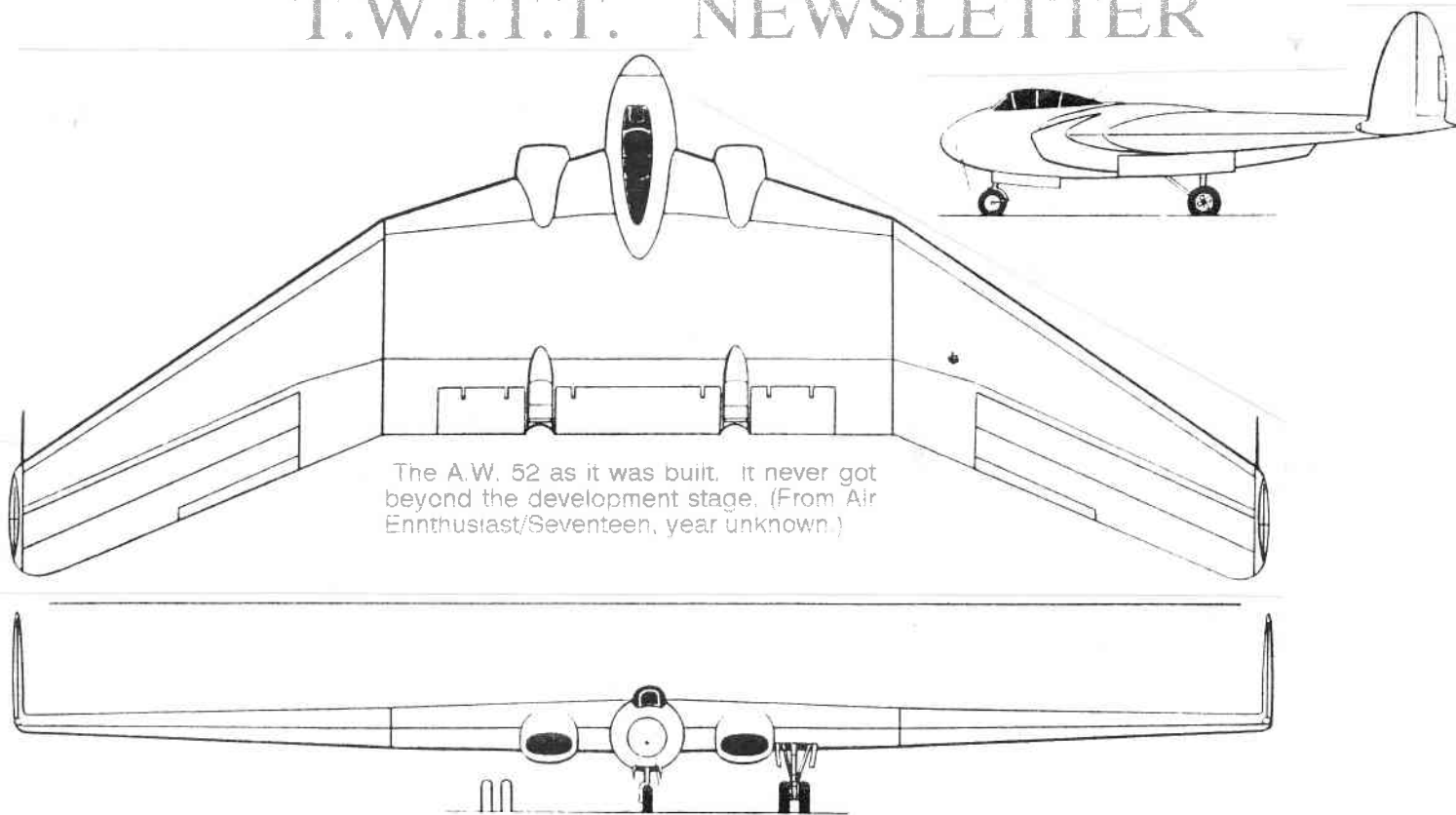


# T.W.I.T.T. NEWSLETTER



The A.W. 52 as it was built. It never got beyond the development stage. (From Air Enthusiast/Seventeen, year unknown.)

**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., **9210** means this is your last issue unless renewed.

**Next TWITT meeting: Saturday, October 17, 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.

**T.W.I.T.T. Officers:**

President, Andy Kecskes (619) 589-1898  
 Vice Pres., Dave Pio (619) 789-1650  
 Secretary, Phillip Burgers (619) 563-5465  
 Treasurer, Bob Fronius (619) 224-1497

Editor (Acting), Andy Kecskes

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

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Wt/#Issues	FRG	AUSTRALIA	AFRICA
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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**



For those of you who couldn't make last month's meeting, you missed an informative talk on how the engineers go about performing testing in a low-speed wind tunnel. Although most of us do not have access to a wind tunnel to tweak our last

design, some of the techniques used can be done in other ways to achieve similar results.

One way has been to use the family car or van as a mobile wind generator to test lift and controllability of models, with the family video camera recording the results. So, you see there is always something to be learned at the monthly meetings, even if it is not directly applicable to flying wings.

Our membership continues to expand into areas of the globe we had never envisioned. One of our newest members is from the Canary Islands, so now we can add Spain as another foreign country with a TWITTER.

Jim Loyd called last week to get some information on Irv Culver's wing twist theories for his newest design (see pages 6-8 for a 3-view). Hopefully by now he has had a chance to talk with Irv and get more detailed information about this technique.

He mentioned building several mockups of the cockpit to test positioning, and seems satisfied that he is on the right track this time. As you can see, he has modified his original design based on some of the input he received from other TWITT members during one of our meetings.

For those of you interested in Culver's twist, Bob mentioned that Ferdinando Gale's book Tailless Tail has a section covering it. The book is available through B<sup>2</sup> Streamlines (see advertisement later in this issue).

We are still looking for someone willing to donate an Apple or HP laser printer with a multiple font cartridge. This would be used to prepare the newsletter and save having to rent computer time and pay the high price of laser copies. We were hoping someone might be getting ready to upgrade their system and have one they could get rid of for a tax deduction. If you do, please contact us.

That all I have for this month. Keep those cards and letter coming so we can share your experiences with others.

Andy

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## OCTOBER PROGRAM

This month we are pleased to have one of TWITT's founders for our program, Harald Buettner. He will be presenting something of interest to all our members, both modelers and full size enthusiasts, and that is how to build fiberglass shapes without making molds and plugs. This should be useful in making cowlings, wing faring, tips, etc., for your favorite project.

Harald made a more detailed presentation of composite construction techniques at the recent SHA Western Workshop, and we have heard it was very well received. So, if you are into building, or think you will be in the near future, this is a meeting you won't want to miss.

For you advance planners, the November meeting will feature Bruce Carmichael telling and showing us some of what went on at the SHA Workshop. This also should be a good meeting, since some of the topics covered during the workshop were quite interesting.

## MINUTES OF THE SEPTEMBER 19, 1992 MEETING



Andy opened the meeting asking if there were any guests. Jerry Blumenthal introduced Bob Murphy who used to run the wind tunnel at Convair and was there to hear our guest speaker.

He showed the group the French magazine sent to us by Gunther Rudat. Upon asking if anyone could help with a translation of the article, Bud Mears offered to talk with a friend in Costa Mesa who might do it for us. Andy will make a couple of copies and forward them to Bud.

Andy then asked if anyone had tried to build the small model in this month's newsletter. Unfortunately, no one had, but we hope maybe one of our other members might have tried it and would let us know how it turned out.

Andy announced that a long-time member of TWITT, John Chalmers, passed away on September 9, after a long illness. John was an avid aviation enthusiast, belonging to SSA, and working with John Reed of San Diego in designing and building a carbon-fiber composite motor glider.

It was announced that Bruce Carmichael would be our November speaker. Bruce then quickly went over the SHA Design Contest, telling us that TWITT Reg Todhunter of Australia won with his Mark II Self Launching Sailplane entry. This is a conventional style aircraft versus a flying wing. We have included a 3-view on a following page. The November newsletter will have a collage of all the entries as a prelude for Bruce's talk.

The raffle prizes were announced as a surge protecting power strip and an Aviation Pioneers Stamp book which includes a history of the stamps and several special cancellations.

Andy then asked Phillip to introduce our guest speaker, Laura Healy, who would talk to us about low speed wind tunnel testing.

Laura began by giving us a little more information about her background and how she got interested in wind tunnels.

Wind tunnels give an effect that is similar to flying the vehicle through the air, but in a less expensive and safer manner. They also can be used at very early stages of the design process to find out both the good and bad aspects of a particular design.

The types of tunnels Laura has worked with are low subsonic aerodynamic tunnels. However, there are other types, which include: high subsonic, transonic, supersonic, hypersonic, spin, high-Reynold's Number, cryogenic, full scale, propulsion, automotive, captive trajectory, icing, dynamic, laminar flow, acoustical, aerothermal, and water.

The Convair wind tunnel is a closed circuit configuration, although there are others like blow down and open jet. The closed circuit tunnel has several advantages in that once the air is brought up to speed it takes less power to maintain it, and there is a little more consistency in the flow. The test section of Convair's tunnel is located as far from the wind generating source as possible, again to provide the smoothest, most consistent air flow.

Laura discussed some of the various types of measuring devices used on the models. These included strain-gage balances, load cells, pressure transducers, accelerometers, thermocouples, inclinometers, and LASER velocimetry. Obviously, most of the more exotic ones are not available to the average homebuilder, but ones like the transducers and strain-gages can be obtained for use in less sophisticated testing.

Laura passed around a number of pictures showing the different types of model supports, like a sting, struts, cables, and even magnetic. Each has its good and bad points so are used based on the type of test results desired. The sting, for instance, places the model in a disturbance free flow by supporting it from the rear where it won't interfere. Cable supports seemed to be the hardest to fit, since they require very special connections at the model and need more interference calculations to eliminate the effects of them on the flow.

Other methods of testing that could be used by the homebuilder include tufts, chalk and smoke. Laura showed one photo of a chalk and kerosene based solution which flowed and then dried to give a very good indication of flow patterns across a surface. One of our ex-members did something very similar to this on his Varieze to enhance farings and reduce drag.

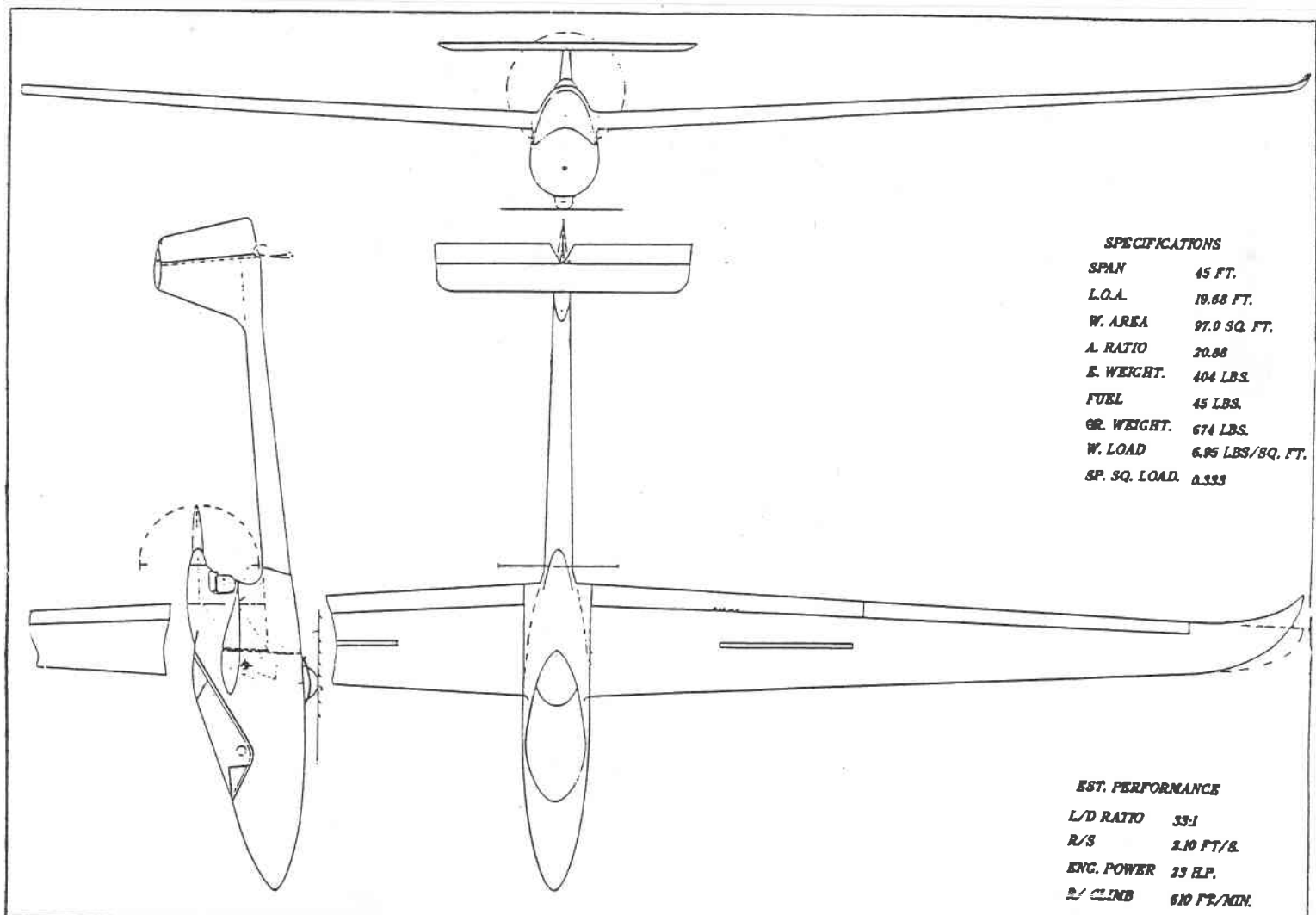
The Convair tunnel is designed for approximately a six to one compression ratio,

MARK II

Self Launching Sailplane  
by Reg Todhunter

1. The design is based on, and uses data feedback from, an existing successful proof of concept self-launcher.
2. The span of 45' is considered a realistic optimum between the parameters of cost and performance.
3. The aircraft is designed as far as possible to be manufactured in kit form.
4. Wing and tail surfaces will be fiberglass/foam composite construction with carbon fibre reinforced spars.
5. Steel tube construction in the fuselage to connect wings, tail boom, main wheel, engine mount and pilot's seat and controls. This also gives improved pilot protection.
6. Forward fuselage pod is to be molded Kevlar/fiberglass skin composite.
7. The tail boom uses rolled aluminum alloy sheet, 2024-T3, and riveted around internal formers.
8. A fixed main wheel for economy and a steerable tailwheel for ease of taxiing comprises the undercarriage. Small wheels at each wing tip will be standard. A one-piece low-cost single curvature windscreen of polycarbonate will be side-hinged for easy pilot access.
9. The cockpit is sized to accommodate pilots of 6'4" and 225# in weight.
10. Where possible, existing control fittings from a production sailplane will be sought.
11. Design criteria are in accordance with OSTIV requirements.
12. The aircraft will be fitted with dive brakes (top surface) and flaps for more efficient termalling.
13. A reflex wing profile is used for faster cross-country speeds.
14. A 23 hp engine with electric start and gear reduction to a 42' diameter folding propeller will insure a high climb rate.
15. A five gallon fuel capacity will give a range of 250 to 300 miles for retrieves or power-on cruising.

SOURCE: SHApTalk, Vol XI, No. 7, July 1992



**SPECIFICATIONS**

SPAN	45 FT.
L.O.A.	19.68 FT.
W. AREA	97.0 SQ. FT.
A. RATIO	20.88
E. WEIGHT.	404 LBS.
FUEL	45 LBS.
GR. WEIGHT.	674 LBS.
W. LOAD	6.95 LBS/SQ. FT.
SP. SQ. LOAD	0.333

**EST. PERFORMANCE**

L/D RATIO	33:1
R/S	2.10 FT/S.
ENG. POWER	23 HP.
R/CLIMB	610 FT/MIN.

giving speeds in the 280 mph range. The tunnel runs at about ambient temperatures, although it does heat up slightly due to the closed circuit. Jerry mentioned that some of the turning vanes used to be water cooled to help control the temperature, but this is no longer done.

The airflow power source consists of a 20' diameter set of wooden propeller blades. These are fixed at about 12.5 degrees of pitch, which gives the tunnel the desired speed range for testing. Some tunnels use composite blades and others have variable (while running) pitch blades to help in adjusting the speed range.

NASA has done extensive work at calculating the effects of the tunnel's structure on the flow and its impact on the model. The engineers also have to do imaging testing when using some types of support systems to eliminate the effects of the support from the actual test results.

Laura mentioned the cable system of mounting models would be the best for flying wings, since the sting and strut would cause interference problems. Depending on what type of measurements you want, strain-gages could be mounted to the cables and then the resulting forces used to compute the moments and forces.

She talked a little about NASA Langley's magnetic suspension system. They are only using it for small test samples through a series of magnets in the model, floor and walls. Apparently, the resulting forces can be measured through the changes within the magnetic field, therefore, eliminating the need for strain-gages, etc.

The tunnel has a series of nets down-stream of the test section to catch anything that might come off the models, either on purpose or accidentally. There is also a set of rapid reaction doors that can close behind the test section to instantly shut off the airflow if there is a problem with the model. This comes in handy during various types of flutter testing to save the model from being destroyed by the flutter.

Laura showed a short video of Boeing doing dynamic flutter testing on one of their prototypes. These models actually were flying in the tunnel by using some basic controls to maintain it in a stable position for inducing the flutter. Weight is then shifted within the model to determine the effects of things like fuel load distribution on flutter.

Another item she was involved with was testing of Atlas missiles on the launch pad being hit by wind from various angles. This was necessary to determine how much it could take since Cape Canaveral sometimes has heavy winds. If they get too high the missile would be left in the hanger versus being rolled out to the launch site.

Other interesting things that have been tested in the tunnel have included, tennis rackets, sail boats, hydroplanes, down-hill skiers, Jack Murphy Stadium, off-shore oil rigs, and shipyard paint booths.

After answering a few questions, Laura

concluded her presentation. Andy then conducted the raffle, with Harald Buettner winning the stamp collection, and Bob Chase the surge protector.

The group then adjourned to view and ask questions of Harald about his molds and plug for his prototype Gooneybird RC model.

---

## LETTERS TO THE EDITOR

9/8/92

Bob



A few months ago I contacted you about locating a set of Icarus II (flying wing biplane hang glider) plans.

Within a few days I received a brand new set from your son Doug. Thank you again. By chance does Doug have any Icarus IV plans as well?

Soon after I received the plans, a TWITT member contacted me and we discussed at length the Icarus II and Icarus IV designs. He was very knowledgeable about the Icarus IV. It seems the Icarus IV was superior to the Icarus II in design and performance. He had a set of Icarus IV plans he was willing to part with. I have since lost this gentleman's phone number and address.

If your son does not have a set of Icarus IV plans for sale, then would you be so kind as to ask around at the next meeting to find out who this kind person was that contacted me. I would appreciate it if he would call me again with regard to perhaps selling (or trading) his set of Icarus IV plans.

Thank you for your help.

Sincerely,  
Bill Spencer  
(602) 284-0223

*(Ed. Note: This should be the best way to get your request out to the entire membership, since only a small portion are able to attend the meetings. Bob should be talking with Doug about whether he has any Icarus IV plans, so by the time you receive the newsletter you may have heard about their availability.)*

*We are pleased to see our members getting involved with each other and helping spread information about flying wings.)*

---

6/11/92

TWITT

Thank you for your response to my letter on page 5 of TWITT Newsletter No. 71 (May 92). Please find enclosed \$8 cash for the total

Don Mitchell tape package.

I like your newsletter and the information it provides.

Aerodynamically, with low speed,

Bob Pierson

*(Ed Note: I don't know whether the newsletter or the tapes will get to you first. The tapes were mailed first class, so hopefully you have now had an opportunity to listen to what Don had to say about flying wings and many other subjects.*

*We particularly enjoyed your unique salutation.)*

-----  
9/18/92

TWITT

Enclosed is my renewal check and my greetings to the TWITT gang.

I haven't had much room to work on my B-10M Mitchell wing since moving here (Arizona), but I'm trying to make room. Lots of projects other than it, but I miss flying.

Because of the above situation I have designed a super simple, cheap, and small enough to stick in my van, primary glider with which my wife and I can be slope glide a bit. Target time to build is two weeks (when available). If it works we will let you know; if not we won't. It's a wing, naturally, and a combination of things that work (usually).

Best regards,

Gil Metcalf

*(Ed. Note: We aren't sure from your letter if you are designing a 1/4 scale model version of a primary or a full size foot launch version. In either case, we will be looking forward to hearing more about it if everything works out well.*

*By the way, we can all sympathize with you when it comes to those "Honey-Do" projects that always seem to get in the way of "more important" things.)*

-----  
9/8/92

TWITT

Enclosed are some sketches of my latest version of my BOOMERANG design (drawings in TWITT Newsletter Aug '91, critique in Nov '91). After reading and agreeing with the criticisms expressed in the November issue of TWITT, I solved the thrust problem by merely raising the wing and lowering the engine (Mark II). I made it sleeker by reclining the people and lengthening the gear legs (Mark III).

I looked pretty sexy but the pilot in me didn't like it. I have flown in Varezes and I never enjoyed the rear cockpit because all you see is the sky above you and the top of

the wing. I didn't like the way I would have to clamber in and out of it either.

I wanted it easy to build of readily available materials. I wanted the structure to be "tweakable" even though I've read all the newsletters and know everything about flying wings. I get confused easily. The fuselage is a steel tube or aluminum box. The wings, rudders and trim vanes are ala KR II. The main gear strut is a bent aluminum bar. The engine will probably be a 85 or 100 hp Subaru.

So, after much studying of my newsletters and many erasers later I came up with the Mark IV configuration. This is sort of a "Model T" approach. It ain't as pretty as the MK III or many of the designs that I have drooled over in the newsletter, but it fulfills almost all of my wants and needs.

I don't like the empty CG being behind the rear wheels so I will move them rearward and adjust the nose wheel strut so the plane will take off without rotating. I plan to use Irv Culver's incidence arrangement. I switched from tapered wing tips to the constant chord wing to increase the elevator moment as well as make the wing easier to build. I'm not at all sure about the wing tip, rudder fin and elevon area. I think I may have too much rudder and rudder fin area. The rudder fin makes a dandy anchor for the outer tip of the elevon, but I remember reading somewhere that having the elevon butt against the fin creates mucho drag.

I really appreciate the effort and advice that some members have given me. It has saved me much effort and expense. So I'd like to submit the MK IV for a critique at one of the monthly meetings.

Cordially,  
Jim Loyd

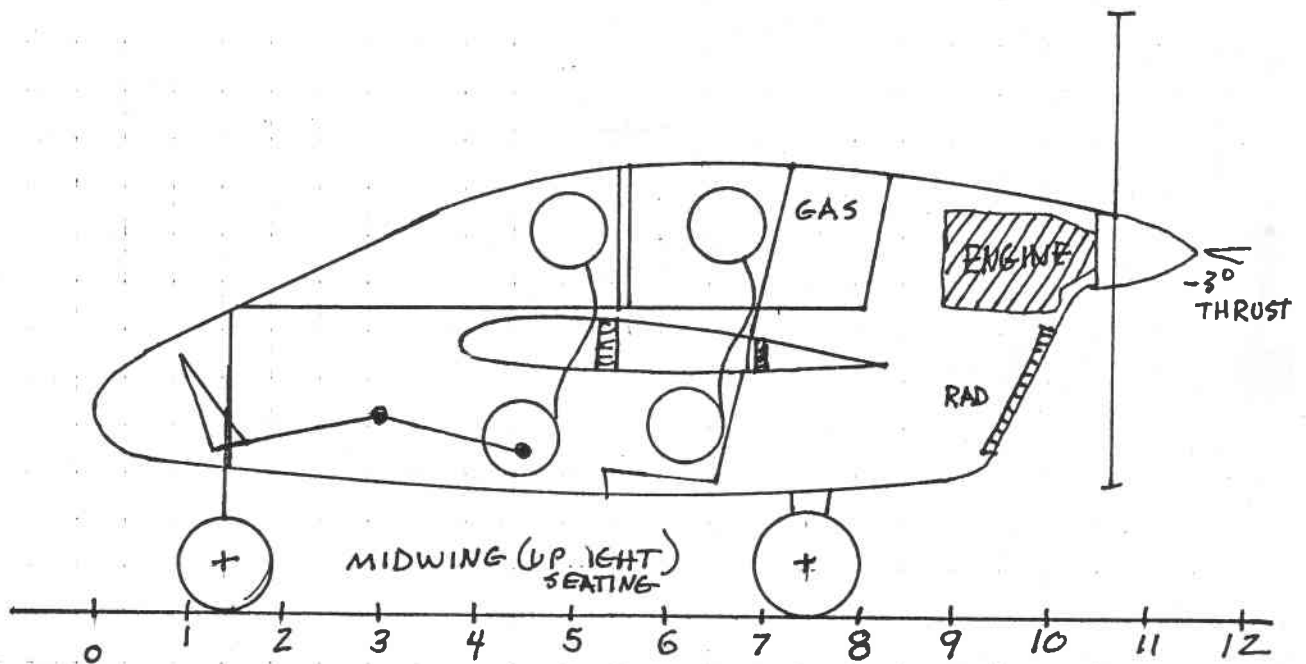
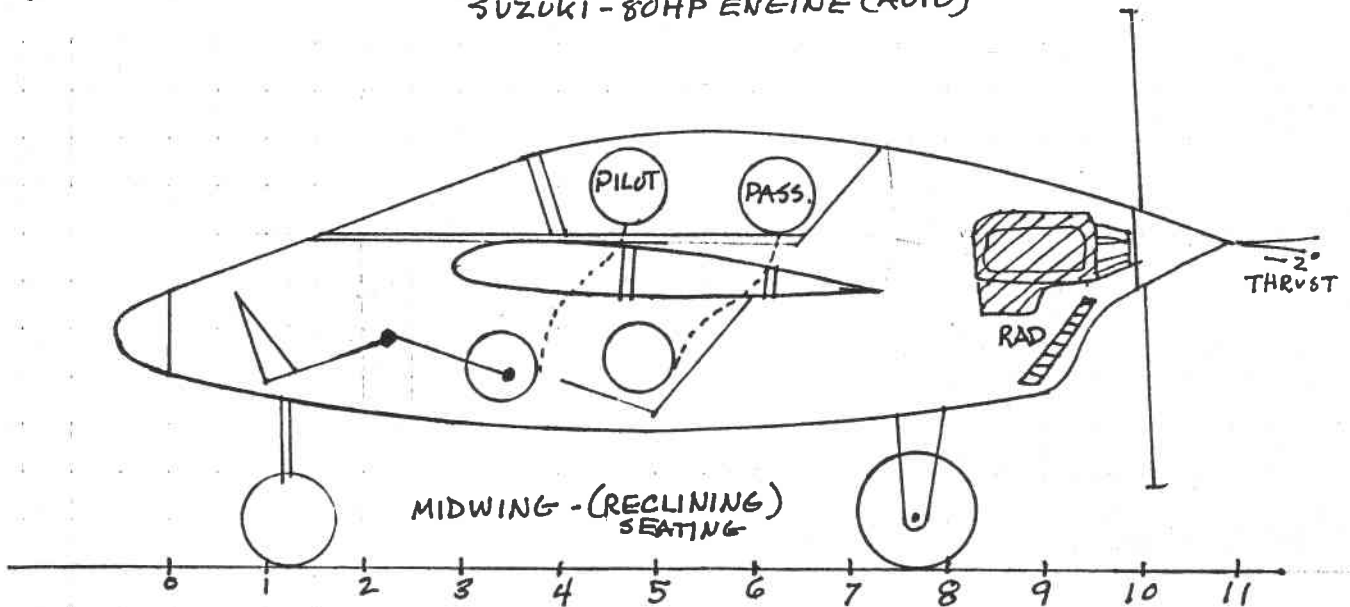
*(Ed. Note: We have included Jim's sketches in this month's newsletter for everyone to preview. We will ask members at the next two meetings what they think about your latest design. We would also like to hear from some of our other members who might have a thought or two about this configuration.*

*It is gratifying to know that the information made available through the TWITT membership has been helpful to you. We hope that others out there will also take advantage of this type of opportunity to get a variety of opinions on designs or other technical matters concerning flying wing development.*

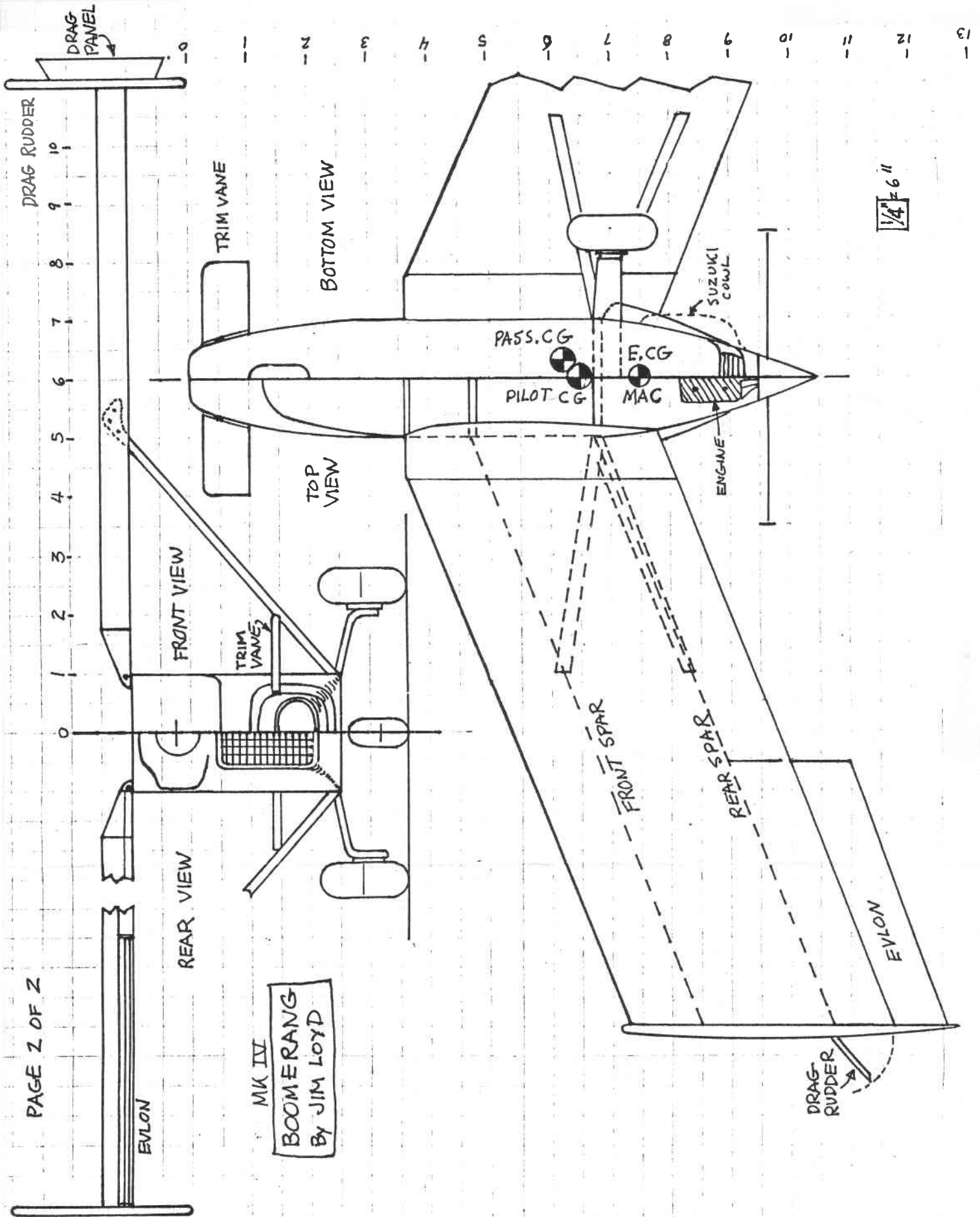
*We received a letter from Jim just before publishing that indicated he has heard from Irv and had alot of his questions answered. He also said he changed the wing design from strut braced to cantilever. He plans on using a steel tube center section on top of the fuselage.)*

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BOOMERANG - M III - MIDWING WITH RECLINING SEATING  
SUZUKI - 80HP ENGINE (AUTO)



BOOMERANG M II - WING RAISED TO MIDDLE OF FUSELAGE.  
ROTAX - SUZUKI SNOWMOBILE - SUZUKI AUTO.



PAGE 2 OF 2

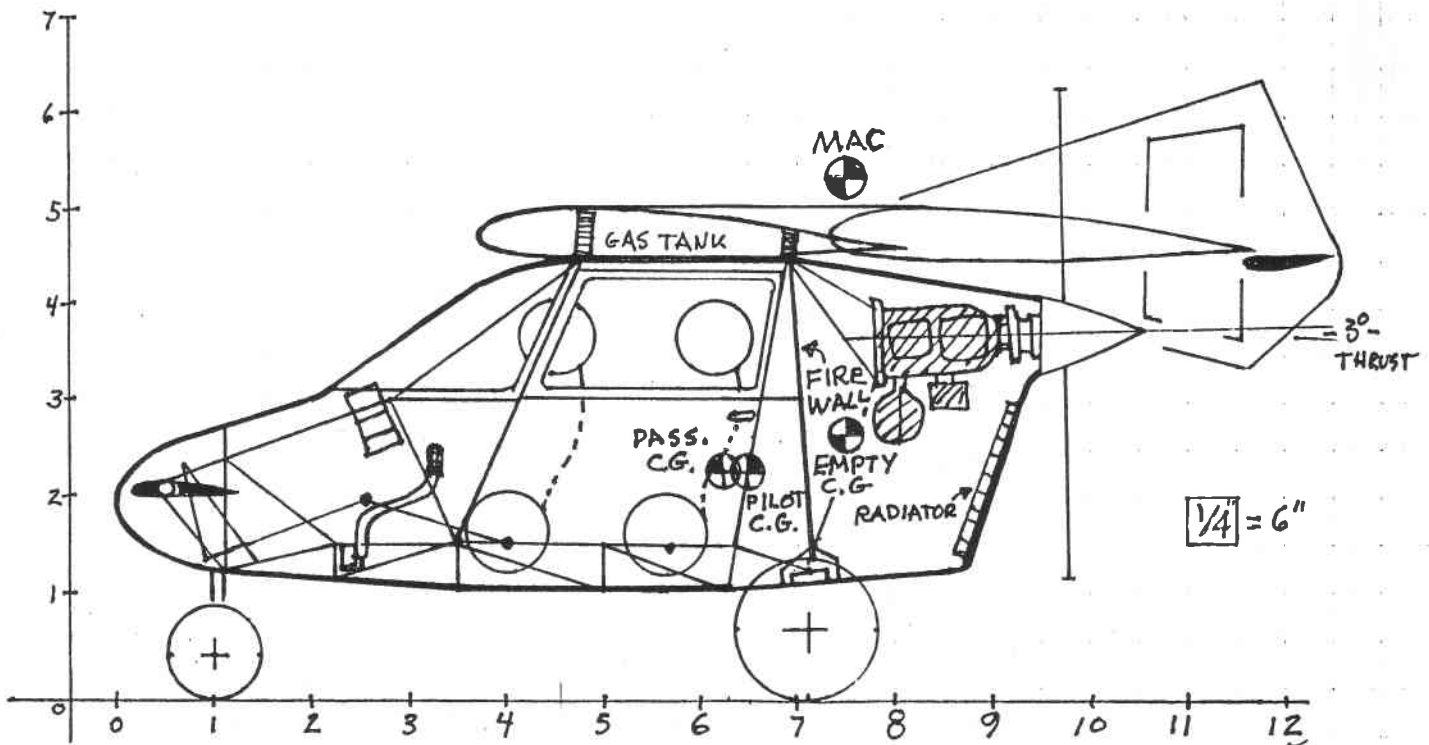
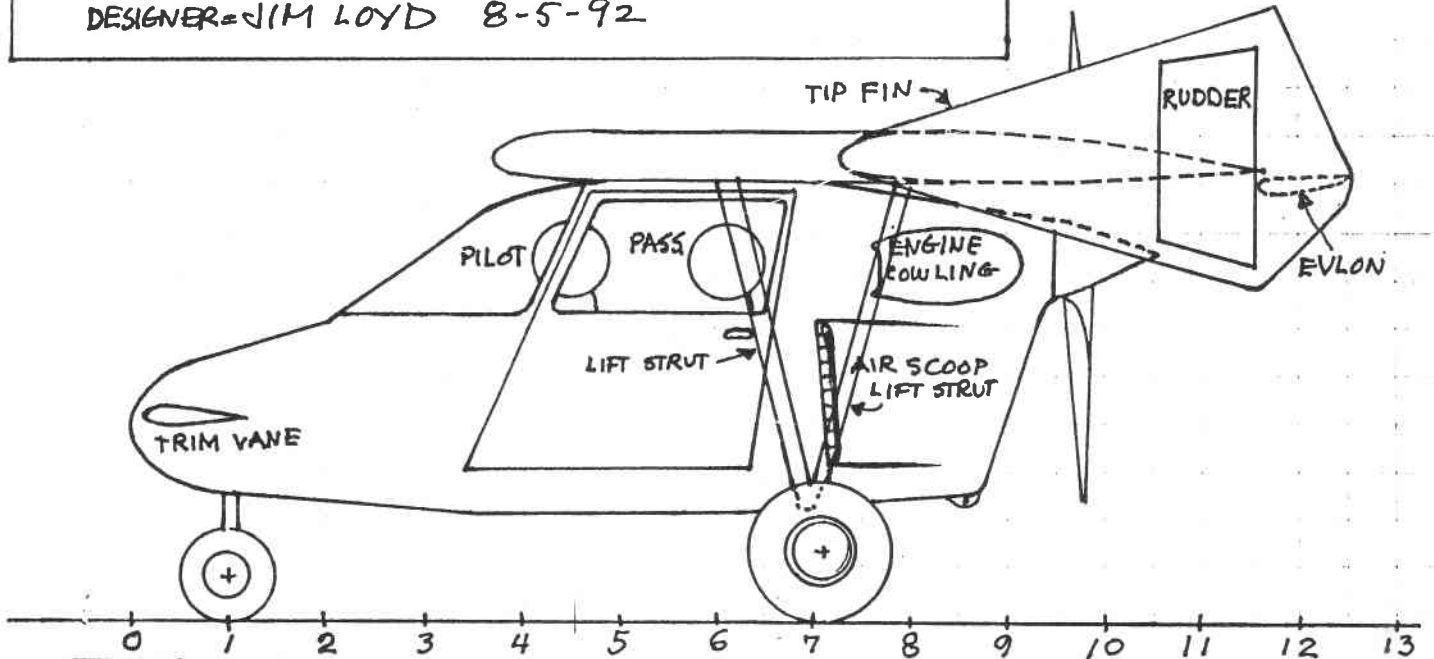
EVLON

MK IV

BOOMERANG  
By JIM LOYD



**BOOMERANG - SPECIFICATIONS: MK-IV**  
 LENGTH = 12'6" WIDTH (FUS) = 24" HEIGHT = 6'4"  
 WING SPAN = 22'  
 WING AREA = 88 SQ'  
 EVLON AREA = 18 SQ'  
 EMPTY WT = 371#  
 GROSS WT = 721#  
 WING LDNG @ G.W = 8.19#/SQ'  
 POWER = 90HP CONTINENTAL  
 SUZUKI 90HP AUTO  
 SUZUKI 100HP S.MBL.  
 POWER LDNG = 8#/SQ'  
 DESIGNER = JIM LOYD 8-5-92



## TWITT LIBRARY ADDITIONS

We would like to thank Karl Sanders for again contributing several pieces to the library.

NASA Report No. CR-181806, March 1989 (Langley Research Center, Hampton, VA 23665-5225.

**"Tailless Aircraft Performance Improvements with Relaxed Static Stability".**

Authors: Irving L Ashkenas and David H. Klyde (per Karl Ashkenas was one of the key aerodynamicists on the Northop B-49 in 1947-49).

For sale by the National Technical Information Service, Springfield VA 22161.

140 pages (Karl sent pages 45-51 which includes results, conclusions and observations, and 2 pages of references).

PURPOSE: To determine the tailless aircraft performance improvements gained from relaxed static stability, to quantify this potential in terms of range-payload improvements, and to identify other possible operational and handling benefits or problems.

**"Wind Tunnel and Flight-Test Investigation of the Exdrone Remotely Piloted Vehicle Configuration."**

AUTHORS: Long P. Yip, David J. Fratello, and David B. Robelen, NASA Langley Research Center, Hampton, VA, and George M Makoviec, Vigyan Research Associates, Inc., Hampton, VA, 1990. pp. 34, 35 & 40.

AIAA CP 90-1261

PURPOSE: The Exdrone RPV is basically a delta-wing configuration powered by a tractor propeller system. Exploratory wind tunnel and flight tests were conducted to determine the configuration's basic aerodynamic characteristics, to identify problem areas, and to provide modifications for aerodynamic improvements.

"A Study of Tailless Aircraft," by Raoul Hoffman, Popular Aviation, April 1942, pp. 19 & 58. (A synopsis of tailless aircraft.)

"A Low Aspect-Ratio Plane," by Raoul Hoffman, Popular Aviation, Sept. 1935, p. 39. (A short review of the Arup Mfg. Co. Arup No. 104, half oval shaped tailless aircraft, powered by a 70 hp LeBlond engine.)

"A Novel All-Wing Airplane," by Raoul Hoffman, Popular Aviation, March 1935, pp. 4 & 7. (A description of a "flying-wing" designed and constructed by the author. The new ship is the second of this type to be built by the author, which presents many novel features. Karl notes this inspired NACA's Charles Zimmerman's Flying Pancake.)

-----  
 Gunther Rudat, from Levet, France, has sent us a copy of "Horten ULM: le biplane vole!," Vol Moteur, No. 77, August 1992, pp. 38-42. (This is an article on a side-by-side Horten

wing)

Gunther included the following letter:

Here is my second chance to share tailless information with you. My last Horten was a model; today we'll enjoy a 2-seater Horten prototype that was flown for the first flight in June 1992 called PUL 10 with a reduced Rotax 582.

The first one, named PUL 9, was a 1-seater and pushed by a Rotax 447. I saw it flying at Moulin (France) 2 years ago by Siegfried Panek, a German disciple of the Prof. Dr. Weimar Horten living in Argentina. He designed and constructed these two flying wings in cooperation with the Italian "Nike Aerdelta."

*(Ed. Note: Bud Mears has offered to ask a friend to translate the entire article, or at least summarize the material. Depending on what we end up with, we will try to publish some of it at a later date. Thanks to both Gunther and Bud.)*

-----  
 Jim Loyd sent us a copy of "Dynamic Modeling," by Stan Hall, Sport Aviation, July 1987, pp. 30-36. (Use of free-flight, dynamically-similar models in estimating full scale aircraft behavior.) Jim indicated he had gotten alot out of this article in terms of using models to plan and test his various designs.

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### INFORMATION NEEDED

**Bob** Fronius, TWITT's Founder, along with some other early aviation pioneers in the San Diego area, are trying to get a National Monument established on the soaring sites at Point Loma. He is looking for information and/or pictures of flight activity from the Point Loma area during the period of 1929-30, including any flights of Hawley Bowlus. If you don't have pictures, but were an eye witness and could provide some detailed accounts of the soaring, that would be great. If you can help, contact Bob at home in the evenings, the hanger during the day, or through the TWITT post office box. Thanks for your help.

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**AVAILABLE PLANS &  
REFERENCE MATERIAL**



**Tailless Aircraft  
Bibliography**

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

**Tailless Tail**, 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.

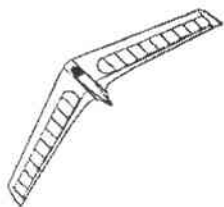
Published by B<sup>2</sup> Streamlines, P.O. Box 976, Olalla, WA 98359-0976, or (206) 857-7249 after 4pm Pacific Time. Price is \$38, postage and handling included (also applies to Canada and Mexico). Orders shipped elsewhere will be sent surface mail unless an additional \$10 is included to cover air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



The cover of the July 1991 issue of RCModeler features a flying wing called the "Stealthbat" offered by Wing Manufacturer. There was no price listed, but they can be contacted at:

306 E. Simmons  
Galesburg IL 61401  
(309) 342-3009  
Catalog: \$4.00

**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

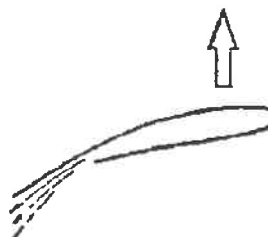
**SAILPLANE HOMEBUILDERS ASSOCIATION**

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)

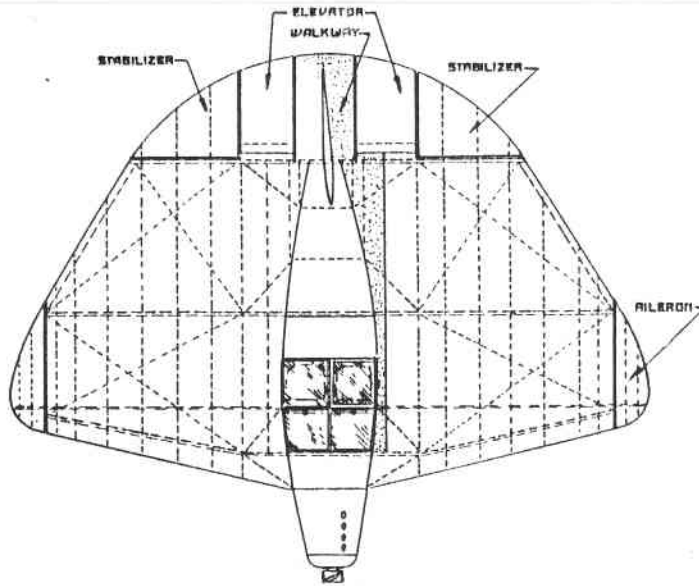
Make checks payable to: Sailplane Homebuilders Association, & mail to Secretary-Treasurer, 545 McCarty Drive, Furlong, PA 18925.



THE HIAM AIRPLANE  
NEEDS YOUR HELP

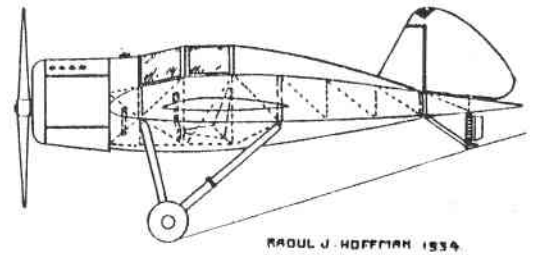
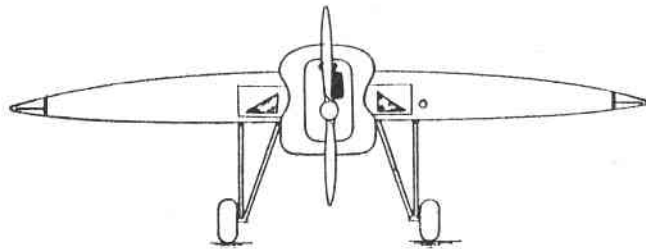
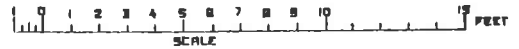
For those of you who would be interested in assisting Budd Love with some aspect of his High Internal Air Mass (HIAM) project, he would be glad to hear from you. This concept has great potential for the future of air transportation.

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



~HOFFMAN FLYING WING~  
SPECIFICATIONS:

WEIGHT EMPTY 900 LBS  
SPAN 22'-8"  
OVERALL LENGTH 17'-8"  
MAX CHORD 14'-0"  
WING SECTION M1 AT TIP, M0 AT STABILIZER, EXTENDED M18 AT CENTER  
AREA 237 SQ. FT.  
POWERPLANT 85 BHP ENGLISH CARROL  
PROPELLER 7'-0" DIA. 4'-4" PITCH  
TWO SEATER, DUAL CONTROL  
RETRACTABLE LANDING GEAR  
ENTRANCE OVER THE WING  
INDIVIDUAL STABILIZER ADJUSTMENT  
CENTER SECTION WELDED STEEL TUBING  
OUTER SECTION WOOD, THREE BEAMS  
LANDING SPEED 28 MPH  
TAKE-OFF SPEED 30 MPH  
TOP SPEED, FIXED LANDING GEAR 135 MPH



RAOUL J. HOFFMAN 1934

SOURCE (above): "A Novel All-Wing Airplane" from reference on page 9.

SOURCE (below): "A Study of Tailless Aircraft" referenced on page 9.

**8500 MILE NONE-STOP**

<p>1 BURNELLI</p>	<p>2 PAPER CLIP WASHER</p>	<p>3 ZANDHIA MACROCARPA</p>	<p>4 HOT STABLE STABLE</p>	<p>17 LINIPLANE</p>	<p>18 APER FLEW 800 FT IN OCT. 14, 1897</p>	<p>19 GLIDER</p>
<p>5</p>	<p>6 THE PIGEON (TAUBE)</p>	<p>7 W. STOUT BATWING 7 200 HP VALKARD</p>	<p>8 PENAUD 1878</p>	<p>21 FAUVEL 580 LBS 75 HP 112 M.P.H.</p>	<p>22 NEW PHILADELPHIA, OHIO 35 FT SPAN 1000 LBS 90 H.P.</p>	<p>23</p>
<p>9 ROTATING ELLEHAMER 1901</p>	<p>10 CAUDRON 1938</p>	<p>11 WATERMAN'S ARROWBILE</p>	<p>12 FOR ELEVATOR</p>	<p>25 ARUP (50 BEND)</p>	<p>26 ARUP WITH TAIL</p>	<p>27 MAN-O-WAR</p>
<p>13 PTERODACTYL</p>	<p>14 FARMAN 1934 120 MPH.</p>	<p>15 HORTON III 895 LBS 388 SW FT 81 FT SPAN</p>	<p>16 RUSSIAN GLIDER</p>	<p>29 WINDTUNNEL 25% MAX. BEST 1/2 19.2</p>	<p>30 BEST 1/2 - 10.8</p>	<p>31 FAUVEL WING ALONE MAX 1/2 17 WITH BODY 13</p>