THE AUSTRALIAN HOMEBUILT SAILPLANE ASSOCIATION

Volume 1 Issue 4 **March 1997**

A new year already has started and the days are passing by, it seems only yesterday that I took from Mark Stanley the task as Editor for our journal, but the reality, so far , is telling me that it is only one year. This issue is Volume 1 - 4 and from now on all the subscriptions are due for renewal.

The annual subscription has been raised up to AU $ 15 in Australia and AUS 20 Overseas.

Due to the excessive bank charges I regret to tell you that only Australian currency is accepted by money order or Bank Checks; not personal checks from overseas.
I am glad to receive support from all of you in the form of suggestions for the journal and letters of encouragement and good wishes but I also regret that I will not answer any letter or phone call asking for information if you do not send a large S. S.A.E.

Do not blame me but the work load in producing our journal has increased. In our last A.G.M at Raywood my friend Peter Raphael was nominated Co-Editor and with his help this scribe will have some relief . We had a very good time in our regatta and get together and those who did not attend missed the opportunity to meet others members.(Read the report By P.Raphael in this issue) .

Paul Dalziel came all the way from Queensland, Paul just bought the first Woodstock registered in Australia from Les Squires.

Our member Gary Morgan came from New South Wales with the latest news and photos of his project , the motor glider that he will be selling as a kit.

Also, from England we had the presence of Gerard Terry.

Everybody had a good time and your editor had the opportunity to meet all of them.

In this issue we welcome Clint Brooks from the U.S.A. he is contributing to the newsletter the "Woodstock Builders Forum" which has very well known articles contained in the american Sailplane Builders Journal.

Sergio Jacobi produced the cartoons and we hope they are to your liking.

We have a new gadget in the form of a modem which will make electronic mail easy with Peter Raphael and Eddy is making sure that the computer system runs smoothly (Could there be a home page on the Internet in the future?)

James Garay

Inside This Issue ☞

MAILBOX

Dear Ed,

Thank for your letter and your interest in ULF-1.

First of all I would like to apologize for my extremely late answer. I have been occupied with a lot of different things and I did not want to feed you with just ordinary type of pamphlet stuff, which at the time was running out, I finally did!

I expect that this writing reaches you early enough to fill (hopefully) a blank space in your Christmas Newsletter knowing how much work is involved.

Yes, we are still alive and plans are still available. Compared with the earlier version, we have included some "add on" features such as: spoilers, closed canopy, landing gear doors for foot launch, center of gravity release hook for winch tow and central wheel. A new version of the flight and operations handbook (to comply with the above changes) is currently in work.

Merry Christmas and a Happy New Year.

Dipl-Ing. Dieter Reich.

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Hello James,

Enclosed is a copy of my last Woodstock article. I am afraid I didn't include any of the photographs this time, as I can't reproduce some of them. They are not referenced in the text anywhere, only the figure drawings I included are.

I hope your association will enjoy the Forum articles, and I am looking forward to hearing from your members on Woodstock issues.

Thanks again for running my classified ad and making space for the Forum article, which will probably be on a bi-monthly basis, as I'm doing here in the U.S.

Regards, Clint Brooks.

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Dear Ed,

I read with interest about the ULF-1 in the latest newsletter as I am interested in building a lightweight glider. Do you have details as to whether plans are still available?

If you have heard of any other similar design I would also be interested in these. Foot launching is not necessary but lightweight and straightforward to build are my main requirements.

Thanks for an excellent effort with the Newsletter.

Wayne Rhodes

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Dear Ed,

My apologies for the delay in returning the membership application form. May I offer my sincere thanks for the opportunity to visit your home with the hospitality shown by you and your wife. I must say I was greatly impressed by your extensive library of sailplane information and your knowledge of motorless flight.
Thanks also for showing John Biggs and I your "Woodstock" sailplane under construction, certainly an effort of fine craftsmanship. I look forward to the successful launch in the not too distant future.

William Wood.

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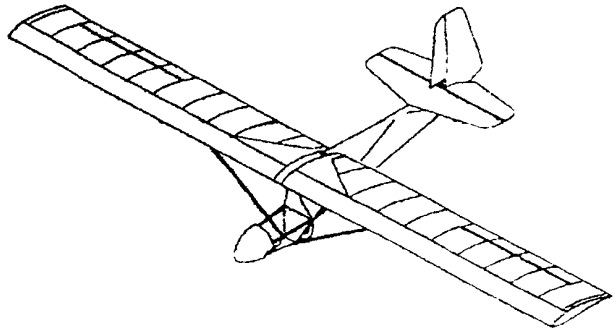
Dear Ed,

Please find enclosed information on the "Compact-110" a cute little ultralight sailplane, which I think is the modern "Primary" glider.

I would like to know if any of our members, anywhere in the world, have the plans, are building it or even flying it.

John E. Biggs.



Compact 110 - Super Light Sailplane

Dear Ed.

Could you please send me more information and/or a contact address for more information regarding the ULF-1 foot launch ultralight glider?.

Michael Habner.

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MEETING WITH G.F.A (GLIDING FEDERATION OF AUSTRALIA.

The Chairman of the Technical Committee John Ashford has invited members of the Australian Homebuilt Sailplane Association to attend a meeting to discuss:

The relationship between the Home builders Sailplane and the Gliding Federation.

The C.T.O/A .Jonathan Shand will also attend, along with Gary Sunderland if available.
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The G.F.A. welcomes the formation of the A.H.S.A. and wants to correct any misconception which members of A,H,S.A. might have in regard to home building.

This will be your chance to air your views, ask questions and swap information.

The meeting will be held as soon as possible after Easter and the venue which will take into accord the distance some of you might need to travel. So please write to the Editor now if you will be attending, if there are weekends which you are not available please let us know so we can pick the best day and place.

The Editor.

TECHNICALITIES

LASER CUTTING-A VIABLE ALTERNATIVE ?

(An excerpt from Pacific Ultralight magazine Nov-96)

After reading Keith Gentle's article in the September issue of Pacific Ultralights on his experience building the EPB-1A Flying Plank back in the mid 50's and the laborious techniques used in the construction of the craft (handsaws, etc) and the fact that he was able to replace the original built up wing ribs with plywood I thought I should investigate one of the modern technologies that have revolutionized the way we manufacture products in the 90's "THE LASER CUTTER".

Not far North of Newcastle at Tornago is the manufacturing company Industrial Switchgear the proud owner of two very impressive LASER cutting machines and after a phone call I was able to arrange a meeting with their cad/cam system manager Terry Potts. He was able to show me around the plant and explain the capabilities of the machines. What follows is a brief outline of what these machines are capable of and hope it is of some value to anyone who can see the potential for it to save time and effort in the manufacture of their project.

WHAT CAN THEY CUT?

Laser cutters can cut just about anything, stainless steel, brass, aluminium, steel, wood, perspex, copper.

WHAT ABOUT THICKNESS OF MATERIAL?

Plywood: from 1/16 sheet up to 30 to 35 mm.
Aluminium sheet: 5 to 6 mm.
Steel: up to 16 mm.
Stainless steel: up to 10 mm.

WHAT ABOUT THICKNESS OF CUT?

One of the machine cuts at 0,15 mm the other a 0,20 mm width. The cut is so clean that very little touching up is required to make the component ready for use. Also every component is exactly identical (saving on sanding & dressing).

HOW QUICK DO THEY CUT?

On 10 mm plywood the speed would be around 7 metres per minute and quicker for thinner sheets.(Terry estimated that all the ribs for the Flying Plank design could be cut in less than 2 hours!).

HOW MUCH WILL IT COST?

The cost on any one job will vary depending on the material used and the size of the order but for instance the rib design on The Flying Plank which is roughly 4 feet in cord was around the $ 6 to $ 7 mark. Of course this would likely be reduced with a bigger production run. For example if a group of builders pooled together and place their orders for components at the same time.

HOW CAN YOU CONTACT INDUSTRIAL SWITCHGEAR?

Phone: 049 648202 or Fax: 049 648732.
Also you can email in DXF format and they can be downloaded into their system without you even having to leave your computer!! Sorry don't have the Email address but they will give it to you if you call.

T-88 STRUCTURAL EPOXY ADHESIVE

Chem-Tech T-88 is a high performance, non brittle, two-part epoxy adhesive designed to give superior results under adverse conditions. The adhesive may be used without modification in normally fitted joints, and cure in any thickness without shrinkage. T-88 is clear amber and becomes virtually invisible when varnished. T-88 exhibits outstanding adhesion and permanence on a wide variety of materials, and is endorsed by leading designers, builders, and organizations.

PROPERTIES

T-88 has exceptional adhesion to most clean surfaces including wood, fiberglass, concrete, aluminium, steel, and many plastics.(Recommendations for surface preparation methods are available on request). T-88 does not bond well to tin, zinc or waxy thermoplastics such as polyethylene. When fully cured, it is unaffected by water, oil, gasoline, and virtually all chemicals.
It will not stain wood and is immune to fungus and rot. T=88 is unique in that it may be applied to damp wood, provided the adhesive is worked well into the surface. Glue line thickness is not critical and clamping is not necessary if the joint is undisturbed during set-up of the adhesive. However when bonding wood where end grain is exposed T-88 may be thickened slightly to prevent excessive absorption. Coverage in average bond joint is 50-100 sq., ft. per gallon.

MIXING

For ease dispensing, plastic spout top may be cut back leaving the molded ridge intact to retain the red cap. T-88 A and B are mixed one-to-one by volume using the graduate measuring cup supplied in the kit. Weight ratio is 100 parts of A to 83 parts of B. Excessive Part B will degrade. Rather than expedite cure and should be avoided. Care should be avoided. Care should be taken that mixing is thorough and streaks can no be seen. Pot life of the mixed adhesive is approximately 45 minutes at 70 °F, however, a coated joint may still be pulled up tight for two hours. Cap containers promptly after use. Mixing in small lots or with large surface area exposure will extend pot life.

CURING

At 70 °F T-88 will harden in 6-8 hours and will reach functional strength in 24 hours. T-88 has been specifically formulated to cure as low as 35 °F without reduction in strength; this cure will require approximately one week. At 150 °F, T-88 will set within 30 minutes and develop maximum bond strength and impact resistance after 2 hours. If excessive flow out occurs, allow 2-4 hours at room temperature before heat cure. Using Part B (hardener) in excess of recommended ratio will not accelerate cure and may tend to retard it.

CLEAN UP

Uncured T-88 may be removed from tools and work surfaces using acetone, toluene, or lacquer thinner, however, it should be removed from the skin using SBS-33 Skin Cleanser (available from CHEM TECH) OR SOAP AND WATER ONLY. Solvents must never be used on the skin. Cured T-88 is virtually impossible to dissolve and must be removed mechanically. Use due caution in handling flammable solvents.

STORAGE

Separate resin and hardener components will have a storage life in excess of one year if containers are kept well closed and stored below 90 °F. Allow cold containers to reach room temperature before opening.

Editors Note, T-88 is a very well know epoxy adhesive in USA. In Australia you can buy it from MARINE TIMBERS Pty. Ltd. 71-73 Roberts Avenue Mulgrave Vic. 3170.

Price: ½ L AU$ 48.00

EPICRAFT EPOXY RESIN GLUE

Epicraft Epiglue is almost a clear, non shrinking, high strength gap filling two-component epoxy resin adhesive. It can be used for bonding a wide range of materials and provides a strong, water-proof joint.

It is particularly suitable for use during the construction of all wooden craft on areas to be exposed to or continuously immersed in, salt or fresh water.
Two fully compatible Hardeners are available, Standard Hardener and Epiglue Cold Weather(Winter) Hardener, (Formulated for use in lower temperature range gluing giving faster setting and curing times.)

Epiglue is not recommended for Boric treated timber.

The resilient nature of a cured Epiglue joint, combined with its fantastic adhesion makes this glue the best material for use in highly stressed joints.

In addition to its use with timber, Epiglue can be employed for gluing of metals, stone, concrete, leather, glass, porcelain and most plastics

SPECIFICATIONS

Temp	Pot Life 250m. mix	Max. Open Time	Full Cure	Min. Cramping Time
10°C	1-2 hours	90 min.	7-10 days	48 hours
20°C	60 min.	40 min.	5-7 days	24 hours
30°C	45 min.	30 min.	2-3 days	2 hours

MISCELLANEOUS DATA

- Linear shrinkage on curing 0.6% maximum
- Moisture Vapor Permeability 0.48 x 10^{-6} gms/hr/sq.cm.
- Moisture absorption after prolonged immersion 0.75% maximum.
- Coefficient of linear expansion 5.1 x 10^{-5} inches/inch °F up to 130°C.

MIXING PROPORTIONS

By volume- 2 parts Epiglue Resin to 1 part Epiglue Hardener.

Epicraft Cleaning Fluid/Epoxy Thinner should be used for cleaning implements before the material has begun to gel.

WHAT'S NEW!

ANNUAL AHSA MEET 1997- RAYWOOD, VICTORIA

"THERE I WAS AT 7'000 FEET WITH THE ENEMY DIRECTLY IN FRONT OF ME AND NOTHING ON THE CLOCK BUT THE MAKERS NAME"

Well, not quite true but a great way to begin a story. I was infact on ferry tow to the Annual AHSA meet and the "enemy" in front of me was actually Citabria VH-SAX piloted by Mike Smith, accompanied by Tailgunner Eddy Self. We had departed our home base at "Smithfield" Wahring earlier that morning and were now looking towards Raywood, the home of the Bendigo Gliding Club after a short hop of 54 nm. Casting off the tow I was able to enjoy some extended soaring while awaiting the arrival of the ground support.

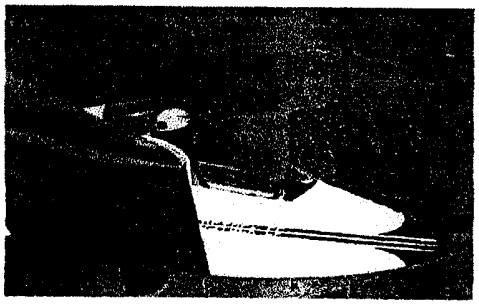
Aerial reconnaissance had revealed the presence of the Vintage Gliding Movement on the ground and it was with this friendly group that we were to share the hospitality of the Bendigo Gliding Club for our annual 4 day meet.
Bendigo is a "winch only" club so we had taken the liberty of providing our own Tug for the occasion. Our ground contingent was composed of Malcolm Bennett, trailering his Monerai VH-HDF. My building partner, Terry Whitford bringing the "Woody" trailer along with the refuelling facilities for SAX and Kevin Parkinson and Peter Arnold with the Catering Corps. It had been arranged that we could camp at the local sports reserve and this became our base of operation for the duration.

The weather proved to be exceptionally kind over the 3 days of flying and although only 2 homebuilt aircraft attended excellent flights were achieved with these, enabling some exploration of the surrounding towns and countryside. If it could be said that there was a downside to the excellent soaring conditions it would be that little time was available for discussions with interested members. It was obvious from the air, the great potential of this area for X-country and its convenient accessibility from our base at Nagambie and it was wonderful to share the sky with the "grand old ladies" of gliding soaring in their element, displaying the character of their time in defiance of the "fantastic plastic" we are becoming accustomed to.

It was extremely encouraging to observe the attendance of many AHSA members over the four days, as some had traveled from far afield just to meet each other. Many pleasant hours were spent discussing aspects of homebuilding and homebuilt aircraft and it is easy to gain the impression that there is a strong and growing interest in this "grass roots" activity within the soaring community.

On Sunday evening the Raywood Hotel became the venue for the AHSA AGM (Minutes in this issue) and after our illustrious Chairman/Editor James Garay had dispensed with the formalities a pleasant meal was enjoyed by all. To conclude the evening videos of Vintage Gliding in Europe and footage of the early Australian gliding activities were presented by Ian Patching to the entertainment of all. The jocularity extended back at the

campsite with James amusing all with a lesson in character assessment, and his observations on the ailing state of the gliding movement.
The Sunday morning broke to another fine day albeit a little windy so preparations were made to ferry the Woody back to base while Malcolm trailered HDF off to sample the Tocumwal air for a few days. Final glide into the home field on smooth morning air was a fitting finale to what could only be regarded as another very successful meet for the Homebuilders Association. Good company, good soaring and pleasant surroundings, this could most easily be summed up by the old cliché. *"ITS THE ONLY WAY TO FLY!"*



Woody soars over Raywood.

Pilot : Peter Raphael

ANNUAL GENERAL MEETING

On Saturday 11/1/97, the First Annual General Meeting was held at the Raywood Hotel. The following financial members were in attendance.

James Garay	Peter Raphael	Kevin Parkinson
Terry Whitford	Malcolm Bennett	Alex Adam
Alvin Peterson	John Biggs	Peter Champness

Apologies - Mark Stanley
Chairperson - James Garay

The first item of business discussed was the growing production cost of the newsletter. To date production is continuing on a voluntary basis, relying on donation of materials for printing and publication. Due to unprecedented interest and growing circulation this cannot continue and it will be necessary to seek commercial methods of producing further editions. Until economies of scale can be achieved it will be necessary to increase the cost of membership. The members in general agreed that the content of the newsletter is invaluable and unique.

Moved - Terry Whitford. That the Annual Fee be increased to $15 Aus.
Seconded - Kevin Parkinson.
Motion carried.

Thanks were then offered by James on behalf of the membership to Alvin Petersen for his kind donation to the organisation enabling the purchase of trophies for the annual meet.

James raised concerns that bank charges are eroding the AHSA funds due to the limited balance held. It has been suggested that a cheque account may overcome this.
Action Point - Terry Whitford to investigate further and advise.

It appears that James is receiving a number of telephone calls from both local and overseas origins which necessitate return calls. This is placing unnecessary stress on his household budget and we cannot expect him to bear this on behalf of our organisation.
Moved - Terry Whitford, that recompense be $20 per quarterly account plus all relevant itemised ISD/STD calls.
Seconded - Kevin Parkinson
Motion carried.

Discussions were held on the possibility of using advertising to offset the costs of newsletter production. It was generally agreed that members should not be charged to advertise in the newsletter but that Commercial Interests may be happy to pay in order to reach our membership.
Action Point - James to canvass potential advertisers.

Alvin Petersen was then asked to present the trophies.
Longest flight for the meet awarded to Peter Raphael, Woodstock VH-HNW
Shortest flight for the meet awarded to Malcolm Bennett, Monerai VH-HDF

Thanks were offered to Mike Smith, Citabria VH-SAX, for his aerotowing services at the meet.

The venue for the next meet was discussed but is undecided at this time as this depends on the decision of the Vintage Gliding Club. Members will be notified when this is finalised.

The suggestion was made that a Homebuilders Symposium be convened at Smithfield Soaring Groups site at Wahring, north of Nagambie, Victoria, as a means of sharing information among members and attracting guest speakers. A date will be set by the Executive Committee and published as soon as possible.

NEW MEMBERS.

We have new members to welcome to the group. They are...
William Wood. Unit 126 Port Phillip Village. Steward Ave. Altona.Vic.3018.
James L .Peddell. Hasting St. Thursday Island. P.O. Box 65. QLD 4875.
Chris Runeckles 4 Snipe Court. High Wycomb. W.A 6057.
Paul Dalziel. M.S.1497 Lot 10 Mount Rascal Rd. Toowoomba QLD.4350.
Dr. Peter Champness. 66Waterdale Rd. Ivanhoe. Vic.3079.
Rod Dash ."Hidden Valley" Barkers Vale Via Kyogle. N.S.W2474.
Jeffrey Hancock. P.O. Box 136 Sth Gate P.O. Sth, Tamworth N.S.W. 2340.
Peter Dall. 53 Macalister Cres. Curtin A.C.T. 2605.
Michael Habner. 13 Rhodes St. Kalgoorlie. W.A.643O

Welcome aboard fellows and we look forward to a long and mutually satisfactory association.

WOODSTOCK REMOVEABLE TAILPLANE MODIFICATION

Dear James,
Please find enclosed a copy of the revised drawings for the WOODSTOCK for your records. Note the changes to dimensions and the reposition of the rear pulley.

We have also received from Jim Maupin Ltd., a copy of the new 13 Mts. wing drawings.

These will be kept in the G.F.A office.

This modification look rather complicated and difficult.. I would recommend people to stick to their 12 Mts. wing version.

Gary Sunderland.

HINTS & TIPS!

Home Brew Disc Sander
by Peter Raphael

Looking around my workshop there are probably 2 pieces of machinery that I would consider as inseparable aids to homebuilding, particularly in wood. The first is a band saw which allows probably the most versatile range of cuts of any powered saw, from straight ripping to complex curves and angles. The second is a homebuilt 12 inch disc sander, this machine with only one moving part is almost as useful as and is complementary to the saw, allowing precise joints to be made.

In this article I wish to describe how you can construct one of these for yourself. The actual materials you use to construct this are arbitrary and it can probably be done via the FETH principle (of things that Fall Easily To Hand). I will assume that if you have the necessary skills to decide to build an airplane then you should have little difficulty with this project.

The principle item required for the project is an electric motor of around 1/4 to 1/3 HP and these can usually be found in old washing machines. Earlier models of a closed frame variety are preferable to the more open arrangement found in later machines due to their dust resistance. Most of these will rotate at around 1440 RPM in either clockwise or anti-clockwise direction , this will only be important when you come to applying work to the disc. A switch should be installed on the machine within easy reach and using correct electrical practice

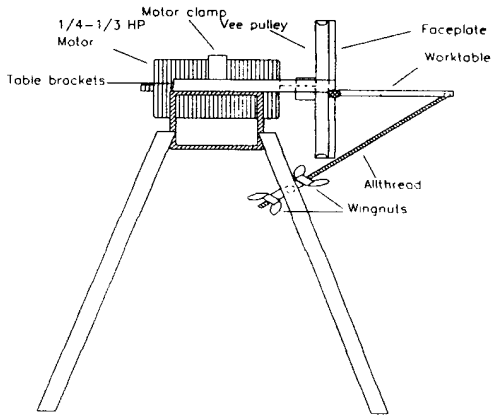
A true running disc is now required on which to mount the abrasive paper and I achieved this by using a 12 inch aluminum vee belt pulley with a suitable bore for the motor shaft. These pulleys are usually machined true on the outer faces and it is to this surface that a suitable wood or metal disc can be attached as a disc mount. In my instance I was able to use 1/4 inch aluminum plate drilled and tapped to the pulley with countersunk screws, but thick plywood would work well and may also allow the use of a smaller diameter pulley. I would not recommend much less than a 12 inch disc as only 6 inches of this is easily usable in practice and the more area available means longer life from the abrasive.

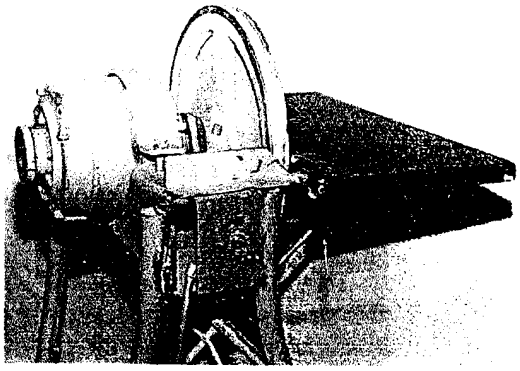
A mount for the motor will need to be constructed and this will depend on the style of motor chosen. I used a section of 100mm steel square tube with a cutaway to cradle the motor and a clamping strap over the top, this provided the chassis for the attachment of a tripod of legs and the pivots for a tilting table.

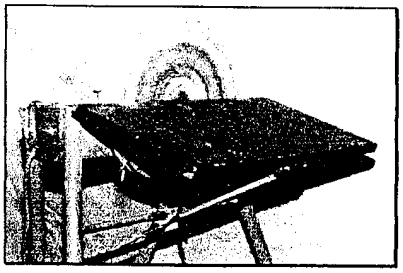
The table will need to be tiltable to accommodate bevels and removable to allow easy paper replacement. My hinges were made from 3/8 ID steel tube with slip in pins, these being easily moved to detach the table. The tilt control is via a length of all-thread pivoting on the outer edge of the table and running through a tube attached to the front legs, under the disc. A wing nut either side of the tube allows for the angle to be set accordingly.

Abrasive paper is attached to the disc with a proprietary disc cement which is a low tack contact adhesive, this allows the discs to be peeled off and renewed and should be obtainable from most good hardware stores. Paper of sufficient size is usually difficult to find so search out your local Abrasives manufacturer as they often discard suitable pieces at ends of rolls or may sell you some off the roll . I would suggest nothing finer than 100 grit paper and recommend regular replacement of the paper when it becomes loaded as this can seal the timber grain and prevent good glue penetration.

I hope my notes and pictures provide you with the inspiration to build this simple yet versatile machine as I am sure you will find it useful for working a variety of materials as your project proceeds. Please construct with safe operation in mind so you may still be around to enjoy your completed project.







SHOP TALK

JUST A LITTLE CHAT ABOUT HOW I DID IT!

By Mark Stanley

G'day everybody!

Well it's been a while since I have been able to get into the shed and do a bit on my WOODY (that's WOODSTOCK to the educated) but over the last few weekends I have managed a few hours of basking in the sawdust so to speak. I have been fiddling with a few small parts that seem to take a lot of work for minimum visual result, also I have more or less finished the basic modifications to bring the WOODY back to the original fixed stabilizer system. The previous owner had elected to fit the removable stabilizer option, but after seeing the trailer system that is used in Peter Raphael and Terry Whitfords WOODY VH-HNW, I opted to return my WOODY to the original Maupin design.

VH-HNW's trailer fittings set is ultra simple, very sturdy but still very light ,basically, a very well planned out system,(how about an article on it fellas?).

Re modifying to the Maupin's design required me to remove the rear skin up to STN 185,2 take out bulkheads 185,2 & 192, remove the centre ply aft face from the stabilizer spar, then use the plans to rebuild to original specifications(I wish you could do the job as quickly as you say it!). One thing I did do differently to the plan system was to assembly the complete stabilizer structure, IE: main spar, ribs, L.E & bulkhead, STN 182,5 & 192 as a complete unit, out of the main airframe, I assembled it clamped/jigged to my work bench and then transferred the complete unit to the fuselage, squared it all up and then glued it in position.(HOOHAA, it looks like a GLIDER not a CANOE)

The plans call for you to build the stabilizer in position, in the fuselage, as stations 182,5 & 192 bulkheads are built up as one unit with the rest of the basic fuselage substructure early in the project. I figured that I had the option to make jigging a lot easier with doing my bit of rebuilding, so why not, the end result is exactly the same with a little less stress.

I have also installed a TOST release up front, and I am fiddling around starting to fit the control runs. I have managed to round up a second hand ASI and a WINTER mechanical vario at reasonable cost, altimeters are around but trying to find a good one seems a little more difficult, still I have plenty of time before the WOODY takes to the air.

My accompanied drawings show the method I used to form the LE shape into the 1 mm ply skins for the stabilizer I am sure there are heaps of different ways to do this job but after a lot of sitting there with a confused look on my face (some would say that's normal) I came up with this, what I wanted to achieve was the part of the ply where the scarf lies over the LE of the stabilizer (and fin) I wanted this to be as straight as possible, not to have any 'waves' in it to make the scarf difficult.

Basically, I cut the skins oversize, trimmed them to fit around bulkheads etc., did the centre scarf(to join the left/right skins) then stapled a 1.1/2" sq. length of timber to the LE of my skin (that's the reason I cut them oversize) .OH..I forgot to mention I installed two position dowels (nails with the head cut off) to line up the skins in the same position each time-as per plans, OK, after stapling the timber to the LE of the skin, I soaked the forward section of the ply skin where the bending was to take place with hot water, let it soak for ¼ hour then place the skin on the locating dowels and clamped another piece of timber over the spar to firmly hold the skin down.

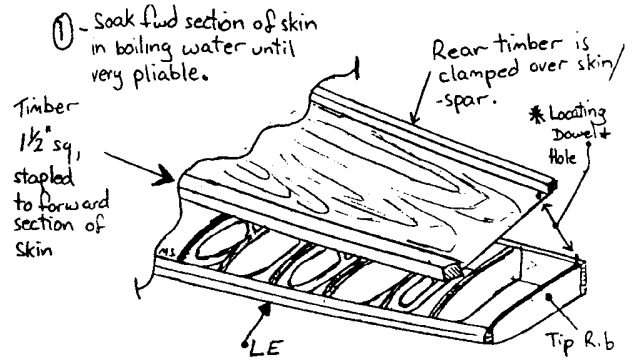
Next, grasp the forward timber (stapled to the skin) and gently bend it around the LE of the stabilizer structure and clamp into position, then let It dry before removing.

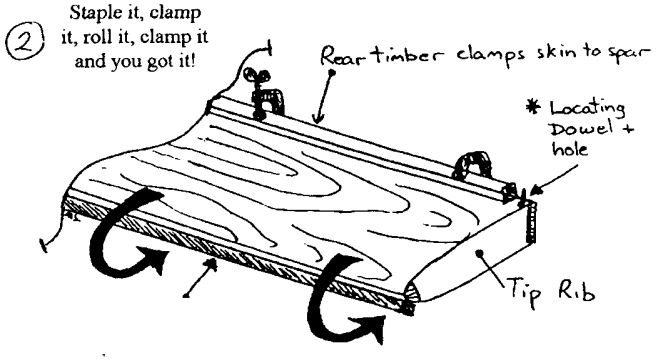
When I removed the clamps, the skin was very nice fit, nice and straight which will make the scarf job very easy.

So now I will do the same to the top skins, scarf it all and glue them, good, easy!. See drawings for further explanation, I guess there is lots of different ways people have achieve the same thing, some better, some worse, but this has worked for me very well.

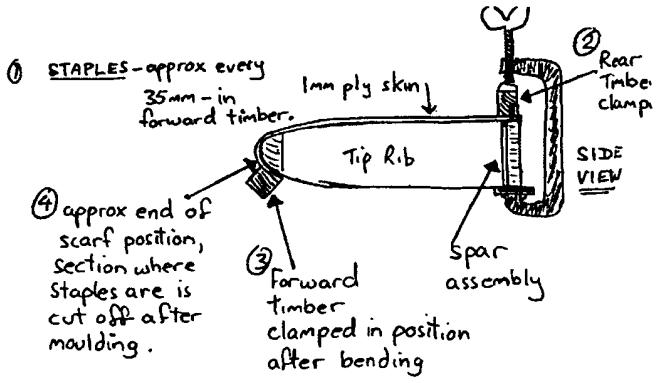
Well , that is where I'm with my WOODY, how about a few more reports on what the rest of you crowd are doing with your projects?.

James, our Editor is as you will have noticed doing and excellent job, and the Newsletter looks very professional .When I was the Editor my efforts were real cut and paste, heaps of typo's but I guess it was a start, any way keep up the top job James , it is a large task he does for free, so everybody please help him out, OK, everybody keep building, and we will all see each and other at the next AHSA regatta, till then, see ya later.





Forward timber is "rolled" around leading edge, then clamped into position until ply is completely dry.



THE ULF - 1

The ULF-1 foot launched sailplane was designed by Dieter Reich and constructed by Heine Neumann of West Germany. Designed for ridge soaring and marginal thermal currents, it has full three-axis aerodynamic control. Its first flight was in November 1977; its first public appearance was in August 1978 at the 3rd International Hang Glider Meeting at the Wasserkuppe, the historic German soaring site.

Since that appearance many hours of flight time have been accumulated by different pilots on a number of ULF-1's. The prototype alone has more than 100 hours total flight time in 150 flights, all starting from foot launch.

More than 140 plan sets for the ULF-1 have been sold all over the world, forty ULF-1's are believed to be under construction. Ten ULF-1's are in operation in West Germany. In 1985 the longest flight lasted six hours, the maximum distance achieved 120 km. Both of these flights started with a foot-launch.

In July, 1980, the ULF-1 design received an air-worthiness certificate issued by the German authorities, after al required calculations and test had been provided by the designers. In 1983 the Australian authorities gave approval for the ULF-1 to be built and flown in Australia. ULF-1 - as far as we know - one of the best performing foot launched aircraft to date, and the only one to be certified by an official authority.

Operation

Since ULF-1 is an ultra-light glider with an empty weight of 46kg (approximately 100 lbs.), the aircraft can be foot-launched from slopes of more than 15 degrees even at small wind speeds. The pilot supports the weight of the aircraft on shoulder straps and uses the side stick for lateral control. The self-launch is very simple and does not require any special skill. As the pilot states the take-off ground run the elevator stick should be in sight nose-down position to lift the horizontal tail. The moment the pilot feels a pronounced seat pressure, the control stick is pulled back until the aircraft lifts off. After takeoff the pilot retracts his legs and puts them on rudder pedals. A sliding slat-type construction behind the pilot's back can be released in flight to provide a seat.

Because of a low sink speed (0.8 m/s at max. takeoff weight) and its good maneuverability, ULF-1 is sensitive to marginal thermal conditions. The best L/D of 16:1 is at around 55 km/h (about 34 mph). To reduce the aerodynamic drag of the fuselage, hinged doors have been fixed to the front superstructure of the fuselage of some ULF-1's. They are kept open during takeoff ground run and closed manually after liftoff. For "record-breaking" flights we recommend a closed Plexiglas wind screen.

We estimate that both measures, the "landing gear" doors and the windshield, can improve the L/D by 10 to 18, which seems to be the upper limit for the ULF-1. Since the glider performance is also at a relatively high speed, the average cross-country cruising speed, including time for circling, can be doubled compared with conventional hang gliders.

Landing the ULF-1 is done on a nose skid located beneath the pilot's seat. Car tows in calm air can be made. Air tow behind an ultralight is possible but has not been attempted yet. We are experimenting with a winch tow release unit attached close to the center of gravity, which opens the flat lands to ULF-1 cross-country soaring.

Construction

ULF-1 is specially suited for homebuilders. The basic construction materials are spruce, birch plywood and balsa wood. The airframe is covered with doped fabric. For hinges, fasteners etc., aluminum and steel sheet are used with fiberglass cloth and resin. Steel tubes are used only for the control stick, control parts in the cockpit area and rudder drive.

The cost of materials amounts to about $1,500 U.S., and the aircraft can be built in under 100 hours. For road transport, the two-piece wing can be detached. In addition, the horizontal tail can be removed. The aircraft can be taken off a trailer and assembled in about six minutes.

Handing Qualities

The three-axis aerodynamic control greatly reduces the pilot's workload compared to a conventional hang glider with its tow-hand yoke bar, and frees one of the pilot's hands.

Dynamic pull-ups to about 20 degrees results in smooth nose-down movement after the wing has stalled. In turns or in turbulent air, there is some wing drop in a stall. Recovery is properly and promptly achieved with opposite rudder. The loss of height is usually less than 10 meters (30 feet).

For sailplane pilots there will be no problems flying the ULF-1. However, experience with conventional hang gliders is not sufficient to handle the aircraft. At least some solo flight experience in conventional gliders is recommended.

ULF Soaring Week at the Wasserkuppe

During the third week of August 1985 there was a meeting of six pilots flying ULF-1's. Some changes compared to the prototype could be noticed. A few ULF's had the "landing gear" doors, closed manually after foot retraction. Another was equipped with a special ballistic recovery system for both pilot and aircraft,

located immediately behind the main bulkhead and activated by means of a mechanical spring release.

There was a lot of flying on and above the nostalgic "holy" mountain, one of the worlds most popular soaring sites. Ridge soaring was mixed with thermal flying so that high altitudes could occasionally be achieved. The flight endurance of the ULF-1's was limited only by individual seat comfort. In most cases two hours sitting on a (for the present) Spartan seat were sufficient. Therefore, most ULF-1 flights ended after one and a half hours. However, one hardy soul flew his ULF-1 for more than six hours!!

Plans Available
A plan pack, consisting of a complete set of 30 blueprints, a cutaway drawing, a construction and flight manual (all in English) is available from the designer and prototype builder at the following address:
Dieter Reich
Anechostrasse 16
D81827 Munchen 82
West Germany

Cost as of this writing was DM460,000

1. Payment must be made by cashier check or international money order. No personal or company checks will be accepted.

2. For airmail shipment write to the designer first asking for the correct amount. Telefax 089 439 414.

3 Postbank Munchen. BLZ 700 100 80, KTO-NR: 4731 95 800.

MITCHELL WING MADNESS

By DR Peter Champness

The Mitchell wing is the brain child of Don Mitchell, a US aeronautical engineer who became interested in Hang Gliding during the 1970's. The Hang Gliders of the day had made some development from the Rogallo Wing, a low aspect ratio flexible wing kite, often seen today as the typical stunt kite controlled by two strings. Some designers however were convinced that a rigid wing aircraft was the way to go for better performance despite the relative awkwardness of such designs.

Taras Kiceniuk as a 17 year old designed a series of rigid wing aircraft called Icarus. Icarus II was a biplane swept wing tailless aircraft which was later motorized and renamed the Easy Riser. Icarus V was a single surface wire braced tailless design with similar sweep back to the Icarus II. Both gliders seem to have been quite successful. Volmer Jensen had several designs which he marked as plans or kits (the VJ 23 Swingwing and the VJ 24 Sunfun) both of which were conventional designs with fin and tailplane at the end of a tailboom. The pilot was suspended under the leading edge of the straight wing on a small seat. One problem of the Volmer Jensen designs was that the pilot weight balanced the tail boom and hence the pilot could not raise the tail unless a fair amount of wind was blowing.(1)

In the midst of all this the Mitchell Wing B10 Buzzard arrived, first seen in early 1977. The Mitchell Wing is a dramatic looking aircraft, a high aspect ratio, cantilever monoplane flying wing with very modest sweep back. The pilot is suspended in a cage just below the wing, consisting of two longitudinal spars at armpit level. After take off the pilot raises his feet and slides into a supine position supported by a sling seat. Because the pilot is positioned at the C or G position , which is also the balance position of the unladen wing, he has no problems raising the wing and take offs can be made in zero wind conditions.

Three axis aerodynamic controls are provided, via elevons and wing tip rudders. A limited degree of weight shift trim can be achieved in flight by shifting slightly forward or aft in the sling seat. The elevons are particularly interesting , being suspended behind and below the trailing edge of the outer wing panels in the manner of Junkers Flaps. Don Mitchell called these devices Stabilators and has evidently protected the design with some sort of patent or trademark.(4) Since the Stabilators are usually generating some down force to correct the negative pitching moment of the main wing they are mounted with the camber directed downwards. The Mitchell Wing B10 uses an NACA 230-15 aerofoil with no washout. Sweepback is about 15 degrees and the wing is gently tapered. The wing is 34 feet in span constructed in three pieces. The outer wing panels are hinged at the upper spar cap and fold inward for stowage or transport like a naval aircraft. The dihedral is 6 degrees on the outer wing panels only. The unladen wing weighs 70lbs and the wing area is 136 square feet. The wing has apparently been static load tested to 1158 lb., 5G for a 190 LB pilot. The glide ratio is quoted as 18:1(2,4)

The Mitchell Wing B10 hang glider has had considerable success. In 1977 Brad White won the US National Hang Gliding Competition (Rigid Surface Aerofoil division) using a Mitchell wing. The Mitchell Wing was quickly taken up by George Worthington who set a number of world records, exceeding 100 miles distance. George's exploits are quite well known. He wrote a number of articles describing his flights one of which was published in Australian Gliding. (3,4) George was killed flying a new design hang glider (not in the Mitchell Wing).

The Mitchell wing was soon developed as an ultralight aircraft. The hang glider cage under the wing was replaced with a semi streamlines open pod suspended from the same four attachment points under the wing and tricycle undercarriage was added to the pod. A pusher propeller was placed behind the pilots seat. Don Mitchell became involved with the M company in Porterville, California which sold plans and kits for B10 hang gliders and ultralights. The Mitchell Wing seems to have been much more successful as an ultralight than as an hang glider. Several B10 ultralights have been completed and flown in Australia. However I have only heard of one B10 hang glider in Australia.

The next and final development of the Mitchell Wing was the Mitchell U-2 Superwing. The wing platform was retained but the dependent pilot position was deleted and a short streamlined fuselage was created anterior to the main spar. The cockpit was enclosed with a bubble canopy (or open cockpit in early versions). The tricycle undercarriage was retained but the main gear was moved outboard and fixed to the main spar. The wing tip rudders were modified slightly; a fixed fin with hinged rudder was adopted instead of the swiveling all flying surface of the B10. Finally the aerofoil section was changed to a modified Wortman aerofoil, reflexed on the inner section but not on the

outer panels which carry the stabilators. The main spar must have been strengthened because the wing was now advertised with a load capacity of 10G. The empty weight had increased to 200lbs. Maximum gross weight was 450 lb. The small engine with pusher propeller was carried on a frame above the trailing edge of the wing. (5) These changes apparently made improvements in performance. The glide ratio was advertised as 21:1 compared with 18:1 on the hang glider version. 25:1 was advertised for a retractable gear although no plans for retractable gear have been released to my knowledge. Cruising speed was said to be 60 miles per hour against a maximum speed of 55 miles per hour for the hang glider.

In the mean time there seemed to have been some changes at the M company in Porterville, California. Jim Meade had become the president of the company and Don Mitchell was no longer mentioned in the company literature. The final product of the M company was a monoplane ultralight with twin tail booms known as the Mitchell P38. The designer was Jim Meade. Some years later the company ceased trading.

My Mitchell Wing U2 kit was ordered in 1981 and arrived some months later. Unfortunately it was shipped in two lots, the second package arriving three to four months after the first. This cost me quite a few hundred dollars in extra freight and duty compared with the cost of receiving a single package. At the time I was seriously challenged by demands of study for my degree and hence construction progressed steadily (building always seemed more attractive than study). After completing the ribs and rudders, as recommended by the instructions I set to work on the main spar. I was somewhat unimpressed on completion of this component when I found a discrepancy of 3/8 inch between the depth of the spar and the height of the rib at a number of rib locations. I wrote to the company about this and received the reply that the instructions had said "build to fit". I felt that this was inappropriate. 3/8 inch seemed too great an error to accept in aircraft construction and I was pretty sure it was not due to lack of accuracy in construction on my part. About the same time a bulletin from the company advised that the spar joiners should be changed. 3/16 "T24 aluminum was substituted for the original 1/8" aluminum fittings. I began to be concerned about the 10G load limit advertised in the brochure.

Several other aspects of the design bothered me. The undercarriage was shown as bolting straight through the upper and lower spar caps without any local reinforcement. Actually I didn't like the idea of the fixed undercarriage and had already started to design a retractable system. The gear was to attach to blocks of pine which I glued to the main spar caps. I now understand that this device is inappropriate and is likely to act as a stress raiser and weaken the spar. Some of the hardware supplied did not seem to be of aircraft grade. The main spar is joined to a laminated curved mid section to accommodate the sweepback of the spar. The join is by a scarf joint of 12:1 ratio. 15:1 seems more appropriate for this critical component.

At this time the project was placed in storage where it remains to this day.

My interest in the Mitchell Wing design and flying wings generally has persisted. I am hoping that sufficient Mitchell Wings will be completed and flown successfully to prove the safety of the design. So far at least three Mitchell Wing U2s have been completed in Australia. One has been flying on and off for 16 years. One has crashed killing the pilot. I have not yet followed up on the third aircraft or several other projects which may or may not be flying.

The Bureau of Air Safety Investigation has investigated the circumstances of the crash and their report is quoted below:
"The aircraft was a tail-less homebuilt ultralight with a cantilever wing. It was reported that the pilot had made several flights during the day without apparent incident. On the subject flight the aircraft was observed to begin a gentle turn to the right, around a sports oval. The wings were seem to suddenly fold upward, the right wing broke away and the remainder of the aircraft fell to the ground.

It was determined that the wooden main spar of the wing had failed at the point where the right landing gear was bolted to the main spar caps. Tests of the wood revealed that it was not of aircraft quality, although the plans for the aircraft specified that aircraft quality spruce was required. The wood was not protected by paint or varnish from seasonal changes in temperature or moisture. The plans also called for the wing nose ribs to be constructed from styrofoam, however the investigation discovered that the material used was expanded polystyrene. This material is less rigid than styrofoam.

The pilot had purchased the aircraft from interstate in a partially constructed condition, with the main spar and the nose ribs already completed. He was evidently unaware of the poor quality of the material used in the construction, which lead to the failure of the structure under normal flight loads.
BASI Canberra 8th July 1985"

So Caveat Emptor (let the buyer beware). There is probably quite a bit more to be said about the Mitchell Wing including a discussion of its flight characteristics and the stability of flying wings generally. Perhaps I will write about it in a future edition. In the mean time if anyone knows anything about the Mitchell Wing I would be pleased to hear from them.

Peter Champness
66 Waterdale Rd
IVANHOE VIC 3079
Ph 03 9497 2048

References:

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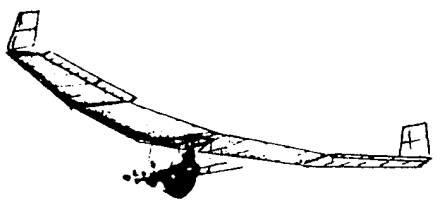
2. Flypaper (Victorian Hang Gliding Association) March 1978
3 Record Busting in a Mitchell Wing. George Worthington, Homebuilt Aircraft Magazine
4. Design and Development of the Mitchell Wing. Don Mitchell, Hang Gliding Magazine, Jan 1978
5. Mitchell U2. Doug Colby, Homebuilt Aircraft Sep 1980



INTRODUCTION.
By James Garay.

Well folks, here is the good stuff that everybody has been waiting for. We are growing in membership and this is telling us that we are on the right side of the road with our association. Our journal is providing our members with valuable, no fuss, simple information on Homebuilt sailplanes.

We are very pleased and I am taking this opportunity on behalf of our members to welcome a gentleman from the United States of America named Clint Brooks. He is very well known for his articles on "Sailplane Builders" - The Journal of the sailplane homebuilders association, a division of the soaring society of America.

Clint is cooperating with the Australian Homebuilt Sailplane Association with the articles in his Woodstock Builders Forum. Welcome aboard Clint! From all of us here in Australia - James, Peter, Vicky, Eddy and Sergio, the Australian Homebuilt Sailplane Association servants!

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Hello James,

And hello to the Australian Homebuilt Sailplane Association! Your editor has put me on the spot to offer some explanation as to why I'm undertaking the Woodstock Project with such detail....

Its quite simple, really. I looked around for help when I first became interested in the project, and found very little available. Talking with Jim Maupin about associations and such revealed that none existed and my best approach was to contact possible builders that had purchased Woodstock drawings. At that point, I had joined the SHA (Sailplane Homebuilders Association) and wrote a letter to solicit the potential interest of a Woodstock newsletter which was published in the SHA newsletter. I only received two responses, one from the now famous John Stockwell, offering abundant encouragement and another from a fellow in Idaho, whom I've never heard from again. Needless to say, I did not pursue it any further.

After a year in the SHA, during which I perceived input to the newsletter and general interest going downhill, I contacted the new editor of the newsletter, Dan Armstrong about the possibility of running an ongoing series regarding the construction of a Woodstock and the ensuing learning curve that would be revealed. Of course Dan consented and I've been attempting ever since to convey what it is like to build the Woodstock and share methods and experience from other builders who would like to contribute to the series (hint, hint...) All in all, I've really enjoyed doing the articles and appreciate the feedback I get. My main purpose was to get educated about the Woodstock and hopefully enlighten those who have not started yet.

As for my personal background, I'm employed in the aerospace industry as a jig and fixture designer with most of my efforts going towards developing, manufacturing processes for advanced composite structures, so I work between production engineering design and manufacturing process development teams.

I have built and flown model aircraft for the majority of my life and this has finally given way to full scale aircraft in addition to flying sailplanes on the weekend. I'm a board member of the Orange County Soaring Association with our fleet of five gliders based at Memet-Ryan airport in Southern California. I'm a private glider rated pilot in Southern California and try to fly every weekend, weather and family permitting.

I actively fly our two Blanik L-13's and Schweizer 1-36 and hopefully I'll get to fly a Woodstock someday too!

I'm also a member of the Experimental Aircraft Association but I've found nobody in my local chapter who is building with wood or has built with wood. Everybody likes the kit aircraft of composite, rag and tube, or sheet metal. Needles to say, some aspects of wood selection and application are sometimes questionable but available documentation on wood construction techniques is, visualizing the type of loading the part in question is subjected to, will generally take care of these questions, if nobody is nearby to ask. As you might gather, this is my first attempt at wood aircraft construction too.

I am impressed with the Woodstock design in the sense that it was developed to be very produceable using a few simple tools, which I am able to attest to. Patience and common sense are your best allies when attempting to construct one of these aircraft.

In closing, I would like to solicit the Australian readership to submit to me whatever you would like to read in the column, and I will certainly incorporate it. It won't matter if the issues are purely Australian, as I'm sure readers of "Sailplane Builder" would be interested in it too. Is "hoop pine" used in construction here? There is a local source for this material in 4" x 8" sheets and the price is very attractive in comparison to birch or mahogany ply. See you bi-monthly for now!

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WOODSTOCK BUILDERS FORUM.

By Clint Brooks

I was going through "Design News" the other day, and came across an ad for the company that manufactures the "Lockwell" pins shown on the Woodstock drawings. A few people are under the impression that the ball detent style of pin is unavailable. There are many sources for these pins, the "Lockwell" brand must have been purchased by Jim when he was

making the prototype Woodstock, and the catalog number made it onto the drawings. For those interested in obtaining the specified pins, contact the Hartwell Corp., 900 So. Richfield Rd., Placentia, CA 92670-6788; 800-360-2217 for a free catalog. "Lockwell" is their trade name for quick release pins.

Back to the construction of the Woodstock. At this point, all frames have been jig located, and sanded fair to each other on the sides and bottom utilizing a series of sanding boards, about 1 1/2" wide and 5 feet long to blend the edges. Don't cut any notches for longerons until the frames are sanded to a faired condition. This way, you will cut the notch to the correct depth and angle, and the longerons won't be over trimmed to fair due to any mislocation attributed to a roughed in notch. The sanding takes a bit of time, but it is important to get the inner surface of the plywood skins in contact with the entire surface of each frame edge for bonded strength. I checked the faired condition as best I could utilizing a piece of door skin ply held against the frames and noting any gaps. Even doing this, it is really hard to get an accurate pre-fit. especially when going from station 59 aft through station 110, as this is the most radical area of transition on the whole fuselage. Not until you actually begin stapling the skins on will you see what kind of final fit-up really exists. I would suggest lightly stapling some throw away door skin or similar material to the substructure dry, as you get to the end of what you feel is all the sanding neccesary to the frames, for any area that simple hand pressure is not fully adequate to reveal gaps. With the dummy skin attached, note any significant gaps along the forward and aft edges of the frames common to the skin, and mark for additional fairing. Check carefully again after the longerons are bonded and sanded fair with the frames.

I went through a few cycles on the fairing process, the product of my modifications to make the fuselage a little wider in the shoulders. I made a cockpit mock-up a while back, and using it I developed some offsets to frames 30.5, 47 & 59 to accommodate wider dimensions at the top, without altering the bottom edges, common to the keel and lower longerons. The new frames faired in O.K. to each other, but when I started to fit up the upper longerons, I found that I had a problem between station 59 and 79; with the longerons fitting only by exhibiting some undesirable reverse curvature. So station 79 had to be altered to satisfy the fit of the upper longerons. This looked O.K. until I started skinning, as there is quite a bit of transition in the skin contours between station 59, 79 & 89, which I don't think looks totally right, but isn't too objectionable in terms of the 'oil canning' effect that naturally occurs there. Needless to say, I proved that one little change does indeed result in a ripple effect that I didn't anticipate. All in all, I remade station 79, 59 and 30.5 to fix loft problems that I generated. I am pleased with the result, however, as the fuselage is roomier in the shoulder area by about 1 1/2" over the stock fuselage, and the contour differences are very subtle and virtually undetectable in comparison to the standard fuselage.

After sanding the frames, use your spruce longeron stock to assist in laying out the notches in the frames. I attached 'C' clamps to the jig headerboards and lashed the longeron stock against the frames to bend them more or less into position and develop where to cut the notches in the frames. Layout height and depth on the front and rear side of each frame, and utilize the longeron stock to visually check the slope of each notch layout from front to rear, drawing lines from the ends of the layout lines across the edge of the frames to act as guides for sawing.

I utilized a very fine toothed X-Acto razor saw to cut the notches. I had another with coarser teeth, but the very fine toothed one works the best. I've had it around for many years, and I don't recall the X-Acto part number for it, but I'm sure it is available anywhere X-Acto products are sold. Carefully saw according to your layout lines, and you will need to do very little to finish the notch to a tight fit on the longeron.

In the Woodstock instructions, Jim suggests bonding both pieces of lower longeron stock at the same time. Talking with another builder revealed that the approach is a handful, especially if working alone. I thought at one time it would be easier to bond the longerons to each other first, using the rigged frames as a pre-forming jig. I found when constructing my cockpit mock-up that getting the stock to form together from station 59 to 79 was quite tough to do. So this time, I decided to bond the inner stock by itself to the frames first, as one piece is fairly easy to form and restrain in place. After this has cured, you can easily form the second piece against it, utilizing the first piece to clamp to in addition to rubber band restraints at each frame. This process worked quite well, and the lower longerons were very easy to bond into place. I used FPL-16A to laminate the longeron stock together from station 110 aft to the fin doubler, and into the notches. Apply this glue a couple of times on the edges of the ply frames, as the grain really sucks up the thin mixture. I didn't position the longeron stock until the glue applied to the notches would stay on the surface, indicating that adequate saturation had occurred. on the end grain of the wood. Pull the longeron into place using heavy rubber bands lashed around 'C' clamps positioned near the notches. You will probably invent all sorts of schemes as to how best to get the tension running the right way. I would suggest you clamp everything up dry at first, and make sure your notches have a tight fit on your longeron. Remove the longeron and rework any notches that don't fit well. FPL-16A doesn't fill gaps real well, and you may want to consider T-88 or similar in areas that the FPL glue would probably flow out of, but strive for good joints.

After all the glue has cured on the first set of longerons, pre-fit the second, outer stock, and use FPL-16A to laminate it to the first, and in the remaining portion of the notches. Use rubber band restraints again, but you will need a lot of clamps to hold it to the first longeron and get a good lamination. I used all of my 'C' clamps up quickly, reserving them for areas that required maximum clamping force to hold the stock together. For the bulk of the clamping I made a bunch of simple rubber band clamps as shown in figure 1. I placed these about every 1 1/2" or so, and collectively they work great at holding everything in place. You can increase force by adding more rubber bands, and spacing the clamps closer together. I made it a point to install the left and right hand stock at the same time, working in a symmetrical fashion, to avoid uneven pre-loading which could result in a warped fuselage. Years of model airplane experience has taught this lesson well!

Once the lower longerons are set, you need to pre-fit and install the upper ones. Start by making the longerons with the break to match the cockpit rails. I made a simple layout on my workbench to allow markoff of the angled cut onto the longeron stock (see fig 2). Once I had established the cut angle, I band sawed the excess off, and block planed to the line. Spruce is a great material to work with in comparison to the douglas fir. The two pieces of stock were solvent cleaned at the joint area,

and bonded with FPL-16A glue; the resulting joint being quite strong.

Again, restrain the longeron stock against the fuselage frames to determine the notch configuration at each frame. It's a bit of a chore to cut out a three sided notch in some of the frames, but is otherwise a straight forward process. I used a file to bring in the three sided notches and obtain a good tight fit and match of the longerons to the frames. I bonded the upper longerons in place using T-88, as you are only bonding at the corner of the frames and I wanted the fillet the T-88 gives.

Rough out the keel by clamping an oversize piece of stock to the frames, and mark where the frames end on the inside surface of the keel. Remove the blank and clamp a flexible stick that is as long as the blank to it with one edge touching the outermost point of each frame end, forming a nice spline through these points. Trace this edge onto the blank, and repeat for the opposite side. Refit the blank to the frames, and make sure your curved lines are outside all the frame ends. I cut the blank out with about 1/2" excess beyond these lines for safety, and then bonded the keel onto the frame edges with T-88. The fairing and cutouts are left for later.

After the lower longerons are bonded, add the fillers, which I ran from station 79 aft to the tailpost. I also bonded in the 5/8" sq. doubler on the lower side of the upper longeron in the transition area. Bond in the shear web and blocking on the lower longeron that runs from station 79 to 110, and also the tail wheel doubler ply on top of the lower longerons. After this, use a sharp plane and begin carving the longerons to match the slopes of the frames. This is tedious and physical, and thoughts of buying a used glider enter your mind as you go. A funny transition occurs at station 79 where the notch area gets a filler; see fig 3 for my solution to this.

I sanded everything fair with my long sanding boards after careful planing. Again, pre-fit a dummy skin to check bond line gaps on the frames and longerons, reworking any areas that need improvement. It's tough to assess a good gap on the longerons aft of station 110, and my finished joint revealed some minor gaps between the lower longeron and skin when I turned the fuselage over and inspected the area. I plan to back fill these areas with a thickened mixture of T-88 and micro balloons. I'm pretty sure at least 75-80% of the area on the longeron is bonded to the skins, prior to filling the gap.

I used mylar to make patterns for the skins. I bought 3/32 birch aircraft ply in 4' x 8' sheets from Aircraft Spruce. You can easily get all the 3/32 skins from 2 1/2 sheets. Using this size sheet, I was able to keep the scarf joints to a minimum, with one at station 110, and another at 30.5. I routed the scarf joints using my router jig, after cutting the skin blank to shape from the mylar pattern. On the skin that runs under the stabilizer, I projected the trim edge up beyond the upper longeron to match the contour of the stab skin, leaving an approximate 3/32 gap. This area will be covered by a fillet during the finishing process.

Pre-fit the skin blank to the substructure, clamp and drill 1/16 dia. holes for indexing nails. Mark the inside surface of the skin with pencil around the frame and longerons edges to designate the bond areas. Again, I installed the skins in a symmetrical manner to prevent any pre-load imbalance from instigating a warp in the fuselage.

I bonded the skin from the tailpost to 110 first. Be sure you leave about 1/2-5/8" of skin projecting aft of the fin spar doubler to bond to the fin spar; the net trim of the skin is the aft face of the fin spar. I varnished the area of the skin between 182.5 and 192, as this area is pretty much closed out by the pre covered stab. I sanded the inner surface of the skins with 150 grit paper in the bond area, and solvent cleaned this and the substructure. FPL-16A was applied to all areas, with additional coats applied to the edges of the frames where end grain soaks up the glue. The skin is then positioned according to the index nails, and pulled into place, using a few clamps as required to retain. Check for glue being squeezed out of all joints, and staple the skin to the substructure. Repeat for the opposite side, and let cure. I left all staples in until the fuselage was completely skinned.

After the side skins are on, clean up the edges common to the canted keel skin, and also along the bottom of the lower longerons from station 110 aft. Bond the 3/32 cap skins to the bottom of the lower longerons with the surface grain running perpendicular to the longeron direction.

I worked in the beveled edges of the keel prior to bonding the doubler onto the outside of the keel. Check symmetry of the emerging keel planform shape as you go. I laid out some lines perpendicular to a center line spaced evenly along the length of the keel, about 6" apart. Check the distance from the center line to the edge of the bevel area, and try to get the left and right hand bevel in the keel to be the same distance from the center, as measured along these lines, using a caliper or some other proportional method to check. After the profile of the keel is established, lay out the cutout between station 59 and 79. I used the inside edge of the keel bevel to offset from, as the drawing is not clear in this respect. My variable speed saber saw was set to a 45 degree angle and used to carefully saw this cutout. The sawed edge will required only minor sanding, if you use a fine tooth blade.

Bond the doubler skin in place, and plane it's edges to match the bevel on the keel edge. At this point, you may want to fabricate the wheel brackets just to have in checking the flatness of the area they mount to as you sand it down. I actually laid out the rough wheel opening prior to sanding and removed it, leaving less area to work flat (I was getting tired of sanding by now...).

I am using an aluminum Azusalite wheel, 5" dia x 4" wide (see the Aircraft Spruce catalog) and an 11.00 x 4.00 8 ply tire which is rated at 350 pounds, purchased from Desser Tire. This is the same as the 11.00 x 4.00 Lamb Tire sold by Aircraft Spruce. The resulting cutout runs completely from the bottom edge of station 59 to the forward edge of station 79 at the offset specified from the bottom of the keel, so I think this tire and wheel combination is about right. I made the axle from a piece of 5/8" dia 4130 tube, which I will include the detail of in the next article.

Back to the doubler; sand it flat in the area of the angle wheel brackets, using a sanding block or carefully applied belt sander, after the canted lower skins are bonded in place. You can finish prefitting the wheel cutout and drill the attach holes for the wheel brackets.

One thing to do before taking the fuselage off the jig is to make the filler between the aft edge of station 79 and the top of the lower longerons. As there is already a shear web in place, this filler is non structural, and can be foam or balsa filled. I used some of my leftover one pound density foam to fill in the pocket formed by the lower longerons and shear web, bonded in with a very stiff micro balloon mix to fill all the gaps. The main thing to avoid here is a moisture trap, so fill in completely whatever you do. I bonded balsa filler blocks on top using 5-minute epoxy, with the grain running lengthwise, and carved and sanded to fair with the rest of the fuselage contour. See fig 2 for the skin filler required to make everything flush.

At this point, the fuselage sides and bottom are completely skinned, wheel and brackets fitted to the keel, and fin doubler in place. I am going to install the tail wheel bracket later, so those holes are not drilled. The 3/32 ply doubler is bonded the full length of the keel, and everything is sanded flush. A major milestone has been reached, almost three years after deciding to attempt building a Woodstock!

Time to remove it from the jig, and see what it looks like without all the jig bits sticking out. I fabricated a simple handling dolly from PVC pipe and fittings for about $25.00, utilizing some casters I already had on hand. The dolly was rigged with the fuselage still on the jig, to allow adjustment to the cradle position and a create a more or less level condition when the fuselage is sitting in the dolly. I padded the edges of the cradles with water pipe insulation foam, stapled in place. I really like the dolly, as it makes it easy to work around the fuselage, and clean up after. I don't think it is strong enough for you to sit in the fuselage, but I support the front end by sliding a folding chair under the nose and raising it out of the dolly before climbing in. The back end is strong enough to support the weight.

Lynn Ericksen and myself unloaded the jig by removing the index pins through the frames and then removing all the headerboards from the jig knees. The fuselage is very light and easy to lift off, and presented no problem in handling. What a great moment, to lift a light, stiff structure like this, and set it into the dolly, a stand alone assembly that looks like a REAL SAILPLANE! Needless to say, we stood there gazing at it a long time, like a couple of kids.

Next time, work progress slows down as cockpit items, etc. begin to get located and installed. Until then, don't give up!

FIG.1

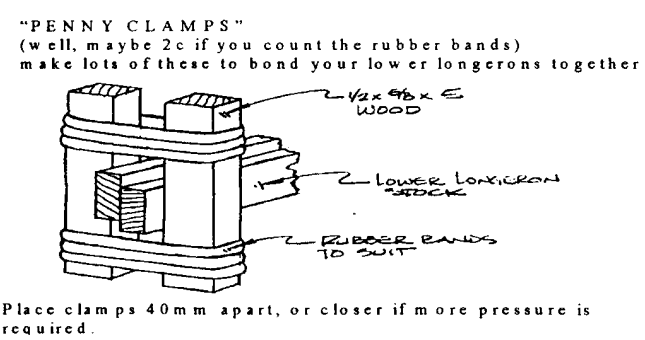
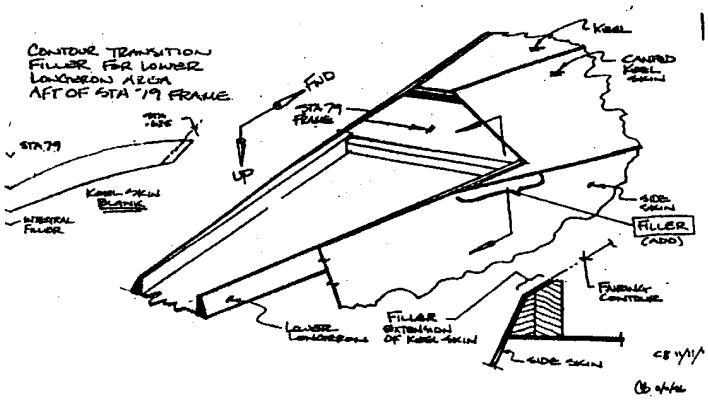


FIG.2



VINTAGE Times

Newsletter of the Vintage Glider Association of Australia
Editor/Secretary Ian Patching
11 Sunnyside Crescent , Wattle Glen Victoria 3096 Australia
Annual Subscription: AU $ 15.00

"SAILPLANE BUILDERS"

Official Publication of
The Sailplane Builders Association
U.S.A.
$29 airmail US $46.00
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AUSTRALIAN HOMEBUILT AHSA SAILPLANE ASSOCIATION

NEWSLETTER

A quarterly publication. Per year AU$ 15. Overseas AU$20
Editor James Garay

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