the local incidence of the surfaces are inclined to produce forward thrust which offsets the parasite drag of the vertical fins. This is possible due to the high amount of lateral flow near a wing tip.

The SP wings hold 18 gal of aux fuel, which increases max range to near 600 miles. This fuel is pumped into the normal fuselage tank by an electric pump. The tanks have flush caps and are filled individually. The weight of the new wings are about the same as the old, metal wings. The tiedown points have been moved to near the tip to allow more convenient attachment of the most common tiedown systems.

The SP wings use the same WA3 straps which are used on the metal wings. These bolt to a stub wood spar which is only two ft long. The rest of the spar is unidirectional fiberglass. The entire skin, trailing edge spar, and ailerons are glass/foam composite. No ribs are used. The SP wings were built in about 110 man-hours which is only 1/3 the time needed for the aluminum wings. Finishing time to obtain a first-class surface contour added about 30 man-hours.

A large number of photos were taken during the new wing construction for use in the SP wing plans. The plans will also show many details to educate the builder in the methods of structural fiberglass application. The plans will also include drawings of a foam/glass rudder. Thus, all the sheet-metal structure will be removed from the aircraft.

Flight tests have shown only a one-mph cruise speed change with reflex position, thus reflex control probably will not be required for a VariViggen with SP wings. I need to do more flight testing with the new wings before I decide on this for sure, but it looks as though we may recommend a fixed reflex and lengthening the nose gear about 2" to allow a slower nosewheel lift-off speed without the aid of up reflex. Rate of climb does not seem to change with reflex position when using the SP wing. All modifications required and details will be included with the plans. The wings will be "service tested" on the Oshkosh trip. We will start work on the construction drawings when we return. I expect plans availability by October.

We do not plan to stock the foam, since it is readily available from other suppliers. We will have the unidirectional fiberglass though, since it is not readily available in partial rolls. We will not stock the Shell epon epoxy resin, but we will refer you to several retail suppliers.

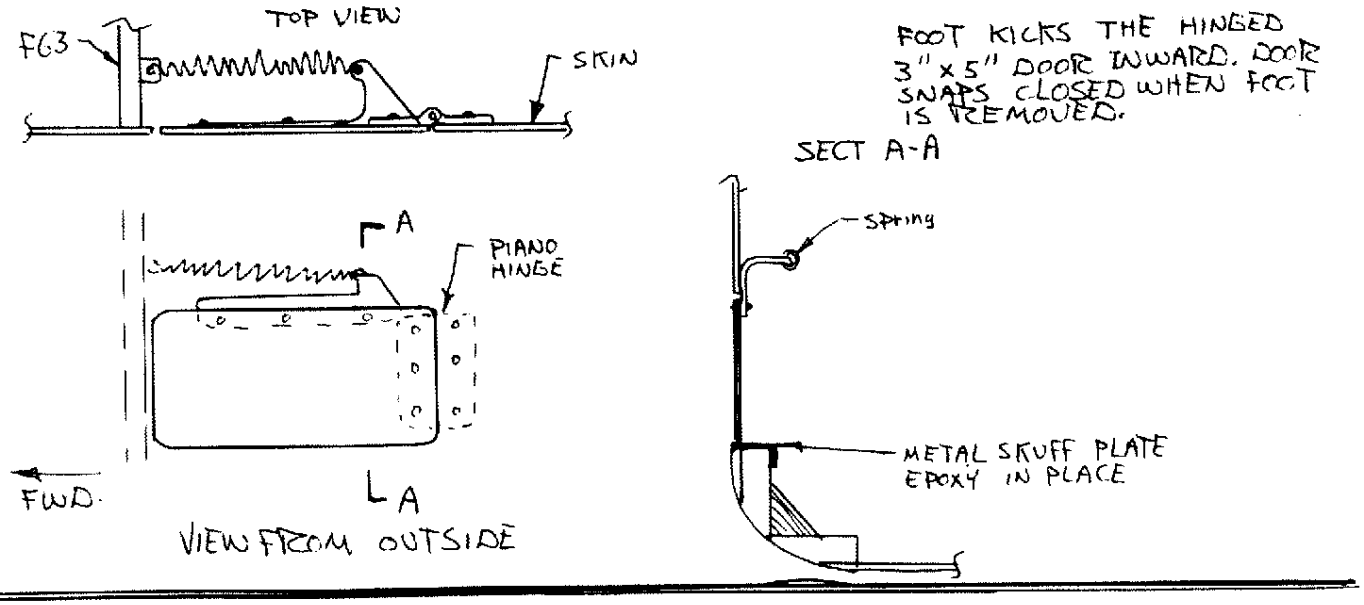
NATIONAL ASSOCIATION OF NASAD SPORT AIRCRAFT DESIGNERS

MORE ON WOOD ADHESIVES - I have received two separate reports from builders who have had poor results from the epibond resin recommended in the plans. Apparently the supplier has been sending out resin which is out of shelf-life or otherwise unsatisfactory. Until this is resolved, I recommend the use of only the epoxies shown in previous newsletters, rather than epibond.

VARIVIGGEN PLANS CHANGES - I can't really believe it, but since newsletter #4, I have received no notices of errors or improvements in the plans! Is everyone asleep or have we finally weeded out most of the corrections? There are important plans changes in the last four newsletters. Vari-Viggen builders who do not have these, should purchase the back issues ($1 each; no charge for Newsletter # 1).

VARIVIGGEN FUEL TANKS AND ENGINE MOUNTS - Vernon Williams (s/n 189) has made five fuselage fuel tanks and will have them on display and for sale ($175.) at Oshkosh. The tanks are excellent quality and include the filler neck and finger strainer. He has also produced dynafocal-type engine mount for his VariViggen and may be talked into making one for yours. Contact him directly - #4 Southmont Circle, Little Rock, Ar 72209.

VARIVIGGEN KICK-IN STEP - VariViggen prototype, N27VV, has been equipped with a kick-in step to allow front cockpit boarding without the ladder. This was a relatively simple modification requiring only about three man-hours. The following sketch is self-explanatory. The shorter-legged pilot may want to move the step up about three inches to easily allow his leg to swing over the side.



VARIVIGGEN INBOARD WING RIBS AND BULKHEAD KITS - Our apology to those who ordered these items at the availability date noted in Newsletter 4 and then waited over six weeks for delivery. Our supplier was unable to meet his initial estimate and when the first kits were inspected, several changes were required. All back orders should have been shipped by 22 July. The bulkhead kits also include F5, F7, F8, F9, and F18 pieces, as well as excess plywood.

VARIVIGGEN CONSTRUCTION MANUAL - Part One of the construction manual has been in stock since June 26. The manual with its many photos is proving to be very beneficial, particularly to the first-time builder. Part One does include landing gear construction, but is not as detailed in this area as it should be. More landing gear construction information will be included in Part Two. The construction manual will not cover the outboard wings, since these will be well photo documented and the procedure will be detailed in the SP wing plans.

NEW PRODUCTS AVAILABLE FROM RAF -

VariEze Information Kit - includes approximately 4000-word description, 14 photos, and one 8"x10" glossy, all specifications, performance charts, homebuilt program, etc. $5. - includes first class mail ($6.00 Overseas).

VariEze Embroideried Jacket Patch - Tri-colored; VariEze planform - $1.95 each.

BUILDING TIPS - If your wood pieces do not fit perfectly for gluing, merely mix asbestos fibers (available from Gougeon Brothers, 706 Martin St., Bay City, Mi 48706) in to thicken the epoxy, so it will not run out of the gap. Structural joints can be made with gaps as great as 1/16" and non-structural "fill-ins" can be done up to 1/2".

SHOPPING - Partz Corp., 1232 W. Main, Owosso, Mi 48867, (517) 725-8565 will anodize approximately 100 small alum. fittings for $15.00. Suggest certified mail, return receipt requested, if you mail your parts to them.

LOOK FOR ANOTHER VARIVIGGEN ARTICLE in "Science and Mechanics" magazine - on the newsstand after September 30.

The following is the schedule of forums at Oshkosh '75 by Burt Rutan:

Design Forum - Friday
VariEze - Saturday
VariViggen - Sunday

VARIEZE COMPLETES 95-HR FLYING - TO BE OFFERED AS A HOMEBUILT IN 1976

The VariEze prototype, N7EZ, has been logging alot of flight time for such a new prototype. It made its first flight on 21 May 75 (almost exactly three years after the VariViggen prototype). The initial test program was completed on 8 July and the area restrictions were lifted. Since then it has been flown to the Hollister fly-in here in California, and on a 1000-mile round trip to Tucson, Arizona.

The back seat has been fitted with a temporay long-range fuel tank for the distance record attempts. Dick Rutan, Burt's brother, plans to fly N7EZ nonstop from Mojave, Ca to Oshkosh, Wi on 1 Aug 75. Then, within the next week, an official FAI/NAA closed-course distance record attempt will be made. Look for an article and the VariEze on the cover of the September issue of "Air Progress."

The VariEze was designed for maximum cruise economy. It can demonstrate 70 mi/gal with 30% power at 135 mph; at maximum cruise speed with 75% power, 48 mi/gal can be obatined at 185 mph. Climb performance for the Volkswagen-powered two place is 1200 fpm at at 880-lb gross weight (two people, 1000-mi range), and 1800 fpm at single-place weight of 625 lb. The aircraft can carry two 6-ft, 4-in people and two specially designed suitcases.

The name, VariEze (pronounced, "Very easy"), refers to the aircraft's ease of construction: The prototype was built entirely from fiberglass in composite form using rigid foam as core material, and simplicity was the key in structural/system design.

This fall, the VariEze prototype will be making assaults on the following FAI World Records in the under 500-Kg (1102-lb) weight class:

RECORD	NOW HELD BY	CURRENT RECORD	ESTIMATED VARIEZE CAPABILITY
Distance In A Straight Line	Kaarlo Heinonen Finland HK-1	1767 Mi	4400 Mi
Distance In A Closed Circuit	Ed Lesher USA Teal	1554 Mi	4400 Mi
Speed For 2000 km Circuit	Ed Lesher USA Teal	142 mph	185 mph
Speed For 1000 km Circuit	Ed Lesher USA Teal	169 mph	235 mph (Turbo Charged)

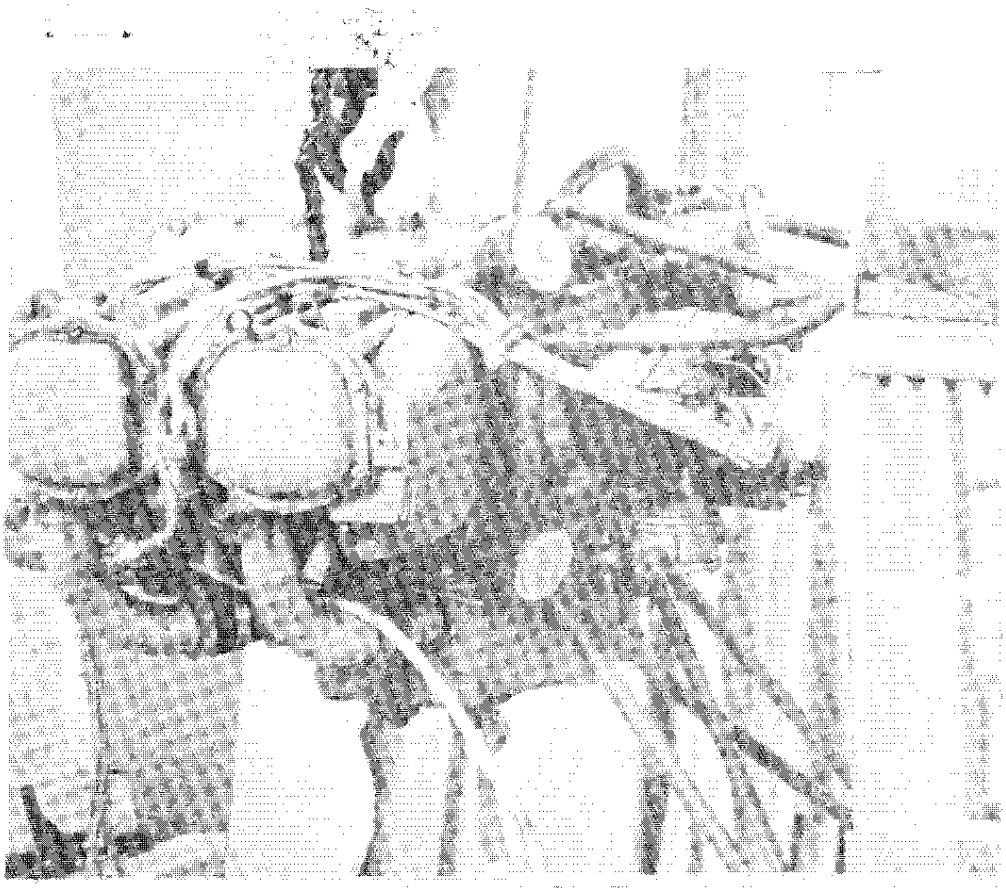
Several changes were made during the initial test program. The pitching moment of the main wing was too great, which transferred too much load to the canard. This was temporarily corrected with metal tabs taped to the wing trailing edge and later permanently corrected by a change in the main wing airfoil. The original canard configuration may have been susceptible to flutter. A modified canard with distributed, overbalance weights has corrected this. The canard uses the GA(W) airfoil which has not performed as well as had been expected. Its chord is only 14 inches, thus at stall, the Reynolds Number is only 500,000. The GA(W) airfoil has very poor lift below 750,000 Reynolds number. This results in a higher than desired stall speed (55 to 60 kt) and poor roll rate below 70 kt. I have located data for an airfoil designed for high lift at the low Reynolds number. After Oshkosh I plan to build another canard for N7EZ using this new airfoil. It will have a low trailing edge camber, thus the external trim tabs will not be required.

We plan to market construction drawings and components for the VariEze in the spring of 1976. Tooling will be constructed this winter for the production of homebuilt components (canopy, cowling, forward seat/bulkhead, main wing spars and centersection spar, molded glass landing gear, and machined parts). The first parts from the tooling will be used to build another VariEze here at RAI. This will absolutely prove the tooling accuracy. This construction project will be photo documented and those photos will be used in the construction plans.

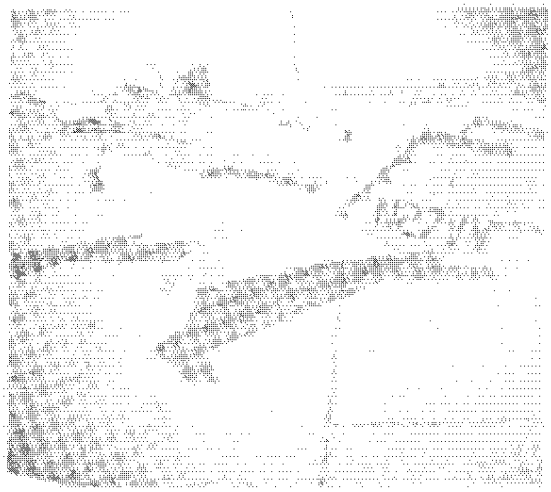
We have received very few builder's sugestions since Newsletter 4. If you have found a "better way" to do something, let us know and we'll pass it on to other builders. Also, if you have questions about the VariEze which are not in the information package or here, send them in and we will answer them in the next newsletter.

NEWSLETTER RENEWAL - When your newsletter subscription has expired, a notice will be placed in with your last issue.

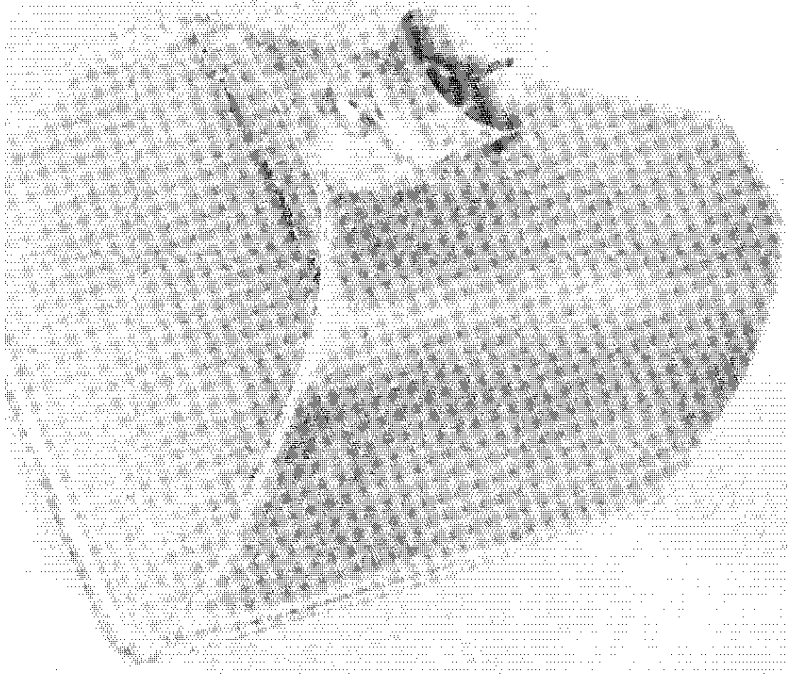
SEE YOU AT OSHKOSH!



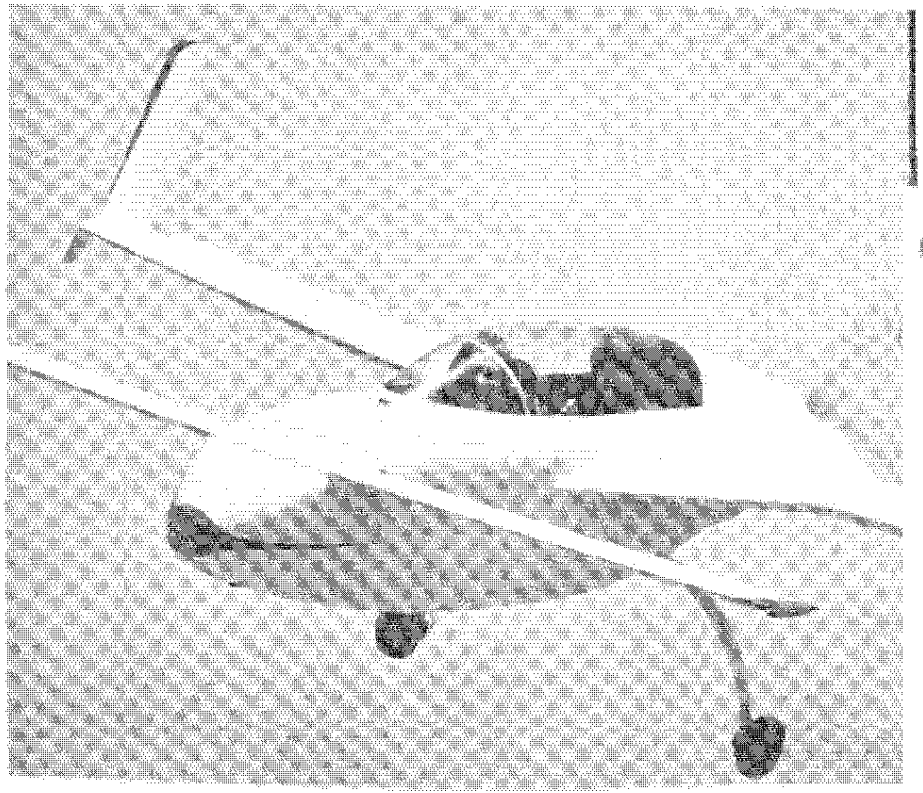
DYNAFOCAL ENGINE MOUNT BY VERNON WILLIAMS

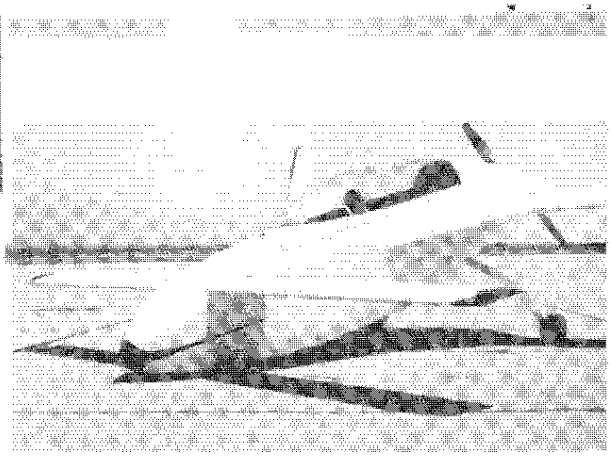


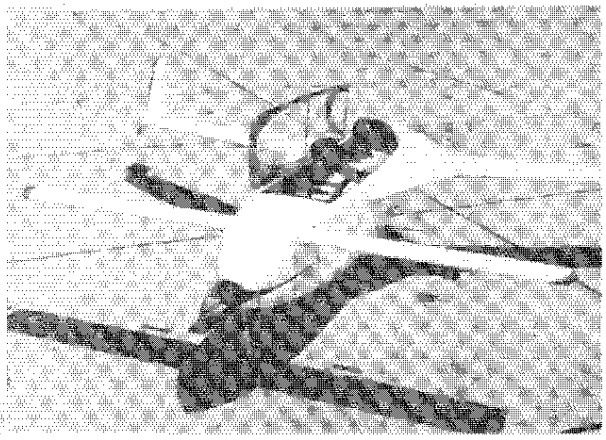
FUEL TANK BY VERNON WILLIAMS

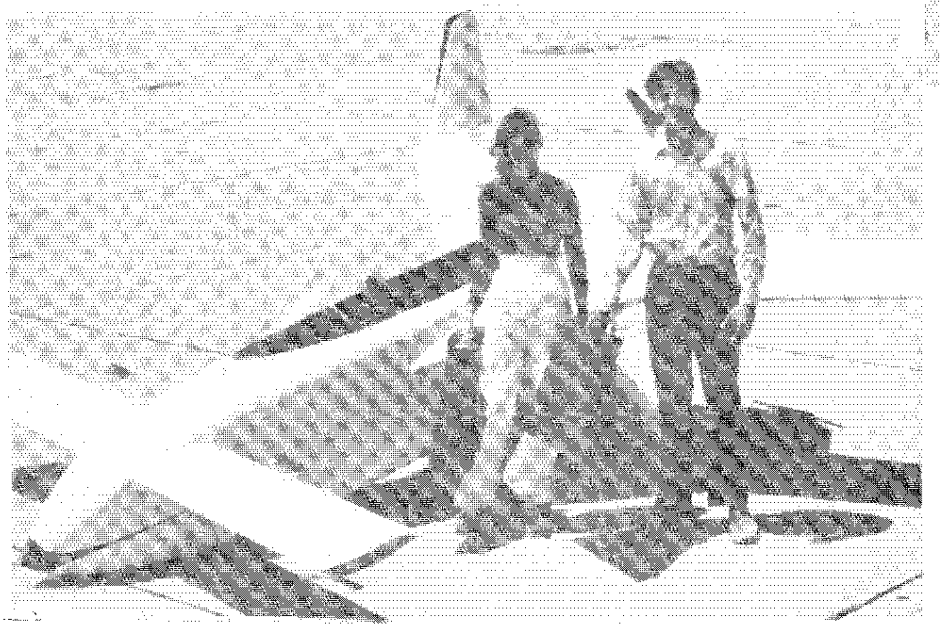


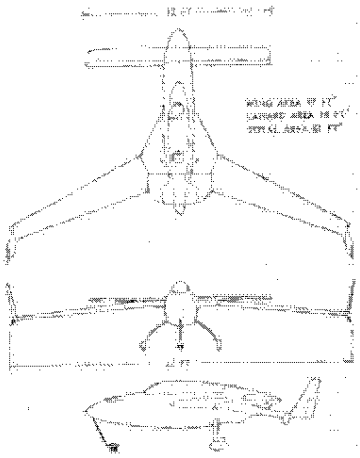
SP WING ON N27VV

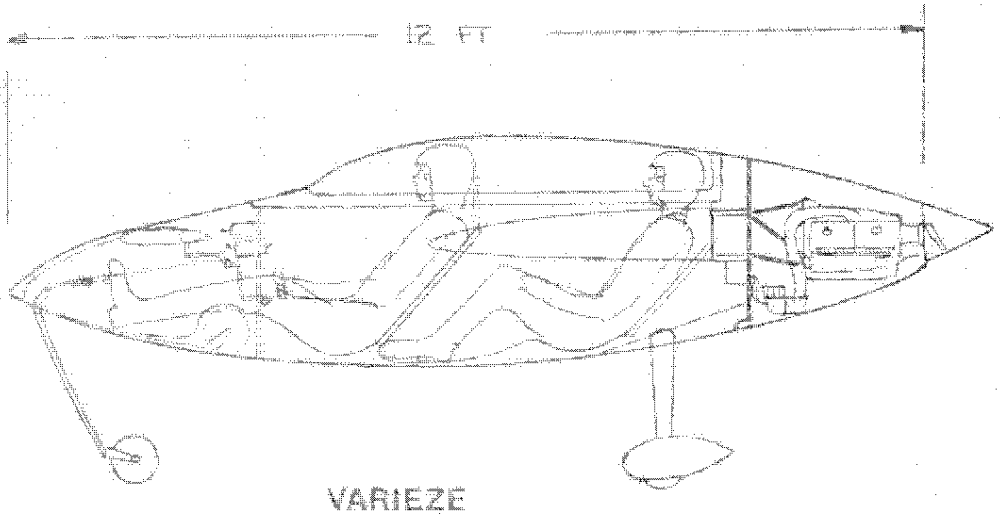












VARIEZE

VariEze