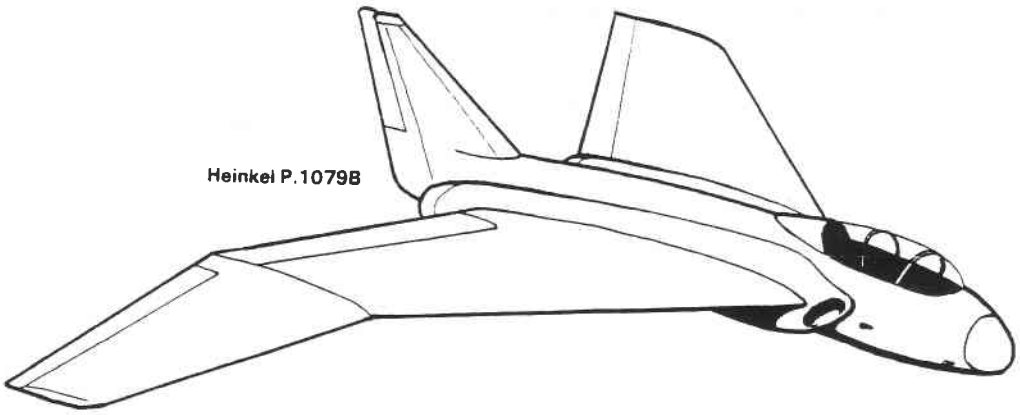
No. 77 NOVEMBER 1992

T.W.I.T.T. NEWSLETTER



Heinkel P.1079B

This twin-jet night fighter was one in a series of five. The P.1079B bore a strong resemblance to the first in the series, though the tail and rear fuselage had been deleted to result in a flying-wing layout. The wings were gulled and swept at 45 degrees. Seating for the 2 man crew was staggered, permitting the nose to be shortened. A second version of the P.1079B approximated more closely to a true flying wing, the fin being ommitted. The gulling of the wing was more pronounced and the wingtip anhedral increased. The engines were more widely spaced than in previous designs, allowing the main undercarriage to be accomodated between powerplant and fuselage. (From David Master's German Jet Genesis, Contibuted by Kevin Renshaw)

T.W.I.T.T.
(The Wing Is The Thing)
P. O. Box 20430
El Cajon, CA 92021

The number to the right of your name indicates the last issue of your current subscription, e.g., **9211** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, November 21, 1992 beginning at 1330 hrs at hanger A-4, Gillespie Field, El Cajon, Calif. (First hanger row on Joe Crosson Drive - East side of Gillespie.).

THE WING IS THE THING
(T.W.I.T.T.)

T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other types of tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is an affiliate of The Hunsaker Foundation which is dedicated to furthering education and research in a variety of disciplines.

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Meetings are held on the third Saturday of each month, at 1:30 PM, at Hanger A-4, Gillespie Field, El Cajon, California (first row of hangers on the south end of Joe Crosson Drive, east side of Gillespie).

PRESIDENT'S CORNER

First off this month I must make a couple of apologies for some major foo-pahs this past month. I owe one to Ferdinando Gale' for citing his book in our advertisement section as Tailless Tail instead of its true title of Tailless Tale. I also owe one to Budd Love for overlooking getting back to him during the meeting, therefore not allowing him to buy a raffle ticket for the Horten book. Gentlemen, please accept my apologies.

Just a quick reminder this month so you can plan your holiday calendars. There will be no December meeting (this has been traditional), so this month's will be the last for 1992.

I would like to thank Harald Buettner for putting on a excellent program last month. As you will see, he has provided sketches of some of the techniques he described, and we hope they help some of you building both full size and model designs. Unfortunately, this is one of those subjects that you can't just listen to on tape and figure out what is being explained. However, if you are interested, and think you might get something from the tape, send $3 US ($4 foreign) and we will be glad to forward you a copy.

As of publication date we hadn't received any mail offering opinions on Jim Loyd's latest version of his Boomerang design. I am sure some of you have ideas about where improvements could be made or could confirm a concept as described in Jim's letter. It's never to late to contribute, so if you do have any comments, please jot them down and send them to us. We will publish some or all of it so everyone can benefit from the interchange.

The modeling world has two articles this month on the Klingberg 100 flying wing. Both are only a magazine page + long, so if you are interested and don't subscribe, you might just go to your local newsstand and quickly peruse them before you decide if it worth buying. Apparently, the aircraft has its good and bad points, but overall seems to be a good flier once properly balanced and trimmed.

We can't emphasize enough the fact that TWITT exists to help you exchange ideas and information on flying wings. So, keep us informed of your projects and ask us questions so we can try to get you answers.

Andy

TABLE OF CONTENTS

NOVEMBER PROGRAM

This month we will be featuring **Bruce Carmichael** covering the recent SHA Western Workshop held over Labor Day weekend at Tehachapi. He will be going over some of the more popular aircraft from the design contest, that we announced last month was won by TWITTer Reg Todhunter with a conventional design.

We have included in this issue a collage of the various designs, and the 8 1/2x11 drawings and specifications will be available for viewing at the meeting.

Bruce will be using slides shot by Bob Fronius to also show some of the types of activity that went on at this excellent workshop.

Hardware for the meeting will be provided by **Floyd Fronius** bringing in his Regallo type hang glider. He also will tell us about the truck mounted winch system that was used again this year at Tehachapi. This appears to be an excellent way to tow a hang glider, since it has a means of controlling the drum's pay-out rate allowing the cable to get longer (yes, longer) as the tow progresses.

Also this month we would like to have some input on Jim Loyd's latest design published in last month's newsletter. Please take another look at it, form your opinions, and let's discuss them. This has worked well in the past, and Jim has made design changes based on this type of feedback.

This looks like a very interesting meeting to wind the year up with, so please mark your calendar.

MINUTES OF THE OCTOBER 17, 1992 MEETING

After getting the sound equipment working so everyone could hear, Andy opened the October meeting.

Andy thanked Bernie Gross for donating a video tape of a quarter scale model of his Pioneer II "Deaf Hawk" flying wing, built and flown by B^2. The second part of the tape was a bat type glider doing some slope soaring, followed by a large scale version of the XB-49 being launched in very high winds. The last part is some coverage of the recent model flying wing contest at Taft. Bernie indicated there wasn't a very good turnout, and the models were disappointing.

The raffle prizes for the day were H.P. Dabrowski's book The Horten Flying Wing in World War II, and a TWITT hat.

The first part of the program was a demonstration by **Ed Lockhart** of his **Twirltail Trimotor** rubber powered indoor model. This is a unique craft, whose tri-plane tail actually rotates as the aircraft flies. Ed's handout describes it this way:

"Twirltail's design revolves around its tail, of course. Until now, no tail has ever revolved around anything. Twirltail turns its tail COUNTER-clockwise, to counter torque from the main propeller. Wingtip propellers counter-rotate too, mainly because we couldn't brag about it if they didn't. They are powered by wingtip vortices, thus generating thrust scot-free. It won the indoor event at the Mississippi Valley Contest in St. Louis with a flight of eleven minutes and six seconds. This was in 1932!"

Under the heading of "Additional Scientific Data," Ed commented, "Knowing the importance of keeping the tail end of an airplane as light as possible, brought about a brilliant design consideration: Astute observers will notice that Twirltail's two-tone colors have the LIGHTEST blue on the tail."

He finishes with: "P.S. There's a great deal more, but that might bore until you snore, or ruin rapport, so we say no more."

We will say that the little craft flew quite well in the confines of the small T-hanger, successfully demonstrating that a tail can also revolve and that wingtip propellers can be made to work.

After gathering everyone back into the meeting area, Andy introduced **Harald Buettner**, whose program for the day was to explain methods for constructing composite structures without making complicated forms and molds.

(Ed. Note: Harald has provided a few sketches of the types of techniques he says could be used. There were many more than those presented here and, hopefully, you will be able to get a general idea from the explanation. Also worth noting was that Harald talked about this in terms of a full size aircraft, but the same techniques could be used for building scale models.)

Harald only covered the area of construction and did not get into types or weight of cloth, how to lay cloth for maximum strength, etc. His presentation was primarily geared towards the basics without using full foam blocks, and making a single version of a design.

He started with a glider fuselage as a means of demonstrating the "how to" build. The first step is to establish the shape. You start this by building a backbone that can be mounted between two tri-pods so it can be rotated as work progresses. The backbone can be made of a large diameter aluminum tube, such as an irrigation pipe, or a built-up plywood box. Either of these are connected to the tri-pods with a smaller diameter rod/pole. If using the plywood box, orient it so one of the corners forms a peak at the top.

Bulkheads that will support the basic shape are then attached to the backbone. These can be made of almost any material, just as long as it will remain stiff and maintain its shape. Things like cardboard, foamboard, masonite, etc., are all suitable. They are mounted to

the backbone about every foot by splitting them in half, cutting out the backbone shape, and then adding doublers to ensure they stay in place and together.

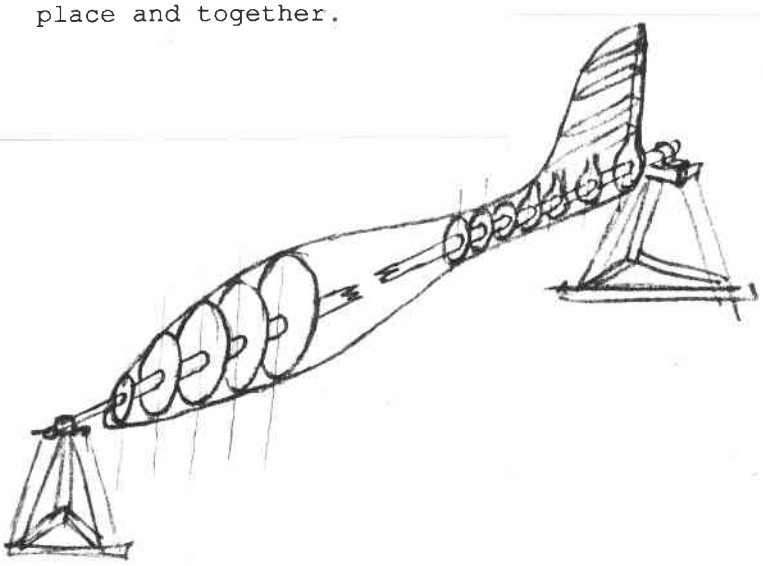


FIG. 1: FUSELAGE FIXTURE

The foam, about 1/2" thick, is planked onto the bulkheads similar to building a boat hull. Glue this sheeting to the bulkheads in such a way that the foam can be separated later without completely destroying it (hot glue might be good here). Some areas will allow using larger sheets as one piece, where more complex curved areas will need smaller pieces spliced together. Every piece should be glued together with the same resin that will be used for the outer/inner skins. The foam then needs to be filled and shaped to the designs specifications. Use microballoons or other material to add bulk to the resin.

Since the whole structure will have to be cut down the middle into two halves, you need to sand in a small recess along the center of the top and bottom of the foam. This should be about 4" wide and about as deep as a couple of layers of cloth. More on what will happen here a little later.

Now you are ready to start laying on the cloth over the entire structure. This includes covering the canopy area, which will be cut out much later in the process. Once the outer skin has cured, you make your cut down the center line to create two halves. Pull the bulkheads loose and throw them away, since the shell will maintain its shape at this point.

You now have to sand the inside of the foam to a reasonably smooth surface without thinning it anymore than possible. At the top and bottom joint areas, you cut the foam back at an angle to leave just the glass skin. At this point you glass the inside of both halves to form a glass and foam sandwich.

Before putting the two halves back together, you have to make and install any necessary bulkheads, including the ones for the wing mount. You can take imprints from both sides for transfer to the foam to ensure the bulkheads will fit properly against the skins.

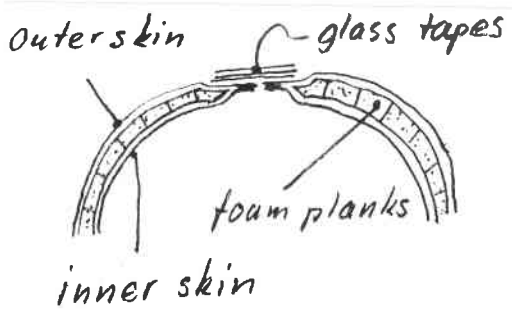


FIG. 2: FUSELAGE CROSS SECTION

The bulkheads are mounted to one half using resin and tape to ensure a good joint where they meet the inner fuselage skin. If you are using thinner foam, you can add some foam doublers along the outer arc to give more bonding area where the bulkhead meets the shell skin. You will also need to make some sort of jig to keep them aligned properly until the resin has cured.

When mounting hardware to a foam sandwich type bulkhead, make sure to put in high density plywood or aluminum hardpoints where the attachment bolts go through before applying the glass cloth. This will provide a crush proof area for the bolts.

The wing torsion pin bar can be mounted on top of the bulkhead by either welding U-shaped straps over it that come down onto the bulkhead, or by laminating it on with multiple layers of cloth. Don't forget to put in hardpoints where these bolts go through to carry the loads. If laminating, make sure there is at least sufficient overlap on each side to provide the necessary shear strength loads.

Once all of the bulkhead work is completed, the two halves are ready for joining. Make sure you dry fit everything before trying to actually glue them together. You want the best fit possible of the bulkhead to the remaining skin so the joint has the most load bearing capacity as possible. This will also give you a chance to coordinate putting everything together quickly, since the resin has a limited working time.

When joining the halves, lay your cloth down into the recess along the joint. The two inches on either side of the joint should give sufficient shear strength. It will take several layers, and when you get through the recess will almost be filled. This will make later finishing easier than trying to feather in tape laying on top of a butt joint.

Once both halves are joined, you can cut out the canopy area and any other access holes necessary, like for the spar and torsion pins, the wheel well, etc. This will also give you access to some of the bulkheads to add any necessary reinforcing tape or cleaning up residue.

Cutting out the canopy leaves an open end

of the glass and foam sandwich. This is structurally weak and must be finished off. Harald recommends cutting the outside skin down about 3/4 - 1" and cut away the foam. Now take glass tape and cover this from the outside skin over the exposed foam and up the side of the inside skin. This will restore the sandwich's strength.

There are several ways to finish this rail area. One is to put unidirectional roving all around the frame and then fill in the remaining cut down with resin and microballoons. Or it can simply be filled with resin and microballoons, depending on the degree of strength called for in your plans. You can also take this opportunity to build in an overlapping canopy rail to provide a better seal between the fuselage and canopy frame.

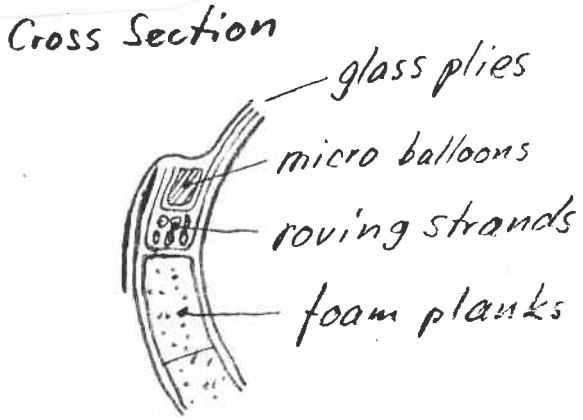


FIG 3: CANOPY FRAME

Once all of the detail work is completed, the basic exterior finish can be started. This will require sanding the rough areas down, without cutting into the structural cloth, filling, and sanding, etc. There are several types of filler, so find the best one suited to the resin and weight restrictions of your design. Harald recommends stopping once the primer coat has been reached, since fitting the wings and tails may require some reshaping of faring, etc.

Harald now moved on to constructing the wings for this composite glider. Although you can build them with a solid core of foam there is a point where this becomes heavier than using the sandwich method. Generally, a wing thickness over 10% should use the sandwich, but things like horizontal and vertical tail surfaces might be lighter, and easier if you use a solid block of foam. This also goes for building the control surfaces.

For the main wing surfaces, Harald described a procedure presented by Robby Grove at the 1991 Tehachapi workshops which uses a type of negative mold.

This "mold" starts with particle board negative shape half ribs spaced at about 1' to 18" apart. Length-wise along these are run recessed stringers spaced about 4" apart on the sharper radius and somewhat further apart on the lesser curvatures. As can be seen in Fig. 4, you are creating sort of a tray to lay the foam into and then installing the inner laying of glass. Make this a little longer than the actual wing so you have some excess to work with when fitting the tips.

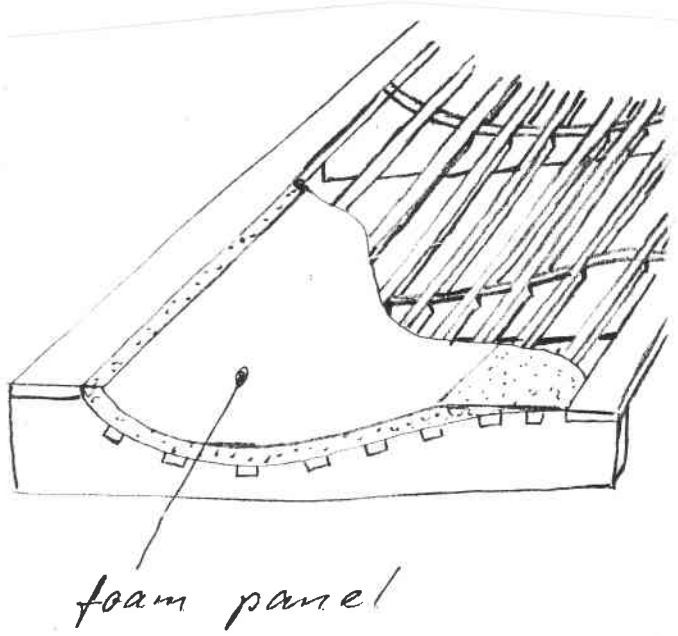


FIG. 4: WING FIXTURE

Into this dished out mold you lay in partially scrimbed foam core material. The scrimb should run spanwise only, which will give it the flex that is necessary to make the curves. Individual planking can also be used with each plank about as wide as the distance between the stringers. They should be glued together and attached to the stringers. Gluing either the sheet foam or planks to the form can be done with something like hot-melt glue, since it cools quickly and only pulls out a small piece of foam which can be filled with microballoons before putting on the top sheet.

Before glassing, cut the foam off along the chord line so it is even with the top of the form. Now lay the glass in all the way to the trailing edge, except where there would be control surfaces, which do not have to be covered at this point.

Now you attach the built-up foam and glass main spar, all the control mechanics, and if its in the design, a closeout spar. Put in any root or tip ribs, etc. These all should be jigged to ensure they are put in the correct location.

Harald suggested creating a quick mold for something like the closeout spar by using 2x4s or similar size wood. Two pieces are attached to a flat surface for the length of the desired spar, the inside waxed so the glass won't stick, and then lay in the cloth. If you need something other than a right angle, plane off one side to the desired angle and then make sure the cloth has a nice radius turn within

the sharp corner. Don't jam the cloth into the tight radius or you might break the fibers and reduce its strength.

When making this type of spar, make sure to include any wood or aluminum hardpoints for hinge attachments, etc., as you put on the layers of cloth. Depending on your design, nut plates could be attached to the hardpoints so the surfaces will be easier to remove, if it ever became necessary.

Harald talked briefly about using honeycomb versus foam for construction. He feels that foam is much better overall for a number of reasons. Foam is easier to form, it is not as porous so it doesn't absorb the resin or provide pockets for resin to collect, and foam is more water resistant over time.

Back to wing construction. The other half of the wing is built in the same fashion, other than installing the spar and hardware. Once both halves are complete, it is time to join them. The halves are left in their respective "molds" for this process.

Make sure you dry fit them to ensure everything fits as close as possible so there will be good bonding. If there are gaps, use resin and/or microballoons to reduce them as much as possible before final assembly. Once satisfied, apply the bonding agent and secure the two halves together until its set.

The basic structure can now be removed from the "mold" so the outer surface can be smoothed and the skin applied. This is sort of a reverse process from the fuselage, where the outer skin was put on first.

Joining the halves at the trailing edge is usually not a problem, since there is plenty of surface material to work with. However, the leading edge takes a little more work to ensure it has structural integrity.

Take one of the "molds" and cut away part of it at the leading edge area so you have room to work when wrapping the skins around. As seen in Fig. 5., you need to sand a recess into the foam about 2" on either side of the joint. The depth should be equal to about one layer of cloth so when finished the surface is almost flush.

Although the Fig. shows a single overlapping tape across the joint, Harald described a slightly different method. When laying on the first outer skin, overlap it into the recess on the other half. Once the whole thing is turned over and the other skin applied, you bring it around into the recess. After it has cured, you can feather this last overlap to come out even with the surface.

Harald recommends making your tips as a separate item. Simply put a piece of foam against the squared off tip, draw a line into the foam, then sand it to shape allowing for the layer(s) of cloth and resin.

The unfinished tip ends on the wing surface need to be closed up in a manner similar to the canopy rail. Depending on which way you cut back the skin and foam, you can reverse the procedure on the tip so that they overlap instead of butt joining. This is much stronger and gives the sandwich structure greater integrity.

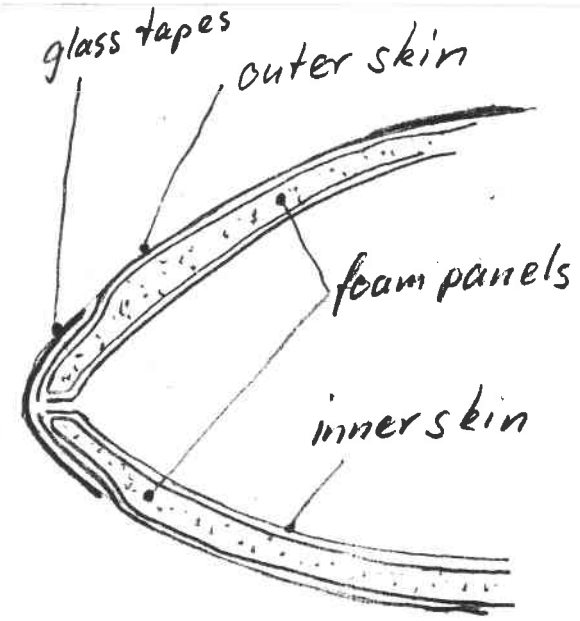


FIG. 5: LEADING EDGE

Harald wrapped up his presentation answering a few questions about some techniques.

During a short break in the presentation, the raffle was held, with Tuto Figueroa winning the Horten book, and Bob Chase winning another TWITT hat.

Bob Chase asked about Jim Loyd's design and whether we were going to cover it. Since no one had anything specific to say, we deferred it to next month, also in hopes of having some input from the general membership. With that the meeting was adjourned.

LETTERS TO THE EDITOR

9/29/92

TWITT

If my assumption is correct, reader John Karlovich (page 4 of Sept. 1992 newsletter) is asking for the coordinates of the Liebeck airfoil #33, often referred to as Case A Liebeck airfoil, as in the attached excerpt taken from AVIATION WEEK AND SPACE TECHNOLOGY, Nov 13, 1972 (by Donald E. Fink, pp. 45-47).

Please find here enclosed the profile of said airfoil, as well as the coordinates for a projected chord of 9.436": both are taken from "An Experimental Investigation Of An Airfoil Optimized For High Lift" by R.E.

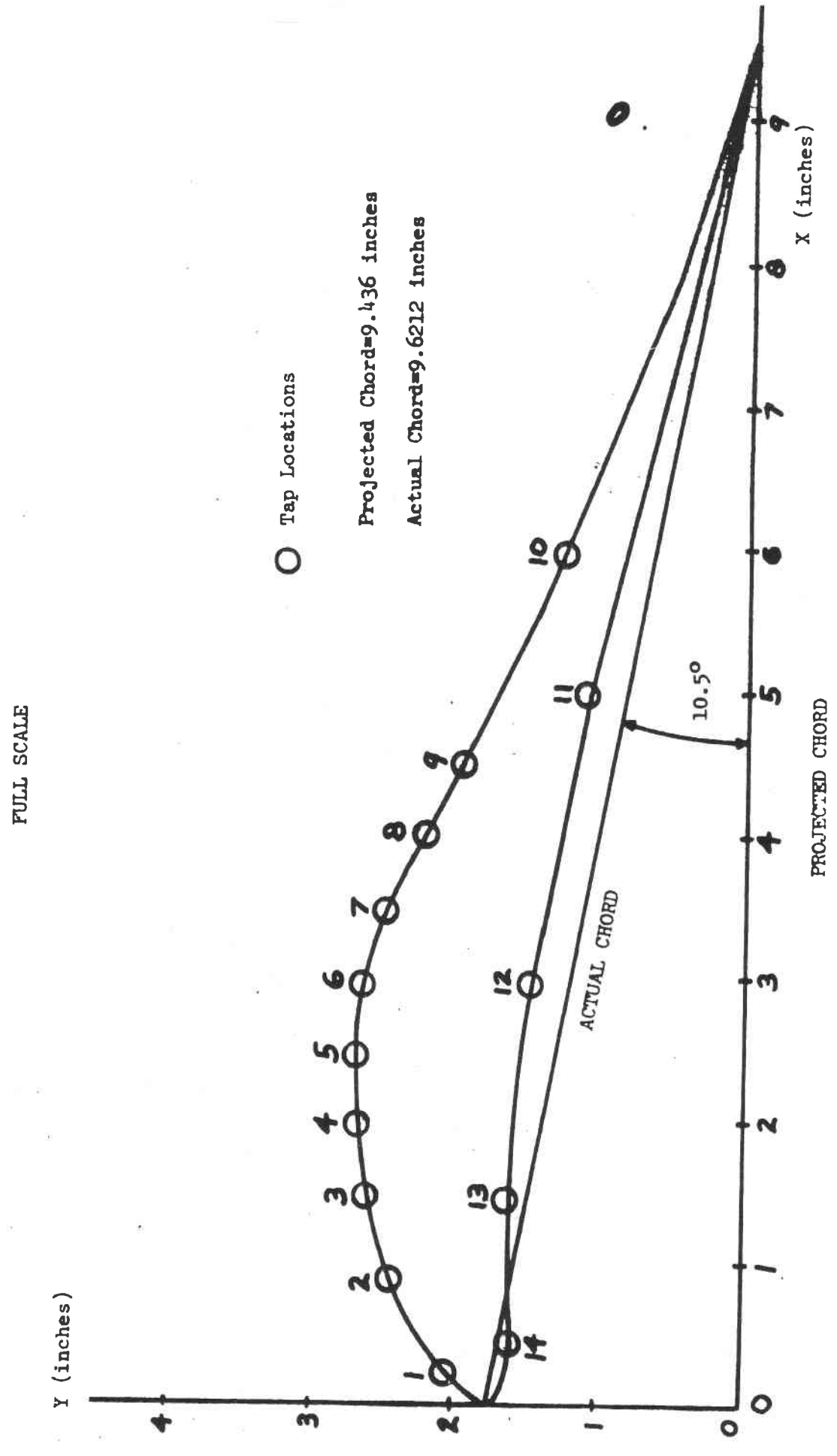


FIGURE 2. Profile of Liebeck Airfoil #33 and Tap Locations (Reproduced from Figure 5 in Reference 4)

Liebeck Airfoil #33 Surface Coordinates for a Projected Chord of 9.436 inches and a Coordinate System as that in Figure 2.

BOTTOM SURFACE

X	Y
0	1.755
0.004	1.732
0.011	1.709
0.040	1.665
0.081	1.625
0.108	1.607
0.173	1.578
0.255	1.559
0.302	1.554
0.355	1.553
0.414	1.557
0.482	1.565
0.645	1.585
0.740	1.596
0.952	1.614
1.192	1.625
1.458	1.628
1.598	1.626
1.893	1.613
2.203	1.590
2.363	1.574
2.659	1.536
3.024	1.488
3.193	1.461
3.533	1.402
3.876	1.336
4.044	1.302
4.388	1.229
4.894	1.114
5.226	1.034
5.551	0.954
6.026	0.835
6.331	0.756
6.770	0.643
7.184	0.535
7.446	0.468
7.694	0.405
8.040	0.317
8.352	0.240
8.540	0.194
8.712	0.154
8.938	0.102
9.066	0.073
9.224	0.039
9.392	0.007
9.436	0

TOP SURFACE

X	Y
0	1.755
0.003	1.779
0.020	1.831
0.035	1.860
0.076	1.919
0.130	1.983
0.196	2.049
0.275	2.116
0.319	2.149
0.415	2.215
0.523	2.280
0.580	2.312
0.704	2.373
0.837	2.432
0.908	2.459
1.055	2.511
1.211	2.559
1.292	2.581
1.459	2.619
1.633	2.652
1.723	2.666
1.905	2.688
2.093	2.702
2.189	2.706
2.285	2.708
2.382	2.707
2.578	2.698
2.676	2.690
2.873	2.665
3.070	2.628
3.167	2.603
3.350	2.540
3.548	2.434
3.659	2.373
3.893	2.249
4.142	2.119
4.271	2.053
4.536	1.917
4.951	1.712
5.378	1.509
5.667	1.376
6.101	1.184
6.389	1.061
6.811	0.888
7.085	0.780
7.481	0.631
7.730	0.540
8.081	0.418
8.296	0.346
8.590	0.251
8.764	0.198
8.989	0.130
9.115	0.094
9.265	0.051
9.339	0.029
9.436	0

Walters and M. Wroniak, published by the Department of Aerospace Engineering, of the West Virginia University, Morgantown, VW, Feb 1974.

The Liebeck #33 airfoil has been designed (and wind tunnel proven) to have turbulent airflow from leading edge to trailing edge, as well as to produce high lift at high angles of attack with relatively low drag, at Reynolds numbers above 1,000,000.

No doubt that such an airfoil is not suitable for low Reynolds number applications; I am inclined to believe that nothing can be gained by eliminating the bottom concavity.

Best Regards,
Ferdinando Gale'

P.S. Insofar, I have not yet received the tapes covering Don Mitchell's speeches, as requested with my letter of July 12, 1992, copy of which is here attached for your convenience.

If at all possible, I would appreciate very much in receiving a photocopy of the German article on Horten tailless, mentioned on page 10 of the Sept. 1992 newsletter: please let me know the relevant expense, which I will refund by return mail.

Last thing: the title of my book, advertised on page 9 of the very same issue is TAILLESS TALE, and not TAILLESS TAIL.

Thanks a lot beforehand for all your attention for the three above mentioned items.

(Ed. Note: We have published the Liebeck airfoil coordinates and profile elsewhere in this issue for everyone's information. We would like to thank Ferdinando for this item, and find it interesting we had to get an American university's information all the way from Italy.

The tapes are on their way, and hopefully, you have received and enjoyed them by now. We did not receive your July letter, and can only assume someone diverted it since you indicate it had $10 US versus an international money order. For our foreign members, if you send us US currency, please make sure it is covered so that it cannot be seen from the outside. This will help prevent potential lose.

Bob has sent you as much as we have about on the German article. It appeared there might have been some missing pieces, and it was a copy of a copy so the quality was not really good. We hope it is helpful in answering any questions you might have had.

We certainly appreciate all the material you have sent us over the past several years. For that reason, we feel the bill between us is even concerning the tapes and Horten material.)

9/18/92

TWITT

Thanks for your kind letter of Sept., 1. I'm enclosing you a $22 International Money Order for subscription, membership application and information package - including one back issue.

Also, I'm interested to know about tailless and flying wing books, specific publications, such as, profiles catalogues, construction techniques and others.

Also, I'm interested to know if all your back issues, from number one, are available and how much would it cost me, including air mail.

I'm a model flying wing enthusiast and hang glider pilot, but my design and construction knowledges are very limited, but I'm looking forward to obtaining it.

Sincere regards,

Angel Armas Fumero
Canary Islands, Spain

(Ed. Note: Welcome to TWITT, Angel. You are our first member from the Canary Islands, but one of many from foreign countries that are finding out about TWITT. We hope you enjoy the information available through the newsletter.

In the advertisement section, Serge Krauss offers an Tailless Aircraft Bibliography that contains an extensive listing of worldwide publications on tailless aircraft and related subjects. It may be well worth the investment to obtain this book as a comprehensive source document.

Regarding back issues, they are all available at this time. We publish an approximate cost for mailing these to foreign countries on page one of each issue. It would cost you about $67 for copying and mailing of the entire stock, but air mail would be extra. You could determine the additional air mail cost by asking your postmaster the rate for about 76 ounces of written material (each newsletter weighs 1 oz. to stay within the U.S. first class rates). First class could move by surface or air within the U.S., but would go by air from the east coast. I have been told it takes about 1 week for a package to get from California to Australia via first class.

TWITT is dedicated to helping members with design and construction problems, so feel free to write and let us know how we can help you. Your questions will be published for the entire membership to analyze and possibly provide you with assistance. We have found many of our members have similar interests, and are most willing to share their knowledge.)

10/22/92

TWITT

Please find enclosed my dues for the current year. My apologies for the delay, and I certainly apprciated your support.

It was great to talk to yourself (Bob) and June by phone earlier in the year. If it was not for you bunch of guys, I would probably have given up designing & building sailplanes.

You will know of me efforts in the '92 design competition for the S.H.A., and maybe this will provide an opportunity to come back (the to U.S.) and be part of your enthusiastic scene again. Sure do hope so!

I'm fortunate to have the Blue Wren which is giving me more flying than ever, and the satisfaction is immense.

Reg Todhunter

(Ed Note: As we noted earlier, Reg won the SHA design competition this year. We are very pleased the members of TWITT can have such an effect on others in the sport, and we too hope that Reg will be able to return to the US for a visit during a TWITT meeting.)

10/10/92

TWITT

I'm a member of TWITT and enjoy your newsletter.

I have been active in the homebuilt movement for the last thirty years. The one flying wing design that really interests me is Don Mitchell's U-2 and the B-10.

Can anyone tell me where I can obtain information on the flight handling of the above designs and where may I purchase plans to build one of them.

Keep up the good work, for here in Colorado information on the flying wing type is scarce. Thank you in advance for any information on the above matter.

Sincerely,
Calvin Foster
9250 Pierce St.
Broomfield, CO 80021

(Ed. Note: It is my understanding that you have already called Bob and obtained Don Mitchell's phone number. What better place to get the information you need than from "the horse's mouth." Don has been a long time member of TWITT, and spoken at a couple of our meetings.

For those of you who might also be interested in U-2 or B-10 plans or other information, Don can be reached at (805) 823-0634. He currently lives in Tehachapi, CA.

If you would like to hear what Don has say about various aspects of flying wing development, his talks are available on audio cassettes for $8, postage included. We hope to have him speak again in the near future and cover one of the above aircraft in more detail.

We hope you have gotten what you needed and are making plans for your future flights in a tailless aircraft.)

10/10/92

TWITT

On the cover of the May '91 newsletter (#59) was an in-flight sketch of Paul Cheney's Flying Surfboard.

Would there be any 3-views available of this design? The ergonomics detail would help me with a project I am working on at present. Also, I'd simply be interested in studying Paul's design.

I hope I will soon have a video tape to send to the El Cajon gang showing my 1/3 scale flying plank in flight.

Yours truly,
Lewis Dewart
Fellow TWITT
29 Fairway Drive
Selinsgrove, PA 17870

(Ed. Note: By the time you receive the newsletter, you should have gotten some material from Bob. Unfortunately, I do not believe it has any of Cheney's design, but more of Harald Buettner's variation on the theme. This is because the cover sketch was all we had on this design.

Perhaps there are some other members out there who know where more information is available on the Flying Surfboard design. If so could be please drop Lewis a line. I know he would appreciate it.)

KLINGBERG WING 100 REVIEW

The December 1992 issue of RCModeler, Vol. 29, #12, pp 24-27, has a short construction and flight review of the Klingberg Wing 100 by Don Edberg. There is also an article in the December 1992, Model Aviation magazine, Vol. 18, #12, p 53, by Byron Blakeslee.

The wing has an average weight of 4 lbs. but can be ballasted to 6.5 lbs. for high wind conditions. It has a wing area of 1100 in^2, consisting of a center panel holding the radio equipment, and two wingtip panels that plug in on 7/32" piano wire rods.

The center section has a full spar tied into the plywood radio box, and there is fiberglass reinforcement underneath the wing skins around all the spars. It has strip ailerons, with 90° of flap movement. The later cause almost no pitch trim adjustments and only cause a momentary nose-up movement when fully deployed.

The BP3D airfoil was designed by Bob Parks and transitions from a cambered center section out to symmetrical, which gives the desired lift distribution on a tailless model.

The model has an adjustable CG feature and "Autoyaw." The later are tiplets that are free to turn outward only to help with crosswind launches and eliminate adverse yaw when rolling into turns.

It is easy to launch since it has a an aft mounted bottom keel, which also ensures a negative angle of attack at touchdown, keeping the plane on the ground. The nose pitches up considerably as the aircraft finds lift, it tracks very nicely, and the 90° flaps make landings easy.

(See the Model Wings section below for two mail-order hobby shops that carry this model.)

AVAILABLE PLANS & REFERENCE MATERIAL

Tailless Aircraft Bibliography
by Serge Krauss
Cost: $20
Order from: Serge Krauss
3114 Edgehill Road
Cleveland Hts., OH 44118

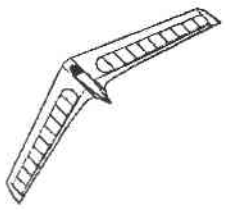
Tailless Tale, by Dr. Ing. Ferdinando Gale'. Consists of 268 pages filled with line drawings, tables and a corresponding English text. It is directed towards modelers, but contains information suitable for amateur full size builders.

Published by B^2 Streamlines, P.O. Box 976, Olalla, WA 98359-0976, or (206) 857-7249 after 4pm Pacific Time. Price is $38, postage and handling included (also applies to Canada and Mexico). Orders shipped elsewhere will be sent surface mail unless an additional $10 is included to cover air mail postage. Washington residents must add 7.5% sales tax.

FLYING WING SAILPLANE PLANS AND KITS: Two time-proven, 13m homebuilt designs suitable for the novice pilot. Build either the MONARCH "F" ULTRALIGHT (19 to 1), or the PIONEER II-D (35 to 1) sailplane.

Info packs $8 each, or $15 for both.

Marske Aircraft Corp.
975 Loire Valley Drive
Marion, OH 43302
(614) 389-6055



MODEL WINGS

Tower Hobbies carries the Future Flight Klingberg Wing kit for $39.99 (item #TE1130) and the Klingberg Wing 100 for $149.99 (item #TE1131). They can be contacted at:
P.O. Box 9078
Champaign, IL 61826-9078
1-800-637-4989 or (217) 398-3636
Shipping: $5.75

They are also available from:
Omni Models
P.O. Box 708
Mahomet, IL 61853-0708
1-800-342-6464 or (217) 398-7738

Klingberg Wing (FFTA1000)	42.99
Klingberg Wing 100 (FFTA1005)	144.99
Shipping: $5.00	

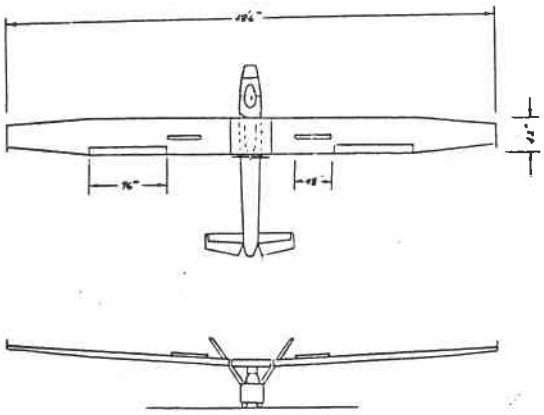
SAILPLANE HOMEBUILDERS ASSOCIATION

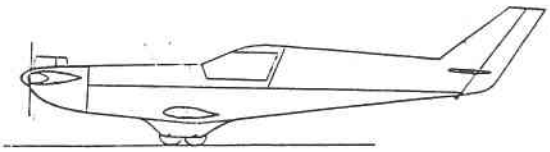
The purpose of SHA is to foster progress in sailplane design and construction which will produce the highest return in performance and safety for a given investment by the builder. They encourage innovation and builder cooperation as a means of achieving their goal.

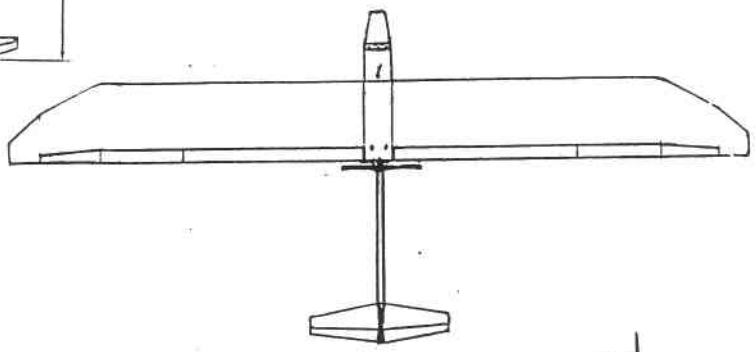
Membership Dues:	U.S./Canada	$17 USD/yr
	Other Countries	$21 USD/yr
	Students	$10 USD/yr

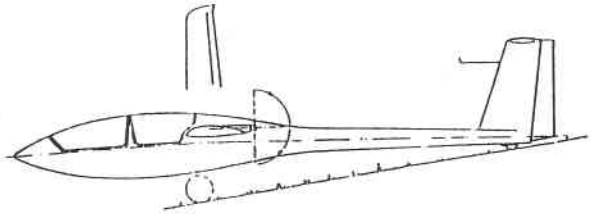
(includes 12 issues of SHApTalk)

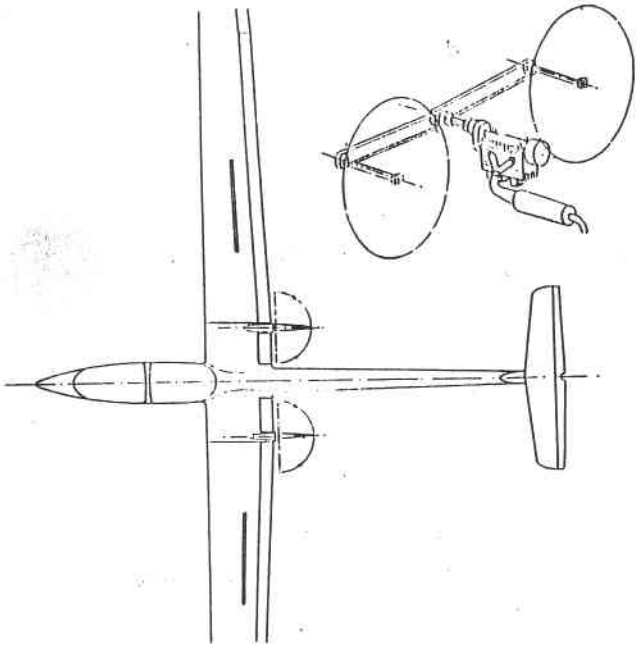
Make checks payable to: Sailplane Homebuilders Association, & mail to Secretary-Treasurer, 545 McCarty Drive, Furlong, PA 18925.

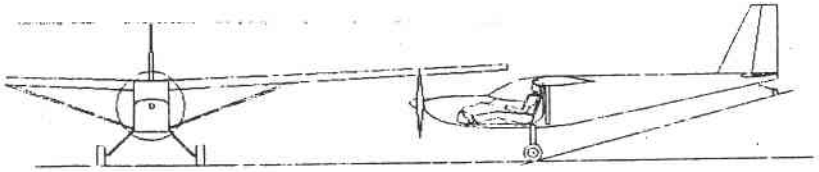


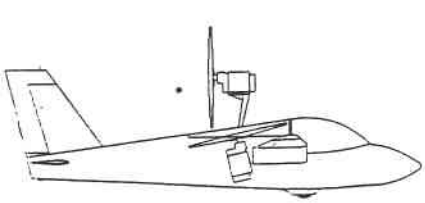




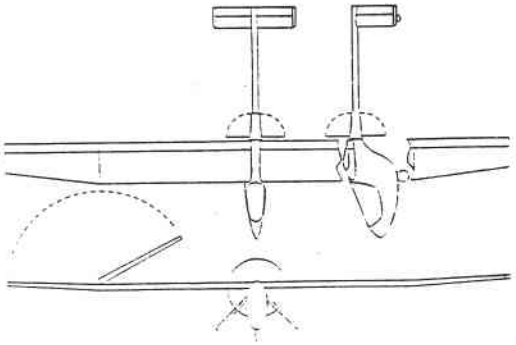


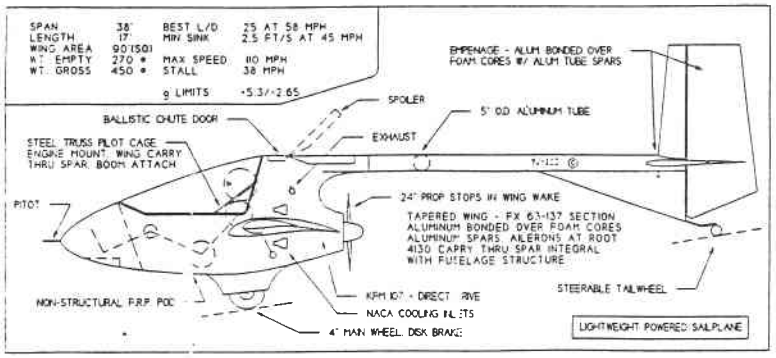






Span = 48' ; Lgth. = 22.5' ; Wing Area = 135 sq Ft
Empty Wt = 600 ; Max T-O Wt = 950 lb
L/Dmax = 26 @55 mph ; Min Sink = 159 Fpm @42 mph ; Vs = 42 mph
SL1-1A1P





SPAN 38'
LENGTH 17'
WING AREA 90 (150)
WT EMPTY 270 #
WT GROSS 450 #
BEST L/D 25 AT 58 MPH
MIN SINK 2.5 FT/S AT 45 MPH
MAX SPEED 110 MPH
STALL 38 MPH
g LIMITS +5.3/-2.65
EMPENAGE - ALUM BONDED OVER FOAM CORES W/ ALUM TUBE SPARS
SPOILER
5" OD ALUMINUM TUBE
BALLISTIC CHUTE DOOR
EXHAUST
STEEL TRUSS PILOT CAGE ENGINE MOUNT WING CARRY THRU SPAR BOOM ATTACH
24" PROP STOPS IN WING WAKE
PITOT
TAPERED WING - FX 63-137 SECTION ALUMINUM BONDED OVER FOAM CORES ALUMINUM SPARS AILERONS AT ROOT 4130 CARRY THRU SPAR INTEGRAL WITH FUSELAGE STRUCTURE
STEERABLE TAILWHEEL
NON-STRUCTURAL F.R.P. POD
KFM 107 - DIRECT DRIVE
NACA COOLING INLETS
4" MAIN WHEEL DISK BRAKE
LIGHTWEIGHT POWERED SAILPLANE