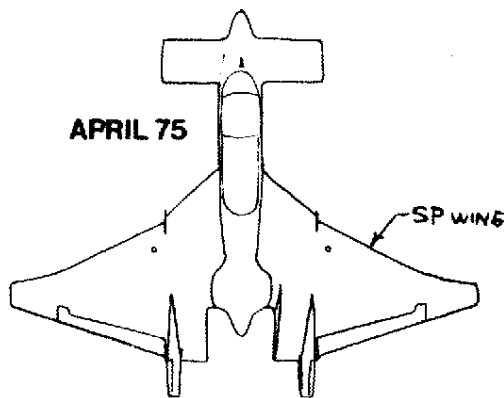


# VARIVIGGEN NEWS NO. 4

APRIL 75



Published quarterly by Rutan Aircraft Factory  
Burt & Carolyn Rutan  
Building # 13, Mojave Airport  
P.O. Box 656, Mojave, Ca. 93501  
(805) 824-2645

Subscription rate: \$4.75/yr, back issues/\$1.00 each  
Current issue is included with Technical Report purchase.

N27VV has seen a lot of action since newsletter number 3. We've logged nearly 100 hours on the new cowling, including trips to San Jose, Watsonville, and Flabob, Ca.; Phoenix, Az.; and Las Vegas, Nv. In addition, I flew the action-packed chase and bomb scenes for the movie "Death Race 2000," which opened April 30 in theaters in the Los Angeles area. We had a lot of fun doing the film, which required many hours of flying, doing close-in passes on race cars. On many of the passes, explosions were set off around the car just as I pulled up. The model used for the crash scene was built from our R/C model plans. The movie is rated R, so be ready for a little crude language and nudity.

A lot of our recent flying has been to give rides and to put time on the new cowling. The cowling has added more performance than I thought it would and cools the engine much cooler than the old configuration. I'm now cruising at 152 mph at 75% power at 7500 feet with the external fuel tank, which means 155 without the tank. When we fly the new SP wing we expect to cruise close to 160 on the 150 hp Lycoming.

The VariViggen was featured in May issues of "Flying," "Private Pilot," and "Plane and Pilot" magazines. As for our comments on the articles, I think they were well done with a few exceptions: The VariViggen does not lose altitude during a power application at normal approach speed and is not control limited as John Olcott mentioned in "Flying" (a retraction has been sent), and Don Crane did not make a full aft stick circuit and landing (that's not hardly recommended for a checkout!). Watch for another article in a future issue of "Mechanics Illustrated."

Scheduled dates coming up include presentations at EAA chapter 40's meeting at Van Nuys, Ca., June 13, and the AIAA/EAA symposium at Boeing Field in Seattle, Wa., June 28. We'll also be attending the Porterville (Ca.) flyin, June 16, and Oshkosh flyin, July 29 to Aug. 4. Ken Ashdown (SN 069) from Ontario, Canada, will be giving a technical presentation on the VariViggen at the First Canadian Symposium on Recreational Aircraft, Ottawa, Carleton University, June 23-25.

Another article about N27VV was written in the "Hangar Flyer" publication by Don Pridham, editor of EAA chapter 92, Orange County, Ca. His comments are reprinted here:

"When we arrived at Flabob, the wind was still calm, but that nice state of affairs didn't last long enough. A REALLY strong 90 degree Santa Ana wind came up for quite awhile there, and everyone walked out near the runway to watch the sheep and goats being separated. . . . At about the height of the wind gusts, Burt Rutan and the VariViggen came zapping into the pattern, came down like he was riding a string, painted it onto the runway without a trace of strain, pain, crabbing, slipping, or anything, turned off in about 6 lengths from touch-down, and taxied effortlessly past toward the tiedown. In the back seat was his enthusiastic and charming wife, Carolyn, and BOTH of their girls!

I kinda remember seeing and talking to a large number of you friendly folks up there, looking at bunches of fine craftsmanship, and eating some excellent food prepared by Chapter 1, but what happened next sort of erased my mind totally on most other happenings. Joel Comfair and I finally found Burt Rutan, who had been very busy fielding the myriad questions about the VariViggen. Joel had wanted to verify the time and place for our next meeting with him. Out of the blue, Burt says, "Don, how'd you like to take a ride in the VariViggen?" My jaw drops. Joel's drops further. "When?" "How about right now," he says. My mind is already popping circuit breakers as I'm thinking what Joel is mumbling (something about who's the Pres.) I consider of course stepping back, bowing a bit, and offering to let Joel go instead ---- HOWEVER, I have to live closely with a person who would never stop kicking my butt if I didn't go. ---ME! ( So now I finally know -- when it gets down to me or somebody else for the goodies, it'll be me every time. Hah, the old id is really there, just like the shrinks say it is!)

So in a numb hazy smiling kaleidoscope we belted in, taxied out staring at a few hundred camera lenses, and made an unreal take off. I watched the elevators very scientifically, and he brought them way down to lift the nose up. It came up very quickly and instantly we were going up at a shocking angle and rate of climb. The minute we were off, he started making a series of 90 degrees right and left turns. After a pass of the field, Burt announced he would demonstrate "departure stalls" (one can hear conversation very well, even though tandem). Thereupon he hauled up the nose in a steep left climbing turn, held it awhile, then stated, "OK, there it is." He then executed beautiful right and left steep banks and directional changes, all the while when it was technically "stalled". Actually we were still seeming to climb about 500fpm and things never felt the least bit "loose".

Burt cranked into the downwind, aiming approximately at the cross on mount Rubidoux, approached the cross, CAME RIGHT UP TO THE CROSS ABOUT ONE INCH AWAY, and casually flicked into an instant left bank like a bored housefly in July. If I'd tried that in my Mooney, crews would have been picking up pieces scattered a mile East of the mountain, and I'd have been crucified. It's really strange though. I have a very healthy respect for flight, and what a plane can and can't (or shouldn't) do, yet not ONCE was I ever the least bit anxious, uneasy, or apprehensive. The VariViggen has a solid feel of confidence and safety throughout the entire flight regime. It is really the finest maneuvering craft I've ever had the pleasure to ride in, and at all times you REALLY KNOW IT'S FLYING. Landing was so apparently simple as to be nearly anti-climactic. Burt had saved another few surprises for the ground, though. Naturally, he had landed super-short, and said, "OK, watch this. We'll go taxiing right between those parked birds," pointing to

a pair of high wingers moored practically tip to tip, with ropes coming down at 45 degree angles and meeting about 6 feet apart. "Have you really thought seriously and adequately about this decision?", I say, as he goes chugging merrily through like he was only pushing a wheelbarrow. I sweat a bit finally that time, as I pictured three airplanes suddenly hugging each other in a big MUNCH! The ground handling is fantastic, as it can, I believe, turn in its own length and width, or bring its nose up touching a building, then turn left or right and taxi away without bumping a wing. (No reverse needed). People -- things are happening in EAA. Thanks, Burt."

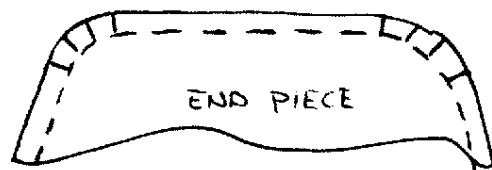
**CONSTRUCTION MANUAL** - Part one of the photo-illustrated construction manual, written by Jim Cavis, SN 31, with approximately 100 photos, is just about completed (includes fuselage, canard, inboard wing, vertical stabs, control system, and landing gear). Part one also includes helpful sketches on jigs and numerous building tips. The written information is similar to plans chapter 5, except expanded to about 35 pages. Also included are pulley bracket drawings for using of the AN220-2 pulleys. Part one will be ready June 15th. Cost is \$18.50 (first class mail) and \$20.50 for Overseas (Airmail).

**SPECIAL PERFORMANCE WING** - The SP wing configuration still looks very similar to that shown in newsletter number 3, but I've greatly simplified the construction method and upped the wing fuel capacity to nine gallons per wing. The construction method was verified on the fiberglass VariEze wing, which was built in two days. We have completed all necessary structural static tests, thermal tests, and fuel compatibility tests. I'm now awaiting another shipment of unidirectional fiberglass to build the flight item SP wings and hope to have sufficient flight test data by mid June to show the acceptability of the new wing.

**ADHESIVES** - Gougeon Brothers, 706 Martin St., Bay City, MI 48706, whom we mentioned in newsletter number 3 as having an excellent epoxy glue for wood (105 Resin plus 206 Hardener at \$25/gallon), now has a mini pump system which attaches to the cans and dispenses the correct ratio (5 to 1). Each stroke of the resin pump gives 1 oz.; each stroke of the hardener pump gives 1/5 oz. Good news is the price: \$3.50 for both pumps. Get two sets; they're plastic and may have a limited life. Gougeon 105/206 still looks like the best resin, although Aerobond 2178 is also excellent (available from Aircraft Materials, 850 E. San Carlos Ave., San Carlos, Ca 94070).

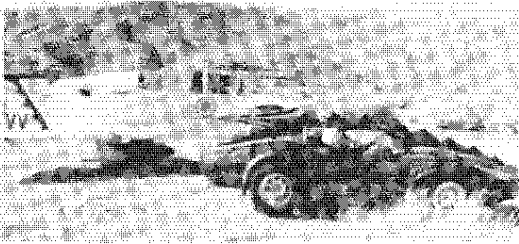
**BUILDER'S PROJECT REPORTS** - The following reports/photos were sent in by builders and I agree with the building hints suggested. You might consider them for your project.

Charles Allen (SN 47) on fuel tank - "The tank was made this way mainly because I had on hand a sheet of 6061 .050 alum., which is a weldable alloy, but of course harder and springier than 5052 - I drew up the two end bulkheads on paper using rounded bends but straight sections in between - Cut the two body pieces at least 1" longer than needed, then bent the "rounded" corners on a friend's sheet metal brake. A series of slight bends is all that is needed, frequently holding the piece over the full-size end patterns to check accurate progress. A right angle flange is bent where the top and bottom pieces join. The two pieces are then joined by about 3 clecoes on each side on the inside flanges. Then the exact cut-off line on each end are drawn on the tank - and the tank is trimmed - I use a table saw, a plywood blade, and a lot of cotton in my ears. And of course safety glasses at all times! Each tank end is then set on the alum. sheet to be used for the end piece and traced. The ends are cut out allowing at least 1/2 - 3/4" for a bent flange all around. Saw cuts are made into the corner areas. The good thing about this is a form block for each end is not necessary - Just a 2x4, or 6, clamped along the straight sections and those sections bent over. The small tabs are bent over a small block. The ends are clecoed onto the tank body. First the .032 baffle is made, put in place. Also the holes for the filler neck, tank gauge and vents and bottom fittings are drilled - I do not flange those holes - Welding the fittings directly to the tank is adequate. The whole thing is then taken to a good heli-arc welder - I left the tank gauge hole open - checked for leaks and then used slashing compound on the inside to make sure - The tank gauge was bolted to .063 alum. plate which was then riveted to the top of the tank using closed-end pop rivets - Sealing compound was put on between tank and plate first - Tank was then primed with zinc chromate and painted - Sounds complicated - but it really is not."

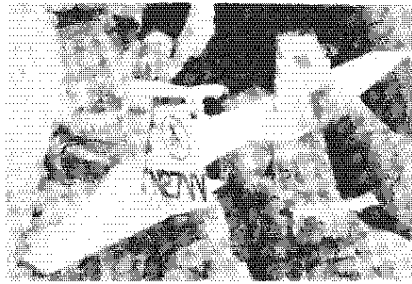


Vernon Williams (SN 189) on reflex screw (RM5/RM6) - "The reflex screw is from a 5" craftsman "C" clamp. It is a 5/8 - 8 acme thread. I cut the neck off the clamp and turned it to fit inside a 3/4" tube. The whole tube assembly is brazed onto the gear of the motor (Ford unit) which has been turned down to fit inside the tube...When turning the drive gear down on one of these motors some precautions are needed because the teeth of the drive gears are hardened and will eat a common tool bit right up. First grind the teeth down to near the base diameter of the gear. Then, you can chuck the drive gear directly in a three jaw chuck and by using a fast turning speed and carbide cutter you can turn the rest of the gear down."

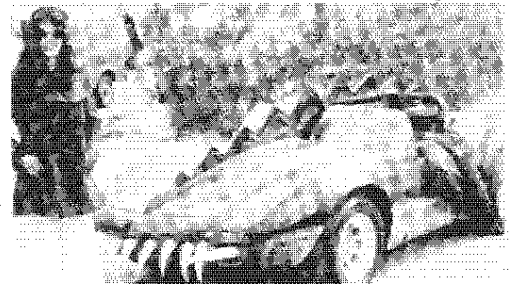
Vernon Williams on inboard wing spar - "The key to this method of construction is to build spar E first. I built mine complete out to FS 25. In building the spar, make your wing ribs first and take the measurements for the spar height from your actual ribs and not from the plans. This is necessary because the drawing shows the height at FS 153 which is in the middle of the spar. Also at least one of the dimensions given is off at least 1/2". I made a stub (about 12") WR25 to use as a spacer and have made the WS9 and WS10 webs. I plan to drill all the holes to mount the wing attach fittings, main gear pulley, and the aft gear pivot point before I even mount the spar on the firewall. The main advantage I see is that when you mount the spar on the firewall (be sure and support it or the weight will pull the firewall down) it gives a nice straight, level, and strong datum to build the wing from. Also, the spar can be out where you can drill the important holes in a drill press. In assembling the whole mess, the WR25 can be slid in and turned up to fit in place and the WS9 and WS10 webs can then be glued in place (the wing attach fittings can be used as clamps) and then the rest of the ribs can be added...Instead of trying to bend WS1, I made it straight and then bent the WS3 and WS4 caps to form the curve of the spar. Then I set my bandsaw to cut the 4° bevel and trimmed the height slightly oversize. Then I got out my trusty Jack Plane and planed it to size. This makes a nice looking spar which should (I hope) make building the wing easier." \*Be sure to note the correction on the spar height at B.L.=0 (7.8 dimension should be 7.3).



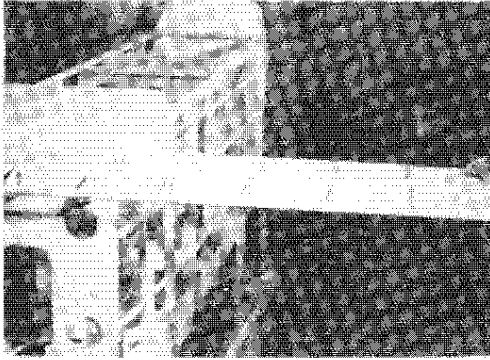
N27VV and the Monster Car  
Filming "Death Race 2000"



Model Being Set Up for Crash Scene



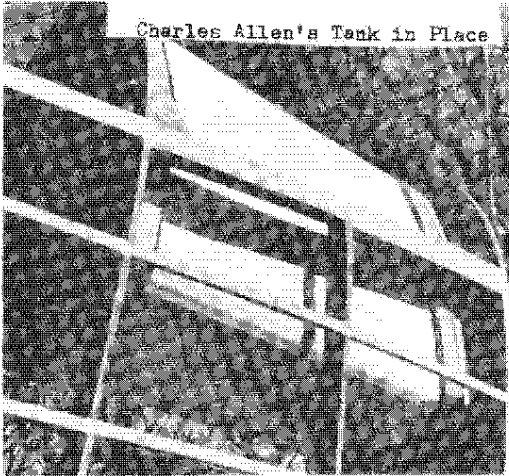
Carolyn with the Monster Car  
Driven by David Carradine  
In "Death Race 2000"



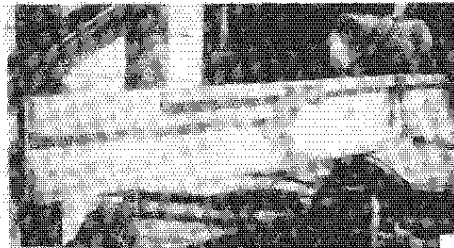
Orville Winfield, SN 114,  
Fuselage and Canard



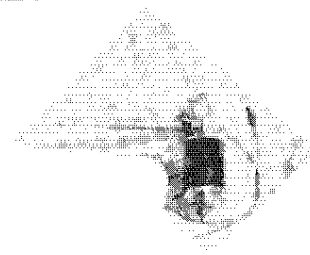
Charles Allen's Tank



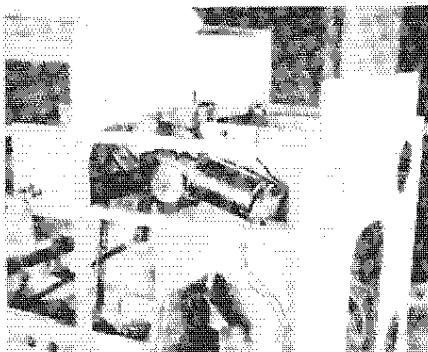
Charles Allen's Tank in Place



Vernon William's Spar E



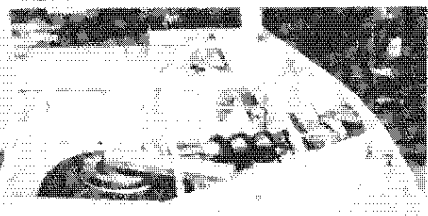
Vernon William's Reflex Screwjack



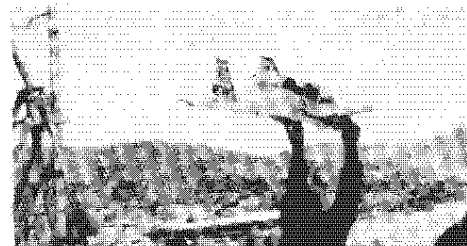
Mike Melville's Nosegear Motor



Mike Melville's Maingear Motor  
View from Underneath,  
Looking Aft



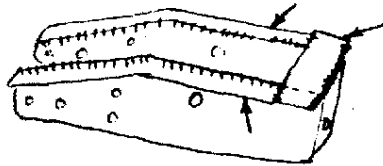
Mike Melville's Main Gear



**PLAN'S CHANGES** - Be sure to incorporate these revisions into your plans now.

Location	PL	Plans
	TR	Tech Report
	NL	Previous Newsletters
	CAT	Catalog
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	CHANGE
DES	PL pg 59	NG38, change 1/16 to 3/32 cable.
OPT	PL pg 40	AB4, move cable shackles 1/2" closer to pivot (change 5.5 to 5.0) to allow sufficient cable clearance with MG6.
MEO	NL#3 pg 7	Change Aero T50 to Arrow T50.
MEO	PL pg 51	MG42, spool 0.5" width should be 5/8" to allow sufficient cable room. Change 1/16" roll pin to 3/32".
MEO	PL pg 24	7.8" dimension on Spar E should be 7.3".
OPT	PL pg 39	Tilt the lower edge of PB2 rearward about 1/2" to allow more cable clearance with SA6.
MEO	PL pg 46	NG1, .5" should be .6". .85" should be .95".
DES	PL pg 38	SA5 has inadequate lateral stiffness. Stiffen by welding 3 pieces to top rim as shown:



1/2" WIDE .050 STEEL STRAPS  
WELDED AROUND TOP RIM  
OF SA5

DES	PL pg 44	Engine position is shown on the plans only by locations of the mount pads on the engine mount drawing. To obtain more prop clearance and the correct fit to the cowling, the crankshaft at the prop flange should be located at W.L.32 (prop flange at F.S.186.5). For conical mounts (not dynafocal) the top mounts should be at W.L.36.2 and the bottom mounts at W.L.26.55. More details on this are shown on the instructions included with cowlings. Delete the F.S.189 circle on PL pg 6. Add a 12" circle with center at W.L. 32. Label it F.S. 186.5.
OPT	PL pg 39	PE2, change 1.3 to 2.0 and change 1.8 to 2.5. This moves cable forward to provide extra clearance with MG43 gears. (May not be required - depends on your MG43 installation.
MEO	PL pg 28	VS1, 2.8 dim. should be 2.5.
MEO	PL pg 17	A fairlead should be installed at B.L.4.3 and W.L.6.3 on F51 to position the rudder cable below F21.
MEO	PL pg 45	Turnbuckle required on 1/16" cable that runs gear up & down cannot be a standard turnbuckle since they use up too much cable room and would run up on either pulley. Total disturbed cable length must be less than 4 1/2" including nicropress sleeves. N27VV has a short homemade turnbuckle made from 2 shackles and a short length of threaded alum tubing. Another method is to eliminate the turnbuckle and adjust tension with a small idler pulley. Vernon Williams substituted a chain as suggested on the plans and he reports excellent results with a Boston K2512 pulley and No. 25 chain.

**LANDING GEAR RETRACTION GEARING**

We are recommending mandatory changes to increase the retraction/extension forces on the landing gear. These new gearing changes will allow use of either the Dodge or Ford window motors and will result in positive gear retraction for all allowable aerodynamic conditions.

**NOSEGEAR** - The system shown on the plans is inadequate for inflight retraction loads with the nosegear door installed, particularly when using the Ford window motor. It is necessary to gear the motor similar to the maingear motor installation to provide adequate retraction torque. Ratio required is between 3:1 and 5:1. The following gears, available from Boston gears (check your local Yellow Pages), will work well:

Boston No.	P. Dia	Hole	Price (1971 Catalog)	
NA11B	0.6	5/16	\$1.95	Mount to motor
NA50	2.5	3.8	\$7.50	Mount on NG6

Be sure to test the power of your retraction by pulling 15 lb aft at the nosewheel with a fish scale while the gear is being retracted. The following quote and photo from Mike Melville further clarifies the installation:

"I am delighted to report that my nose gear retracts effortlessly in about 10 seconds even with a constant 15 lb aft pull. Pulling the pin and swinging the gearmotor away from the gear allows the nosegear to freefall down and lock. It works perfectly and I could not be more pleased. Also, when I lowered the gear ratio, I did not move the spool NG1, but I lowered the gear motor downward until the small gear engaged the bottom of the large gear. This worked out well, as nothing now protrudes up into the canard."

I understand it is possible to find a gear which will mesh directly with the gear provided on the Ford or Dodge unit. This eliminates the need to adapt a small gear to the motor. Don't ask where to find this gear though, as I have no source and those who have found one scrounged them at surplus outlets.

**MAIN GEAR** - Plans call out a 1:4 reduction for MG43 gears. This should be increased to between 1:6 and 1:9. The following Boston gears will fit and work well, providing a 7.3 ratio:

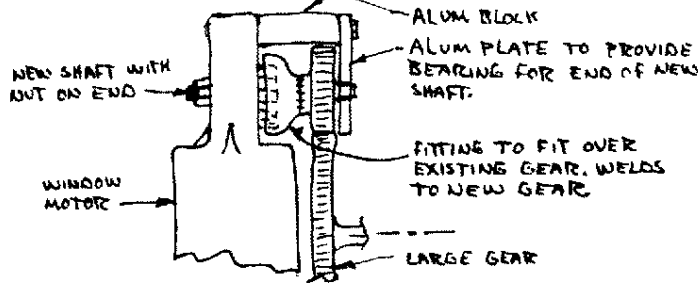
Boston No.	P. Dia	Hole	1971 Price	
NA11B	0.6	5/16	\$1.95	Mount to motor
NA80	4.0	1/2	\$9.40	Mount on MG41

NB series gears can be substituted for the NA series on either nose or main gears. The following quote and photo further clarifies Mike Melville's excellent installation: (photo on page 3)

"The view of the motor assy shows it temporarily clamped in position with 2 "C" clamps. I used a 12-tooth gear on the motor and 97-tooth gear on MG4...It retracts in 12 seconds and is not effected at all by pulling 10 lb outward on each gear (during retraction). My wife says I am like a kid with a new toy!...I have not had the courage to drop the main gear all the way from the top (emergency extension system) as I am afraid it will break something! It is probable that my MG6's will snap solid into place (down lock) when I do let it free-fall. I will try this after I get the bottom skin on."

As I remember, I waited to skin the bottom also, before testing the emergency freefall system. MG6 (MG5 lugs) have always snapped into the locked position during emergency freefall testing.

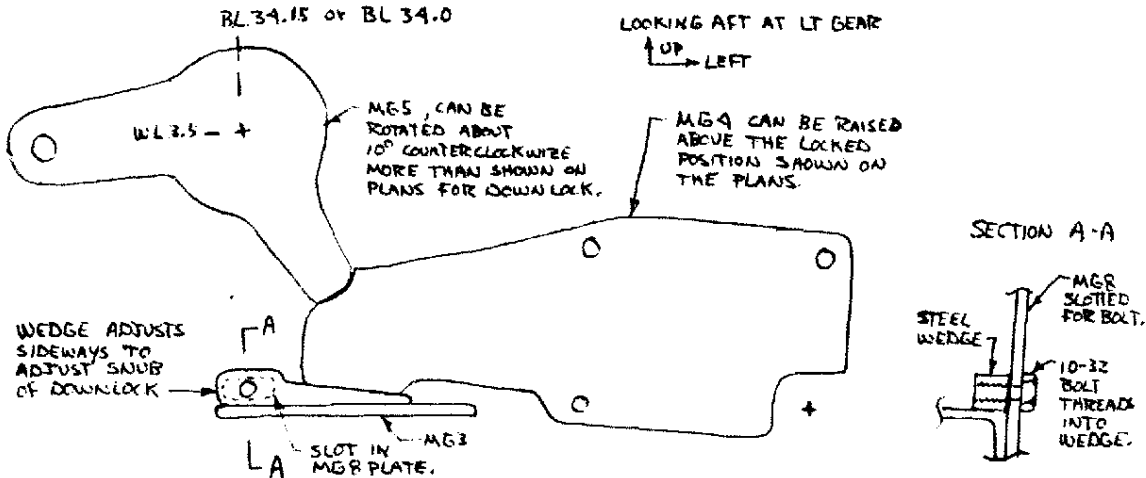
Depending on your gear motor and gears selected, you may have to modify the shaft in the gear motor and provide a shaft bearing on the outside of the gear. The following sketch shows Mike Melville's modification:



Of course, if gears are available which would mesh directly with the gear on the Ford or Dodge motors and provide 4:1 ratio for nose gear and 8:1 ratio for main gear, the installation would be greatly simplified. If anyone knows of a source of these size gears, let RAF know and we will print it in a future newsletter.

**MAIN GEAR DOWNLOCK ADJUSTMENT**

The plans do not show any adjustment on the snubbing of the gear in the downlocked position. I have noticed a slight amount of freeplay in N27VV's right gear after 400 hours that is not serious enough to require attention but I am recommending that you include an adjustable wedge that can slide sideways to provide downlock snub adjustment. The MG4 beams sold by RAF were machined shorter than the plans due to an error, but these will now fit well when used with the downlock adjustment. If you are making your own MG4 beams, make them approximately 1/4" short on the end so they will fit with the downlock adjustment. To provide the best downlock geometry with the adjustment installed and the shorter MG4 beams, move the pivot for the MG5 lugs outward (toward the wing tips) about .15" to B.L.34.15. This move is not absolutely required, though, if you have already located the pivot at B.L.34, the downlock will function with a thicker wedge on the downlock adjustment, and the gear total motion to the extended position will be closer to 92° than the 97° shown on the plans and the main gear extended position will be inboard of the B.L.40 position shown in the plans and should result in more even tire wear than on N27VV (I now have to reverse the tires during the wear cycle since they wear more on the inboard side). The sketches show the geometry of the downlock adjustment and the new position of MG4 and MG5 in the locked condition.



**BUILDING TIPS**

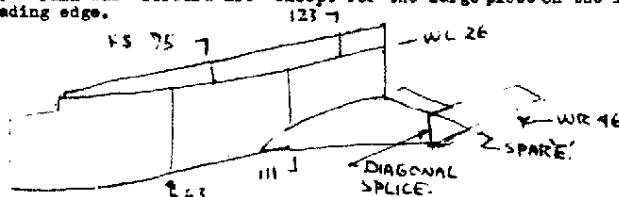
You don't need to weld the caps on MG13 with the nutplates riveted inside. You can drill two 5/8" holes on the front or back near the ends and install the nutplates, or a locknut, after welding.

The following are the Lycoming-listed dry weights for the engines recommended for VariVigens: O-235-2421b, O-320-273 lb, IO320-292 lb, and O-360-285 lb.

Vernon Williams has ordered a ground-adjustable wood prop from Bernhard Warnke, Box 50762, Tucson, Az. 85705. This appears to be a good way to have the safety and light weight of a wood prop and also have the flexibility of the adjustable feature. (See March 75, "Sport Aviation" for article.) We are presently working with Sgnsenich in the development of a wood prop for VariVigens that is similar to the wood props they developed about two years ago for the Thorp T-18 homebuilt. More details after flight testing when this one is available.

The Pafnir number for the 5/16" balcrank bearing is BC5W11.

The following sketch shows the position of the skin scarf joints on the fuselage and inboard wing of N27VV. 50"x50" birch plywood was used. Grain was 'forward-aft' except for the large piece on the inboard wing which is parallel to the leading edge.



**SHOPPING** - The following companies have excellent spruce kits for the VariViggen. They include all spruce cut to the sizes shown on plans page 4. I can vouch for their excellent quality. Write them for prices and availability. Aircraft Spruce and Specialty, Box 424, Fullerton, Ca 92632; Aircraft Materials Co., 850 E. San Carlos Ave., San Carlos, Ca 94070.

Some builders have had problems locating the very important decimal steel tape measure, suggested in Newsletter #1. Bill Riddell (SN 50) reports that he has access to a large number of the 61-112 rulers and any builder can send him a check for \$6.50 which includes postage and he will send a ruler. Bill Riddell, 4575 Shadesview Dr., Pensacola, Fl 32504.

Lloyd Toll, Box 303, Hazen, Ar 72064 does excellent alum welding and is equipped to build fuel tanks for VariViggen. He has alot of fuel tank experience. Write him for quote.

The following company has a stock of aluminum at 1970 prices, 50¢/lb!: McGowan Company, Inc., 560 E. Maitland, Ontario, Ca.

#### NEW PRODUCTS FROM RAF

Add the following items to your RAF Catalog. Prices and availability as indicated.

V-CSP - We have a limited number (5 ship sets) of the LS-806 pulleys in stock now. These are the 2-bearing pulley used in the primary control system (10 places) and fit the brackets drawn in the plans. They are new and equal or better quality than the best AN220 pulley. Price is \$3.75 each if picked up here. Add 25¢ for each pulley ordered to cover packaging and postal/UPS shipping charge if you want them shipped.

V-INRIBS - This is a package of birch plywood pieces with all the inboard wing ribs (except WR46) drawn on them (full size of course!). The homebuilder saws along the lines with a saber saw or band saw to fabricate the ribs (eliminates scaling up plans). A 2-inch overlap is drawn on the longer ribs for the homebuilder to scarf together. Price \$78<sup>00</sup> Availability JUN 20 Add \$5 - for packaging if not picked up at RAF. Shipped freight collect.

V-BKHDS - This is a package of birch plywood pieces with F20, F32, F41, F51, F63, F70, F91, F103, F111, F121, F137, and F152 drawn on them. Eliminates scaling up the plans; builder cuts along lines to fabricate bulkheads. Price \$169<sup>00</sup> Availability JUN 5 Add \$5 for packaging if not picked up at RAF. Shipped freight collect. This package also includes WR46 inboard wing ribs. 3/8" ply is marine fir AA grade.

V-CMAN1 - VariViggen Construction Manual (part 1) - See description elsewhere in this newsletter. Availability, 15 June '75. Price \$18.50 including first class mail, or \$20.50 for air mail Overseas.

#### VARIVIGGEN COMPONENTS

All machined parts are in stock in adequate supply except V-WAA which we are down to two ship sets and it will be about six weeks until we get more. We can sell the eight tapered pins separately if you want to fabricate your own straps and buy the heat-treated, cad-plated taper pins. Note that they are tapered 3/4" per foot rather than the taper shown in the plans. Thus, a standard pipe taper reamer can be used to taper your straps (before heat treat of course!). Price for the eight pins alone is \$37.00 including packaging.

Some builders have asked why NGSA is so expensive. The following is a list of the operations required to build it, which gives you an idea of why the cost is so high: Cut three 4130 steel tubes to length and face ends, machine plug to close tolerance for shrink fit in tube, shrink fit plug and tube, fabricate 'U'-shaped part which fits the Scott assembly, weld assembly of five parts (weld backs up the shrink fit to assure no leakage), heat treat, grind strut, hard chrome, re-grind strut, mask strut, cad-plate lower end, bake assembly for surface embrittlement. I've had the entire nosegear assembly from the parts in the first 25 ship sets on N27VV for the last 50 flight hours and have had no problems at all with any of the parts.

Do not order backup rings for the nosegear installation. The strut is designed as a low pressure assembly and provides excellent sealing with the o-ring alone with no requirement for backup rings. We will still supply the O-ring set and scraper to complete the nosegear assembly. If you are building your own nosegear parts, machine the o-ring groove to fit the o-ring only and do not use backup rings.

Installation instructions are included with all RAF-supplied machined parts.

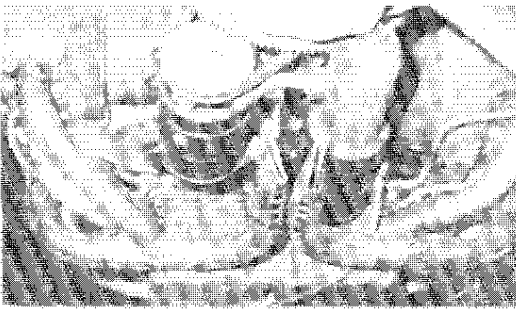
All fiberglass parts have been in stock since March 5th. Installation instructions included with all fiberglass parts include drawings detailing the installation of landing light, all doors, engine cooling baffling, engine induction system, exhaust system, cowling exhaust shields, carb-heat system, cabin heat system. Note that unlike conventional baffling, VariViggen cowling installation results in the magnetos and fuel pump running in cold air rather than air heated by the engine cylinders. This extends magneto life and eliminates vapor lock.

Instead of my description of fiberglass parts, I'm including a quote from a letter from Mike Melville (SN 115).

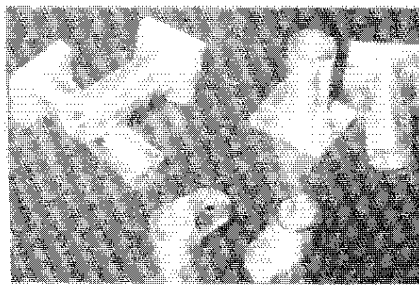
"What can I say, Wow! Much to my delight, my fiberglass parts arrived today, in perfect condition and beautifully packed. The shipping charge was very reasonable and the quality of the parts is out-a-sight!! I could not be more pleased. I expected them to be good, but this is really professional quality. Just super! I also received my "Flying" magazine and was pleased to see the article about the Viggen. I think it is an excellent article and the photos are great. The new cowling looks good in the last photo. I love mine, the finish is unbelievable. The instructions are worth their weight in gold as well."

The new nosecone design eliminates the F26 metal ring by providing a joggle which allows bonding the plexiglass dome on flush without a ridge on the outside.

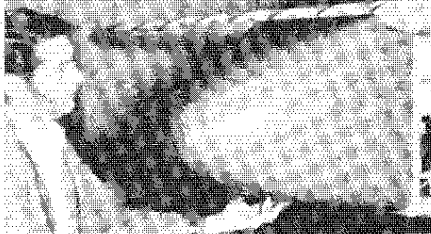
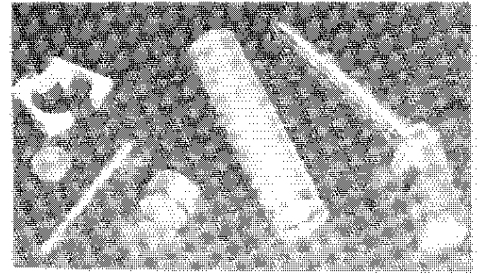
Our packaging cost for the set of all fiberglass parts is \$20.00. If you pick up these parts here at the Mojave Airport you can save \$20.00.



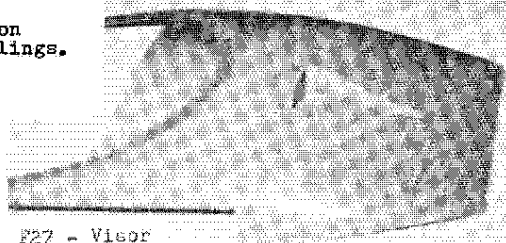
Exhaust System. Note squashed ends and multiple lower outlet holes. Complete exhaust system installation instructions are supplied with cowlings.



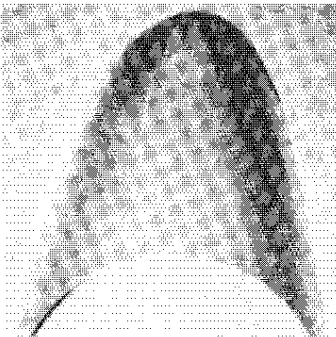
RAF-Supplied Machined Parts



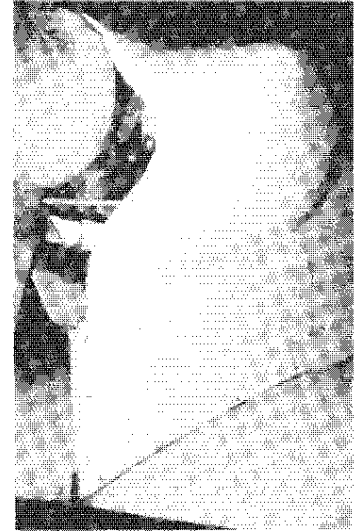
RAF-Supplied Nose Cone On Jim Cavis's Fuselage



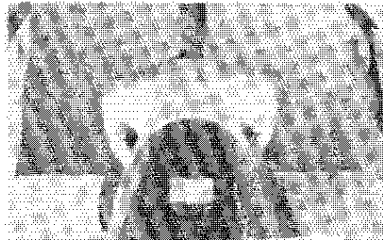
F27 - Visor



RAF-Supplied F28. Note air outlet and recess for fuel servicing door.



New Cowling from Rear



New Cowling from Front

**VARIEZE**

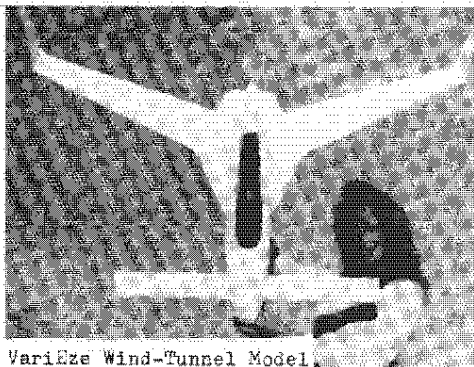
The VariEze, a prototype aircraft built at RAF since Newsletter #3, is nearing completion. First flight should be before June 1st. This aircraft is being built as a research project to evaluate the feasibility of a high-aspect ratio (eleven, on wing and canard) canard configuration for optimum cruise performance. This aircraft may be offered in plans and kit form if it proves to have good flying qualities and safety and when we have completed all flight tests, including spin, flutter, environmental, and reliability tests. In the mean time, we hope to use it to capture most of the important speed and distance records in the under 500 kg weight class. Releasable specs are shown in the following. Please don't ask us for any more information than is shown here as all other information must be withheld pending completion of the appropriate development and testing. When it's available, further information will be in "Sport Aviation" magazine and in "VariViggen News."

Construction - Fiberglass/Foam composite, no structural wood or metal  
 Wing Area - 49 Ft<sup>2</sup> Wing Span - 24 Ft  
 Canard Area - 14 Ft<sup>2</sup> Canard Span - 12 ft  
 Gross Weight - 870 lb  
 Empty Weight - 380 lb (VFR)

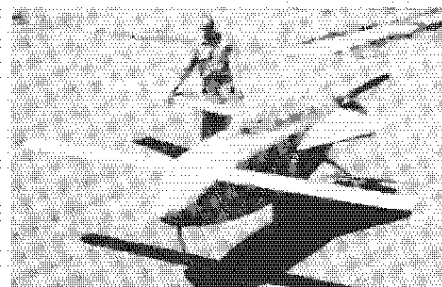
Two-Place Wing Loading 13.8 PSF  
 Pwr - Volkswagon or Franklin 60 Direct drive, prop mounted on engine  
 Elevons on canard, no control surfaces on wing  
 Fixed main gear - airfoil-shaped, molded fiberglass strut.  
 Retractable nose gear - ball/screw assembly allows retraction/extension on the ground with crew in the airplane. Thus, the airplane "kneels" and parks on its nose.

Directional stability provided by Whitcomb 'winglets' with single-action rudder/speedbrake surfaces. Only about 25% of the number of parts as in a conventional structure/configuration. Structural method allows maintenance of exact surface contour for even severe flight loads. Flight surfaces are being contoured to within .003" per 2" surface waviness.

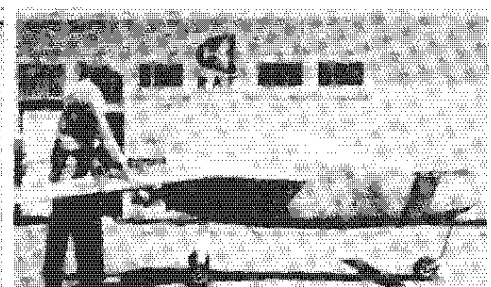
All performance estimates are being withheld - I refuse to claim estimates that I myself don't believe, and since this is now just a research project, I cannot answer any questions pertaining to it. Sorry.



VariEze Wind-Tunnel Model



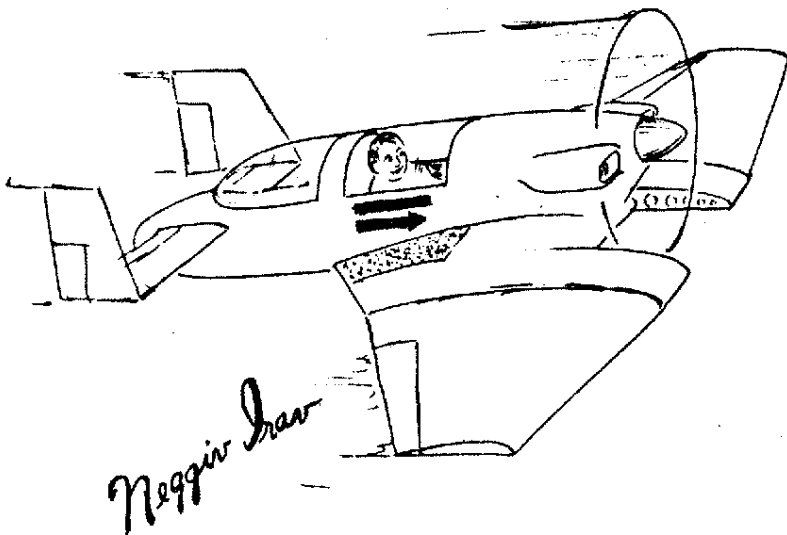
VariEze Prototype. Burt's dad, George, is holding wing.



VariEze Prototype in Front Of RAF Headquarters

Jerry Stewart received this letter and sketch from a friend:

"Dear Jerry,  
Have uncovered an obvious mistake in the design of the sportplane you are building. The rudders are supposed to be attached to the elevators - not the wings. (The designer was celebrating April first when he drew the plans.) Shifting the rudders to the rear (as shown) will also greatly improve forward visibility and will keep the plane from spinning wildly during flight.  
If you're in doubt about which way it goes - I suggest you start from the middle of the runway when you start your take-off run.  
Above all - remember to land just before the fuel guage reaches full.  
(If the same guy designed your parachute, - your're in real trouble!)"



Do you have something to contribute to "VariViggen News?"

**FLASH! World's first VariViggen gear-up landing.**

The newsletter was held up to include the details of my first gear-up landing. It occurred during the airshow at the Corona regional EAA Flyin, May 4. N27VV gave airshow demonstrations on Saturday and Sunday for the flyin. On Sunday, I had completed the airshow demo, all except the landing; when I moved the gear handle down, I heard a different noise and noted that although I had electrical power to the main gear (transit light on) the mains did not come down. The failure was later determined to be the spring that connects to MG24 uplock arm. The spring had apparently been knicked with pliers when forming the hook on one end in 1970 when the spring was installed. Five years later, during the airshow demo, the spring broke. Without this spring, the right main gear remained locked up. After several passes over the crowd, for inspection of gear position and some radio discussion with those on the ground on whether or not to land in an adjacent grass field, I decided to land on the main hard surface runway with the nose gear down. This was taking the risk that the nose gear would not fail and thus reduce the damage. I made a "full-stall"-type landing with engine and switches off and after a short roll/slide, I got out to inspect the damage. Damage was limited to one skid (VS1 extension with small wheel) a small scrape on one wing tip - (only one rivet damaged) and partial collapse of my centerline fuel tank. The tank remained attached firmly on its mount and did not leak. The nose gear took the 'slap down' load well with no damage. About 20 volunteers lifted the aircraft up while I scampered underneath to manually free the uplock and to lock the gear down. I then taxied back to a hangar, inspected the aircraft, elected to pin the main gear down and locked for the flight home and within 1 1/2 hours of the gear-up landing, I took off and flew it back to Mojave where I was greeted by 60-knot surface winds. Landing and taxi-in were uneventful despite the fact that at the time, two other aircraft were being jerked from their tiedowns and suffered wind damage much greater than my earlier gear-up landing!

I learned a bit from this experience:

1. Inspect uplocks during preflight and use appropriate quality control during their installation.
2. If faced with a main gear-up landing, pull the main gear circuit breaker, extend the nose gear and make a landing with the nose quite high (full flare) on a hard surface. This landing is really not more difficult than a conventional landing and you can expect very little damage.
3. Gear-up landings on VariViggen are far safer than on conventional aircraft where one of the first things to get damaged is the carb and fuel line and the possibility of a fire exists.
4. Note that the emergency extension free-fall system backs up an electrical failure and a mechanical failure of the electrical motor and gear box, but does not extend the gear with a jammed uplock. I do not recommend a design change of any type since the gear has had nearly 1000 satisfactory cycles during all types of weather and flight conditions. Any change now would be starting at zero experience with a resulting increase in risk.
5. Gearup landings have a very positive appeal from a marketing standpoint. It emphasizes how rugged the structure is (to survive with only minor damage) since we immediately received seven orders for plans from people who saw the landing!