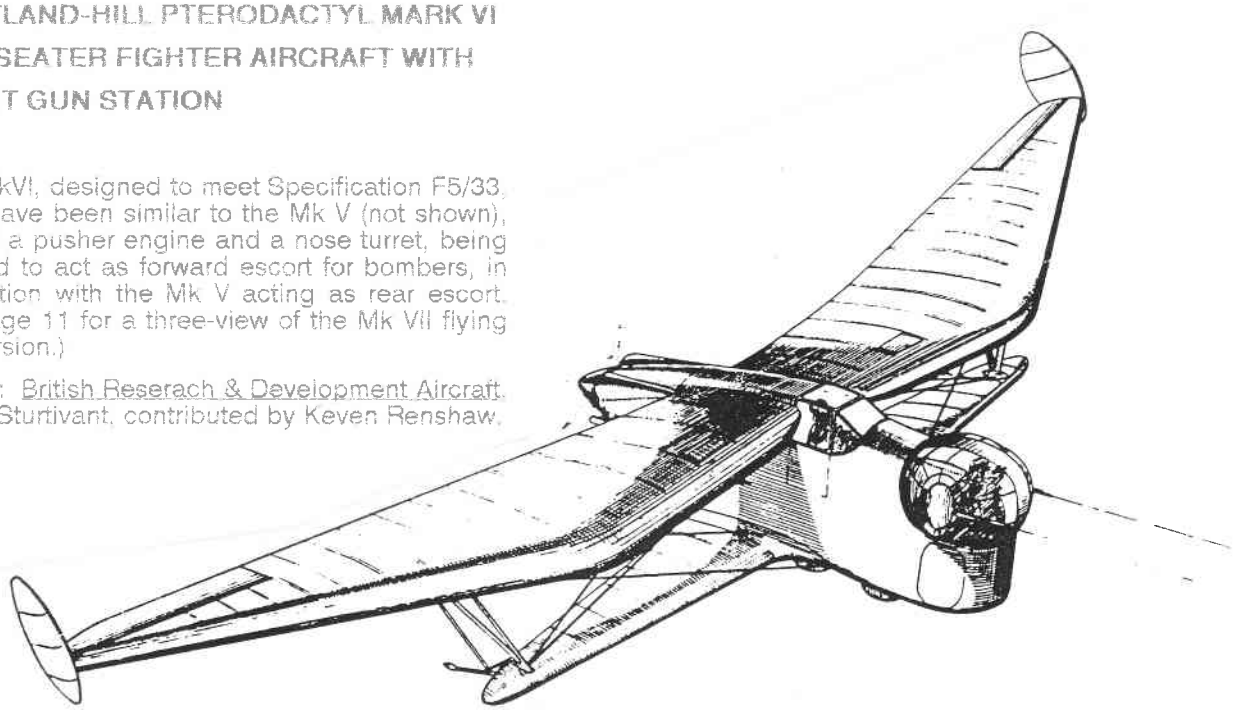
No. 82 APRIL 1993

T.W.I.T.T. NEWSLETTER

WESTLAND-HILL PTERODACTYL MARK VI
TWO SEATER FIGHTER AIRCRAFT WITH
FRONT GUN STATION



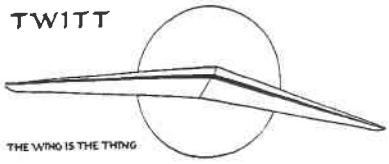
The MkVI, designed to meet Specification F5/33, would have been similar to the Mk V (not shown), but with a pusher engine and a nose turret, being intended to act as forward escort for bombers, in conjunction with the Mk V acting as rear escort. (See page 11 for a three-view of the Mk VII flying boat version.)

Source: British Reserach & Development Aircraft, by Ray Sturtivant, contributed by Keven 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., **9304** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, April 17, 1993, 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 tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is affiliated with The Hunsaker Foundation which is dedicated to furthering education and research in a variety of disciplines.

The **T.W.I.T.T.** office is located at Hanger A-4, Gillespie Field, El Cajon, California.

Mailing address: P.O. Box 20430
El Cajon, CA 92021
(619) 224-1497

Subscription Rates:
$15 per year (US)
$22 per year (Foreign)

Information Packages: $2 (includes one newsletter)

Back Issues of Newsletter: $0.75 each (US)
Postage Paid

Foreign mailings: $0.50 each plus postage

Wt/#Issues	FRG	AUSTRALIA	AFRICA
1oz/1	1.00	1.00	1.00
12oz/12	5.00	6.75	5.00
24oz/24	9.00	12.25	9.00
36oz/36	14.00	19.50	14.00
48oz/48	16.75	23.00	16.75
60oz/60	21.75	30.25	21.75

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).

TABLE OF CONTENTS

PRESIDENT'S CORNER

So far this has been a good year for TWITT. Membership continues to grow a little each month and almost everyone is renewing as their dates come due. I would like to thank everyone for their new and continued support during the remainder of 1993.

This month's issue will finish the article by Al Backstrom on "The Elements of Tailless Airplane Design." We hope you are getting some valuable information out of it, and find it useful in working on any of your current projects. I would like to thank Al for giving us permission to print the article, and would be very pleased to publish any of his material that he felt would be of interest to the general membership.

I was glad to see that the mail is picking up this month, with some new material being submitted for addition to the library. This makes it available to everyone who has an interest in a particular design or theory. I would like to thank those of you who have been gracious enough to make the contributions.

We are still in need of new monthly meeting program material. Please give us a call if you can come up with an idea and a speaker who will join us on a no-cost basis. Although we would prefer something on flying wings, other areas of flight and design may be acceptable.

I would like to make another plea to anyone who might be getting rid of a laser printer, due to an upgrade project, etc., we could use for publishing the newsletter. This could be either a full donation, or a sale to TWITT at a reduced price. Remember, the donation is tax deductible.

We are rapidly reaching to point where the next cost increase in copying by the print shop will force us to raise the domestic subscription rate a few dollars. (Note: We have kept the rate at $15 for nearly 7 years.)

I hope everyone is having a wonderful entry into spring and is looking forward to the upcoming flying season.

Andy

APRIL 1993 PROGRAM

The program for this month will feature Vic Saudek, a member of the U.S. Soaring Hall of Fame, speaking to us on the historical highlights of gliding. He has also indicated he will be glad to expand on any phase of his talk or on the information presented below.

Born in Pittsburgh, PA, some 77 years ago. At age 9, he and a playmate (now a retired department head at Boeing) spent a couple of days trying to figure out how to convert a see-saw into a glider.

At age 13 he read in the June, 1929, issue of National Geographic of the emergent glider movement in Germany. Three years later he learned of the Haller-Hirth Sailplane Co. in a nearby suburb, where he met Martin Schempp and Gus Haller, and saw the sailplanes "Schloss Mainberg" and "Haller Hawk."

Starting in 1933 he was a member of numerous U.S. Nationals ground crews, and worked as an official during the 9th & 10th Nationals.

He founded the Carnegie Tech Glider Club, soling their primary in 1935. The club designed, built, flew and crashed the "Flying Anvil" & built a "Haller Jr. Hawk" from a kit.

His first job as a mechanical/aeronautical engineer was with the Frankfurt (MI) Sailplane Co, which only lasted several months. He moved to Calif. to work on B-25s, P-51s and B-28s, but eventually returned to Connecticut to join Pratt Read's LNE-1 Navy glider project. He designed glider pick-up installations for numerous aircraft, and help develop pilotless gliders for commercial operations.

He "moonlighted" as project supervisor of the Sierra Wave Projects from 1950-55, obtained his commercial glider rating, silver and gold badges, and was inducted in the Soaring Hall of Fame over the intervening years. He has written a number of articles for Soaring magazine, and has had three papers accepted by OSTIV.

Currently he is doing design work on Bob Blaine's "AEOLUS, an upgraded Pratt Read, having retired from Hughes Aircraft Space and Communications Group.

This should be a good program for the "old-timers" to reminisce, and for the younger folks to learn what it was like in the earlier days of glider development.

MINUTES OF THE MARCH 20, 1993 MEETING

Andy opened with the usual welcoming of everyone to another fascinating meeting of TWITT and took care some housekeeping items.

The raffle prize for the day was to be the Pioneers of Aviation stamp collection from the Post Office.

Andy then asked Bob Archer to come forward and explain a little bit about his business of building radio and navigation antennas for aircraft. He started by making wingtip antennas for Bonanzas, but they didn't go over very well, even though they worked well.

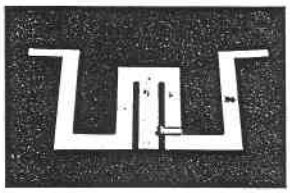
BOB ARCHER SPORTCRAFT ANTENNAS

21818 Ocean Avenue
Torrance, California 90503
(213) 316-8796

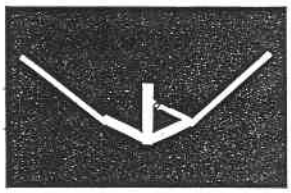
ANTENNAS FOR COMPOSITE AIRCRAFT

These antennas have been designed by Bob Archer of Torrance, California utilizing concepts common to military aircraft and space vehicles. The antenna performance is superior to most in use today in private aircraft. The only requirement for maximum performance is that the antennas must be installed in accordance with the installation instructions.

SA-005 This transponder/DME antenna is an etched copper clad epoxy circuit board dipole that is designed to be installed inside non-conductive aircraft without need for the additional installation of a ground plane. The dimensions are 6"x 7" and it can be installed in the aft fuselage or the wings with the 6" dimension vertical.



SA-006 This com antenna is designed to be installed on the inside surface of the aft fuselage of composite and wood aircraft. It is a dipole that is folded up to minimize the vertical dimension and requires 12" of fore and aft space and 26.5" vertically. It is designed with flexibility so it can match the internal curvature of the aft fuselage. The VSWR is less than 2:1 across the com frequency band.



SA-0007/SA-008 These antennas are essentially the same with the exception of the overall length and the matching devices with the com antenna being installed vertically and the nav antenna being installed horizontally. VSWR is less than 2:1 over their respective frequency bands. The outer ends of these antennas may be swept to +/- 30 degrees to facilitate installation in various aircraft types.

Additional technical data available upon request.

He then got into designing antennas for the T-18, then moved on to the LanceAir. He solved the size problem by incorporating the aircraft's wing lighting system wiring into the design of the antenna and has been getting very good range with very little directional problems. (We have included copies of his two fliers in reduced size elsewhere in the newsletter. If you would like more information about what would fit your particular application, please contact Bob.)

After going back and having our members introduce their guests for the day, Andy introduced Ray Cote to tell us about his cross-country experience with the Ryson ST-100 "Cloudster."

The Cloudster was the last aircraft built by T. Claude Ryan, with the help of Ladislao Pazmany as design engineer and Bob Fronius as one of the main builders. Ray was the chief test pilot throughout the projects life cycle.

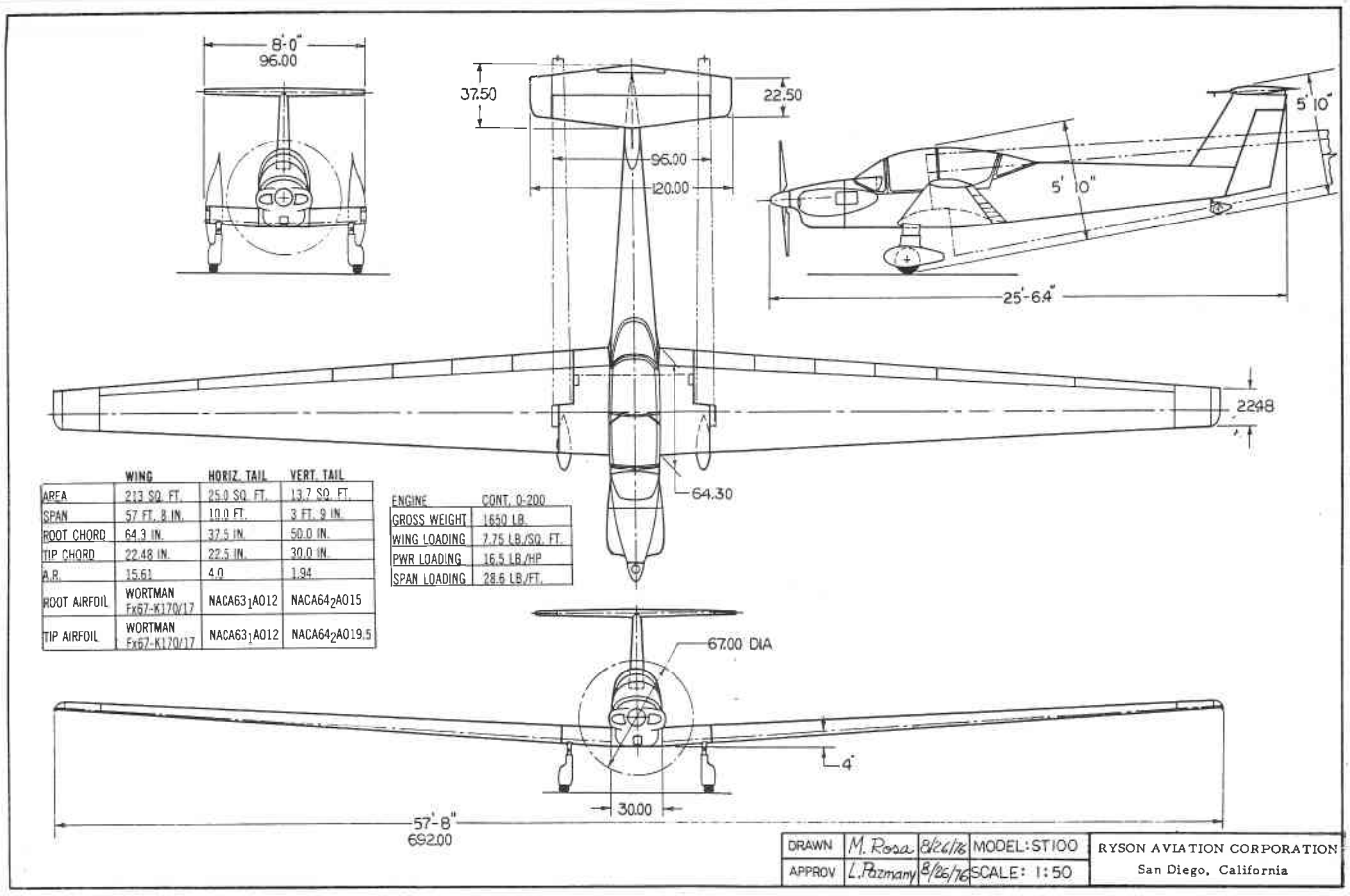
It is a fully licensed, type certified airplane and glider. It was certified in both categories since there was no motorglider category in the U.S. at the time this aircraft

was built.

The project involved three years of design and construction, and two years of flight testing. It flew about 750 hours of testing, including 60 hours of cross-country all around the U.S. Mr. Ryan had decided he wanted to fly the aircraft to Oshkosh on one tank of gas, so Ray practiced for several months out over the desert before attempting this 1900 mile feat.

make up for the previous deficits. He would only launch at a time when it appeared lift would be triggering so that minimum engine time would be needed to reach soaring conditions.

No specific stops were planned, since the idea was to conserve gas not make a pre-planned route of flight. Each day he would head approximately northeast, working lift until the late afternoon and then landing at the most suitable airfield in the locale.



	WING	HORIZ. TAIL	VERT. TAIL
AREA	213 SQ. FT.	25.0 SQ. FT.	13.7 SQ. FT.
SPAN	57 FT. 8 IN.	10.0 FT.	3 FT. 9 IN.
ROOT CHORD	64.3 IN.	37.5 IN.	50.0 IN.
TIP CHORD	22.48 IN.	22.5 IN.	30.0 IN.
A.R.	15.61	4.0	1.94
ROOT AIRFOIL	WORTMAN Fx67-K170/17	NACA63$_1$A012	NACA64$_2$A015
TIP AIRFOIL	WORTMAN Fx67-K170/17	NACA63$_1$A012	NACA64$_2$A019.5

ENGINE	CONT. 0-200
GROSS WEIGHT	1650 LB.
WING LOADING	7.75 LB./SQ. FT.
PWR LOADING	16.5 LB./HP
SPAN LOADING	28.6 LB./FT.

The starting point was El Mirage field in the Mojave Desert of California, after Bob Fronius triple sealed the gas tanks. The trip took five days with 18 hours of soaring flight and 13 hours of powered time, he reached Oshkosh. The arrival was done as a glider with a roll-out to the grandstand for a dramatic entrance.

The techniques Ray used to conserve fuel included soaring as much as possible, using the engine at its lowest power setting consistent with safe flight altitude, and gliding into destination airports as soon as it was known it could be made. Once on the ground the plane was moved by hand to the tie-down area, and pushed back out to the runway before engine start. Ray indicated that cold engine take-offs were no problem during the trip.

On some days he would get behind on his planned gas utilization curve, while other days he would be able to get far enough ahead to

On the last day enroute Ray ended up getting caught in a cold front and landed southwest of Oshkosh in a blinding rain storm. He sat in the plane for 30-40 minutes until the storm passed, pulled the plane up to a hanger, knocked on the door and asked where he was, since he admits he was lost. After talking with Mr. Ryan on the phone, it was decided he would try to make Oshkosh as soon as the frontal system moved past.

Ray was able to get airborne later in the afternoon, catch some lift about 40 miles south of Oshkosh and soar the rest of the way in, arriving at about 5,000'. Mr. Ryan was on the grandstand as his latest, and newest aircraft arrived during the 50th anniversary of the Spirit of St. Louis flight.

The Cloudster had the same performance as a Blanik L-13, with an L/D of 26:1, and a sink rate of about 180'/min. He would cruise using 16-1700 RPM when using the engine, which gave him about 2 gph in fuel consumption. He also

indicated he cruised at the best L/D whenever he had to use the engine.

Main gear leg — designed by Pazmany. Paz did so much landing gear research in the course of the development of the ST-100 that he is now writing a book on the subject.

The next day Ray put the plane through its paces in the various events at Oshkosh, which included take-off and landing distance, high speed, low speed runs, etc. He placed fairly well, but the wings still had water in them from the previous day's flight in the rain storms that the plane was really too heavy. This was all done without refueling from the flight from El Mirage, so when they finally did put gas into the tanks, they only took a total of 28 gallons.

After Oshkosh, the aircraft was taken on a tour of numerous airports around the northeast and midwest, including Elmira so that Schweizer factory could get a look at it. Most of this was done under power, with the only gliding only being done as a demonstration for interested people.

Ray used some slides to show the types of terrain he had to cross during the cross-country flight. He used combinations of thermal, ridge, and cloud street types of lift during the soaring flight phases. There were times he would power cruise below some very desolate looking bluffs and mesas in Arizona and Colorado.

He then digressed a little from the Cloudster presentation and showed us some slides of his Formula 1 racing days. He also talked a little about flying the replica Spirit of St. Louis, for which he was the test pilot. That aircraft is now on display at the San Diego Aerospace Museum.

Bob Fronius makes some adjustments in the Cloudster's roomy front cockpit. Bob is one of several EAAers who were involved in the design and building of the prototype ST-100.

To close his presentation, Ray showed a short video covering his Formula 1 victory at the Reno Air Races with his new racer "Alley Cat" over people like Deke Slaten. He also talked briefly about a new Formula 1 design in response to some questions from the audience. This will be a full composite aircraft and is still under development.

His final closing remark concerned the value of glider experience even for a power pilot. He has had to deadstick his racers, and recently put a PT-22 down on a stretch of Interstate 8 between two cars going 60 mph after losing oil pressure. He attributes the success of these landings to being able to better judge power-off glide paths just like you would in a glider landing.

The raffle was conducted in-between the speakers. The Aviation Pioneers stamp collection was won by Tuto Figueroa.

Andy then introduced Garry Gramman who told us a little about the Mooney Mite he has owned since 1950 and had brought over for the group to inspect. He still flies it several times a month and it is in excellent condition.

His model is powered by a Lycoming engine versus some earlier models that had Crosley engines. There were about 120 of the "L" model built. An interesting thing is that the engine mounts are an integral part of the airframe instead of being a steel tube frame mounted to a firewall.

The Mooney Mite was a prototype for the development of the larger production Mooneys that everyone is familiar with. It cost him

about $1800 in 1950, and he thinks he has owned a Mooney aircraft longer than anyone else in at least the U.S.

The wing is all wood construction, with a monocoque fuselage aft of the cockpit and steel tubing for a stronger pilot area. This was fortunate for Garry, since he had an accident with when he got caught in wake turbulence one day. It has retractable gear, with a steerable nosegear, and has since added an electrical system for the radio and navigation equipment.

At this point everyone broke up into smaller groups to hanger fly and look over Garry's airplane.

LETTERS TO THE EDITOR

3/12/93

TWITT

Enclosed is our check for renewal of our membership for another year.

This has been a very busy time for us, as we are just putting the finishing touches on the English version of Dr. Gale's book on aircraft structures and our own "On The Wing...", a compilation of our first 52 RCSD articles. (Both should be available later this month.)

The arrival of the March issue was quite effective at bringing us back to the real world. Thanks. More later.

Sincerely,

B^2 (Bill & Bunny Kuhlman)

(Ed. Note: If Dr. Gale's new book is anything like the last, you should have a good seller on your hands, again. The book and B^2's compilation of articles are available through their publication service, as advertised later in this issue.

The Kuhlman's write a monthly column for RC Soaring Digest on a number of different subjects covering the world of flying wing models and tailless aerodynamics. These are quite informative for both the modeler and full size enthusiast, so if you are interested in learning more, please contact them at B^2 Streamlines.)

(This is a composite of two letters Alan sent us during March.)

3/12/93

TWITT

I enclose the photos of the Hornet 160 Flying Wing. Free Flight Hang Gliders of Adelaid went bankrupt designing these machines. One was sent to the EAA in Wisconsin, however, due to better knowledge of flight characteristics a Grasshopper won the competition against the Hornet.

David Betteridge was the designer. He was also an official in the Minium Aircraft Assoc., but all had disappeared with the failure of Free Flight. The Hornet was then returned to Australia, and the Grasshopper was sold in the U.S.

I have enclosed some photos of an Unknown Wing at last year's EAA Fly-In. This has the registration number and appears to have a Rotax motor, with elevators and ailerons and a nose wheel.

It appeared to be a museum machine and nothing was about it anywhere. I wonder what TWITT can give about it.

On the Fauvel designs, Evans Aircraft, Box 744, La Jolla, CA 92038 sell the AV-361 drawings, but I feel this may be a wrong address. Falconair Aircraft in the U.S. and Canada sell AV-36 drawings. I have a set from Falconair, but he left the airfoil offsets out (which Fauvel always supplied), then sold the offsets for $300. I have been told Falconair drawings are badly reproduced, however, my set was good.

The AV-36 was the only flying wing to have a normal license and with a VW engine in the center section became the AV-45. There was also a turbine starter jet motor version of the AV-45.

The AV-36 often had sticks of lead which were loaded according to the pilot's weight. Today the Marske machine is a similar flying wing and simpler to build, however, Marske has not equaled the designing of Charles Fauvel.

I hope this interests people.

Yours Sincerely,

Alan Lewis
Paddington, Australia

Structurally sound, the air frame is stressed to 6.5g ultimate load. With fuel usage of less than two gallons per hour, through excellent drag characteristics, the aircraft achieves enormous fuel cost savings, using standard gasoline.

(Ed. Note: I hope that one of our members might be able to fill in the blanks about the aircraft in the picture. It looks like a straight forward design that might make a reasonable homebuilt project if any information is still available. What do you say guys, What Is This Mystery Airplane?

The Hornet 160 photos wouldn't come out for reproduction in the newsletter. However, we have included one of the 130 model, noting that there appear to only be some subtle changes between the two in the area of the rear fuselage faring and the vertical tip rudders.)

3/4/93

TWITT

Thank you for sending the extra newsletter after my membership expired 1/93. Work and school kept me so busy that I couldn't get around to renewing until now. Enclosed is my check to cover the subscription and extra newsletter.

Enclosed are some materials on the XP-79B, the turbo-jet powered derivative of the XP-79 rocket interceptor, unofficially knows as the "Flying Ram" because it was intended to slice off the tail assemblies of enemy bombers. I don't know if they all are of a high enough quality to reproduce in the newsletter, but I am including them for interested members and because I need help with a project to build a ducted-fan powered R/C model of the XP-79B.

For 6 years I have searched for detailed dimension drawings, paint scheme drawings, and airfoil cross-sections for the "-79B", having contacted Northrop, the NASM, the National Archives, and many other sources, but with very little to show for my efforts. If any fellow TWITT could help me, I would be most grateful.

Lastly, I would like to offer my apologies to Kevin Renshaw for failing to send him thanks for all of the Horten aircraft material he sent me in response to my first letter. I couldn't find his package until recently, and all of the things I had to do before and after the hurricane have kept me busy. Sorry to be so late in responding, Kevin, but thank you very much for the information. I really appreciate it.

Sincerely yours,

Jason Wentworth
3081 N.W. 4th Terrace
Miami, FL 33125

(Ed. Note: Thank you very much for the material on the XP-79B. When I published the 3-view of the XP-49 rocket version in February it was partly filler, but also to see if anyone would look at it as an easy to build slope soarer.

Hopefully, we have some members out there that might be able to help you with some of the material for your model project. Let us know how it turns out, with some flight pictures, if possible.

The exchange of material like that between you and Kevin is kind of what TWITT is all about. We are glad to see that it works, which also helps to protect some types of valuable information since more then one person will end up with copies. Keep up the good work.)

(Letters to the Editor continued on page 10.)

THE ELEMENTS OF TAILLESS AIRPLANE DESIGN

by A.A. Backstrom

(Ed. Note: Presented on the next three pages is the last segment of the article published in the March 1993 TWITT Newsletter, which first appeared in Sport Aviation, May 1979, Vol. 28, No. 5, pp. 39-44, and is being reprinted with the permission of the original author, Al Backstrom, a member of TWITT. It was brought to our attention by Bob Chase, who thought our members could learn some basic design principles and theory from it. We hope you have enjoyed it, and that some have benefited from its presentation.)

fuser tips, in addition to providing the yaw forces, will produce a roll force in the desired direction and some desired up pitch force during a turn.

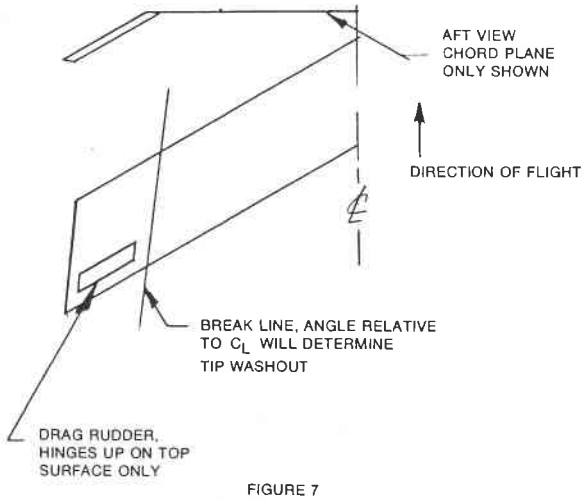


FIGURE 7
DIFUSER WING TIPS

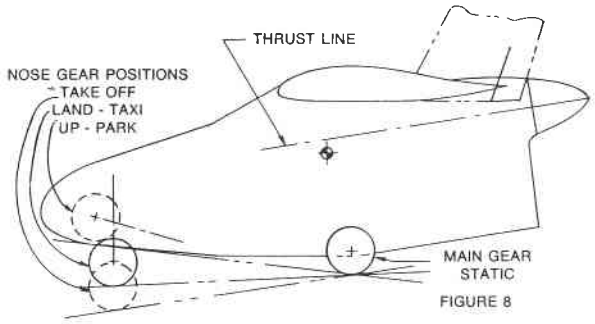


FIGURE 8

Power Effects

For our small airplane discussion only propeller types will be covered. As a tractor propeller will generally reduce the stability of an airplane, it is desirable to arrange for a minimum of adverse forces to be counteracted. Ideally, you would want power changes to be made with no control corrections being required. To accomplish or approach this, it is necessary to use an offset thrust line. Vertically the thrust line should be slightly above the CG and should be canted (left or right depending on propeller rotation) to counteract the combination of things generally referred to as torque. The offset thrust lines are illustrated in Figure 2. If possible, the thrust line should be adjustable in a prototype to allow a best setting to be found, just like a free flight model airplane.

For a pusher design, the problem is somewhat simpler since no left or right offset is necessary. The thrust line should pass slightly above the vertical CG location. You can see this shown in Figure 8.

The vertical location of the thrust line for a tractor should not be more than 20% MAC above the CG and not more than 10% for a pusher.

Spins

There was at one time the belief that tailless airplanes could not be made to spin. Sorry, but this is just an old pilot's tale. In fact, during the thirties the Hill Pterodactyls were spin tested and I remember Dr. Lippisch telling of the German authorities requiring him to do extensive rework on one of his Delta series so that he could show that it would spin and recover. Tailless airplanes can, and should, be designed to be unspinnable but it must be done in the basic design rather than hoping it will fall out naturally.

Basically, to prevent spins it is necessary to maintain a large amount of damping in roll at minimum flying speed. To accomplish this, most of the outer section of the wing must not be stalled. This can be obtained by wing twist, slots, elevons (which provide effective wash out in the up range), or a combination of these. Also, tailless airplanes need to have the same stability power on as power off. Offset thrust lines, as discussed in the section on power effects, can provide this.

Landing Gear

Most tailless airplanes of today use a tricycle type landing gear. If you design one around a tail wheel, you can use the geometry Pazmany calls out in his book on lightplane design. Paz's information on tricycle gear is also satisfactory except in many cases it will have too much load on the nose wheel. Due to the limited elevator power on many tailless designs, they cannot raise the nose wheel early enough in the take off roll without help from wing lift. This requires that the airplane sit at a high deck angle which will reduce nose wheel load. The resultant will be poor nose wheel steering authority if this is used for ground control. In some cases also the empty airplane will sit with the tail on the ground which makes it easy to blow away. Figure 2 shows an arrangement with a single position nose gear that will have more weight on it empty than loaded. Figure 8 shows a multi-position nose wheel arrangement inspired by Burt Rutan's VariEze. This allows a lightly loaded nose wheel for take off, moderate load for landing and taxiing, and a negative ground angle for parking.

High Lift Devices

Although the use of high lift devices is limited, there are some things that can be done to reduce minimum speeds. Slots can be used full span to increase Cl max but the increased angle of attack required will lead to landing gear design problems. This was the reason for the extreme gear design on the Vought F7U-3 airplanes. Conventional trailing edge flaps can be used on some swept back designs. A split flap would be the preferred type.

There have been several proposals to use a centrally mounted flap on swept wing tailless designs as an elevator. This is an intriguing idea as the elevator would be deflected downward and increase Cl at low speed. An elevon type control system reduces Cl at low speed. With proper aspect ratio and sweep angles it will work in small models and Figure 9 shows such a planform layout.

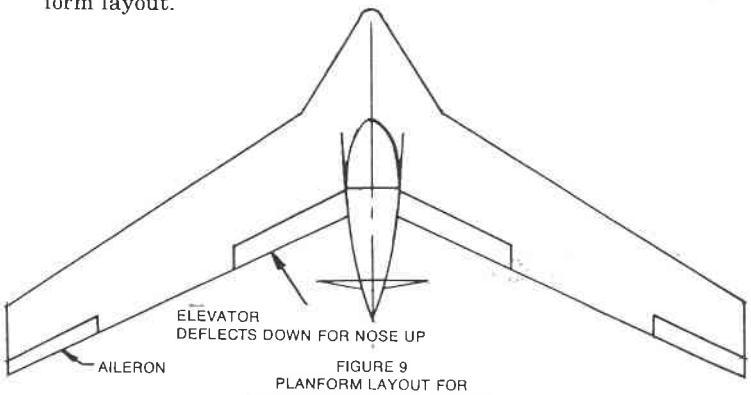


FIGURE 9
PLANFORM LAYOUT FOR
DESIGN INTENDED FOR INBOARD
ELEVATOR

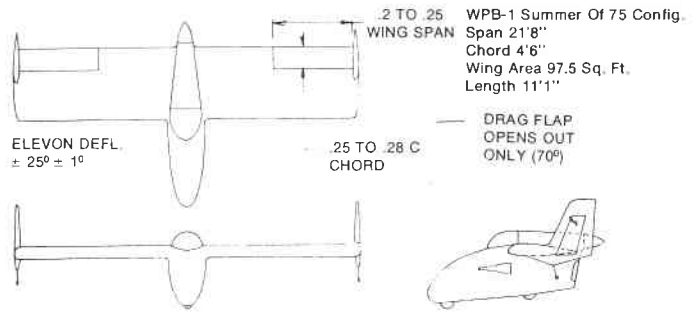


FIGURE 10

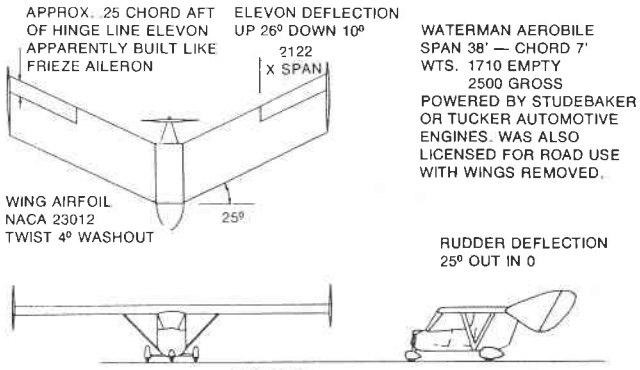
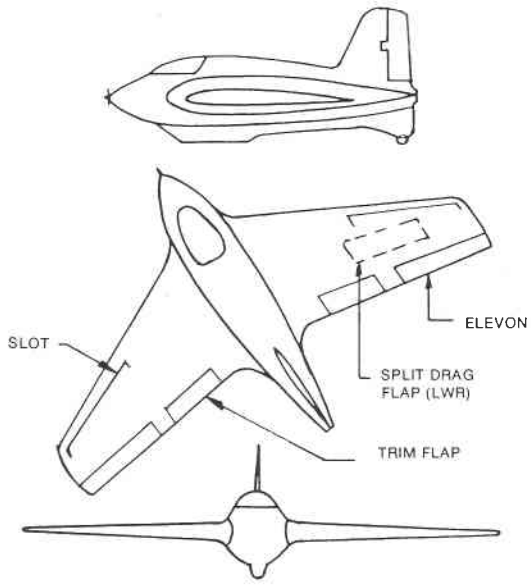


FIGURE 11



ME.163 ROCKET
INTERCEPTOR
FIGURE 12

Designs For Further Development

I started to call this section "Designs Worth Copying", but I thought better of it. For a long time I have considered a good designer to be one who only copies good ideas. There are two people who have good designs that are not covered here. This is because they are both still active and selling drawings. They are Jim Marske, 130 Crestwood Drive, Michigan City, IN 46360 and Charles Fauvel, 72 Boulevard Cornot, 06400 Cannes AM, France. Jim has a line of sailplane designs and Fauvel has both sailplanes and small airplanes. Largely forgotten these days is the fact that the Fauvel AV10 was certificated in France in the thirties and at one time held its class altitude record. (Also, a two-place plank sailplane has been certificated in Australia.)

Figures 10, 11 and 12 show a Flying Plank, Waterman Aerobile, and the Messerschmitt Me.163. Very good detailed drawings of Waterman's Aerobile are available from Paul R. Matt, Box 33, Temple City, CA 91780. I have presented the Me.163 because I do not have any detailed information on Dr. Lippisch's Delta series airplanes. If anyone has detailed information on these I would like to get a copy or, better yet, they should write them up for publication.

I would not recommend copying the true flying wing types unless you are willing to make revisions to increase directional stability.

Where To Find More Information

I have had many inquiries for material on tailless airplane theory and practice, etc. so I will pass along my normal reply. The best general study of tailless airplane history, stability, etc., was written by A. R. Weyl and published in **Aircraft Engineering** magazine during 1944 and 1945. This is a British publication, but there are copies in several engineering libraries in the U. S. During World War II, NACA did a lot of tailless airplane studies that are covered in Wartime Reports. These reports cover one study each, but they are worth reading to find out what did or did not work in the wind tunnels. WR-L-199 was the report that convinced me to proceed with the plank design.

Roll Your Own?

The rest of this discussion is primarily intended for those people interested in true experimental design development.

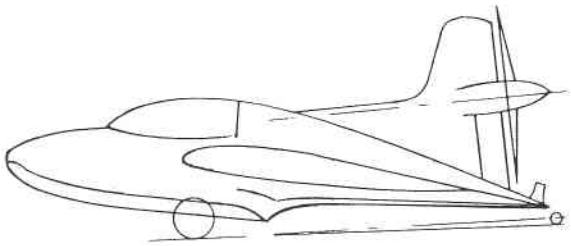
As in any design work, the first step is to set your objectives, performance parameters, etc. When this is done you can start sketching out a design that you feel might meet them. For now, we will only consider development of a stable and flyable airplane; performance is a separate problem. From your sketches, develop a scale layout to see if you can fit everything into your envelope. Looks pretty, doesn't it? Will it work? Well, let's use an example to find out. Figure 13 shows a small amphibian design I started a few years back. Note the drawing description, "Concept Layout." The finished machine may be a lot different. So build a scale profile glider model (about 1/20 scale) as shown in Figure 14. You must be able to make this fly stably across the room. Any changes required must be shown back on your layout. You can experiment with drastic changes easily at this stage so see what you can do to make it better.

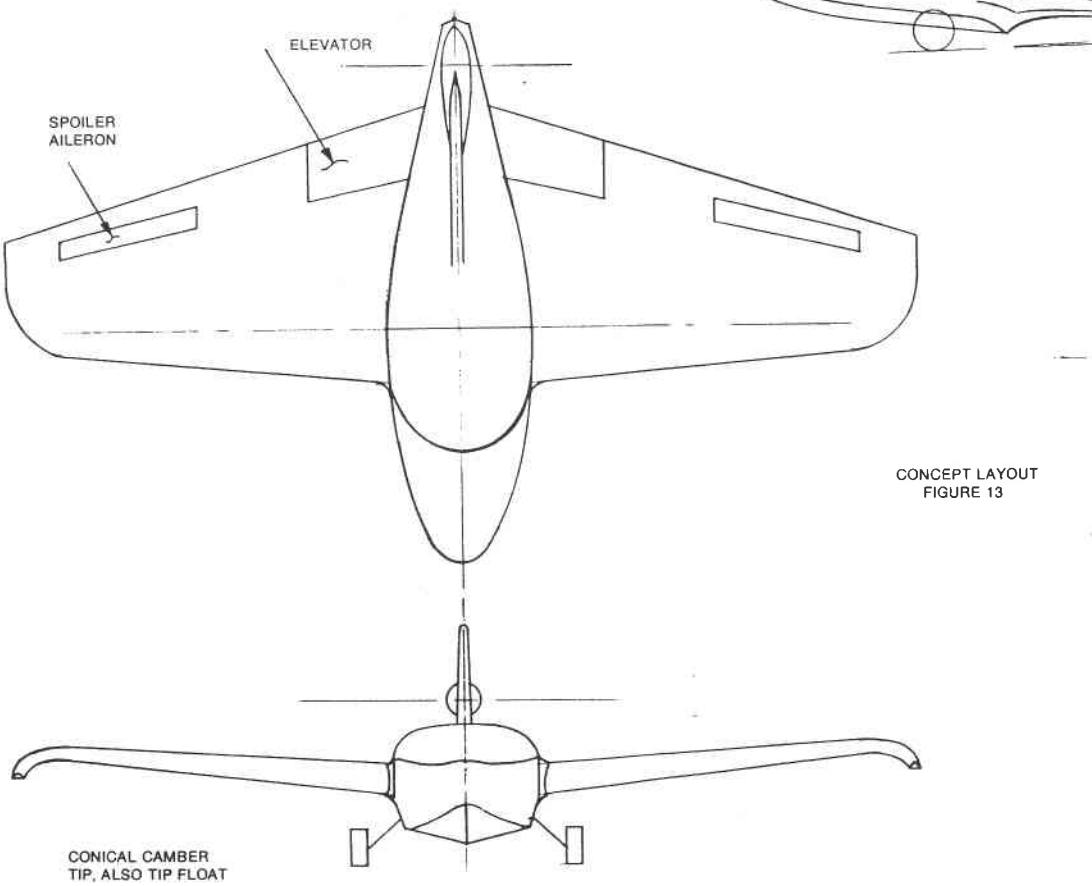
The next step is to go three dimensional at about 1/10 scale, glider or powered free flight. This will let you look at your lines, etc. and further check stability. Again carry any changes necessary back to your layout.

Now, depending on your faith, guts or whatever, you can go to a R/C model or full scale. A 1/5 or larger scale R/C model can check many static stability and control effectiveness items. For instance, we would have found that the WPB-1 layout would have a landing gear geometry problem if this step had been taken. If you go to dynamic scaling, a lot of additional items can be checked, but for small airplanes it is almost as easy to go full scale.

Epilogue

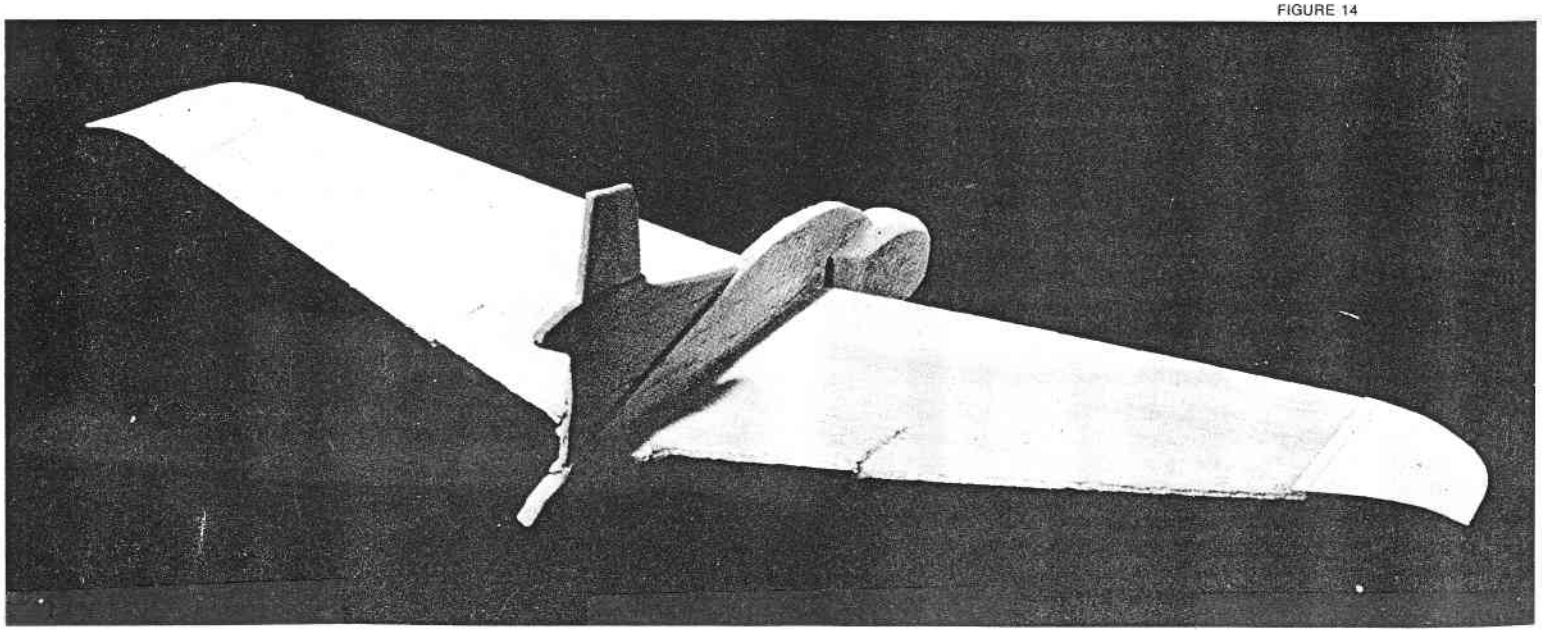
The tailless airplane offers the most potential for the ultralight field. Also it seems that we should have reached a point in airplane design where we must consider ways of improving performance that do not rely entirely on a bigger engine. It seems that current economics (initial and operating costs) are changing the situation to where the bigger engine is not necessarily the cheapest overall solution to obtaining increased performance.





CONCEPT LAYOUT
FIGURE 13

FIGURE 14



(Letters to the Editor, continued.)

3/28/93

TWITT

A friend called this morning and told me of Don Mitchell's passing and the fact that he and Richard Avalon were in the process of developing a new wing design.

I am no longer able to pass my medical and am trying to get my Mitchell U-2 down to Section 103 ultralight rules. I have the weight to within about 15 lbs., but find the design so clean, bringing the top speed to 55 kts. (62 mph) is not feasible without increasing the drag factor in some way.

I understand the new design will be within Section 103 specifications. Could you tell me how I might get more information on this. I would like to start a new wing project.

Sincerely,

Newton W. Borden
11 Rainbow Lane
South Weymouth MA 02190

(Ed. Note: Richard Avalon is a member of TWITT, as is Newton. Perhaps this will get them both together to talk about the new wing design, and both will be able to help each other in some way. Richard can be contacted at: 892 Jenevein Ave., San Bruno, CA 94066.

We hope that if the new design works out, TWITT will get a story out of it to share with our other members who may be interested in the ultralight applications.)

AVAILABLE PLANS & REFERENCE MATERIAL

Tailless Aircraft Bibliography

by Serge Krauss

3rd Edition: An extensive collection of books, articles and other items related to the development of flying wing (tailless) aircraft design and construction.

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.

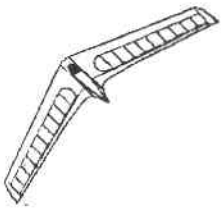
Published by B^2 Streamlines, P.O. Box 976, Olalla, WA 98359-0976, or (206) 857-7249 after 4pm Pacific Time. Price is $38, postage and handling included (also applies to Canada and Mexico). Orders shipped elsewhere will be sent surface mail unless an additional $10 is included to cover air mail postage.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

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.

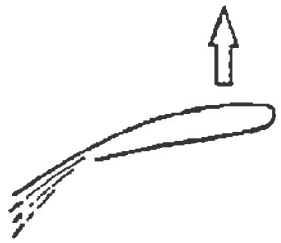
Membership Dues:	U.S./Canada	$17 USD/yr
	Other Countries	$21 USD/yr
	Students	$10 USD/yr

(includes 12 issues of SAILPLANE BUILDER)

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

FOR SALE - Consolidated booklet of the 3-views and specifications for all the SHA Design Contest aircraft. This is a nicely done newsletter style publication that gives you all the information in one place. Bob will also be including one issue of the TWITT Newsletter. (If you are a TWITT member, you might want to specify with issue of the newsletter you would like, to avoid duplications.)

Cost: $4.00 US, Postage Prepaid
Contact: Bob Fronius
P.O. Box 20430
El Cajon, CA 92021



THE HIAM AIRPLANE
NEEDS YOUR HELP

For those interested in assisting Budd Love with the future development of his High Internal Air Mass (HIAM) project, he would be glad to hear from you. This concept has changed in recent months to include design of a Horten type flying wing utilizing HIAM technology. (See Dec '92 newsletter, page 4.)

Contact: AIRLOVE, LTD.
6423 Campina Place
La Jolla CA 92037
(619) 459-1489

BELOW: A three-view of the Pterodactyl MkVII, which was to have been a tailless flying boat fitted with four Gipsy Six engines in tandem. Specifications were drawn up for the aircraft, but not pursued. (Contributed by Kevin Renshaw. Extracted from: British Research & Development Aircraft, by Ray Surtivant, date unknown, page 49.