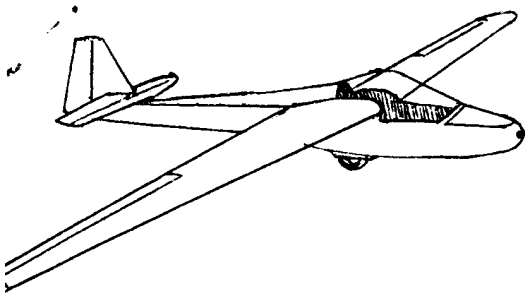

The HOMEBUILT SAILPLANE
ASSOCIATION

P.O. Box 503
LOXTON,5333.
Sth Australia
AUSTRALIA.

Issue – No-1
Oct 94

EDITORS CORNER:

G,DAY FOLKS, Well here it is,the first of hopefully many issues of our little magizine, Like the newsletter I,m new to this game,so if you have any ideas that you might like to see in this magizine, please let me know.

I will try to run member profiles in each issue,starting with the story belonging to Terry Whitford and Peter Raphael, who together have built a WOODSTOCK.

I hope members find it intresting reading about their fellow enthusiasts hopes, dreams and the joy of those dreams coming to reality when their sailplane finally takes to the air.

A few of the ideas that we already have are;building tips,matrial sorces,classified adds, reports on members progress, completions, members profiles,alist of members bits and peices that are normally only used once in a project then stashed away,never-to be used again;[moulds,drill jigs etc], a calender of events of intrest,cartoons and new members,(as the hords pore in).

Hopefully, in time we will have a list of who,s doing what,with what, so that if some--one gets stuck on a section of a project or comes up with an easier way of doing things,we can pass the information on with a minimun of fuss to the other members.

Just in case anybody is intrested in who the culpret is thats responsable for this mess,my name is Mark Stanley,I,m 29,have been flying gliders since 1979,tryed ultra--lights for a while,then came back to gliding when the novelty wore off,I,ve been flying models since year dot,have a Border Collie for my "Best Mate",and own one and a halve gliders, the ONE is a vintage E.S.-56 NYMPH,(Schneider design), and the HALVE is a partly completed WOODSTOCK, which I have recomenced building after buying the project from Trevor Kilmier of Adelaide, who for personal reasons, could;nt finish the project.

Anyway, enough dribble from me for now, on with the fun and games!!!

As mentioned in the genral information sheet, advertising space is available in this newsletter, so if you've got any AVIATION oriented thing to buy,sell,swap,loan of just give away,please let me know and I'll pop it in the next newsletter.

PRICES are as follows: COMMERCIAL BUISNESS"S:$2.50-Quarter page,$5.00 half page etc.

H.S.A. Members: Private adds-FREE! Thats right folks,you read it first here,FREE,
Thats right, something for nothing,Stranger things have happened,
My giddy aunt,Well strike a light,Blow me down,FREE,Strike me pink,ETC

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One only; MONERAI MOTORGLIDER KIT,$3,000 O.N.O.
One only;CHEROKEE 2,Vintage glider,Fully restored,with trailer,$6,000.
For futher details phone Garry Morgan on 6244024 or 6240718(home) or Work-018253466
or write to Gary at 86 Joseph Banks Drive,KINGS LANGLEY,N.S.W.,2147

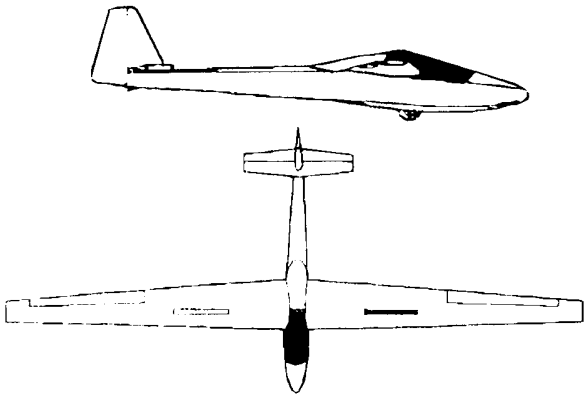
Builder Profile

In our first newsletter for the HOMEBUILT SAILPLANE ASSOCIATION we hope to introduce in a series of profiles people who have completed or are in the process of completing a homebuilt project.

In this edition we will be meeting "Woodstock" VH-HNW and her creators Terry Whitford and Peter Raphael.

Terry and Peter commenced gliding with Sportavia in 1977 and having graduated into the joys of cross country flight soon decided that the only way to own a glider and also indulge their creative abilities would be through homebuilding.

After much consultation and the purchase of plans set no. 157 a workshop ("its car garage!,Dear") was constructed ,materials gathered together and the first pieces cut in April 1982. The first flight was to take place some 8 years later and though this may seem a long time, this in itself lead to



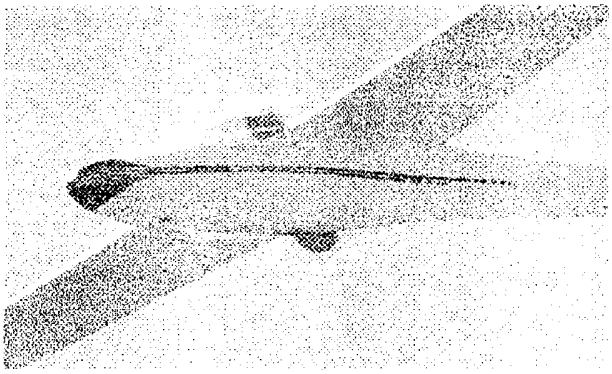
the successful completion of the project. In a partnership the success or failure will depend on the flexibility to pursue a "normal lifestyle" as, and when necessary.

Terry, then residing in Frankston with his wife Carol and three children, had to first construct a workshop before work could begin . He later moved to Lang Lang and then to Beechworth in his job with the then State Bank, these along with the raising of teenage children were no small impediment to be overcome.

Peter, single at the time the project commenced is now married with two young children. His contribution to this delay involved marriage to a suitably understanding partner, home construction and extension of the family. Having the fortune of sufficient workspace at his home allowed the project to be transferred and work continued as opportunity allowed. It was during this time that accomplished Monerai Builder, Malcolm Bennett lent his experience to the project and provided inspiration to push the project to completion.

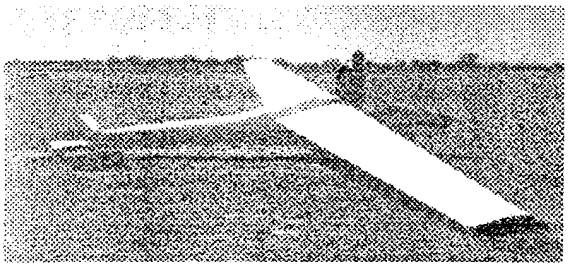
Lets find out some more about the "Woody"...The glider is of conventional timber construction built accurately and closely to the original drawings and incorporates the relevant AN's notified by the GFA. A number of other modifications for which approval has been obtained are extended tips, repositioned rudder pedals, control stops and spring trim . A major modification was the substitution of the cable aileron system in the wings with a pushrod system and though additional time was spent developing this the effort was well worth it. Aside from the lack of need to readjust with climate changes the ability to bring the mass balance inside the wing has removed a draggy appendage. The reduction in breakout forces also provides a lighter and more balanced feel between pitch and roll axises. Thanks are due to Mike Burns for his support and assistance in encouraging and approving these changes in a positive manner during his time as CTOA.

One authorised modification not included was the removable tailplane as this had not been flown when the project began. This has proven not to be a significant disadvantage as clever trailer design has overcome any transportation problems. The glider is finished in ceconite using the Blue River System and this has proven durable and easy to maintain.



On the 12 of March 1990 VH-HNW took off into the cool southerly breeze of a Tocumwal morning.Towing to 5000 feet the aircraft was flown through a sequence of handling tests before returning reluctantly to earth. Thirty three minutes of flight all but erased memories of the years of effort and celebration was the order of the day.

Stalling at 27 knots and being reluctant to spin make this glider a pleasure to fly, often climbing through the thermal inside heavier gliders. Control response is excellent in all axises with the rudder being particularly effective.The top opening spoilers, though not speed limiting are adequate and the view from the cockpit is excellent. Three basic instruments in a walnut panel and an AIR 960 radio grace a cockpit which echos attention to detail. Questions as to whether the project was worthwhile are best answered by the wide grin on the owners faces as they step from the aircraft after yet another enjoyable flight. When one embarks on a project of this nature we are often made aware that our expectations may not be met.This could not be said of the Woody.



Terry and Peter are proud and pleased with the results of their effort and are more than happy to discuss aspects of the project with interested persons. There are many pitfalls and barriers in constructing a glider and having someone to talk to who has been down that road can ease the way.

But this is not the end of the road as Terry ,Peter, Malcolm and Kevin Parkinson have undertaken to bring to completion a "Duster" uncompleted by two previous owners. This path has its own pitfalls but then that's another story!

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Edithvale 3196
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Terry Whitford
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Stanley 3747
Ph. 057 286565

This BUILDER PROFILE of Terry Whitford and Peter Raphael is the first in what I hope to make into an ongoing series, so that all of the members of the H.S.A can get to know each other a little since we are spread out all over the country side.
I would like to request that all members put pen to paper and do a rundown on themself -s and their project even if it not finished or even if it not started yet,and that way it will help everybody to achive their own dreams by knowing that someone else has probally been there before,so, please write it down,send it in, and we will make an article out of it.
Thanks must go to Terry and Peter for starting us off with such a well thought out story of bringing a dream to reallity,and when the DUSTER comes along a little, we'll do a story on that to.

The following is a list of the first batch of members,we will update the list and print it as new members join our group.

NEW MEMBERS: The ORIGIONAL bunch,first to rallie to "the cause" etc

As at the time of writing ,we are slowly gathering a small herd of people together. This is of course good to see, I would like welcome you all to the H.S.A.,and thank you all for supporting us,the folling is a current listing of our group and thier projects.

No-1,Mark Stanley (S.A.) WOODSTOCK. Purchased project 1/2 built from Trevor Killmier.

No-2,Peter Raphael (VIC) WOODSTOCK.Built in conjunction with Terry Whitford.----FLYING

No-3,Terry Whitford (VIC) WOODSTOCK. "SAME AIRCRAFT ↑" Peter Raphael. ---- " "

No-4,Erwin Lackner (S.A.)CHEROKEE/GRUNA BABY. Previous projects completed------FLYING

No-5,Trevor Killmier (S.A.) WOODSTOCK. Sold project to Mark Stanley-

No-6,Vic Kruhse (N.T.) WINDROSE. Still under construction.

No-7,Mike Burns (N.S.W.) BG-12 ~~/~~ CHEROKEE FLYING,Owns AVIATION AND GENRAL ENGINEERING,TOWCUMWAL.

No-8,Brian Berwick (VIC) WOODSTOCK. Still under construction

No-9,Gary Morgan (N.S.W.)Restored CHEROKEE,TERN,1/2 built motor glider,J2 sport and J3 Solitare,and Grasshopper ultralights.

No-10,Donald Nairn,(S.A.)Wants to build aircraft similar to the PW-5

This picture probally has'nt got much to do with building a glider,but I sure that others would feel as I do in saying that I REALLY WISH I HAD ONE at some stage's of my project!!!!!!!!!(just kidding really)

REGATTA

I have spoken to a couple of our members about this subject,I would like you all to let me know what you think about it and we can start to plan for a regatta.

One of the plans is the possibility of joining in with the VINTAGE SAILPLANE ASSOCIAT--ION regatta that they hold each year,this would at least give us and them a few more people to talk to and a few more gliders to have a look at.
The V.G.A. regatta normally runs for a full week,but we could run for the same amount of time or make it less,whatever people wanted.
I have spoken to Allan Ash of the V.G.A.,and he feels that it would be O.K. as the performance of the aircraft is fairly close,and we wouldn't have anybody charging around at 120kts when every body else is doing 40kts!!!!
The main thought is that at the moment we dont have a lot of aircraft in the air at moment,so a regatta by ourselfs may be a bit of non event,but if we join in with the V.G A, we can all have a good time,SO, let me know what you allthink and we'll start the ball rolling for a regatta in 95.

BUILDING ARTICLES

As previously mentioned,building tips will be a part of this newsletter, so to get us off to a good start, Gary Sunderland has kindly given us his permission to do a re--run of his exellent articles,HAMMER AND SOAR,some of you may have already read the articles, some may not have seen them at all,whichever of these you may be,the arti--cles are worth a read.

I will run the articles, one per issue of our newsletter, till we run out.
The first will be an article on BUILDING IN QUALITY, have a good look at the cartoon accompianing the article,it makes you think about too many chiefs,not enough indians!!

Just before we get into Garys article, I'll make mention of the last few pages of this newsletter,they are a new AN,(No 98,issue 1),if you read through it you will find that it is good food for thought,some of you will already have read it but I thought I wou--ld enclose it for the benifit of those that have not seen it.

BUILDING IN QUALITY

HAMMER & SOAR
by Gary Sunderland

Most amateur builders take great care in constructing their aircraft and show considerable pride in the final result. Only people with a deep interest in the construction process itself may be expected to complete an aircraft.

My advice to those interested in saving money on the ownership of a sailplane is to buy a used machine. Building a sailplane is only for people who enjoy working as much (or more) as they enjoy flying.

Most builders start with the aim of achieving absolute perfection. However, the sailplane of our dreams is never in practice achieved.

Despite all care, mistakes are inevitable and many processes in construction involve a learning phase. Thus the builder is forced to reject much of his own work until he learns the proper technique or achieves the proper skill.

In my own sailplane project, I estimate I had to do many jobs three times before I was satisfied, and a lot of expensive material ended on the workshop floor.

While perfection is unattainable, quality is essential to the final airworthiness of the aircraft. Quality is the builder's responsibility and has nothing to do with a gleaming finish.

Many builders like to put in a lot of extra work and effort, such as sanding and painting parts in out-of-the-way corners and in other non-essential work which will be rarely seen.

This reflects a reasonable pride in workmanship and nowadays this is recognised in judging for concours events at aircraft flying rallies.

An aircraft is, however, not like a piece of furniture. This may be beautifully polished on the outside yet contain all sorts of internal flaws and hidden defects while still being satisfactory as a piece of furniture.

Quality in aircraft means not just the final appearance but also structural integrity.

Some assurance of quality may be established by the inspector at the various stages of construction but in the end it is the individual builder who is the main controller of quality.

Few inspectors are equipped with x-ray eyes and the builder is the only one who will know if there are mis-drilled holes inside a joint or if the heat was turned off at some stage during a curing cycle.

The question the builder must ask himself every day as he works on his project is, will I be happy to fly this aircraft one day, knowing this part is fitted inside the aircraft?

If the answer is "no", then the part must be scrapped, no matter what the cost or delay that results from the decision.

Near enough is not good enough for some aspects of building and no amount of glossy paint will make up for a lack of structural integrity. Consider the following case histories:

- A two-seat rebuilt sailplane suffered a structural failure. A main spar repair contained brush spruce. The timber did not meet the appropriate aircraft specification and was brittle. Two people were killed.
- A two-seat homebuilt suffered a wing outer spar joint failure. The builder was working from an incomplete set of plans and had substituted aluminium rivets for the steel bolts called for in the drawing. Two people were killed.

These fatalities were to overseas aircraft but in case you think local builders are better, here are a few examples closer to home:

HOMEBUILDING?

Sets of drawings are available on loan from the GFA Secretariat to help prospective builders decide on a suitable project.

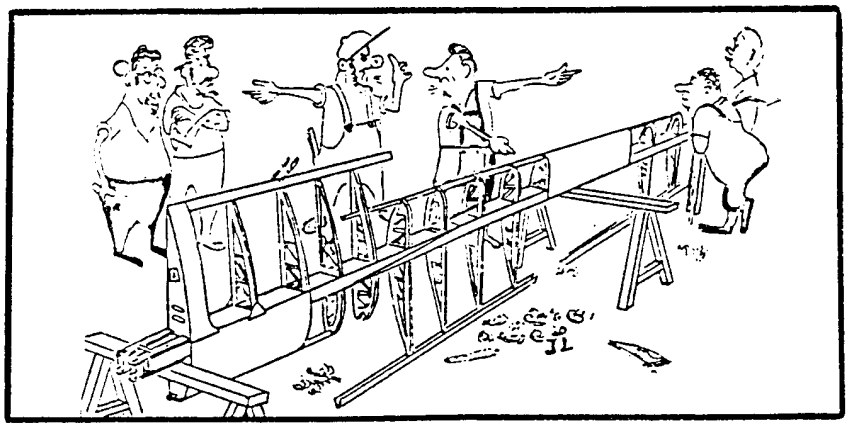
• A homebuilt crashed at a flying display when the ailerons became disconnected. The builders had substituted aluminium for steel in the aileron pushrods. The glider "landed" in a tree and the pilot escaped unhurt.

• A homebuilt disintegrated due to flutter at a comparatively low speed. The builders had modified the control circuits substantially. The pilot baled out and survived.

Incidentally, don't think that making things stronger will necessarily be better. A chain is only as strong as its weakest link.

Assuming the designer has done a reasonable job, the parts will be correctly proportioned on the plans. Strengthening an individual part will lead to increased stiffness or weight which can throw more load onto other parts.

Stick to the drawings or have any changes properly authorised or approved. Quality is peace of mind.



MORE ON QUALITY or Traps for Beginners

HAMMER & SOAR
by Gary Sunderland

"Hammer and Soar" has recently featured articles on quality control by builders and has provided a list of some reputable suppliers.

It is self evident that the airworthiness of any glider can only be as good as the quality of the materials and parts that go into its construction. Hence the need to be confident of the source of your supplies.

Builders should be aware that aircraft materials are not necessarily better or stronger than their commercial equivalents. The difference is that aircraft specification parts come with an assurance of minimum performance which are incorporated into the 'design allowables.'

Commercial parts on the other hand usually note only the mean average values. There is no minimum because people's lives do not usually depend upon them.

The GFA Airworthiness Notes contain some excellent information on materials and specifications and should be required reading for all prospective builders.

It is a hard world out there where you are buying and every builder should be aware that for every reputable supplier there is another looking to take a sucker's hard-earned cash for second-rate goods or even no goods at all.

Your local Sport Aircraft builders can probably tell you a few illuminating stories of such 'gentlemen'.

Apart from the outright villians, there are many well-intentioned but ignorant people who will want to 'help' you by filling your order, not with specification materials, but with something 'almost as good'. In such cases, always refer to your local inspector or State RTO/A before parting with any cash.

This is not to say that aircraft materials cannot be defective. Timber in particular can contain hidden faults which may be uncovered subsequently. Just blame the tree, not the supplier.

The advantage with using a reputable supplier is that he will usually replace any such faulty material free of charge. You don't get that sort of support from a commercial supplier.

This sort of thing must be allowed for in the cost of aircraft materials and this increases the price to you, the buyer. A case of 'you get what you pay for.'

The quality assurance built into an aircraft material is all about selection and inspection. A tree is just timber when it is felled but if it is subsequently selected by an inspector and found to comply with a specification, then it is fit to be included in your glider.

In theory, if you are appropriately experienced and have a copy of the specification, you might select your own timber. However, this usually takes a lot of time and effort which would be better devoted to other aspects of your project. Better leave it to the experts and professionals.

You may have to be involved in selecting your own marine plywood. Remember that commercial plywood may have a core veneer made from any old rubbish as long as the faces look reasonable.

Thus any faulty veneer may be used and usually is, for reasons of cost.

Marine ply is somewhat better, as it is intended for a structural application and the core and hidden veneers should be of similar quality to the faces. Even so, marine ply should be inspected carefully.

You will probably not have this problem if you are building from a kit. Reputable kit suppliers occasionally have things go wrong but will usually stand by the builder. After all, their reputation is their future business.

For example, the Monerai recently had problems with the discovery of some soft aluminium parts found in the USA. John Monnett took effective action to warn Monerai builders worldwide and institute limits and inspections to find defective parts.

This event should not be seen to reflect unfavourably on Monnett. On the contrary, quality assurance activities of this kind should give Monerai builders more confidence in the product.

Incidentally, the GFA is currently involved in studies relating to the use of automotive fuel in place of Avgas in glider tugs in Australia. This is interesting in the context of quality because Avgas is made to meet a specification whereas motor fuel is virtually uncontrolled.

The oil industry advises that the cost of manufacturing Avgas and motor fuel is very little different at the refinery. The great difference in price to the user is the cost of quality assurance in distribution.

Without quality control there is no assurance of safety and the cost of assuring quality is well worth while. Meanwhile, another person can only see two products which seem to be much the same although one is twice the price of the other.

Given that all the elements required for correct functioning of a tug may be critical, to me it seems that filling it up with uncontrolled motor fuel makes as much sense as using coach bolts and fencing wire to construct the control circuits.

Since we have mentioned steel parts, a few words on that subject may be in order.

Low carbon mild steel is often specified and used in glider construction. Ordinary mild steel is quite suitable in many instances and these days the material is invariably weldable.

To some extent, the same remarks apply to some fasteners, nuts and bolts, specified for some wooden gliders in particular. These are quite suitable in certain low-strength applications because of the reliability of low-carbon, low-alloy steel.

Things get a mite more complicated when we become involved with high-strength fasteners and other parts. Non-aviation fasteners are fairly reliable and are widely used in commercially built sailplanes but some selection and inspection is probably involved in most instances.

It is not quite the same with items you buy from your local automotive supplier. Caution is indicated before you incorporate such items into your project.

The traditional hardware for most homebuilt aircraft are AN parts. The

Army-Navy or AN specifications are of World War 2 origin and have since been superceded by the military specifications (MS) or National Aeronautical Standard (NAS) parts.

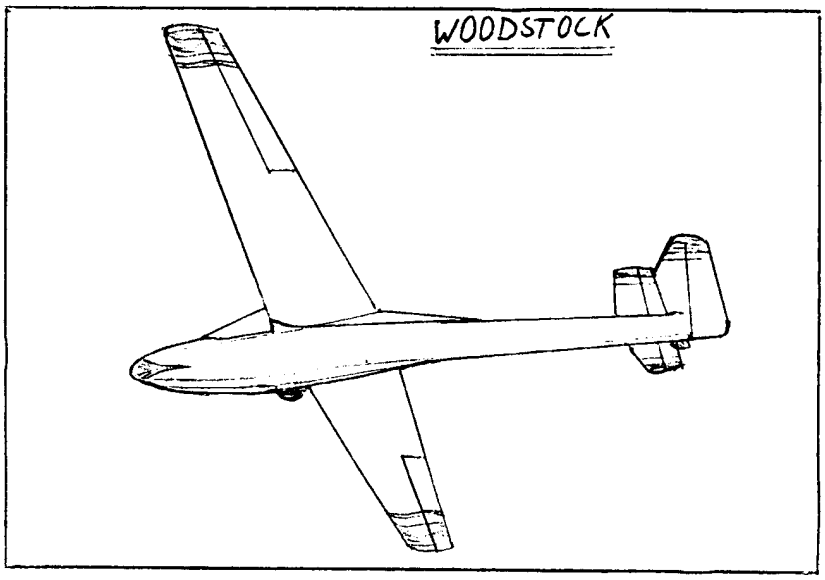
AN parts are still being manufactured in the USA and are freely available through aircraft supply houses. However, the US airworthiness authority, the FAA, advises that as the AN specs are superceded their manufacture is not regulated as for NAS parts.

There have been a few cases reported of AN hardward being below strength, out of tolerance or otherwise not up to the original AN specifications.

When using AN parts, you will find they are much superior in performance to ordinary commercial hardware but check the items carefully for defects such as sharp corners and machining marks.

In particular, check that the fit of nuts and bolts is adequate and that Nyloc nuts are not just holding on the plastic.

My Moba 2 sailplane was assembled mainly with AN hardward and from memory I had to reject about a dozen items out of several thousand incorporated. Among the rejects were a matching nut and bolt without any thread! Hardly a safety problem but evidence of the sort of quality variations present in their manufacture.



THE FINAL WORDS

Ef sum off youz R wurriad bout D spellin,pleez dunt bover ta lett me no,I jus bild Da grider,an wen I gat th munny, I fly da griders.
Ef I spemt al me times loookin at da dickonery,I woodant av tine leff ta tri ta bild me owwn grider,noww wood I?

An ef I coodnt bild da grider,I coodnt pratennd ta no whut Imm talkinn bout,wood I, soo I jus spall et ow et soouns,an ope pepoll don knotis et muchh.

Thes es knott a poligy, butt a statamant, ta kept D letars off conmplant ta a minmun.

Sa gud-by far now an se ya nex isssue,tel them, anjoy ya bildin. ED

If you have a story to tell,whether your project is finished or not, or you just want to share a dream,please send it to me,as this is your magizine and other members may find it intresting and besides, as I said before, I,m new to this newsletter game and want a little guidance in which direction this newsletter should go.

Anyway, thats about it for this issue, I hope you have found it enjoyable and infor--mative,I personally hope that our movement grows in popularity, and that this newsletter grows with that movement.

All the best for now, take it easy and I,ll see you next time.

REGAURDS

Mark Stanley

P.S.-Something to chew on before I go,:THE "GOLDEN EAGLE" IS A HOMEBUILT!!!!!!!!!!!!!

Copy of just arrived AN printed on blue paper Graham R

THE GLIDING FEDERATION OF AUSTRALIA

AN 98
(ISSUE 1)

AIRWORTHINESS ADVICE NOTICE

TYPE AFFECTED: ALL NEW GLIDER TYPES. (Includes local designs, major modifications and first of type amateur-built gliders which have not previously been flight tested and approved.)

SUBJECT: FLIGHT TESTING NEW GLIDER DESIGNS

BACKGROUND: This Airworthiness Note applies to the flight testing of new design, first of type and amateur built gliders, as well as major modifications to existing gliders. (Information relating to flight testing motorgliders and self-launching sailplanes will be the subject of another AN.)

Airworthiness procedures for Amateur Built sailplanes are provided in the MOSP Part 3 Section 48. These procedures cover all classes of amateur builts, including local designs, first of type and subsequently built gliders from a kit or plans.

Major modifications to a glider may require flight testing to establish that the modified aircraft still meets the appropriate standards. Major modifications usually involve external changes to the shape of the glider, such as extensions to the span, or fitting winglets, or alterations to the flight envelope. In such cases this AN may be used as a guide, and any non-appropriate parts ignored.

GFA Members may obtain further advice, relating to their specific projects, from the CTO/A, STO/A, DOO and the Design and Development Committee. This service is not available to persons outside the GFA.

SAFETY CONSIDERATIONS: Some years ago a GFA test pilot was killed when a first of type amateur built glider went out of control on approach. The likely cause was disconnection of the landing flap on one side, due to a lack of positive engagement. Because of the design this lack of engagement was difficult to see when the aircraft was assembled.

Some years before that we almost lost another test pilot who was conducting an aft centre of gravity spin test on a new type glider. The glider had small vee-form tail surfaces and great difficulty was experienced in inducing a spin. Although a number of the type were flying in the USA, it is likely that this was the first spin ever encountered in this type of sailplane. After attempting to recover several times the pilot decided to bail out and unfastened the harness. When moving forward to open the

SIGNED: [signature] CONVENOR DESIGN AND DEVELOPMENT	For and on behalf of: THE GLIDING FEDERATION OF AUSTRALIA

canopy the glider unstalled itself and the pilot regained control. Recovery height was below 1000 feet.

Recently we had another bad accident on the first test flight of an amateur-built glider. Although the type was a proven design, and many examples had been constructed and safely flown in Australia, the accident investigation indicated some queries on the location of the release, the incidence of the tailplane and the loading of the glider may not have been resolved before the test pilot attempted the first winch launch.

From these examples we can see that test flying can be hazardous. Like all flying the potential dangers need to be appreciated and suitable precautions taken to minimise the risks involved to the pilot. Because there are so many factors involved in the first flights of a new glider it is impossible to list them all here. On the other hand the great majority of new gliders, including prototypes, get up into the air and back down again successfully. It is expected that the test pilot will find things which require adjustment or modification, but that is the purpose of the test flight. Each flight should be carefully planned and alternative courses of action worked out in advance to cover the various emergencies which might occur.

All of those persons who have been connected with any phase of the design, construction, modification and inspection of the glider, have a duty to ensure that their work was carried out to the appropriate standards and that all required information is provided to the pilot and to the CTO/A.

BUILD STANDARD:

The build standard of the aircraft must be established and documented at the outset. In the case of an amateur built glider the design data will consist of all of those drawings and construction manuals specified by the designer, plus other design documents to control any changes which the builder may have made to the glider during construction. The aircraft must be inspected to ensure that it conforms to the design data. The builder is required to maintain records of stage inspections and complete a Construction Certification. It is the builders responsibility to ensure that documents exist to describe each item of hardware and for any changes made.

Builders should be aware that relatively minor changes to materials and processes may adversely affect safety. For example different rivet types have different shear strengths. Minor changes to materials can also lead to unexpected results. For example nylon bushes can cause rapid wear to steel parts. Any questions relating to specifications, parts substitutions, repairs and modifications, from the builder or inspector, should be referred to the RTO/A or the STO/A. The more complex changes will need to be referred to a person who is qualified to approve the design of modifications and repairs.

DESIGN ENGINEERING: In the GFA we are fortunate to have a number of qualified and experienced design engineers available to be consulted. The GFA Design and Development Committee can also provide advice relating to the certification of amateur built sailplanes and the more complex modification projects.

Any person may attempt the design of a new modification, or even a complete sailplane. Formal engineering justification will be required, to comprise part of the type record for the project, so appropriate engineering qualifications are necessary. Even if the person is well qualified and experienced they will need to work with a consultant or the D&D, to organise checking and obtain the eventual approval.

The design standards to be observed will normally be the current OSTIVAR or JAR 22, as called up in CAO Section 101.26. Modifications to existing sailplanes may be carried out to the standards current when the type was approved, unless specific features are known not to be satisfactory.

For amateur category sailplanes, which have been accepted on the basis of a demonstrated history of safe operation, the standard of the modification should be at least equal to the original design. Designs originating in the U.S.A. and flying there in the EXPERIMENTAL system, may be assumed to comply with the FAR 23 and the Basic Glider Criteria handbook. If no aerobatic manoeuvres are claimed the sailplane should be assumed to be in the NORMAL category, as far as the flight envelope, flight testing, and eventual clearance for manoeuvres is concerned.

INSPECTION: During construction an assigned inspector will have completed various stage inspections. These are organised to examine each part of the structure immediately before it is closed up.

Following completion the sailplane will be subjected to a "Form 2" inspection against the usual glider airworthiness standards. Where new construction is involved particular attention should be paid to the alignment of parts, by sighting from a distance, recording the actual incidences and deflections achieved, not just that they are within limits, and checking the controls for binding and friction. Normally there will be some excess paint to remove. Load the control surfaces in each direction and re-check clearances through the total deflection. It is appropriate to involve the test pilot in this part of the inspection, and also to clear the cockpit layout. Check combinations of controls together, against interference, and recheck with covers and cushions in place. Blow out the instrument lines and make sure that they are free of leaks. Ensure that the ASI is freshly calibrated.

Note that it is sometimes not possible to complete all of the items on a Form 2. For example it is not possible to make and install the limitations and loading placards until the flight tests are completed and the data is computed. Just note any items which are missing and any items of test equipment which are installed.

WEIGHT AND BALANCE: The builder should be aware of the need for weight control during construction, particularly if it is a small glider. Heavy control surfaces, too many modifications and excess cockpit furnishings can reduce the airworthiness and utility of the sailplane.

Each new sailplane must be weighed on completion. Some sailplanes subject to a major modification may also need to be re-weighed.

For the initial flights of a new sailplane the weight and balance inspector should concentrate on loading the aircraft in the centre of the nominated range. After weighing the glider empty, have the test pilot occupy the cockpit, in what is the optimum position for operating the controls. Note that the wearing of a serviceable parachute is mandatory for the first flights in any sailplane. For added support do not use thick cushions. Rather blocks of rigid foam plastic which are taped to the seat. Comfort here is secondary to safety. Calculate the position and weight of fixed ballast to achieve the desired central loading. After bolting the ballast to the correct station, re-weigh with the test pilot on board to confirm the result. Note that some small gliders may be "pendelled", or balanced on a piece of angle iron to check the C.G. position.

Subsequent tests will require the aircraft to be loaded to number of C.G. positions. At this early stage make only general allowance for this ballast. For instance provide longer attach bolts. The future test C.G. positions and ballast required will depend on the evaluation of results from the initial test flights.

TYPE INSPECTION: This is required for first of type sailplanes, including any amateur builts which happen to be a first of type. As noted in the MOSP 48-8 the CTO/A will direct whoever is to carry out this inspection as to the details and reports required.

This person should be particularly alert for any design features which appear to be unusual, or different from other sailplanes. Gliders have evolved by rejecting features which have been found to be unsatisfactory in service. Even so, an unusual design feature may acceptable, or even an advance on existing gliders. Report on the feature as you see it.

TEST FLYING : A flight test program should be drawn up for each new design sailplane which will include specific test schedules for initial flights, followed by a step by step expansion of the flight envelope, leading to critical flight test demonstrations.

Because amateur built sailplanes usually vary to some extent from the type design, each new glider of this category should follow the same test regime. If examination of the data indicates that the glider appears to be similar to an aircraft which has been previously been tested and approved, then the CTO/A may decide not to repeat certain tests.

INITIAL FLIGHT TEST SCHEDULE: At the time of application for an initial Permit to Fly it will not be possible to draw up a complete program of schedules for all tests. However the "APPLICATION" must include all of the information listed in the MOSP 48-9, plus sufficient information to enable the CTO/A to draw up an initial test schedule and issue a Permit to Fly. The following will be required;

THE TEST AREA. Built up areas are to be avoided. This is usually not a problem at gliding sites.

THE PILOT. The requirements are laid down in the MOSP 20.5.4. The level of skill and experience required for testing new design, or prototype, sailplanes is considerably more than is required for post-maintenance checks on approved sailplanes. As noted above a newly constructed sailplane of an established type may also contain a few variations from standard which need to be sorted out. The nominated pilot should have extensive experience flying a wide variety of aircraft. If the type to be tested has certain characteristics, then the pilot should be experienced on a similar design. Any queries should be addressed to the Director of Operations.

THE SCHEDULE will confirm the weight and C.G. location for the first flights. It will also nominate the speed limitations, which should not be more than 0.9 of the structural limiting speeds during the initial flights.

The purpose of the first flight will be to carry out a brief qualitative assessment of the control handling and to determine if there are any features which need to be fixed before testing begins. All controls should be functioned at altitude and low speed handling should be investigated. The glider should NOT be fully stalled at this stage.

THE LAUNCH METHOD<S> will be nominated. Aerotowing from an aerodrome or large field is recommended, as this enables the pilot to lift off and try out the controls gently before starting to climb. When wire launching this check is best carried out from a car tow. The field should be large enough to allow plenty of room for a landing at any stage of the flight. Wind strengths of up to 20 knots are usually not critical, provided the crosswind component is close to zero. Winch launches should only be scheduled after the gliders pitch control has been demonstrated to be adequate.

DE-BRIEFING: After the first flight the pilot should be thoroughly de-briefed by the designer and/or the person nominated by the CTO/A. If no major modifications or adjustments are required then the formal part of the initial flying may proceed. Some adjustments will normally be required. If the adjustments are major, then the procedure for design, inspection and initial flight test must be repeated. At all stages the CTO/A is to be informed of these developments.

INITIAL TEST FLIGHTS: Following the first qualitative assessment that the sailplane appears to fly normally, the next stage is to obtain some test data. Stick position, and thus elevator angle, should be measured against indicated airspeed. This requires some sort of crude, but moderately accurate, measuring scale to be mounted in the cockpit.

Next we need to measure the static position error over the speed range. This requires an additional calibrated ASI in the panel, plumbed to a trailing static source. This is located at the end of 15 metres or so of plastic tubing. The GFA can provide details of a cheap and accurate trailing static system. It is possible to obtain the data from just one flight, but an aerotow to about 6000 feet is necessary.

The margin of control in pitch, at the mid-C.G. position, is determined from the plot of elevator angle against true air speed. If an adequate margin exists we can proceed to the next step.

FURTHER FLIGHT TESTS: The flight test program should then proceed methodically to expand the test envelope to the sailplanes design limits. At each stage the data should be evaluated, to determine if it is safe to proceed to the next step. The major goals in this program will be;

Measure elevator angles at various C.G. positions, flap and/or spoiler positions. Measure control forces. Determine the neutral point and stability margin.

Determine the stall speeds at various flap and/or spoiler positions. Check low speed handling and stall behaviour from straight flight and turns at various C.G. positions.

Establish freedom from buffet to the demonstrated diving speed.

Demonstrate spin recovery at various configurations and C.G. positions. (See below.)

If, at any stage, a problem occurs or is foreseen, the designer or the CTO/A may elect not to proceed further. This means that the type's approved flight envelope may be within the design structural envelope.

SPIN TESTING: The spinning trials for a new design sailplane are such a major and critical part of the flight test effort that it is worth special mention. Assuming that the rest of the flight envelope has been cleared, the stall and high speed dive tests have been completed, then we are ready to start spin testing.

The least requirement, to permit a gentle stall only clearance in the FAR 23 NORMAL category, is an attempted one turn spin and recovery with normal controls applied. This is the minimum flight demonstration that the GFA insists that all sailplanes should undergo for the issue of a C of A in the amateur-built category. Note that the MOSP 48-9 (3) refers to "Extended Aft C.G. Limit" tests. These are only applicable to gliders designed to the BCAR-E.

Spin tests are conducted at height and away from built up areas. The test pilot should have a definite plan of action in the event that the sailplane does not respond to normal recovery action. For example Vee and Tee tailed gliders will sometimes recover better with no rudder applied and forward stick. The bail-out height should be set at no less than 1000 feet above the terrain.

Start at the most forward C.G. and work backwards. Tail ballast, if required, may be jettisoned in flight if it is water or sand. This can provide an additional means of safety during the critical test. A tail parachute might also be considered as an alternative, although deployment may not be as reliable as dumping ballast.

Many sailplanes, particularly amateur builts, will exhibit different spin modes between left and right, due to slight inaccuracies in the wings. This is acceptable as long as each recovery meets the requirement.

If a full spinning clearance is desired (for an amateur-built type) or is mandatory (as is the case for the JAR 22 Requirements) the above procedures are then repeated for two, three, four, and finally five turn spins. These demonstrations will take up a great deal of flight time, and should be organised to take advantage of good soaring weather, unless there is lots of money to pay for the aerotows. The test pilot needs to be methodical and cautious. Any tendency for the spin to flatten and/or increase in rate should be thoroughly investigated before proceeding to the next series of tests.