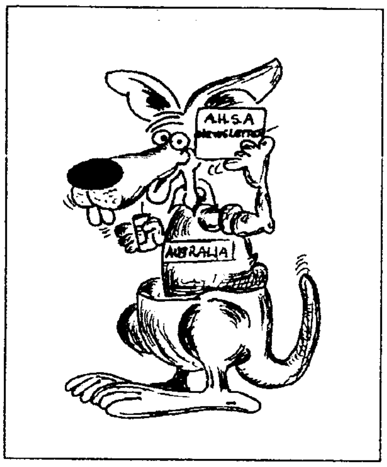
THE AUSTRALIAN HOMEBUILT SAILPLANE ASSOCIATION

Volume 4 Issue 13 **SEPTEMBER 1999**

G'day Folks! *Welcome again* to The Australian Homebuilt Sailplane Association journal, you are holding in your hands the result of several weeks of planning and with one goal in mind, to fill a perceived need for "how to do". Never before have we had such a publication around. Our concept with this journal is that it will become a valuable resource for you in your home built sailplane project.



At some point along the way through these pages you will find something that could be of interest and I think you will find that our members are starting to share their knowledge with us. This issue, for example, features two articles on *How to Build a Canopy*. I hope this will be the starting point for the construction of the canopy for my own project 'WOODSTOCK' that is coming to the stage of completion with the help of my friends Malcolm Bennett and our Erudite and Multifaceted skilled Secretary Peter Raphael. What can I say...once again. Thank you fellows!. Thanks to Sergio Jacobi, our cartoonist and excellent craftsman, who donated two Emu eggs painted in Australian motifs which I sent to Janice Armstrong (the Editor of Sailplane Builder - our cousin publication in the USA) as a souvenir on behalf of The Australian Homebuilt Sailplane Association and with the courtesy of John Ashford who delivered them personally. Read the saga in the **Mail Box** section.

I have to give my sincere thanks to Sir Douglas Vanstan and our multifaceted skilled Peter Raphael "The Erudite" for sharing with us their experience on how to build a canopy, I am sure that this tip will be useful to somebody .

Our Next Symposium will be held on the 13th and 14th of November 1999 at Smithfield Soaring Group, Nagambie. Note this date on your calendar. Very interesting topics will be discussed and we will have the presence of Graham Bett, Carbon Dragon owner from NSW. Let me know as early as possible if you will be attending so that we can arrange the catering. As before, camping sites will be available - or there is plenty of motel/hotel accommodation in Nagambie.

More information will be available in a circular in October.

James Garay

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Inside This Issue

Presidents Corner from the Oval Office

By Gary Sunderland

The result of the GFA Plebiscite, on amalgamation with the HGFA, was a majority in favor, but unfortunately, not with the required margin to carry the process forward.

This leaves our AHSA with less favorable opportunities for action, in that we remain a "poor relative" in a small organization, rather than an important link in a much larger soaring body.

Nevertheless, we can still aim to cater for those HGFA members who aspire to greater things, in terms of rigid wings and more performance. The GFA and HGFA Executives are still keen to cooperate in future, so we can still help them, and also help ourselves to gain more influence and kudos in the process.

At our next Symposium, in November, I will outline a suggested way forward, in the next Millenium, that will hopefully have the AHSA becoming the leading progressive body for soaring in Australia.

Coming back to the present, our last issue carried a report of load test on the American Spirit/Falcon by our American cousins. This look generally good news, but the USA report did not mention the tail load. Anyone doing proof tests should be aware that the balancing tail load is usually negative (ie. down) so has to be added to the "non lifting" load.

The tail loads need to be factored into the calculation of the wing bending loads, as described in the FAA "Basic Glider Criteria" handbook.

Another item from the last issue was our "Editor's Note" on the response to March edition. My comments seems to have had the desired result, to wake up the few people, but please do not complain to James. Just say what you have to say direct. My telephone number is (03) 5367-5374 and I will be pleased to exchange views with any member, and accept any constructive criticisms.

SAFETY PROCEDURES FOR CONSTRUCTION AND RIGGING.

We have recently had a rigging defect found in a LS 3a after flight. This means that we have now had two rigging incidents within the last year in my club V.M.F.G.

One incident of this sort is bad enough, but two in a short time looks like. A bad habit that we must break.

Lets go back to basics. We all take great care when rigging a glider, but anyone, and everyone(this means you) can make a mistake. The way we cope with human error of this kind is to have an independent person check the critical connections.

In a practical situation, it takes at least two people to rig a glider. This means one person can complete the centre section rigging whilst the other attaches the tail. Then you can swap over and check each others work before closing the covers and taping up.

This is the way I was taught by Alan Patching, over forty years ago, so there is nothing new about it. If one person is very senior in experience, say an instructor, it is vital that this safety system is not abandoned. In such cases the senior person must use one helpers to check the connections. Look upon this as a training exercise. Show the helper how the connection work and to understand how to inspect them for safety. Every one needs to start sometime, so grab every training opportunity that present itself.

These good safety practices should be reinforced by written procedures. If you look the current GFA annual inspection, form 2, you will see that there are places where duplicate inspections are signed off for major re-assemblies after maintenance. That copes with the annual inspections, but we really need something for subsequent rigging of the glider.

The GFA's Operational Regulations 4.3 state that a glider must be inspected and certified , on GFA form 1, following each rigging. Unfortunately there is no provision for a duplicate inspection sign off on the form 1, daily inspection, nor any mention of such inspections in the GFA Daily Inspector's Handbook.

The DI Handbook is worse than useless in that it says, apropos main fittings (4.1). "there is little that can go wrong with them" (Ha-ha!) and, under controls (4.22) indicates that visual inspections are not possible or unreliable. I would suggest that certified dual inspections would be a better solution to such problems than having the pilot bail out, as suggested!

A new Form 1, maintenance Release and D.I. Book is coming out which well fix this problem. In the meantime, be careful out there.

FROM THE INTERNET. (1)

Top glider pilot killed: Clem Bowman, the 1997 U.S. glider champion, was killed in a crash near the Minden-Tahoe, Nev., airport. Bowman, an air race competitor for more than 10 years, was being towed aloft when the horizontal stabiliser on his Genesis sailplane fell off and the craft plunged about 100 feet to the ground. Early speculations is that the glider had been improperly assembled before the flight ***(The Marske "GENESIS" is an Experimental sailplane of composite construction. It is believed that a number have been built by home builders in the U.S.A.)***

FROM THE INTERNET. (2)

On June 21st 1998 a serious accident occurred in Nevada involving a new DG-800B, due to loss of the elevator control. The pilot returned to the airfield with severe oscillations and impacted on the ground hard short of the runway. He suffered serious injuries to his back, but the doctors are hopeful for a full recovery.

The preliminary investigation of the accident showed a disconnected bolt as the cause, which connects the elevator push rod in the fin to the elevator connector. The bolt was found in the fuselage, and it bore the color code of our inspector, applied after a satisfactory inspection. The safety stop nut was not found.

After intensive consideration and testing we are fairly certain to be able to duplicate the event. Our control connections are primarily safe tied by means of M6 safety stop nuts of the normal DIN quality. This quality of nuts is used by all other manufacturers, as far as we know, and has worked properly in several thousand airplanes. However, every manufacturer also knows that a small portion of these nuts does not have the blue plastic ring. Usually the mechanic will discard these nuts immediately, because he can see that the ring is missing, and he would notice when tightening the nut that he could turn it without resistance right up to the parts section, and would feel the expected resistance of a safety stop nut.

But there are also a small number of defective safety stop nuts on which plastic ring is squeezed out while being fastened. These nuts have the same feel when being tightened as normal nuts, but when tightened the ring is either squeezed in a corner or has fallen off completely. The inspector should be able visually to identify such a nut. But if it is in a visually inaccessible location and can only be inspected by feel or by testing the tightening moment, he would not detect it.

That is exactly what happened to the bolt in question, because it is installed in downward direction while the fuselage halves are in the mould, and one could have seen such a compressed ring only with a mirror or an endoscope. Our inspector cannot imagine that he would have made his inspection mark on the bolt without the nut being installed. No one else worked on this part after the inspection, because according to the manufacturing logs the fuselage was glued together immediately afterwards.

In this manner a correctly tightened but not safe tied nut loosened itself in our testing with engine running within a few minutes and then fell off. That could have happened even during a test flight in Germany. The nut would probably fall out of the open end of the fuselage. We know what the subsequent events were!

Of course we tried to learn various lessons from these events. I would like to give you our most important conclusion, and urge you to incorporate them in your own manufacturing process.

From now on we will only use safety stop nuts of aircraft norms which are much more expensive, but where experience has shown that they can guarantee that no plastic rings are missing, or can be improperly compressed. If all the manufacturers would follow this practice, then a similar accident could probably prevented in the future.

FURTHER COMMENT

Our German friends are mistaken if they believe that all aircraft parts are free from defects. It is quite common to find plastic rings missing or loose in AN-series stop nuts. In fact I used to have a matching AN 3 A bolt and AN 365 nut, both without any thread! This was a safe fault, because the parts could never be used!

The message is: There is no substitute for careful duplicate inspections at every stage of manufacture and maintenance. A mirror and torch are standard equipment for any inspector, so I am amazed and shocked that a German manufacturer is not insisting on visual inspections.

All home builders take great care and pride in their projects, but we must all rely, and insist, on independent duplicate inspections before "closing up" any component.

Your assigned inspector is your best friend, make his job easy and value his advise. It may save your life!

MAIL BOX

Dear Ed,
Thanks so much for the Emu eggs! The funny thing is they didn't arrive here with John Ashford - apparently he forgot to bring them, but called home and had someone else bring them from Australia to Germany for the meetings and then Dan brought them back from Germany to the USA.

Those eggs are very well traveled and arrived in great shape. They are beautiful and they came with two leather stands. Please let Sergio Jacobi know how much I appreciate his work - he is a very talented man. They have a rightful place on our mantle and I thank you greatly for them.

Dear Ed,
Thought I should bring you up to date with my movements. To reduce the major impediment to future play projects I have sold our new house in Victor Harbor with an 11 x 6 Mts. shed and we are building a new one back in Adelaide with an 11 x 6 Mts. shed...I wonder why...!

The upside is that it gives me time to think more about what it is that I want to build. You know the downside, time and Money.

Noticed that you published a members profile in June. For your next list here is mine. Trust your Woodstock is going well. Regards. Alan Bradley.

Dear Ed,
Thank you very much for your letter and the information from Alan Patching. The article on the Carbon Dragon is a bit shorter than I thought but nevertheless I found a few new and interesting details. Today I am also sending a short letter to Alan.

On another note, since I am very interested in aircraft/glider design I must mention that your comment about Alejandro Ramirez Pineiro in Chile (who is re-calculating the tail of the C. Dragon) made me very curious and I would warmly welcome any news on that. Please keep me informed, any cost which may arise I will gladly cover.

Thanks also for the e-mail address of Steve Adkin. Today I sent him a message regarding the Carbon Dragon, hopefully I will get some more interesting information. Yesterday I spoke with Graham Bette and we discussed the trip to Nagambie in November this year. Hopefully I will have the opportunity to meet you during the symposium there. Until then I wish you all the best. Boz Ilic.

Dear Ed,
I have today sent the fees to renew my subscription. My interests are to initiate a development in self-launching glider, built from kits or plans with heading towards low cost. (I have built a Monerai powered version).

My skills have been used to create a computer program in aerodynamic calculations, for those forgotten factors that must be with you when it comes to gliders. This program uses Mts. Kilo and Newton. This is a first step in development but also a way of checking out performance from existing gliders. The program is available in English for $40.00US/Dls delivered world wide. The original intention was to help Swedish projects. Lots of calculations in many steps are not the way ordinary people will work, you may redo it many times before finding the solution. That is why such programs are needed before you start the drawings of the project.

Most glider pilots want progress and are not intending to spare time, except for flying. That is why my program is needed.

A new engine for the Windex 1200 has reached new stages. It gives 60% more trust than the Koenig. Test bench has been done for 15 hours and the test fly is expected this autumn.

The EAA Chapter 222 Sweden expands during the 90, while the Gliding Association is dropping the membership during the same time. The gliding group has several homebuilts flying. Some projects are very close to test flights.

I am happy to see that the A.H.S.A. expands in membership and also appreciate your good work with the Newsletter. "Do it yourself" don't listen to people telling you to "do this or do that". There is no need to. Many happy landing to all of you.
Nil Ake Sandbag.

***Ed's Note:** Thanks Nil for your good wishes on behalf of the AHSA Servants I must tell you, it is with your support and the rest of our members that make this organization work well. By the way, do you know if my friend Hans Lagergreen is still around? I would like to hear from him. Can you pass on the message?*

TECHNICALITIES

PERSPEX.

I.C.I. Technical Information.
Courtesy J. Ashford.

Perspex is the registered trade name for Polymethyl Methacrylate sheets and rods manufactured by I.C.I. (Imperial Chemical Industries Limited).

PURE SOLVENT CEMENTS.

A SOLVENT TO BE USED FOR CEMENTING ACRYLIC SHEETS SHOULD HAVE THE FOLLOWING CHARACTERISTICS:

(1) It should readily attack Perspex at room temperature, without leaving a deposit.
(2) It should evaporate at such a rate as to allow time to bring the two surfaces together before drying out.
(3) It should not necessitate a prolonged cure or drying time before the joint can be handled.

Chloroform meets these requirements and is readily obtainable and is perhaps the most widely used solvent for this type of cementing.

Also in general use are ethylene di-0chloride, methylene di-0chloride, trichloroethylene and glacial acetic acid. Solvents have no gap filling properties and so are not suitable for other than edge joints, which should not, in general, be greater than ½" (12.7 mm) wide and 18 to 24 inches (46 to 60 cms) in length.

METHOD OF USE

Solvents can be used by either of two techniques both of which, however, require that the surface to be cemented should be cleaned and prepared to give a good mechanical fit with no gaps greater than 0.001 in. (0.025 mm) Generally, one edge of a piece of Perspex has to be joined to the original surface of another piece, and the edge should be machined square and smooth but should not be polished.

The two methods differ in that in the first, the initial solvent attack is restricted to only one of the two surfaces to be jointed (the cut edge is selected), but in the second the two mating surfaces are attacked simultaneously.

METHOD (A)

A pool of solvent is poured on to a glass plate or other flat surface; the machined edge of Perspex is then held in the pool of solvent until it is thoroughly and uniformly soft throughout the joint area. This takes about one minute with most solvents (5 minutes for glacial acetic acid), and after this period the Perspex edge is removed from the pool, the excess solvent is shaken of, and the softened edge is carefully brought into contact with the second surface. First contact should be made at one end and the softened edge lowered gently so as to force all air in front of the increasing contact area. The joint is then clamped under light pressure for the curing period which varies, according to the solvent used, from about half an hour with chloroform and longer with other solvents, up to 3 hours with acetic acid. After this time, the joint may be safely handled although its maximum strength may not be reached for some days.

METHOD (B)

The surface to be cemented are brought together and held in a suitable jig so that at one end of the joint the two pieces are in contact while at the other end there is a gap sufficiently wide to allow the standard wide-bore needle of a hypodermic syringe to enter. A measured quantity of solvent is injected in the gap by means of the syringe and spreads by capillary movement over the whole area of the joint. After about 30 seconds the gap is closed and light-clamping pressure applied. It is important to control the amount of solvent closely as too much may spoil the adjacent surfaces and too little will lead to dry joints. The hardening time before the joint may be safely handled is similar to those of method 9a) above.

PROPERTIES

Under good conditions and with well made joints, shear strength at normal temperatures of about 2.000 lb. per sq. in. (140 kg/ sq, cm). May be obtainable some days after making. Exposure to damp conditions or outdoors weather causes the strength to fall very rapidly, because of the gradual absorption of moisture from the atmosphere, and the joint may fall apart after a few months. For this reason the use of pure solvent is severely limited, and in applications where continued maintenance of strength is required, this type of jointing cannot be recommended.

Solvent joints, if carefully made, present a good clear appearance but it is relatively difficult to make the joints consistently bubble free. On the other hand they require very little equipment for their preparation, masking of adjacent areas should not be necessary and they can be made in a very short time.

For non load bearing members, to be used under dry conditions and where failure would not result in serious consequences, pure solvent joints can be used (e.g fancy goods, small display stands, small boxes and covers} but the others forms of cementing described below are to be preferred.

"TENSOL" CEMENT No 6 (Solvent/ Polymer Cement).

Tensol cement No 6 supplied by I.C.I, Plastic Division in cans as clear solution ready for use is prepared to a specified viscosity at a standard temperature. The cement should be stored in a cool place an the can should be tightly closed as otherwise solvent will lost by evaporation and the viscosity will increase. Under good conditions the cement may be stored for at last a year if the can has no been opened.

The gap filling properties of Tensol Cement No 6 are limited and surfaces should be machined to match within 0.002. (0.05 mm) Masking of adjacent areas is generally necessary.

Correctly prepared joints made with Tensol cement No 6 have markedly better weathering properties and greater strength than joints made with chloroform, though again under damp conditions, the strength of the joint gradually be reduced.

Ternsol cement N0 6 is intermediate in performance between pure solvents and monomer/polymer cements, and may be used in a wide range of industrial applications, where Perspex is used structurally and where the use of an all acrylic cement is not practicable.

To be continued...

ASK-21 SCHLEICHER SEAT
BY S. STEVE ADKINS
An excerpt from Sailplane Builder.

While researching past issues of the SHA publications, I was very pleased to see the side-view drawing of the Squid-12 glider seat in the February 96 issue. I have been struggling with a concern about seating room ever since receiving plans number 278 for the Carbon Dragon from Maupin Ltd. While Maupin Ltd reports flights by a 210-lb. pilot, the 17-inch seat width had me bothered. I sat in a Jantar once resulting in sore hip bones due to the narrow fuselage. The K-21 two-seat glider has one of the most comfortable seats in the business. I have completed a 3-hour plus flight in blue lift here in Minnesota and felt extremely comfortable the entire time. A 2-hour flight in a K-21 at Tehachapi was a breeze. On the other hand, 1-hour plus flights in a 1-23 or a K-8 are real butt-busters. I am 6 feet, 2 inches tall and weight 226 pounds and find the k-21 perfect. I might mention that I was previously flying the K-21 at 236 pounds, but the Carbon Dragon has forced me on a diet. The Minnesota Soaring Club has 85 members of all sizes and everyone loves the K-21 seating. Smaller members merely add cushions.

As a result, I resolved to determine the dimensions of the K-21 and make suitable adjustments in the Carbon Dragon. My thoughts were adding 1-2 inches at the centerline of all pod frame templates while retaining critical dimensions for wing mounts, etc. Much to my surprise and relief, I see no adjustments necessary. The drawings below provide a side view of the K-21 seating area followed by several cross sections. I'll vouch for at least 90 % accuracy of the drawings. Some areas may be slightly more rounded (Microsoft Word graphics are somewhat limiting).

My process was to take many measurements of the K-21 and record them on a field sketch. Next, this sketch was developed into a scale drawing (see below). Then, the scale drawing was "blown up" to full scale using a photocopier. These full-scale drawings were pasted on cardboard. After waiting one month for a good flying day, I arrived at the field on October 29, 1995; our last official scheduled flying day for 1995. Armed with scissors, duct tape and razor blades, I trimmed and padded the full-size cutouts until the fit was close. Forty-degree temperatures and a crew anxious to put the plane away created some pressure, but the club members were very helpful. (We hang our four gliders from the rafters in a WWII hangar, so there is no access once the plane is stored).

A few things about the Schleicher. The control stick is mounted at section C-C. The rudder pedals are adjustable. My drawing shows the pedals about 1-inch short of full extension. The seat back is adjustable at the top. My drawing shows the seat back in the rearmost position. The back can be adjusted about 2inches forward in two steps. In the forward position, my head is forced into the canopy. The seat back has a concave pocket suitable for a parachute. A foam pad normally fills this space. The factory-supplied cushion is fairly thin (1/2 inch or less) and is very comfortable. The dip in the floor between the seat and the rudder pedals is an area where ballast is bolted in place to adjust for lighter pilots.

Most key to this seating area is the elbow "slot" as shown in Section B-B. Without the elbow slot, I would œmd the cockpit constricting. At the knee area, I find the cockpit a little wide, about 19 inches. Sixteen inches is just right (I don't like to sit bowlegged). The "leg-holes or kneeholes" under the cockpit are slightly restrictive while climbing into the glider, but represent no serious problem once seated (about 1/2 inch higher would be nice). Many craft seem to find pointy things to jam into your knees...no problem with the K-21. The instrument panel top is 9 inches from the top of my knees.

Other dimensions:
24" Rudder pedal top to from edge of seat (plus or minus the 2" of fore-aft motion)
23" Rudder pedal base to from edge of seat
56" Rudder pedal top to top of seat back
17" Front edge of seat to lowest point in seat bottom
21" Lowest point on seat bottom to the top of the seat back
23" Width between the fuselage sides at the top (just below the canopy)
27" Width at the "elbow notch" (compare this to sharing 38" in a Cessna 150)
18" Wide at the top of the seat pan (and narrowing towards the bottom)
14" Wide at the bottom of the seat pan
38" From the instrument panel top to my eyes
8" Up from my knees to the line-of-sight from my eyes to the top of the instrument panel

So, with all this information, get out your scrap lumber and start building your seat mockup for your glider. Finally, without going into full details, I am looking forward to the side-mounted control stick in the Carbon Dragon.

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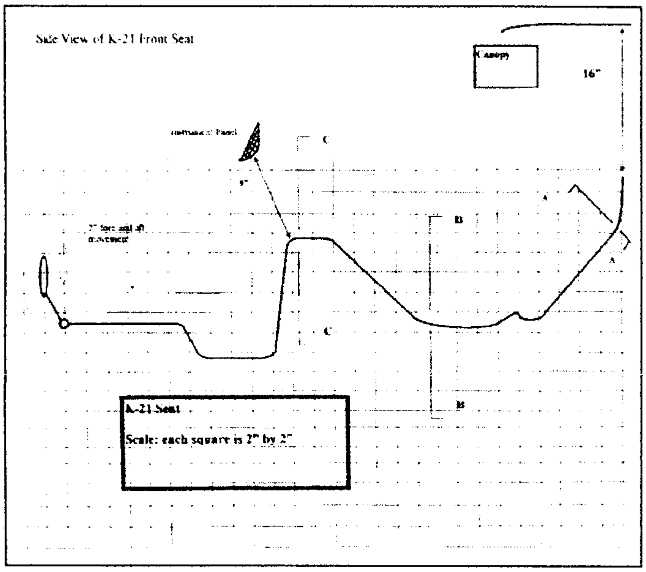
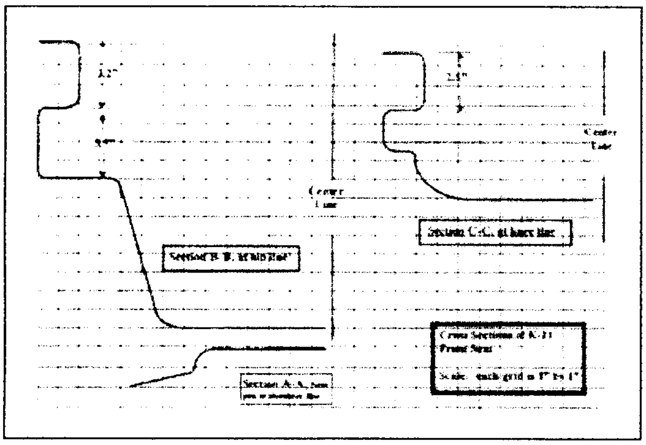


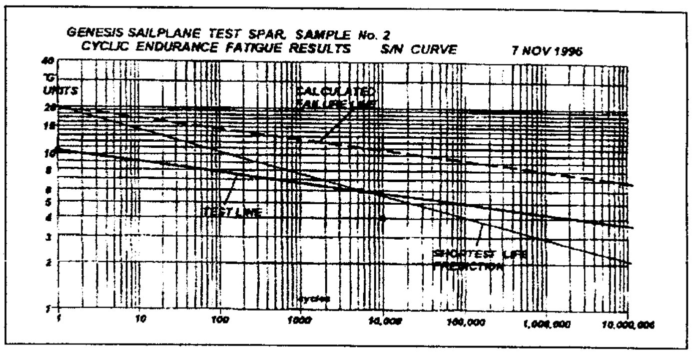


CARBON SPAR DESIGN

Jim Marske

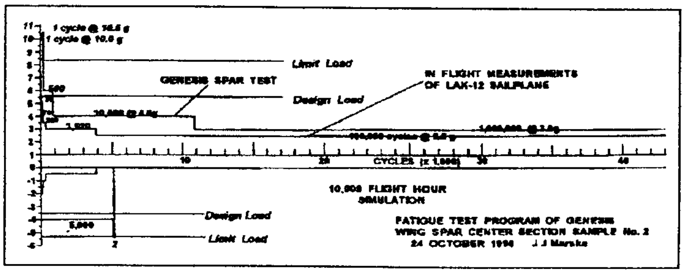
An excerpt from Sailplane Builder.

Carbon spars for sailplanes have been around for quite a few years and are responsible for quantum savings in spar cap weight and increased stiffness when compared to fiberglass roving. Sailplanes require special attention in spar design due to their long slender wings. The carbon roving commonly used in the industry fall short of the manufactures advertised strengths. Experienced engineers were quick to caution that the advertised strength values were difficult to Obtain. The manufacturer data sheet claimed 310,000-psi tensile strength but gave no compression data. A call to the manufacturer produced a claim of 100,000 psi in compression. Engineers who have built carbon spars encouraged me to back off to 90,000 psi in tension and 60,000 in compression. To satisfy myself of the strength I had several tests strips made up of hand lay up carbon roving and sent them to an independent test laboratory for evaluation. The results of the five each test samples were disturbing. In tension the values ranged from 152,000 to 190,000 psi. In compression the values ranged from 48,000 to 74,000 psi. The reason why there was so much scatter and the values lower than expected is that it is almost impossible to lay the roving down without zigzag waves every few inches. You can only pull the tow till it's shortest filament pulls tight and the rest lay in small waves. As a result, to acquire the necessary strength on our prototype sailplane, our completed spar was fairly heavy but very stiff. To prove the spars strength we static loaded it to +5g and -3g. Measured wing tip deflection over the 49.2 foot wingspan was a modest 25 inches at +5g.



We needed carbon that was stronger and more consistent in strength values. We looked into pulltruded carbon rod. Samples were closely examined and waves were found in the filaments also. Shortly afterwards I found a brief news release concerning a carbon rod expounding very straight filament alignment. The companies name was NEPTCO, Located in Rhode Island and they produced a carbon rod named GRAFLITE. A sample rod was obtained and after examination, of the filaments, they were indeed, very straight Furthermore, it's claimed strength was very .impressive -both in compression and tension. The manufacturer claimed a tensile strength of 315,000 psi and a compressive value of 200,000 psi and I did not doubt it. In fact, I believe that the compression strength is at least as high as the claimed tensile strength. When bending the 118 inch diameter rod to first sign of fracture, it was the tensile filaments that were failing, one at a time. In addition to the high strength, the automated manufacture of the rod tightly controlled it's physical dimensions and resin content assuring consistent strength properties.

Since our wings are very long and slender we must design to deflection rather than to strength when using NEPTCO's carbon rods. The modulus of elasticity for wet lay-up roving versus NEPTCO's carbon rod is similar at 18 million. Based on the prototypes wingtip deflection we found it desirable to nearly double the wings deflection on the production wing. The reason for flexible wings is to provide a softer ride for the pilot when flying at high speed through turbulent air. By decreasing the number of rods we can obtain the desired results. Of course the stress is increased in the spar cap but is easily within strength limits of the carbon rod.



The next step was to prove that the rod will function as a spar cap and will carry the required loads without delaminating or failure. A spar segment of the aircraft's center section was fabricated and static loaded in the laboratory. No failure occurred during a loading sequence to the load limit of +8.3 g's. This load limit represented an aircraft gross weight of 1,200 pounds times a safety factor of 1.5 as required by JAR-22. Being impressed with this success, not a creak nor pop was heard, the load was increased past the load limit of + 8.3g's to +10.0 g's without incident. Going to +10.5g, we reached the maximum output load of the test machine, and again no degradation of the rods was observed. This load was nearly twice the spars design load of + 5.55g's.

Satisfied with the static results we now proceeded to do dynamic cyclic endurance testing. Since the majority of the rods do not span full length of the spar and were cut off square we had concern as what would happen at each rod end in the mid section of the spar where a stress riser may occur. So we embarked upon a cyclic endurance test at an elevated load to force an early failure.

The first run consisted of a load excursion of 0 to +4g's. We hoped to obtain 5,000 cycles but stopped at 10,000 cycles. We then increased the load excursion from 0 to +6g's expecting a failure in a few hundred cycles. We stopped the test at 5,500 cycles.

The test spar was inverted in the fixture to apply negative loading. The test lab director insisted that we not exceed -3g. We started the test cycling between 0 and -4g's and ran for 5,000 cycles. No degradation was noted.

To finish the test we repeated the static loading test. Starting at 0 load, ran one cycle to +8.33g and two cycles to -5.33g. Again no degradation was visible.

The above data was plotted on a logarithmic scale SIN chart. Since no failures occurred during testing we cannot predict the actual life expectancy of the beam. However, we can draw a 'test line' which tells us that the spar will live to, and beyond, that number of cycles. Also, we can draw a 'shortest life prediction' line from a point we have calculated for a static failure of the beam through the point of maximum cycles versus load. Due to the limited testing of one sample we should base test validity only on the 'Shortest Life Prediction' line. The SIN curve is presented below.

The next question was, "Just how many flight hours all this cyclic testing is equivalent to. We reviewed a report on recorded accelerations made in a sailplane similar to ours during a 50 hour flying period. These flights included accelerations recorded during towing, takeoffs and landings and ground handling. All accelerations had been counted, grouped together and plotted on a chart. We took this chart and multiplied the cycles by 200 to find the expected life cycles of 10,000 flight hours. This expanded data plus our Genesis test data was transferred to a new chart to obtain a comparison. From our extrapolated data I feel that we have easily acquired an excess of 10,000 flight hours. A diagram of the results is presented on the following page.

Several years ago a survey was made among various glider clubs around the world as to the maximum flight hours that had been accumulated on any one glider. They found that only a few gliders had accumulated 5,000 flight hours. However, one Australian club reported 6,000 flight hours on one of their club sailplanes.

If NEPTCO's rod were to be used on a lower aspect ratio wing, say less than 10, the tip deflection will be greatly reduced. In such a case the rods can be stressed at much higher values without obtaining excessive deflection. Further dynamic testing of additional beams will be required at or near critical stress levels. We need to know the stress limits of the matrix bond to the rods. Behavior of the rods and matrix at the rod ends. Buckling characteristics of the rods in compression. Ultimate strength of the rods in tension and compression in various beam configurations. Experimentation with various fillers in the matrix resin.

Weight savings can be significant. Currently my Monarch sailplane uses 1/2" diameter pulltruded fiberglass rods as spar caps. The glass rods weigh 16.0 lbs / aircraft. Converting to GRAPHLITE rods the weight is reduced to 2.4 lbs resulting in a savings of 13.6 lbs I aircraft. As you would expect the cost of the carbon is higher but not prohibitive. Current price of the rod is 35 cents per foot and may be purchased in any quantity. Another way of looking at this material is to compare it with current aircraft construction materials.

It is three times stiffer than fiberglass and half the weight. It is twice as stiff as 2024-T3 aluminum and three times lighter or it is three times stronger than fiberglass and half it's weight. It is four times stronger than 2024--T3 aluminum and three times lighter.

This is one of the most exciting new materials to come along for aircraft construction since fiberglass.

Although the rod is supplied in various diameters the 1/8' diameter seems to be the most cost effective. It is sold by the foot and is shipped coiled up on a 3 ft diameter spool and lengths can be as long as 20,000 ft. GRAPHLITE is quite light, 125 ft of 1/8' rod weighs only one pound. NEPTCO can be contacted at: (401) 7226378 and ask for Steve O'Meara.

WHAT'S NEW?

Scheufler Resin Available in Australia

MartinG.Scheufler. Kunstharzprodukte. GMBH.Stuttgart. Germany.

After many years of waiting , the market leader in Epoxy Resin System for sailplanes, motorgliders and ultralight is now selling in Australia. You can get these LBA approved resin system is for a fair price in Australia now.

Any FRP glider repair can be done with these systems as they ideally bond to all other epoxy resin systems used in sailplanes and motor gliders up to date. Older systems like Shell GE 162, 163 with Hardener Laromin are no longer available (or only leftovers) even if most maintenance manuals of older aircraft refer to those systems. You can use Scheufler L 285+ H285,286,287 instead of the older system without any problem. The experience of many successful repairs overseas and in Australia as well as intensive material testing programs in Germany are the best proof you can get.

All major sailplane and motorglider manufacturers use Scheufler resin systems in their current production lines. And there are many good reasons for that. Like the best price to performance ratio on the market of LBA approved systems. Or the best physiological properties which prevent from loosing qualified staff frequently due to resin allergies.

Excellent wet out and compatibility with glass, carbon and aramide (Kevlar) fibres. Guaranteed availability even for the relatively small aircraft market because Martin Scheufler has committed himself to the gliding movement. And amongst any other good reason you get sound technical advice whenever you need it.

Try the Scheufler L 285 system and find out its qualities yourself. We can make you a special introduction offer. How does that sound?... Certainly, we also sell other quantities.

For more details contact the distributor.
Tobias Geiger. 96 Rachelle Rd. Keilor East. VIC. 3033
Phone 9336 0205.

"VSA" AIR WORTHINESS COURSE

The next VSA. Air Worthiness basic course is planned for the second week in October, starting at 9 A.M. on Saturday 9th October, through to 9 P.M. Friday 15 October 1999.

Esteemed lecturers are:
John Ashford - on overseas developments OSTIV and the Sailplane Development Panel (SDP)
Alan Patching -. Fatigue flight loads and flutter.
Phil Hearne - NDT.
Dough Lyons - Wood and fabric

RESULTS OF THE JUNE GFA PLEBISCITE ON AMALGAMATION WITH THE HANG GLIDING FEDERATION OF AUSTRALIA.

Number entitled to vote: 2662.

% participation and % yes vote.

NSW/ACT	**53%**	**61% Yes**
VIC/TAS	**41%**	**52% Yes**
QLD	**43%**	**50% Yes**
SA/NT	**47%**	**36% Yes**
WA	**53%**	**83% Yes**
TOTAL	**47%**	**55% Yes**

GLIDER TRAILERS.

(Vic Roads information BULLETIN)

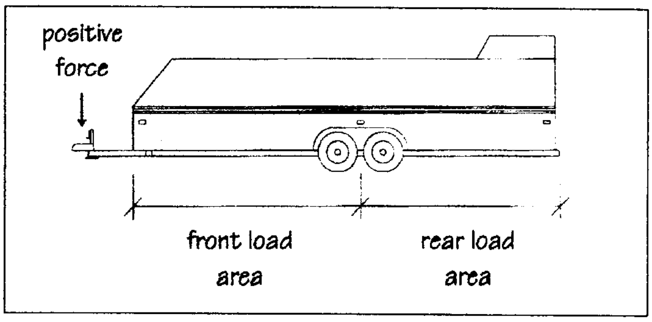
The Australian Victoria State has moved to make it easier and safer to tow trailers containing gliders. The Gliding Federation of Australia has requested Victoria's assistance in facilitating the towing of these relatively narrow, long trailers with rear overhangs up to 5.0 metres. Gliders are built to international class specifications. Most new gliders are imported from Europe and delivered in custom built trailers. The axles on the trailer are positioned to achieve the correct trailer balance and handling characteristics. This means that the trailer rear overhang may exceed the Australian limit of 3.7 metres.

Gliding is an international sport with continuos stream of international visitors bringing their own gliders and trailers to Australia. Recognising the increased rear overhang will enable gliders to be readily transported in Victoria.

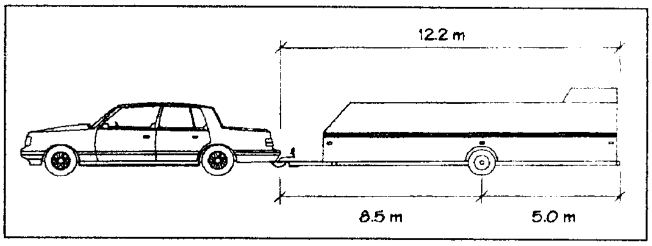
As from 28 May 1999, a class 3 notice published in the Victoria Government Gazette No. S 78 , allows glider trailers to have a maximum rear overhang of 5.0 metres when being towed in Victoria.

GLIDER TRAILER DIMENSIONS.

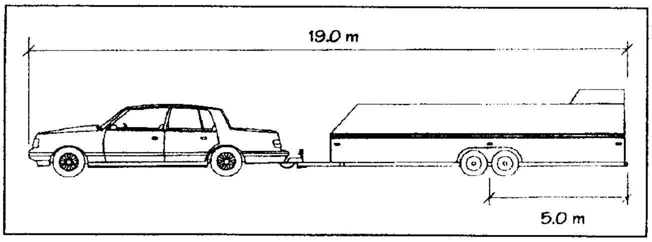
(1) The rear overhang of a glider trailer must not exceed 5 metres.
(2) The rear load area on the trailer may be longer than the front load area provided there is a positive downward force on the towing vehicle's tow coupling. It should be noted, that when the trailer is being towed without a glider in it, there must continue to be a download force on the tow coupling.
Some ballast may be necessary towards the front of the trailer to achieve this force.



(3) The width of the load carrying area, or body, of the glider trailer must not exceed 2 metres if the trailer rear overhang exceed 3.7 metres.
(4) The glider trailer must not exceed the following maximum dimensions:



(5) The overall length of the motor vehicle and glider trailer must not exceed 19 metres.



GLIDER TRAILER REQUIREMENTS
The glider trailer must only used when transporting a glider and any glider accessories associated with gliding, or for empty travel.

ASSESSING YOUR ROUTE
The owner, operator and driver are responsible for planning each journey to ensure that the vehicle crosses bridges and negotiates curves and intersections in a safe manner. Such planning should recognise that some roads and intersections may not be capable of accommodating vehicles at the dimensions in this bulletin.

CARRIYING DOCUMENTS
The driver of a vehicle towing a glider trailer with a rear overhang exceeding 3.7 metres must carry a copy of this bulletin or the Gazette Notice in the driving compartment and must produce it when requested by a Vic Roads Officer or a Police Officer.

DETAILED INFORMATION
For detailed information on requirements, refer to the Victoria Government Gazette No S 78 of 28 May 1999.

FURTHER ENQUIRES
For further enquiries, contact Vic Roads Permit Issuing Officers on (03) 9881 8852.

e-mail: oreganj@vrnotes.roads.vic.gov.au

SOMETHING ABOUT HOOP PINE
By Graham Kevin.

If you are about to embark on a building program, there are a number of things you need to consider, not the least of which are the material you use.

If timber is your chosen medium, you will find this information useful.

Q. Why use Hoop Pine?

A. Its stronger, less expensive, available locally, available now an order this week- build next week. Hoop Pine is distributed by PRO-MARK Pty.Ltd. and the selection process and Quality Assurance program begins when the tree is felled. The staff visit the mill and supervise the cutting of selected logs. As each plank is cut, it is individually inspected for compliance with the Standard. The selection process is carried out in accordance with Emergency Standard (E) 3D.803-1944.

The selected planks are then taken to our factory where they are stripped out and stacked and allowed to air dry naturally. It will take 6 to 9 months before the timber has stabilized and the moisture content of each plank has equalized with the ambient M.C. In Southern Queensland, this is around 10%. Further West or South and the ambient M.C. will be reduced to about 8% depending on conditions.

At this point each plank assume its own identity and is given a separate number to ensure traceability in the system. When the timber has reached the required M.C. levels, samples are then cut from each plank and are subjected to various mechanical tests to determine its suitability for use in aircraft construction. These mechanical tests are carried out in accordance with another standard called Emergency Standard (e) CD.800-1944.

Once all testing has been completed, those planks which have met every requirement are then strip-staked to await re-cutting into different sizes for aircraft construction. Any plank which fails to meet even one requirement or test, is immediately rejected.

The finished component which a customer buys from PRO-MARK IS GRADE a AND Class 1.

Since 1942, Hoop Pine has been recognised as a substitute for Sitka Spruce and indeed Douglas Fir. Its structural properties have been well documented for over 55 years, but until now its value in terms of aircraft construction have not been fully realised. Most certainly it has not enjoyed the same prominence or promotion as other aircraft grade timbers. Its density is about 18% greater than Spruce or about 20% stronger than aircraft grade aluminium, with respect to strength to weight ratio.

The following values are representative of the timber that PRO-MARK sell;

Moisture content:	10-13%
Density	550 kgs.M3
Compression parallel to grain	57 MPa
Modulus of rupture	100 MPa
.Modulus of Elasticity	13770 MPa

The publication, "Wood in Australia"-K.Bootle, reported Modulus of Elasticity averages for Hoop Pine of 13000 MPa and Modulus of Rupture averages of 90 MPa.

Why settle for less, when the best is available locally!.

HINTS & TIPS

MAKING A CANOPY FOR THE WOODSTOCK
By Peter Raphael (The Erudite)

Making the canopy for the first time for the Woodstock was a quite challenge and this is the process I used as best as I can remember .Forgive me if I over explain the processes and reasons but it is better to know to much than not enough but I will be experimenting again when I am going to help our editor to make his canopy soon.

The basic frame was formed from ½ inch commercial aluminium tubing though the cockpit sides were ¾ inch this was all socketed together at the corners with turned spigots made from aluminium sheet stock. These were subsequently pop riveted and epoxied in place and the corners then ground to match the contour of the tubing.

Shaped saddles were glued and riveted to the sides to provide a flat area to affix the canopy latches and ¼ inch brass locating pins are reduced to 3/16 inch and placed through the frame and riveted over to locate the frame. We used two in the front bow and one each side near the rear of the cockpit.

Keep the frame undersized to allow for the acrylic and fibreglass and leave a couple of millimeters clearance over the wing to allow for movement.

The acrylic I used was **2m/m cast acrylic** (Extruded acrylic is cheaper but will not work, its internal stresses promote cracking and this resulted in my first failure). The protective plastic should be left on and only removed where necessary for gluing. The acrylic can be cut most easily with a cutoff wheel in a 4 inch angle grinder, far safer than sawing. Make a cardboard pattern (this is where you determine how much headroom you will have). **Once you have the blank cut it is advantageous to carefully clamp the acrylic in place on the frame and anneal it at about 80 degrees for two hours to relieve some of the stress and make it easier to fit**

At this stage I used two different methods as the acrylic I used was incorrect on the first attempt and had to be removed, I will detail both: The frame was spiraled wrapped with I inch fibreglass tape and fitted to the fuselage. **The acrylic was clamped in place and countersunk self tapping screws were placed.about every 3-4 inches.** This was then removed and coated with was free polyester resin and filler applied to the frame before the acrylic is refixed over the wet filler (a mix of polyester resin and microballoons/Q-cell etc). This method can be very messy and makes it difficult to achieve a smooth frame, but results in a strong bond and rigid canopy.

HAVING HAD TO REMOVE THIS FIRST CANOPY DUE TO STRESS CRACKS APPEARING WHILE GLUING THE TOP HAT, I WAS ABLE TO STRIP THE FRAME AND THEN DO MOST OF THE FILLING IN THE BARE STATE.

This was much easier and I still had the correct contours on the frame for the new acrylic. **I think I would now attempt to do most of the filling first and fix down the acrylic on a thin bed of polyester filler later. It is essential to do most of the filling as well as the final fitting of the flat wrap, with the frame attached to the fuselage.**
The "TOP HAT" is trimmed to fit to the top of the canopy and is held down by tape and positioned laterally by small ply plates and copper wire twitches. This is then stitched in between with careful application of ACRIFIX 192 using a syringe needle to control the application. Being heavy handed and hasty will result in lots of bubbles and a wide glueline. Once secure, removal of the fixing and repeated applications of glue will see an even joint around the TOP HAT.

The screws heads can be filled and the frame painted, I used white gloss enamel. Cut a paper pattern of the flat wrap and put it away and hope you will never need it.

SHOP TALK

THE FOUR MOST POWERFUL WORDS

There was a boy named Tommy who had a particularly hard time at school. He continually asked questions and he never could quite keep up. It seemed that he failed every time he tried something new. His teacher finally gave up on him and told his mother that he could not learn and would never amount to much.

But Tommy's mother believed in him. She taught him at home. Each time he failed she gave him hope and encourage him to keep trying.

Whatever happened to this boy Tommy? You might know his full name. **Thomas Alva Edison**. One of the most significant inventors the world has ever known. The inventor of the electric light bulb and over 1000 other inventions.

His potential needed to be nurtured and released. In short, he needed someone to believe in him. The most powerful thing you can do for another person is to believe in that person, to nurture and release the potential of that person. In fact the most powerful words you can say to another are, **"I believe in you".**

SMILE ☺

YOU DON'T KNOW JACK SCHIDT

It's easy to feel somewhat inadequate when someone says, "you don't know Jack Schidt" but, after reading this, you will know the whole story.
Jack Schidt is the only son of Awe Schidt and Oh Schidt.
Awe Schidt, the fertilizer magnate married Oh Schidt, the owner of the Kneedeep Schidt Inn.
Jack Schidt married Noe Schidt and produce six children.
Holy Schidt, their first, passed on shortly after childbirth.
Next came twin sons, Deep Schidt and Dip Schidt; two daughters, Fulla Schidt and Giva Schidt; and another son, Bull Schidt.
Deep Schidt married Dumb Schidt, a high school drop out.
Dip Schidt married Lotta Schidt, and they have a son, Chiken Schidt. Fulla Schidt and Giva Schidt married the Happens brothers. The Schidt Happens children are Dawg Schidt, Byrd Schidt and Horace Schidt.
Bull Schidt just married a spicy number, Pisa Schidt, and they are awaiting the arrival of baby Schidt." **NOW YOU CAN SAY THAT YOU DO KNOW JACK SCHIDT"** (An excerpt Pacific Flyer July 1999.With thanks).

HOME BUILT PROJECTS

By Sir Douglas Vanstan.

Steps to follow if you are going to start building your dreams home built sailplane.

1 Contact G.F.A. (Gliding Federation of Australia. Re. Building approval of glider type.
2 Are all drawings & building instructions approved and up to date including any modification or alterations.
3 G.F.A. may wish to inspect your workshop to see that it is of adequate size, cleanliness & storage. They may want to see a sample of your work.
4 G.F.A. may recommend or provide a list of current C.of A. inspectors to oversee and advise you at each stage of construction.
5 Obtain from G.F.A. all relevant documentation for your building project. E.g. M.O.S.P. section 3,4. & M.O.S.P. section 4-1.
6 G.F.A. may assist you to overcome any problems you may have with information not provided or unclear on the drawings or building instructions.
7 Keep a log book of the project, to include all receipts for materials used, release notes if previous owner has provided

any. Make sure that all materials are aircraft quality, and workmanship to G.F.A standard.

BUILDING MY WOODSTOCK

By Brian Berwick.

Jim, thanks for your inquiry about my Woodstock project. (HB-126). The owner of HB 126 was John Tyson of Koo-We-Rup, he commenced building in 1992 under supervision of Gerry Downs (RTOA) By June 1993 he had had enough and advertised it in the Australian Gliding Magazine for $ @000, less than half of the material invoice, one viewing and I was hooked.

A week later the part built fuselage and removable tail had pride of place in our dining room ,now that an understanding wife..! Also a good way of getting a workshop built to have dinner in. I built a steel garage 9.00 x 6.60 m. with large sliding doors on one side, and over a period of time I purchased adequate tooling and second hand benches.

I contacted the GFA to advise them that I had taken over the project, and despite my years as a LAME with wood and fabric endorsements I was required to provide the standard "Instrument Panel" test piece to the RTOA for testing.

Having passed, I was allowed to rectify some wiffles in the rudder cap strips prior to getting on with structural work.

I formed all the metal work for the ailerons push rod mod. And removable tail mod, during the quiet time at work, (welding and Cadmium plating at the right price)

In December 1993, I first met our **Erudite Secretary and multifaceted skilled, Peter Raphael** and his second **Terry Whitford** at Smithfield so that I could look at their Woody. It became obvious that I would have to be careful with weight control (maybe I could join a Gloria Marshall or Jenny Craig weight watchers programs). Also it would be necessary to alter the canopy height and rudder pedal position to suit my posture. Peter and Mal have been very helpful since that day. When I left Smithfield, Peter was thermaling the Woody over someone's hot pie and enjoying it immensely.

During 1994 the removable tail mod turned out to have many errors built in which took considerable effort and redesign to rectify. My drawings BWB-1 approved by Gary Sunderland are lodged with the GFA. Diagonal measurements taken after installation proved spot on, so the effort was worthwhile.

The last six months of 1994 were spent carrying out house alterations. Back into it in 1995 I installed the elevator control system, the removable tailplane mod calls for a pip-pin connection at the elevator horn, even with an extra inspection panel in the rear fuselage a special tool will be needed for rigging in the field.

During the rest of the year I skinned the tailplane,installed rudder cables and added the forward fuselage decking. Eight months of 1996 were spent overhauling and carrying out aged aircraft requirements to Ansetts DC-3. So not much progress on the woody, however I met Jim Garay our esteemed Editor for the first time when I visited King's Park to look at his project, much further advanced than mine.

My father became ill and passed away over the new year of 1997 so again not a lot achieved. When I did get back into the Woody mode I discovered a mismatch in the depth of the tailplane an elevator spars that meant de-skinning the elevators and re-profiling the spars and ribs.

At AHSA meeting that year I canvassed the idea of fitting Arrow or K-6 wings to overcome my weight problem as I decided not to join any weight watcher program. I placed ads in magazines and made many phone calls but could not come up with anything suitable.

Following preparations for a daughter wedding and all associated matters I installed the required fuselage torsion stiffener mod and fitted the rear top decking after a close up inspection by RTOA.

The first half of 1998 was spent nursing my mother at home, which became around the clock operation for Margaret (my wife) and myself before she passed away. We went up to Broome for a break after that. Later in the year I took the project up to Smithfield for the AHSA convention. I contacted Mike Burns with a view to re-stressing the wing to allow increased weight.

Mike came up with EO-9806 which allows a 20 kg increase in the gross weight while maintaining a 5 G proof rating. This should allow a 105 kg pilot and chute cockpit weight, whereas the normal Woody cockpit weight is about 85 kg. A very useful increase. In simple terms the mod involves increasing the depth of the upper and lower spar booms and increasing the span of the front web ply skin.

As I had the standard spar size Douglas Fir, I purchased some deceased estate material that had been intended for a Luton Major. That project was stopped when the shed caught on fire due to metal late turnings falling into wood shavings on the floor. (The original Luton aircraft factory was burnt down when metal turning fell on the floor).

I took the wood to CSIRO for testing against specifications and came up to spec. (The specs were in a book written by Lattimer Needham, the designer of the Luton Major) ..SPOOKY....!

So far this year I have made and fitted the seat, the cockpit floor and installed the instrument panel with shock mounts from an A-320 cockpit voice recorder.

I have commenced the wing mod by laminating 6 of the 8 booms. Hopefully the saga of the interruptions is over. The test flight is provisionally booked for the next millenium.

I have made contact with Les Sparks in the USA (lesspark@aol.com) he runs The Unofficial Woodstock site (http://members.aol.com/woodglider/). There is a lot of information and photos, including some of my tail mods. I have sent him a copy of the original Ken Davies drawings for the removable tail. At least one is being incorporated over there by Jack Goritski. (jack@nni.com)

BLOWING A CANOPY - Or how to induce a nervous switch

By Sir Douglas Vanstan.

A few days ago I was talking to our Editor who is building a Woodstock, how's is going Jim..? I asked, great was his reply "I am about to make the canopy".

I began to tell him how I blew a canopy for a CHEROKEE-2 I did build back in the 6o's.

"How about writing an article for the Newsletter" so being the persuasive gent he is how could I refuse.

Few people would disagree that a nicely fitting canopy free of blemishes with gently flowing lines that compliments the general line of the fuselage is a shine of beauty.

Many think a blown canopy is more than they can tackle and settle for a flat wrap one with a fibreglass cap to fair it into the fuselage. Whilst there do the work O.K. you will have a blind spot above you whish can be annoying or even dangerous in a busy thermal.

Free blown canopies do not fit all gliders this is a decision each builder has to make: for example, if the cockpit is narrow and the sill low, a free blown canopy may result in an unsightly bulge on each side. Back in the 60's the otherwise lovely lines of the Slingby Skylark-3 & 4 were sometimes spoil by an over blown canopy, more suited to a helicopter than a glider. Fig.1.

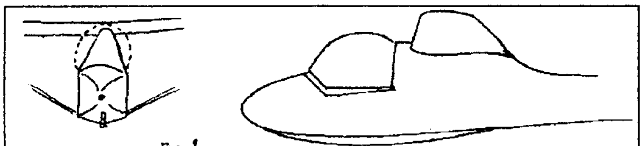


Fig. 1. Examples of over blown canopies.

There are other ways of making canopies such as vacuum forming into a female mould, E.g. LIBELLE or K-7 or drape molding over a male mould. While these processes may be within the scope of a resourceful builder there are two areas of concern: one being the risk of making the heat softened Perspex with the mould surface, the other is to maintain an optically perfect surface free from imperfections or waviness caused by the moulding process.

The process of "free blown" is centuries old, glass blowing, balloon blowing or even blowing soap bubbles like our kids do. Who can remember their childhood days blowing soap bubbles with a pipe the right way up a sphere would form and lift off, if we turned the pipe over gravity tended to elongate the bubble, "Presto". We could use gravity to our advantage building our canopy as will become evident later.

Perspex is a trade name for acrylic sheet used to make the canopy (see earlier Newsletter article By John Ashford). For our purpose 1/8" or 3 mm. Thickness sheet is O.K., size of sheet required is dictated by the dimensions of the jig. Allow several inches overlap all around. The sheet is protected by paper on each side which is removed prior to forming, from now on the surface is easily damaged or scratched so be careful how you handle it; soft clean gloves help to protect the surface and also assist handling the hot sheet.

So much for the preamble lets get to the action..! I should warn you I used three sheets of Perspex to make two good canopies; the first sheet was used a few times to learn the process. This sheet was heated and clamped to the form with "C" clamps around the edges, the job is much easier if you have some one to help as the softened Perspex is rather floppy like a wet rag, it is also hot so gloves are needed. When everything was clamped up and suspended in the oven upside down, the oven was heated up again and then the air pressure was turned on, the Perspex began to take shape when it pulled out on one edge, some of the "C" clamps had let go; open to be correct the softened Perspex deformed enough to pull away from the clamps. We pulled the form out and refitted the clamps, returned the form to the oven and reheated, but before applying air pressure we retightened the clamps once again, returning the form to the oven, this time when the Perspex was hot enough air pressure was applied and everything worked fine.

After being heated several times during the learning mistakes this sheet was marked and unsuitable for use.

The next sheet was heated and clamped to the form put in the oven again heated and the clamps retightened, reheated in the oven and the air pressure applied, this time every thing worked well and we had a nice canopy.

Number three was done the same way with a good result; this was to be a spare in case the other was cracked when fitting to the canopy frame, luckily this did not happen; in fact it was later fitted to the club Arrow when its canopy was broken.

N.B. I suggest using strong spring clamps to maintain their pressure and grip on the Perspex and form during the process. Fig.4

The form can be made of plywood or chipboard or even sheet metal its function is only to give you a base to clamp the Perspex too while heating and blowing the canopy. Naturally its outline and dimensions will have a direct bearing on the final shape of the canopy, together with the air pressure applied to the heat softened Perspex sheet.

You can control the air pressure and monitor the process trough a window in the side of your hot box-oven. Fig 2.

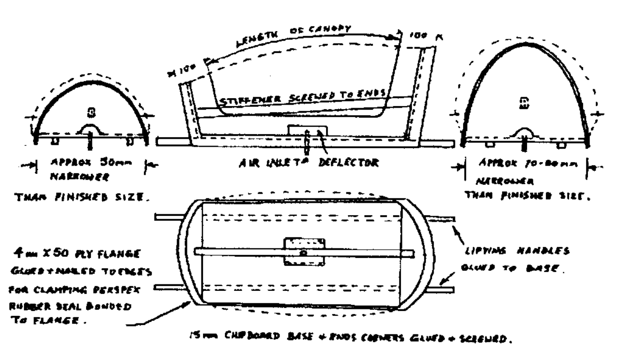


Fig. 2.

The air pressure required to form the shape is not high but you will need a reasonable capacity compressor as the clamped joint between the Perspex and the jig may leak, this can be reduced by sealing the edges of the jig with a strip of rubber. Fig 4.

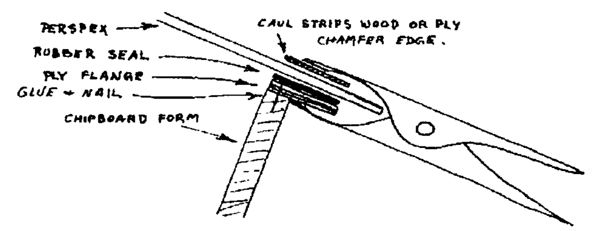


Fig. 4 USE CLOSELY SPACED STRONG SPRING CLAMPS.

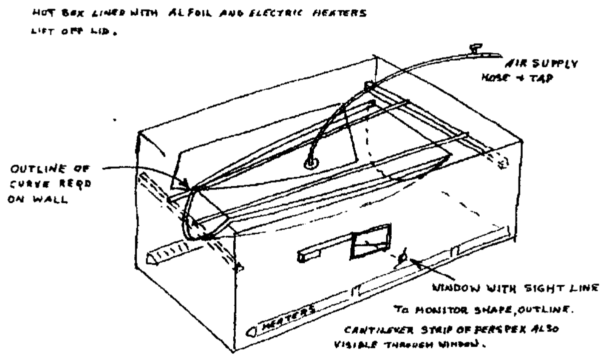


Fig. 3.

Fig 3 The hot Box or oven can be made of cheap ply, or chipboard and lined with aluminium foil, exterior insulation would be nice to contain the heat. The box should be high enough to suspend the Perspex sheet from one edge free of the bottom of the box. This will allow the sheet to be heat softened prior to clamping it to the jig, best done with the form/jig supported upside down and with the assistance of a helper or two, the sheet is offered up and clamped to the jig not as easy as it sound for the softened sheet now resembles a wet rag and respond accordingly. Fig 5.

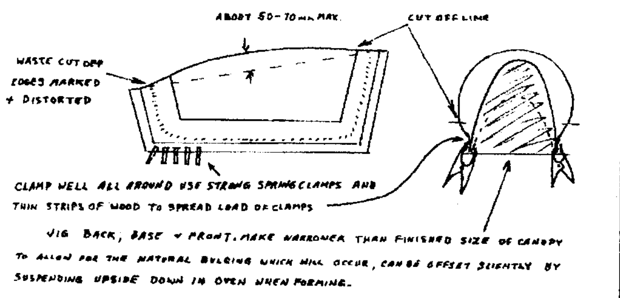


Fig. 5.

You may be able to bend and clamp the sheet Perspex to the jig without first heating it, this will depend on the bend radius and your nerve as there is the possibility of the sheet cracking!.. that is the risk. Fig 4 & 5.

Clamp a caulk strip of wood or ply on the outer edges of the Perspex to spread the load of the clamps. Now comes the exciting bit, suspend your form upside down in the heat box (remember soap bubbles). Make sure the Perspex can not touch any thing in the oven when it is blown to the shape on the reference line you have marked on the wall of oven box opposite the window, connect the air line, close up the box, switch on the heaters and when your Perspex strip sags and the sheet on the form looks soggy to, gradually turn on the air pressure and watch this soggy bit of Perspex take on the shape of your dream canopy.

When you have the desired shape or somewhere near it switch off the heaters , maintain some air pressure to hold the shape until it cooks if everything has gone to plan you should have a nice canopy...! You can stop switching now and Good luck.

FOOT LAUNCHED GLIDERS

Part 6

Peter Champness

The idea of a high performance foot launched glider never quite goes away. If the performance of a sailplane could somehow be achieved by the foot launched glider the pilot would enjoy the freedom of the skies, casting aside the necessity for expensive tow launches and possibly the whole club structure as well including duty rosters, working bees, committee meetings, airfields and associated infrastructure.

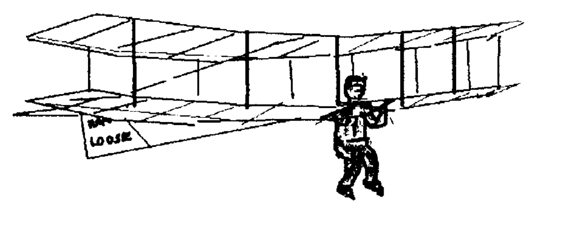
Designers have not neglected the problem. A number of designs have returned to the conventional tail structure, consisting of tailplane and fin at the back of a tail boom. Most of these designs include conventional aerodynamic control surfaces instead of weight shift to control the glider. Two reasons for adopting a conventional tail structure are:

i. improved aerodynamic stability with a wider range in the allowable centre of gravity,
ii. greater maximum coefficient of lift resulting in a smaller wing for a given stalling speed. Maximum coefficient of lift requires the use of a cambered aerofoil.

Cambered aerofoils invariably have a forward pitching moment. That means that the aerofoils wants to pitch forward following the curvature of the camber. The forward pitching moment can only be over come by the addition of a balancing surface acting at a distance from the wing, either forward of the wing (canard) or behind the wing (tailplane)
The disadvantage of a conventional tail structure in a foot launched glider is that the pilots weight (forward of the C of G) is generally required to balance the weight of the tail behind. Consequently the tail hangs down at the back, dragging on the ground which makes it difficult to run. If sufficient wind is blowing the tail is not such a problem. The tail should float up into the flying position requiring only one or two steps to become airborne from a hill slope or cliff top. Unfortunately the wind is not always blowing briskly and when it is the conditions are often not ideal for foot launched gliders. Even if the wind is blowing gusts and turbulence can make the glider very difficult to control during the critical moments before and after launching.

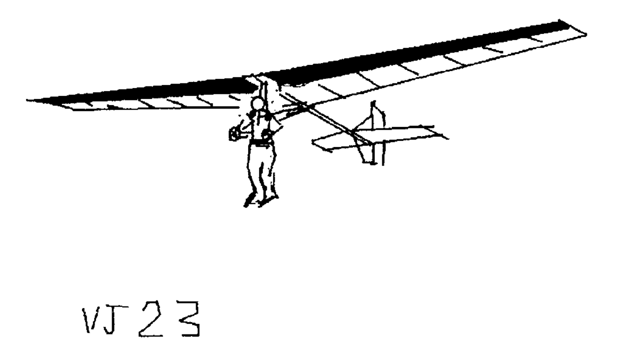
The tail at the back also complicates the landing maneuver. Hang gliders are normally landed by flaring the wing to a very large angle of attack just above the ground. The wing is stalled and acts as a large drag brake slowing almost to a standstill as the pilots feet touch the ground. Seagulls usually land in this way often without needing to make a single flap of their wings.
The trailing tail however will often contact the ground first preventing the pilot from achieving full aerodynamic braking. He then touches down too fast and trips over falling flat on his face and dragging the wing down on top of him!

Hang Loose
Jack Lambie
Jack Lambie designed this glider for the first Lillienthal commemorative hang glider meeting in California 1970. The design is actually quite reminiscent of the Octave Chanute design almost one hundred years earlier. The biplane wing uses the Pratt truss with a wire braced tail unit behind. The pilot hangs from the lower leading edge spar and controls the glider by swinging his lower torso and legs about. The best thing about this glider is that it was built for less than $25. None the less I don't think that anyone would want to fly it very high.

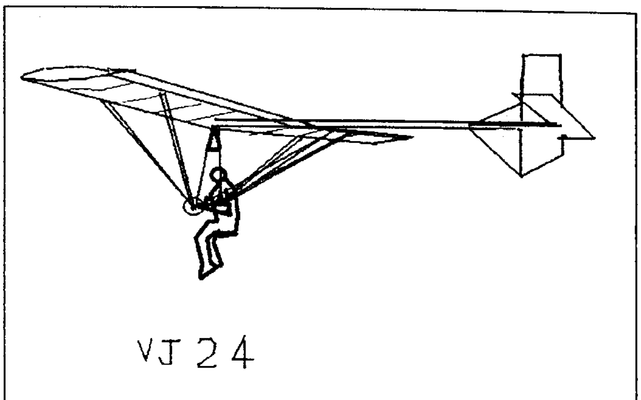


VJ23 Swingwing

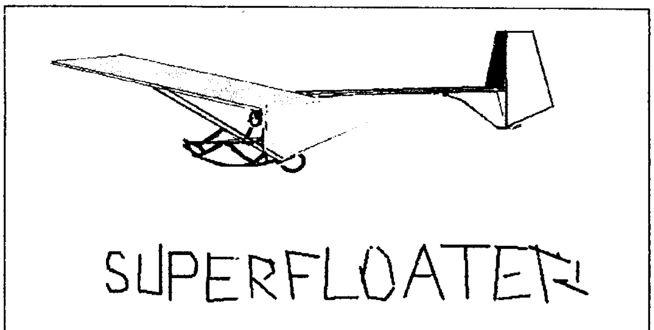
Volmer Jensen
The VJ23 was an elegant cantilever high aspect ratio (for a hang glider) foot launched glider which was advertised in the 1970s and 80s. The aerodynamics were somewhat spoiled by the pilot position which was normally sitting or hanging from the armpits with the legs down. the tail was carried on a tubular boom.



VJ24 Sunfun
Volmer Jensen
The VJ24 used the same tail boom and tail as the VJ23. The wing was simplified, used metal spars and ribs instead of wood and was constant chord with strut bracing.



Superfloater
Klaus Hill
Similar to a primary glider in appearance, the superfloater was designed to be foot launched and landed on its skid and wheel. A minimum wind velocity of 9 mph was specified for take off.



THE RAPTOR A RIGID WING HANG GLIDER KIT BY MATT KOLLMAN

An Excerpt from Sailplane Builder

The Raptor is a rigid wing hang glider constructed of fiberglass, carbon fiber and aluminum. There are two versions: a collapsible and a hard wing.
The collapsible wing has hinged ribs and a cloth sail. The ribs fold flat against the D-tubes. the D-tubes unhook from the keel. The right and left wing are bagged separately. The keel and control bar have a separate bag. This results in three items to transport. The collapsed wing halves are about the same diameter as a conventional hang glider but 21'4" in length. The hard wing is covered with a heat shrink film and does not collapse. The wing halves unhook from the keel. Setup time for a collapsible Raptor is 20 minutes. Setup time on a hard wing Raptor is 10 minutes. It is possible to transport a hard wing on top of a full size truck or van. It does require a special rack and the glider is open to the elements. The rack I developed for my vehicle cost about $30 in materials and took about an hour to complete.

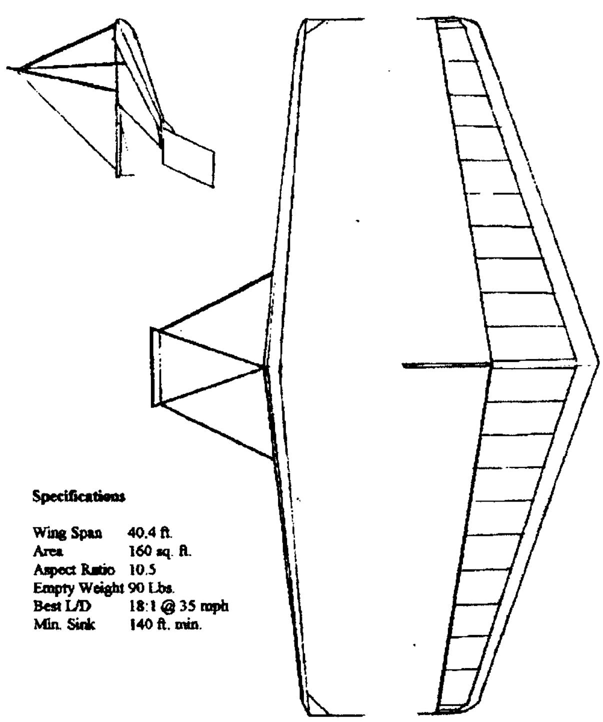
The control system utilizes sliders to activate tip rudders for roll control. This is the some system used on the earlier Fledge hang gliders. Pitch control is achieved through weight shift. Side to side weight shift has no effect. Both rudders can be deployed together for glide path control.

The Raptor is pitch stable. There is very little bar travel through the speed range. Bar pressure increases significantly at higher speeds. Stalls are mild and recovery is rapid. The glider is roll

neutral. Once a rudder is deployed the glider will roll in that direction. When the desired bank angle is achieved, the rudder is returned to neutral. The glider will continue to at that angle. Opposite rudder is need to return to level flight.
The Raptor foot launches very well and has a large flare window on landing. Landing the Raptor can be tricky due to the 18:1 glide. I always recommend first time pilots allow plenty of room for overshooting their final approach. The rudders can be both deployed simultaneously to act as very effective spoilers, however, this technique should first be practiced and learned at altitude. Recommended skill level is hang 4 or better.

Raptor Price List

Hard wing		**Collapsible**	
Ready to Fly:	$7800	Ready to Fly:	$9500
Kit:	$5800	Kit:	$7800



Specifications

Wing Span	40.4 ft.
Area	160 sq. ft.
Aspect Ratio	10.5
Empty Weight	90 Lbs.
Best L/D	18:1 @ 35 mph
Min. Sink	140 ft. min.

There have been several experienced hang glider pilots who have the Raptor. Many of these pilots had no experience with drag rudders and had only flown weight shift gliders before. I was one of them. I had not flown a glider with drag rudders prior to test flying the first Raptor. The transition to drag rudders was an easy one for me. I have had over 150 aerotows to date and haven't broken a weak link yet. Compared to the old days when I was flying a HP2 hang glider, when a weak link break was not uncommon.

I have attempted to spin this glider with no luck. It appears to be spin resistant. I have not tried to force it to spin. I have stalled it at various bank angles. The result is always the same. The nose will drop, and the glider will build up speed and lock back into the turn.

Current Status

One proof of concept hard wing was completed and has logged 70 hours of airtime (pictured in Hang Gliding magazine). Three collapsible Raptors have also been completed. Flight testing is completed on the collapsible Raptors. There have been many flights to date characteristics seem to be identical to the hard wing. The collapsible Raptor have also been truck tested. The gliders well exceeded USHGA requirements for pitch stability. The second hard wing Raptor has been static loaded to +5G, -3G @ 250 lb. hook in weight and load tested for torsional strength. This static load was done to verify the strength of the new D tube design. The new D-tube employs state of art composite materials to reduce weight. The prototypes are also slightly smaller than the proof of concept (160 sq. ft. versus 170 sq. ft.); however, the wing platform is nearly identical. The proof of concept glider is now available for demo flights at the Wallaby Flight Park in Florida. We have completed tooling for the first production run. Bailets Composites located in Mojave CA. has produced all molds necessary for large scale production. Bailets Composites is owned and operated by Roy Bailets. Roy has over 20 years of aerospace-composites fabrication experience. Production has begun and the first glider is nearing completion.

The production gliders are a further refinement of the prototypes. New materials are being used on production gliders which results in a stronger and lighter airframe. Dick Cheney is producing the sails for the collapsible gliders. We are planning to certify both the collapsible and hard wing version, however the gliders for the first production run will not be certified. I have been requesting certification information from the USHGA for over a year now and to date have received nothing.

The goal is to build as light as possible but still be tough enough to withstand normal use and abuse. The prototype gliders are holding up very well. They have been whacked hard enough to break the down tubes with the gliders sustaining no other damage. Current projections indicate the hard wing production glider will be 80 lbs.(The second hard wing prototype weights 93 lbs.) The projected weight on the production collapsible glider is 85 lbs, the two collapsible prototype gliders built 115 and 118 lbs.) Both kit and ready to fly gliders will include rudders and rudder storage bags and a bag for the collapsed keel/control bar. The collapsible gliders will also include bags for collapsed wings. The first production glider is scheduled for delivery in mid August 1997.
hard Wing Kit Assembly

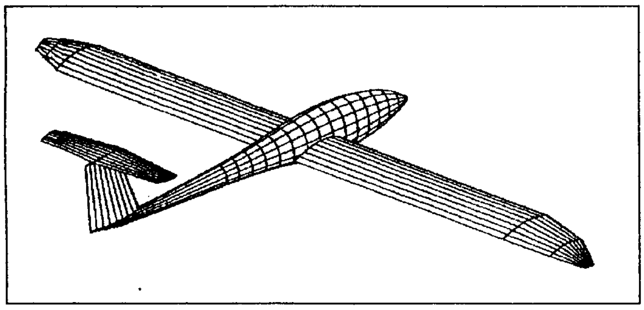
The kit assembly should take approximately 100 hours. No special tools or jigs will be required. The wing assembly will require a work space 25'x10'. The ribs will be bonded to the D-tubes using epoxy (supplied with the kit). The trailing edge will be bonded to the ribs. The covering is heat shrink film attached with double-sided tape and adhesive. The covering is heat shrunk using a conventional iron. This results in a light weight finish that can be polished or waxed. I feel that waxing or treating the surface to relieve the surface tension increases the performance. The only draw back to this material is it isn't real durable and will require recovering every 2 years. The Raptor could also be covered with standard dope and fabric. This should produce a more durable finish that should also be heavier.

Collapsible Kit Assembly
The kit assembly should take approximately 60 hours. No special tools or jigs will be required. The wing assembly will require a work space 25'x10'. The rib hinges will need to have pins installed. The sail will then be mounted. The keel and control bar will be built from materials supplied. This will require cutting and drilling tubing and building cables. Availability - Gliders will be sold on a first come first serve basis. A deposit of 25% will hold a

production slot. The remaining 75% is due prior to pickup or delivery. Our long term goal is to build the highest performance and safest hang glider possible to produce in any quantity dictated by public demand.

Silent
Light Sailplane

An Excerpt from Sailplane Builder



Bruce Carmichael received information from Dr. Paul MacCready concerning this light sailplane developed in Northern Italy. Bruce contacted the manufacturer to confirm details and a more complete article will appear in the next issue. The German Government has purchased a Silent for experiments in electric self launching. JAR 22 load tests were satisfactorily passed April 28th in Germany at +6 G-4 G at 595 lbs all up weight. The tests were sponsored and paid for by the German government.

Each wing weighs 63 pounds, the fuselage plus tail weighs 83 pounds for a complete empty weight of 209 pounds. Construction is glass and carbon. Current price for this very light, 39.36 ft. wing span sailplane is $22,400.

More details:

Fixed faired gear
Length = 20.92 ft
Height = 4.42 ft.
Aspect Ratio = 14
Wing Area = 110.83 sq. ft.
Max. Glide Ratio = 32.5 at 59 mph.
Min. Sinking Speed = 2 f.p.s with
170 lb. pilot ; 2.1 f.p.s at Max. Gross Wt.
Stall speed = 37 mph @
Max. wing loading 4.86 p.s.f
Stall speed = 31 mph @ wing loading of 3.72 p.s.f, with 170 lb pilot + 22 lb. parachute.
Dive tested to 155 mph at zero flaps
Vne + 124 mph @ -6 deg. flap
99 mph @ 0 deg. flap
Photo furnished by mfg.
ALISPORT
Viale Verdi, 58
1-34074 Monfalcone (GO)
Italy
Tel. 0481.778994

Sportster SA4

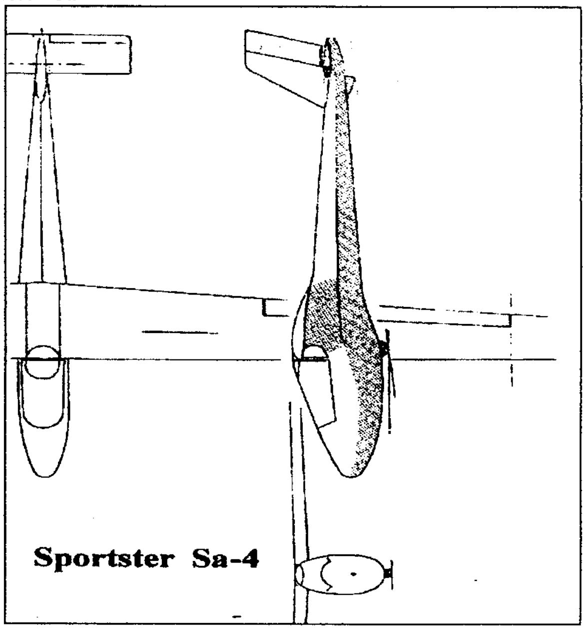
An Excerpt from Sailplane Builder

This should be welcome news! Work is underway to develop a new homebuilder's sailplane, that will have better performance and be easier to build than any other now existing. A design team and construction group has been organized and is now active. More volunteers will be welcome to join in this group effort. If you are interested in participating in this program, please contact Don Santee.

The specifications are given on the 3view drawing. The general configuration and dimensions are the result of many hours of thought and a lifetime of contemplating the self-built sailplane. Building and flying hours have affected the many aspects of the Sa-4. The counsel of wiser heads has made its impression in many places. There will be those who say that the Sa-4 looks "unsophisticated". In response I can only say it is intended for the average person--not for the expert and experienced builder.

Our SHA organization is not involved. Only individuals are making this happen. Profit is not a motive. Time and materials are being donated. Professional engineering has been utilized. Static testing is part of the program. We hope to fly a prototype at the 1999 at Tehachapi, or Elmira, We need help of all kinds, computer people, composite workers, someone to tabulate the many bolts and pieces so that a bill of materials can be compiled. So many things to do and with many hands to help it all goes so easily! Lets all work together!

Sportster Sa-4



A forty-one Foot Sailplane Designed for the Homebuilder
This is a cooperative effort by individual members of SHA to provide plans and other aid for those who want to construct their own medium performance sailplane.

Designed and engineered by members
Chief Designer Donald Santee

WINDANCER UPDATE

By D & J. Armstrong.

Thanks to all of you who viewed our display at the SSA Convention in Knoxville recently. We appreciate the enthusiasm of so many of you for the Windancer, and are working hard to complete the prototype.
As a result of feedback from many of you we will be offering full kits for sale, in addition to plans and components. We anticipate taking plan orders after flight testing the prototype, currently scheduled for late Summer.

The Windancer design and construction is now under " full speed ahead" Fabrication of plugs and molds is in progress. This ultralight sailplane, with its classic racing glass look, will be launchable by traditional sailplane aerotow, autotow,bungee launch, and ultralight aerotow. The design has been worked and reworked to meet the design goals of easy-to-fly, excellent handling lightweight yet durable composite glider with many launch options.

We are also pleased to announce a permanent location for Armstrong Aviation, LLC. We are building a new hangar at Mountain Valley Airport, in Tehachapi, California The hangar will be utilized as a location to store and showcase the Windancer and our upcoming other products, such as motorgliders and two place sailplanes. We hope to have the hangar up and operational by the end of the Summer.

Paul Johnson's "WINDROSE"

Flight Report
Type WindroseVH-UII **Test Number** 8
Pilot Paul Johnson **Place** Bacchus Marsh
Date 23/6/99
Gross Weight 350Kg
CG Position
Temperature 13 degs C
Air Pressure 1008
Refer to GFA AN116 report

Conditions
The day was sunny, no wind, cool at 13 degrees C, and we were in the centre of a high.

Ground Handling
Original Prop
32" X 20" static thrust 109 Lbs @ 5700 RPM

Two runs were made one in each direction. On each occasion a ground speed of 40 Kts was achieved. As the stall is 45 Kts. Take off was not possible.

Reserve Prop
32" X 19" static thrust 115 Lbs @ 5200 RPM

Changed to the second prop (own design) and carried out 2 runs again. First run noted that the wing came up quicker than previously but with the aircraft leveled still around 40 Kts. On the second run (back to the start point) the WR lifted off, very briefly due to insufficient runway remaining.
Note *No cowlings were fitted refer to Hans Lohr's comments on the original prop.*

Observations
The WR needed nearly 60 lbs to pull it along a bitumen runway with me on board (40lbs tyre pressure). I found that with a normal "nose over, wings unloaded attitude" the WR had a top speed of around 40 Kts on the ground. I believe that this was due to the load on the wheel remaining high.

On the last run I 'tried' to pull the WR into the air. With the aircraft in a nose up attitude the WR seems to accelerate from 40 to 50 kts quite quickly. This I believe was due to the load coming off the wheel as the wing took up the load.

The Actual Flight
After a general discussion, covering my emergency landing fields, the latest take off point I should use, the best low level approach path for a "down wind" (less than 1-2 kts)

Landing, It was decided (by me) that the time had come.
The intention was to taxi (high speed) to the far end and take off toward the assembled crew complete with video cameras. Not believing the last run where I HAD taken off I tried my new found technique, and yes it will leave the ground.

The C of G is right on top of the wheel therefore the WR is very sensitive to either the application of power or the application of brake. But by now I was comfortable about the feel of UII (Uniform India).

Turning around 'into wind' I eased the throttle full open and marveled at the slow, wing down, acceleration. I wanted to be off at the cross strip, I can't be sure when I lifted off because I immediately switched my focus to the end off the strip and my ability to land before the fence.

After leveling just above the ground to confirm adequate air speed, (50+ kts) I eased into a shallow climb. At the point of 'give it away' I was some 40' – 50' up and on my way, heading toward No 1 emergency landing paddock.

With only 5200 rpm (didn't increase with speed [which is my experience with pushers]) the rate of climb was low. I can't say how long it took me to climb to 900' but I remember thinking that it was similar to "2 up in Zephyrus behind Beaufort's old Tripacer."

The rate of climb varied between 0 and 250' a minute with a speed range of 50 – 55 kts.

Above 400' I found myself singing Rod Stewart's "We are sailing" [the cockpit of a WR is the only place my rendition should be heard]

At 900' I decided to terminate the flight, I backed the throttle off to 4800 rpm, noted that at 55 kts there was no climb, I pulled the throttle back to 3000 rpm for ??? seconds then shut the engine down.

I found myself 'high' off the end off the strip (runway 09) and carried out a side slip (on landing, as the spoiler is less than useless) the WR side slips very well. As luck would have it (I won't admit it to my friend), I rolled to a stop beside my crew which contained:
Keith Nolan & Doug Cameron (without their help I could not have completed this project)
James Garay The Editor of the "Australian Homebuilt Sailplane Association"
John Ashford from the Gliding Federation ofAustralia.

Where to from here?

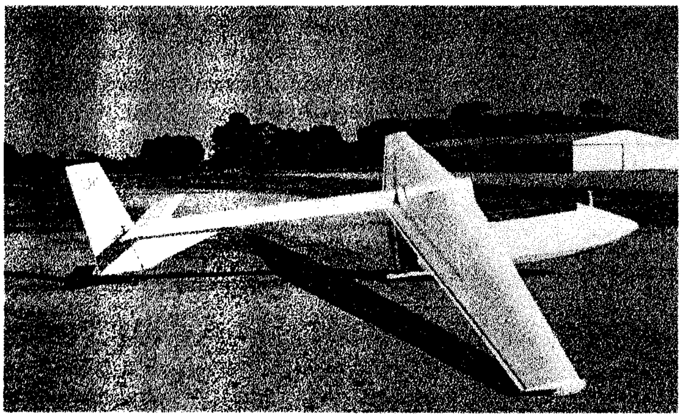
The propeller was built deliberately wider in cord than calculated to enable fine tuning as required. With 5200 rpm maximum and with maximum power for the Rotax 377 at 6200 rpm then the cord needs to be trimmed with the current pitch of 18"retained.

Comparing the original prop and work done by Jan Carlson (Sweden) this rework to the propeller is underway.

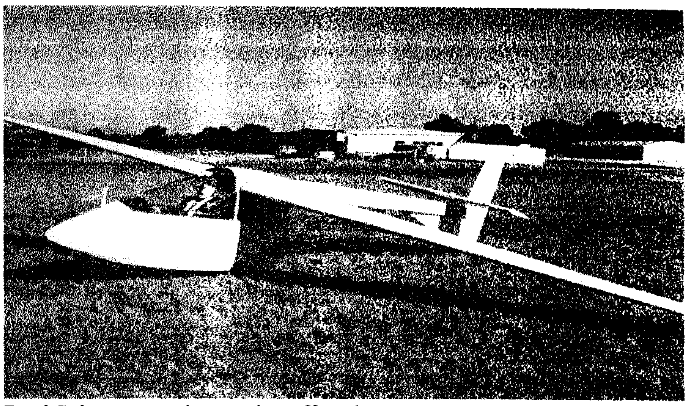
Summary

The first flight of VH-UII under it's own power is the culmination of nearly 14 years work. My computer modeling of the WR is quite close to the actual performance achieved and the climb rate achieved. Jim Maupim claimed 200' a minute rate of climb with this aircraft I believe this to be achievable.

Keith Nolan helping with the canopy.



Paul Johnson Windrose.



Paul Johnson ready to take off under power.

CLASSIFIEDS

VINTAGE TIMES.
Newsletter of the Vintage Glider Association of Australia. Editor Tighe Patching. 11 Sunnyside Crescent. Wattle Glen. Victoria 3096. Australia. Annual Subscription: AU $ 15

" SAILPLANE BUILDERS "
Official publication of The Sailplane Builders Association U.S.A. Regular Membership (third class mail) US $ 21.
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(Payment may be made directly in Australian Dollars to : Colin R. Owers. Pudman St .Boorowa. NSW 2586, saving bank charges)

"Acrifix 192" Acrylic cement. Peter Raphael still has some of well known stuff, if you want some for canopy repairs, give Peter a call, he is selling it at AU $ 15 a tube plus postage. Peter Raphael. 34 Ivan Ave.Edithvale. Vic.3196.Ph.(03) 97723929.

Attention " Woodstock" Builders...here is the good stuff..!
"Woodstock" sailplane sketchbook illustrated construction manual US $ 25. Also available are drawings for simple jig used to construct various components. Package deal of sketchbook and jig drawings US 85. Overseas customers add US $ 15 for Air Mail delivery. Send SASE for more information to: Clint Brooks. 2231 Vuelta Grande. Long Beach CA. 90815 U.S.A.

The Australian Homebuilt Sailplane Association

home Page can be found at:
http://www.geocities.com/CapeCanaveral/hangar/3510
Webmaster: Peter Raphael - pete_raph@yahoo.com
This new medium will be used to periodically include new information regarding our association as it comes to hand.

Thus far, it includes:

- A builder's profile- Peter Raphael and Terry Whitford's " Woodstock" VH-HNW and Malcolm Bennet's " MONERAI" VH-HDF. And shortly we will have Paul Johnson's "WINDROSE" VH-UII(Please feel free to send your" profile" for inclusion.
- A list of approved (in Australia) types for home construction.
- Graphic images.
- Subscription information
- Links to the Gliding Federation of Australia and other Gliding related Web sites
- E-mail the Editor - eddie@labyrinth.net.au (Jim's Son)
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Our next symposium will be held on the 13th and 14th of November 1999 At the Smithfield Soaring Group, Nagambie.

Notify the editor if you will be attending so that catering can be arranged.

Accommodation is available at Nagambie - and camping sites at Smithfield