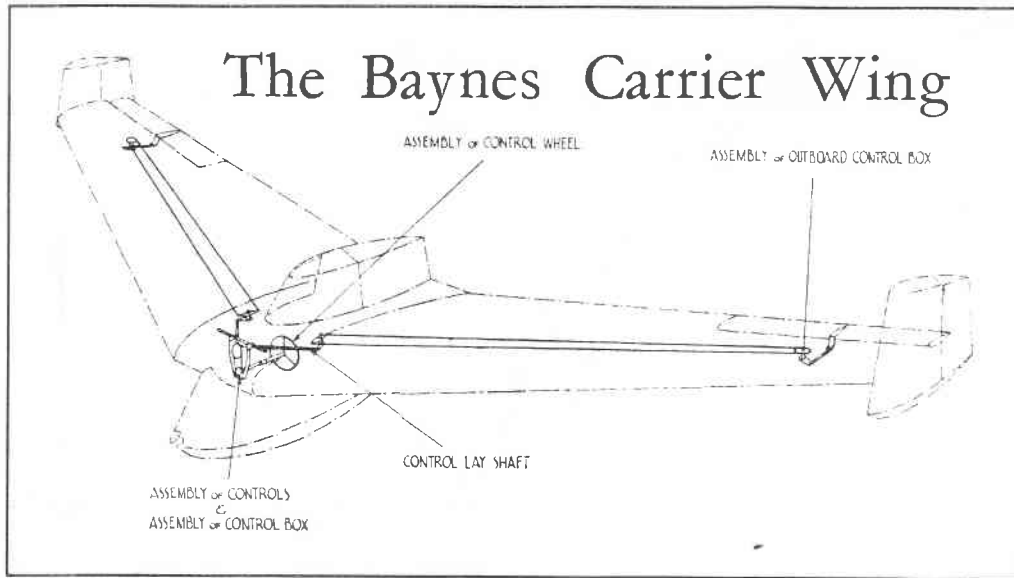


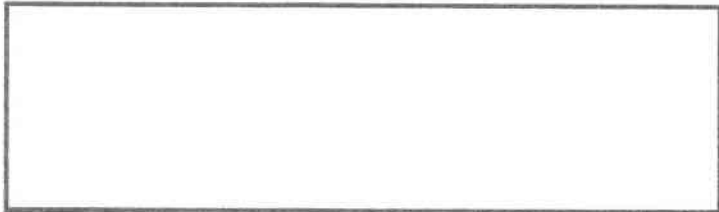
# TWITT NEWSLETTER



The Baynes Bat, designed by L.E. Baynes, a British sailplane designer and built by Slingsby Sailplanes at Kirkbymoorside, Yorkshire in 1943. The 33' span, all-wood glider made its first flight in July 1943. (From the TWITT library.)

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**TWITT**  
 (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., 9006 means this is your last issue unless renewed.

Subscription rates are \$15 per year for U.S. mailings and \$19 per year for foreign mailings due to higher postage rates.

Next TWITT meeting: Saturday, June 16, 1990, beginning at 1030 hrs at hanger A-4, Gillespie Field, El Cajon, Calif. (First hanger row on Joe Crosson Dr.)

TWITT' S  
4 th ANNIVERSARY CELEBRATION

June 16, 1990

Location: Hanger A-4  
Gillespie Field  
El Cajon, Calif.

Time: 1:30 PM

Short Business Meeting  
Election of 1990/91 Officers

Model Airplane Building Contest  
(Flying Wings Preferred)

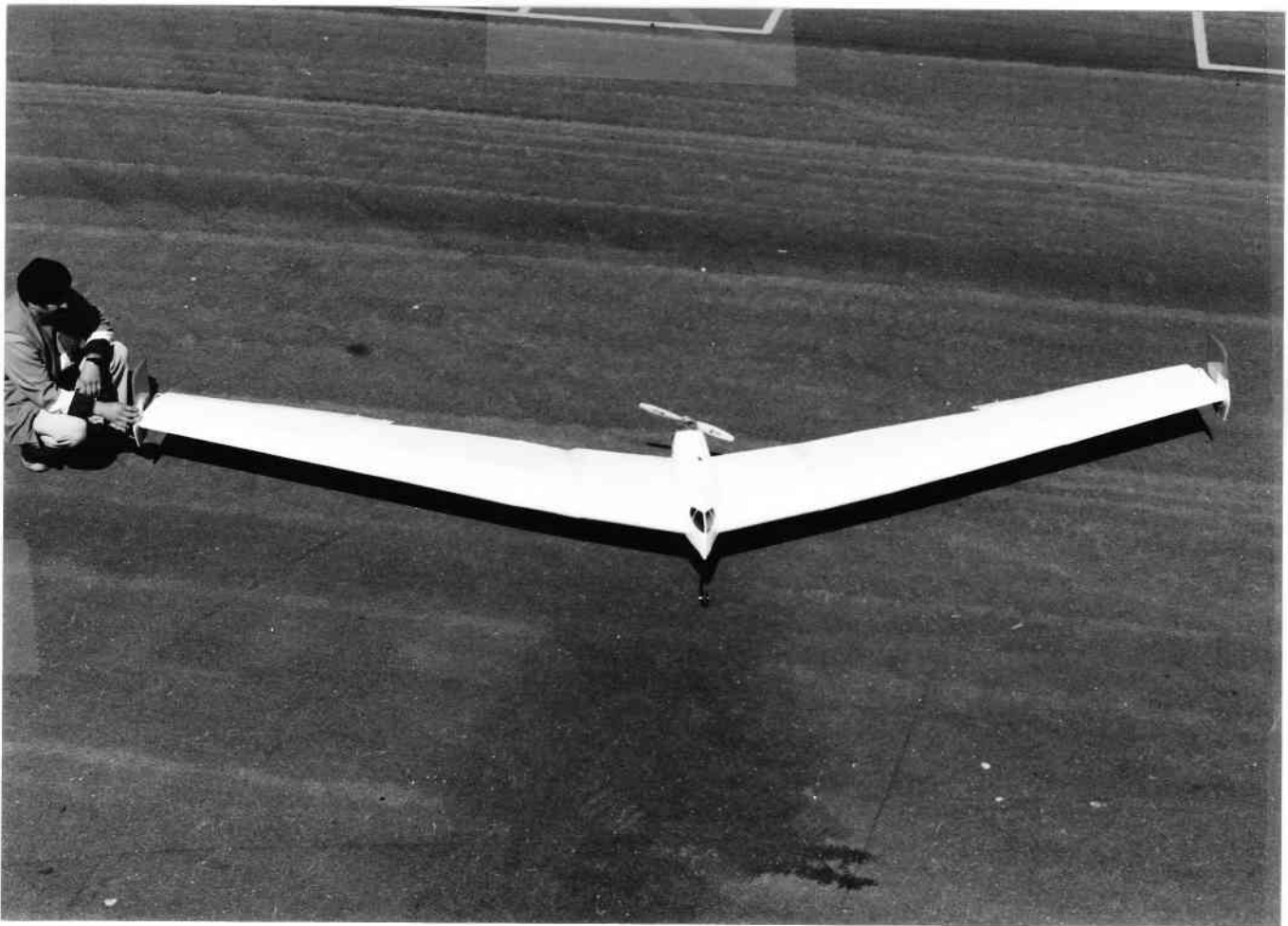
Fly-off To Determine The Ultimate Winner

Cake and Ice Cream

Sodas, Coffee, Tea, etc.

Hanger Flying Mandatory

Bring your favorite video/slides  
of aviation highlights



Don Mitchell designed AM-01 RC FLYING WING - See page 6 for more details.

## PRESIDENT'S CORNER

It's hard to believe that TWITT is coming up on its fourth birthday with the June meeting. As in past years we will be having an anniversary party rather than a regular meeting and a formal program. As I mentioned before, we are planning on having an aircraft building and flying contest using materials provided by TWITT. The idea, of course, is to build a flying wing and successfully fly it against the other entrants. For you model builders who are able to come, you can bring your own tools and glue, but you will have to use the supplied materials. Now is the time to start thinking about your dream ship and how you would put it together using balsa or possibly foam board. Also, if you have any videos, slides, picture albums, etc., that you would like to share with us on an informal basis, please bring them along. We will provide the equipment for viewing. All this fun and cake and ice cream too!! DON'T MISS IT

Also at this meeting we will be electing a new slate of officers for the 1990/91 period. As of this newsletter we haven't received any nominations from the general membership, so nominations will be made from the floor during a short business meeting. We need someone to run for President, Vice President, Secretary, and Treasurer (these last two can be one person). It would be nice to have some new blood in these positions, hopefully with new ideas that will help TWITT continue to progress. WE NEED A GOOD TURNOUT FOR THE MEETING TO HAVE FAIR ELECTIONS SO PLEASE COME.

I have submitted a letter to a local computer hardware dealer in the hopes of receiving a donation of our own computer equipment to use for the newsletter, developing a bibliography of the TWITT library, etc. As of publication I had not heard back, but the owner was very receptive to the idea when I discussed it with him.

The U.S. Postal Service struck a new blow for violence in handling our precious newsletter. One member sent us what was left of his newsletter, the cover page pieces mostly taped together, and asked if we could send him a complete one. We have taken care of the new mailing, and want all of you to know that if you have similar problems let us know so we can get a new newsletter to you. Just drop us a postcard identifying which issue didn't arrive or was damaged beyond use.

One last item for this month. We have ordered another dozen TWITT hats so our members can advertise what we are all about. These have been used as raffle prizes, as well as sold individually. If you are into hats, baseball style that is, they are available for \$8.00 apiece whether you buy them at the hanger or mail in your order. Once we see how the demand goes we can have more made so everyone can be properly decked out.

Andy

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## ADDITIONS TO TWITT LIBRARY

AEROPLANE MONTHLY, May 1990, Vol. 18, No. 5, Issue No. 205.

Philip Jarrett, "Nothing Ventured," pp. 266-267. Describes the Baynes Bat of 1943, with pictures and one schematic.

Richard Riding, "Bowlus Twin-Boomers," pp. 268-270. Describes wartime American experiments in proof of concept twin-boomed troop transports.

(Donated by Mark Motley)

*(Ed. Note: According to Bob, Don Mitchell took one of the twin-boomers and by removing the booms and installing his external control surfaces, made a flying wing.)*

Wooldrige, E.T., *Winged Wonders - The Story of the Flying Wings*, Smithsonian Institution Press, Washington, D.C., 1983. A comprehensive history of tailless aircraft from 1870 to 1983, including a select bibliography of tailless aircraft.

(Donated by J.C. Pemberton, Scanivalve Corp.)



RON BORNE

## MINUTES OF MAY 19, 1990 MEETING

Andy opened the meeting by telling the group about a letter he received from Marc de Piolenc telling us about a letter he had from Dr. Karl Nickel in Germany. (See copies of both letters in the Letters to the Editor section.) Of course, TWITT will provide whatever assistance it can to help support Drs. Nickel and Wohlfahrt's efforts at accomplishing an English translation of their book on tailless aircraft, *Schwanzlose Flugzeuge*. Unfortunately, we had stopped printing the reprint authorization notice on the cover of the newsletter back about number 29, and that has concerned them in relation to publishing several articles from TWITT in the new book. These minutes should serve as notice that anything published in the newsletter can be reprinted by anyone as long as the author is given the proper credit for its contents. (We will begin printing the notice either on the cover or inside starting with the June issue.)

Andy then told the group about Phillip Burgers upcoming trip to Los Angeles for a symposium on flying wings being sponsored by the Edwards Air Force Base Museum. We have provided him with business cards and a two page handout to use while he is talking with people and place on a table with other brochures and pamphlets. We hope he will be able to make contact with others who are interested in Horten designs, as well as private development of flying wing aircraft. (Phil will relate what happened at the conference at a future meeting, probably July.)

The raffle prize was to be a disc sander, however, due do the small turnout it was decided to have two hats used as prizes. The disc sander will be put off until the June meeting, since we hope to have a much better attendance.

Andy then introduced our featured speaker, Bud Feurt (pronounced Fort) and his associated Ron Borne, who is a ground effects expert. Bud began with a video of Aero Marine's Sea Hawk during construction at a factory in Singapore. The Sea Hawk is not an aircraft, but rather a ground effects vehicle designed to transport up to eight people over relatively short distances between islands. It is classified as a boat since it does not fly over 50' above the water. Because of this they elected to use Keith Black (of drag racing fame) engines to drive the propellers. These are aluminum

block, 454 cu. in. engines bored out to 540 cu. in. and turbo charged, producing up to 610 hp. at around 5000 rpm.

The concept is to have something that is faster than a boat but slower than an airplane and doesn't need a runway. The wing was designed by Ken Sheffield, of England, is very thick and has a high drag factor. The floats have a plenum chamber in them that is fed by engine exhaust. This chamber is evacuated through small holes in the float's bottom which allows for a cushion of air to build up and help the vehicle break free of the water's surface.

The vehicle was constructed in Singapore, since the project sponsors were there and envisioned its use amongst the many small islands around Singapore. The workers had little knowledge of aircraft building techniques so had to be trained for each step of the construction. As they gained experience in working with metal construction tools, they were able to speed up building, but many would take the knowledge and go work for one of the regional airlines. This slowed production, somewhat, since new people had to be constantly trained.

The airfoil is 41" thick which allows enough depth to actually bury the engines within the wing. The vehicle is built with 5052 marine aluminum since it did not have to have the same load factor capability as an aircraft. The lift coefficient is about 3.2 with an L/D of about 8. Automotive engines were used since they could develop the necessary horsepower on 92 octane auto gas rather than having to use jet fuel which would be in short supply on most outer islands.

The vehicle is currently under flight testing, however, there has been some trouble with the centrifical clutches. These are now being replaced with a direct drive belt system which should allow for the various speed ranges of the engine/propeller combination.

The new belt drive is built by Gates and involved special toothed belts. Since Gates had the patters on the these specially shaped teeth they had to approve the construction of the sprocket pullies and this took a lot of coordination with Gates and several other companies before they were finally able to get the complete drive system.

As it turned out the pontoons were bigger than necessary and the struts a little to

long. The struts have been shortened, but the pontoons have remained the same size. The vehicle sits about 8" into the water, since the plenum chamber fills with water after the engines are shut down. This helps to stabilize the vehicle while it sits in rough seas. It only takes a few minutes after engine start to push the water out, and there is a relief valve to prevent overpressurizing the chamber.

After Bud completed his portion of the presentation, Andy introduced Ron Borne who explained his involvement in the ground effect design and development. Ron is an aeronautical and chemical engineer, and has worked for several major aerospace firms as well as performed extensive research in the area of ground effect vehicles.

Ground effect sort of got started when a step was put in the hulls of boats to help raise them up and reduce the wetted area causing drag in the water. The next step was hover craft which rode on a cushion of air to get the hull completely out of the water. Then came the hydrofoil which got the hull out of the water, but still left the foils below the surface creating drag.

In the sixties it was decided that aerodynamic lift could be used to reduce the drag. Dr. Alexander Lippisch was one of the early leaders in the area of ground effect. Lifting a boat off of water in this way resulted in a large aft movement of the center of pressure and caused instability in the longitudinal plane.

Ron demonstrated by drawing an example on the board which showed how the lower 25% of the pressure distribution is affected when you get a wing down close to the water or other flat surface. The compression of the pressure between the wing and the surface produces more lift without any real resulting drag. However, this only works well with low aspect wings. Dr. Lippisch developed some planforms which overcame the pitching tendencies, but research sort of stalled upon his death about 10 years ago.

Ron went on to explain how he has tried to overcome some of the problems of longitudinal stability by incorporating a canard type frontal structure. Although this did help the problem it did nothing to improve lateral stability. Ron then reshaped the vehicle to have the main planes form a three point lifting system. (The shape of the model he had at the meeting was very similar to the Rameses 1 pictured elsewhere in this issue, however, it was much more streamlined

with a dual propulsion system.) The idea is to prevent the dynamic pressure built up between the hull and the surface from escaping and reducing efficiency.

Other designers have tried using exhaust gas to create a cushion of bubbles between the hull and water, and then dynamic lift to finish the process of reducing drag. Although it resulted in a drag reduction of about 50% it never really worked well enough for commercial development.

Ron explained that by keeping the vehicle close to the surface, the drag factor becomes about half and you get about twice the speed for the same amount of energy. Also that the trailing edge vortices never develop since the air doesn't seem to know it has lifted the wing off the water. Some of Ron's experiments have shown they are getting about 40:1 L/D with an aspect ratio of 1.

Another aspect of ground effect flying had to do with the affect of power changes on the controllability of the vehicle. As throttle changes were made the torque and thrust would have a tendency to make the craft tilt to one side. Ron thought of trying a setup where he had propellers rotating in opposite directions to counteract this problem. This was also necessary since you don't have a lot of time to make corrections to attitude due to the close proximity of the surface. Ron has achieved speeds of up to 160 knots with a research vehicle he built for British Petroleum some years ago.

Ron talked a little bit about the angle of incidence of a ground effects vehicle. In this case you don't have to worry about changing the angle of incidence since the vehicle has an optimum speed to fly, unlike an aircraft. If you get it out of ground effect your highly efficient 40:1 airfoil becomes about 8:1 and requires a lot of power to achieve any speed, but this is not what it's designed for. The horizontal tail plane is used to help control any tendency to become fully airborne. Automated flight control systems could also help to provide the necessary reaction time to prevent inadvertent lift off into the flight regime. These vehicles are also very sensitive to weight and balance especially if they get airborne.

Ron indicated he would like to do more work in trying to calibrate the benefits achieved from ground effects. He thinks probably Lippisch and Detweiler have the

best data to date, but nothing more has been done with it. Ron had the opportunity to use the wind tunnel at Southampton University, but found you can't actually duplicate the necessary conditions since the floor of the tunnel remains stationary. Although there are tunnels with moving floors, Ron hasn't heard of them or had a chance to work with one to prove his theories.

Ron indicated that the liftoff speed is somewhat below the suggested 60 knots due to the 20 lb wing loading. This is a benefit of ground effect, along with the lower power requirements once in the air. Ralph Wilcox asked about this affect on the Convair Sea Dart and Ron explained the plane's problem stemmed from the wing planform being the reverse of what is needed for a good ground effect vehicle. Since the Sea Dart had a delta wing, as it entered ground effect the center of pressure moved aft into a section of greater wing area instead of less. This induced the pitch oscillations that caused the pilots so much trouble. A pure ground effects vehicle is therefore wider in the front and narrower in the rear so there is less adverse influence as the center of pressure moves aft.

Ron answered a few more questions from the audience before wrapping up a very interesting aspect of the Sea Hawk project. The meeting adjourned to the ramp outside the hanger to observe Robbie Grove's Whisper composite aircraft. Specifications and three views of this aircraft are published elsewhere in this issue.

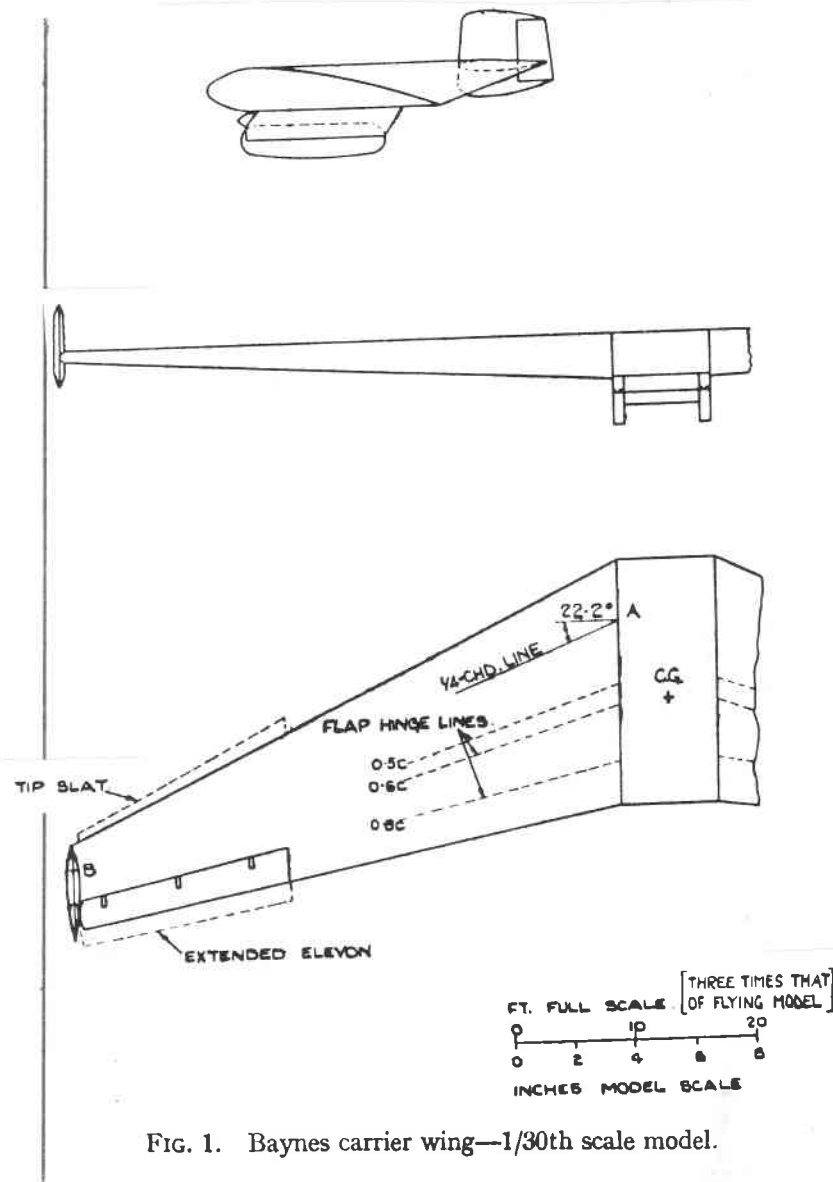


FIG. 1. Baynes carrier wing—1/30th scale model.

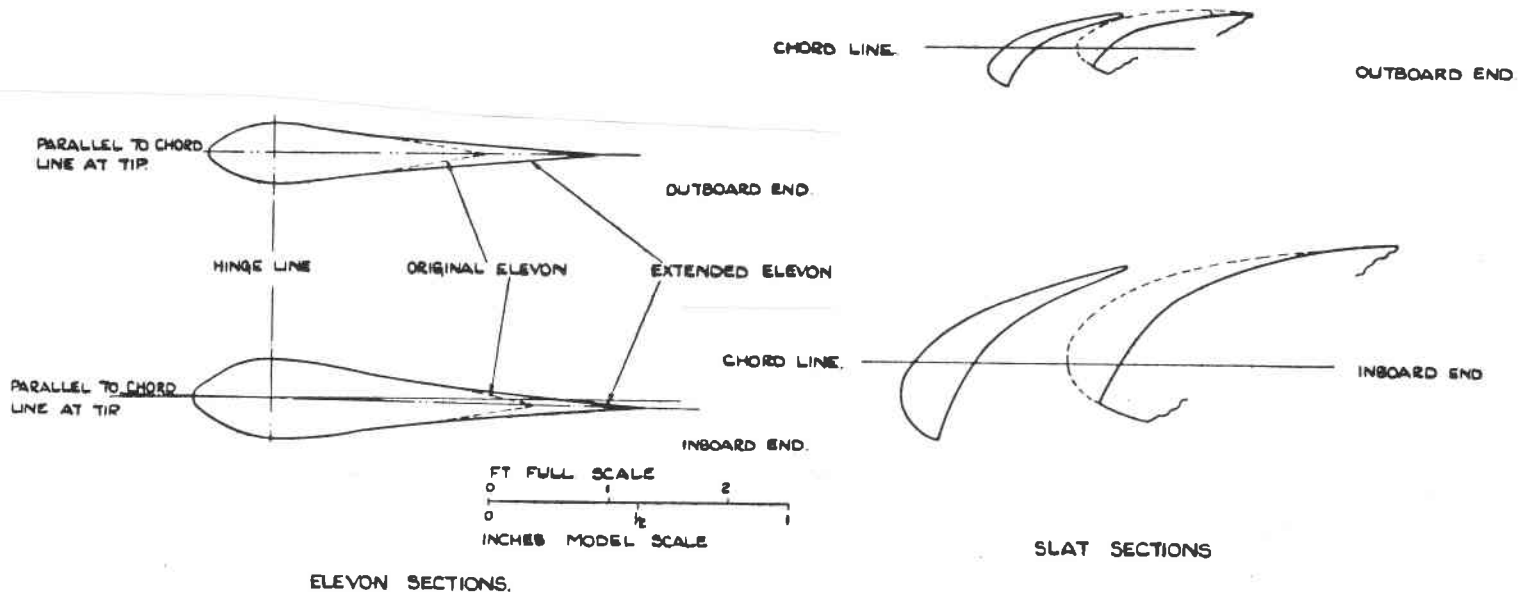


FIG. 2. Slat and elevon sections for 1/30th scale model.

LETTERS TO THE EDITOR

May 23, 1990

Dear Andy,

By the time your readers see this I will be at my summer Colorado address (129 Citadel Dr., Ridgway CO 81432 until about Labor Day) with the few remaining tailless aircraft bibliographies. Currently, I have only one remaining original quality copy, about ten reasonable-quality copies, and a small stack of others with various defects. I have no immediate plans for producing more when these are exhausted, unless I have opened more of a market or achieved a major increase in content. Listing about 1500 tailless items, 500 items of related interest, annotation, and other useful information, it is to my knowledge unique and by far the most ambitious, extensive work of its type ever published. Since it is soon to become at least temporarily unavialable, anyone who has been putting off an intended purchase should probably order now.

I wish to thank all of you whose kind comments and feedback have encouraged me to continue the project. I really enjoy the correspondence and have also been happy to help. Those who have followed up with bibliography contributions, rest assured that they have been added and are now in a supplement which will be available in the fall. It currently stands at about four pages, and will probably be offered as a direct computer print-out. I will decide how to handle it when I know its size and scope. It will be continually upgraded as new information arrives.

Meanwhile, I'd like much to hear from members with major collections of tailless material. While my collection of less than 900 items is already recorded among the 1500 tailless items in the bibliography, several of you are reputed to have larger collections. I hope these people agree that a bibliography of such material fills a major void in the literature and would wish to help push the project forward. As I said in my introduction, such a document can be neither comprehensive nor exhaustive, but it can be improved. While I cannot search for more tailless material in the San Juan rockies, I can enter more material into the computer this summer. This would be a GOOD time to send me expansion material, if

you've a mind to do so. To this end, I offer one free cosmetically substandard (but complete) copy to anyone willing to search his major collection for items I've missed and record bibliographical info for me. Any takers?

And remember, this may be the last chance in a while to have a tailless aircraft bibliography. If you're interested, let me know soon.

Thanks.

Sincerely,

Serge (Krauss, Jr.)

*(Ed. Note: The TWITT library has a copy of Serge's bibliography for those of you in the local area who would like to compare your information with that of Serge's. I hope there are several TWITTERS out there who will take him up on his offer since this project benefits everyone interested in flying wings/tailless aircraft.)*

May 12, 1990

TWITT

Please enter my subscription to your fine magazine. Your publication always provides a lot of useful information and interesting articles.

We are sending you some photos that I hope you can use. It's our new Don Mitchell designed AM-01, RC FLYING WING. Don has been designing and building flying wing aircraft for over 40 years and has many models currently flying. The Mitchell Wing B-10 ultralight and the U-2 motor glider are two of his excellent flying wing designs.

The AM-01 has a 16' wingspan, a 3' chord at the center section and 1' at the tips. A leading Los Angeles pilot/designer, Steve Mahrle, installed a 2.5 hp Homelite engine on the ship and did the initial flight test program. He said it's a real dream to fly, has a broad speed range, and a great glide ratio. The wing can also perform some really exciting aerobatics maneuvers.

The wing will be marketed by:

WING, RPV  
892 Jenevein Avenue  
San Bruno, CA 94066

For additional information, please contact Richard Avalon at the above address.

Best Regards,

Richard Avalon

(Ed. Note: Our long-time readers know that Don Mitchell is a member of TWITT and that we have published information about both the B-10 and U-2. It is interesting to see what is being done in the radio control area that can eventually be translated into the full size thing.)

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May 16, 1990

TWITT

I just received the notes of the March 17th meeting. If you need a translator for the French gliding books catalogue just fire it up to me and I'll take care of it. Just send it to my Calgary address. I'm just over in Turkey on a business trip.

Passed through the the Deutches Aero Museum in Munich. They have a full scale replica of Lilienthal's glider.

Regards,

Stewart Midwinter

(Ed. Note: We really appreciate the offer, and hopefully by the time you read this newsletter Stewart will have the catalog in hand and be working on it. If anyone out there can help us with German translations, please let us know since there is almost always something coming in from our fellow members in Germany and Austria.)

---

May 29, 1990

Dear Bob:

Thanks for the infor about Brad Powers ...a terrible tragedy, but never heard the details about what happened and how. Could you fill me in, please?

The TG-2 looks GRAND! What a beauty! I used to fly the old TG-3 that belonged to the "Southern Tier Air Group" on Harris Hill. It was a club within a club where a few guys got together and bought a TG-3. We used to auto tow, auto-pulley tow, and aero tow (behind our Stinson L-5) called (what else?) The Tug. Good fun, and I got so I could even soar the old bird instead of just glide. My log shows a lot of 5 minute flights, too.

I never flew the TG-2, although my friend

(now deceased) Jack Wilkins had one, and used to say she'd spin like a top if you weren't careful. Wonder if she had the correct washout in the tips???

One thing I really like about the TG-2 is the fact that she's all metal and will last a couple of lifetimes if she's cared for properly.

I often wonder what became of my old Schweizer 1-20. It has passed through many hands since I owned it back in '58, and I even have a strip of fabric from the nose that carried the logo and painting "The Blue Auk."

Guess that's about it for now, but tell Doug he's a lucky man!

By the way, Judy is renewing the subscription exchange with RCSD and TWITT.

Happy soaring,

Jim (Gray)  
(R/C Soaring Digest)

(Ed Note: Brad Powers passed away during, or shortly after, an operation performed as the result of a medical condition requiring him to seek help through a hospital emergency room. Sorry we can't be more specific, but we didn't save the newspaper article. Hopefully, someone reading this newsletter can help Jim locate the current owner of his 1-20 and send him the information at: 210 E. Chateau Circle, Payson, AZ 85541.)

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Dear Andy:

The enclosed letter from Karl Nickel mainly concerns the Newsletter, so I am forwarding it to you for reply. I have already answered it insofar as it concerns me personally, but I can't set policy for the Newsletter. For what they are worth, my recommendations are:

1. That we publicize Schwanzlose Flugzuege in the newsletter and (if Karl agrees) solicit advance orders.
2. That we try to arrange bulk purchase, pre-publication discounts for TWITTs.
3. That we give the greatest possible encouragement and help to their plans for an English language edition, including:
  - a. help with translation and editing (I have already offered my own help in these capacities).
  - b. permission to reprint original articles from the newsletter.



c. help in locating copyright holders of U.S. copyright material and in obtaining permission to reprint.

d. publicity as in 1., above.

If this project is half as good as I think it is, it is worth supporting. Since Drs. Nickel and Wohlfahrt have had to subsidize printing, I am anxious to see that they do not lose their shirts.

Regards,

Marc

*(Ed. Note: The Board of Directors agrees with all the above points made by Marc, and TWITT will do whatever it can within its resources to help further this project into an English edition. We hope that as Drs. Nickel and Wohlfahrt progress toward this goal they will keep us informed and provide us with any material which they deem we can handle for them. Dr. Nickel's letter to Marc is printed below.)*

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Karl Nickel

April 17, 1990

Dear Marc:

I do hope that you received the interval papers in the meantime. The reason why I write today to you has to do with TWITT.

A former colleague of mine, Dr. Michael Wohlfahrt, and I just finished the manuscript of a book. It is written in the German language and has the title *Schwanzlose Flugzeuge* (tailless airplanes). Our main goal for this book is a certain completeness. We do hope that we are able to cover with it all domains and aspects of tailless airplanes. Therefore, the manuscript became rather large: it consists of more than 600 pages, contains some 220 drawings and 50 photos. It will be printed by the publishing house "Birkhauser" in Basel, Switzerland. Unfortunately, we have to pay a rather large sum in order to subsidize the printing costs. We hope that distribution begins in August of 1990.

As soon as the book is out we will start to work toward a second edition in the English language. We hope that the publisher will permit us to preprint some of its English parts in TWITT (if you are interested, of course).

The existence of the "TWITT newsletter" was of the greatest help to us. This brings me to one question to you: until number 29

of TWITT the following label was posted on the front page - PERMISSION IS GRANTED to reproduce this publication, or any portion thereof, provided credit is given to the author and publisher, and to TWITT. Since number 30 this label is missing. What is the reason for it?

This is of special interest to us since we wanted to make use of articles and drawings from your newsletter. Naturally, at every point full credit would be given to both the author and to TWITT. One special example is the article: Wainfan, Barnaby; "Let's Consider Airfoils for Flying Wings", TWITT Newsletter Number 33, March 1989, pp. 8-11. We liked this article so much, that we translated it and that we want to include it completely in our book. We wrote to Mr. Wainfan a separate letter and asked for his permission.

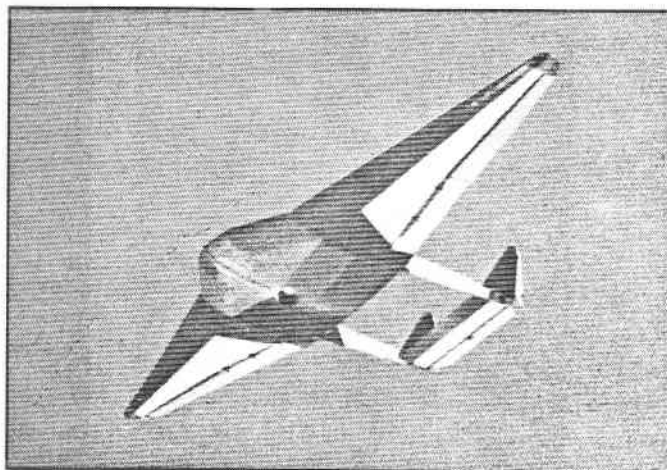
With my very best greetings I am

very truly yours

Karl

*(Ed Note: The elimination of the reprint permission label on the newsletter's cover was simply an oversight as editors changed several times. It will be included in future newsletters beginning with this one. If Dr. Nickel hasn't already received notification about using TWITT material, this will serve as notice that all past and future articles are fully useable. We hope we will be hearing more from Dr. Nickel so we can help him with the translation work as well as provide a market for the English addition.)*

---



Above, the Bowlus scale glider well and truly airborne, clearly showing the fabric-covered areas.

AVAILABLE PLANS/REFERENCE MATERIAL

Tailless Aircraft Bibliography

by Serge Krauss

Cost: \$20

Order from: Serge Krauss  
3114 Edgehill Road  
Cleveland Hts., OH 44118

Horten H1c construction drawings with full size airfoil layout. 30 sheets 24" x 36" with specification manual. Price: \$115.

Horten Newsletter

Cost: \$5 per year for US/\$7.50 foreign  
Order from:

Flight Engineering and Developments  
2453 Liberty Church Road  
Temple, GA 30179  
(404) 562-3512

WANTED

MITCHELL WING or other powered glider or truly soarable ultra-light, preferable with trailer.

Have cash or will trade for high performance (L/D 34:1) sailplane with enclosed trailer, oxygen, and instruments

Call Chuck at (619) 447-2519 (San Diego)

Quicksilver Hang Glider for research purposes. If you have one for sale or know of anyone who does please contact:

Randy Bergum  
P.O. Box 6831  
Fullerton, CA 92634  
(714) 680-4963

The following was found in the Los Angeles Times newspaper on about May 4th or 5th. Hopefully someone from TWITT will be able to provide some help.

RESTORING '40s Northrop N9MB Flying Wing, need experienced volunteer woodworkers. Saturday work only. Call David Murray at (818) 369-8056 for details.

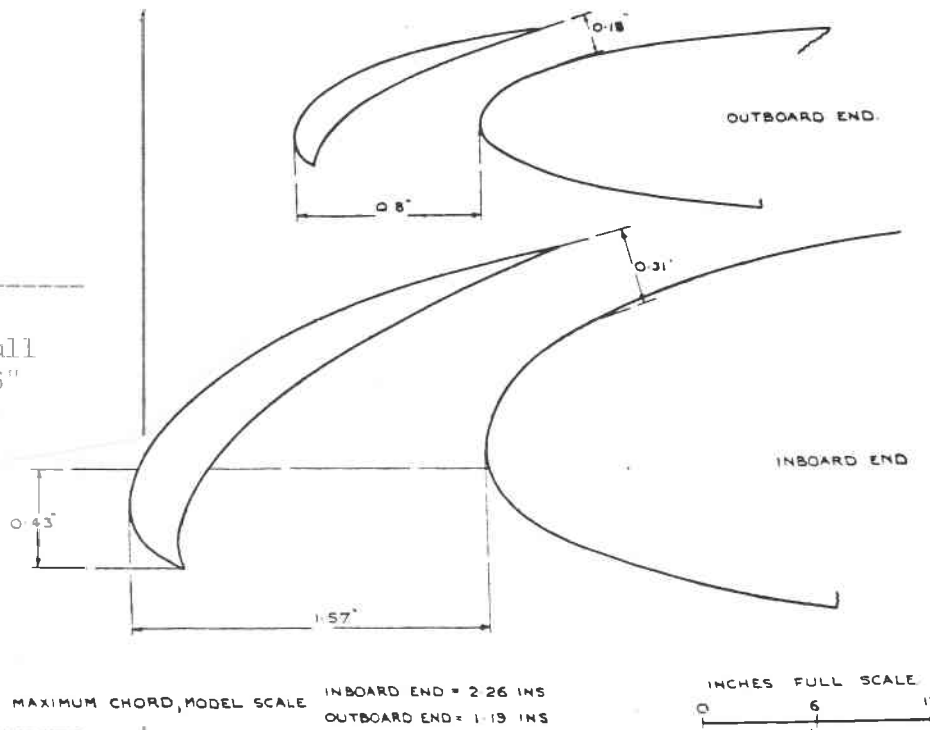


FIG. 11. Slat sections for 1/12th scale model.

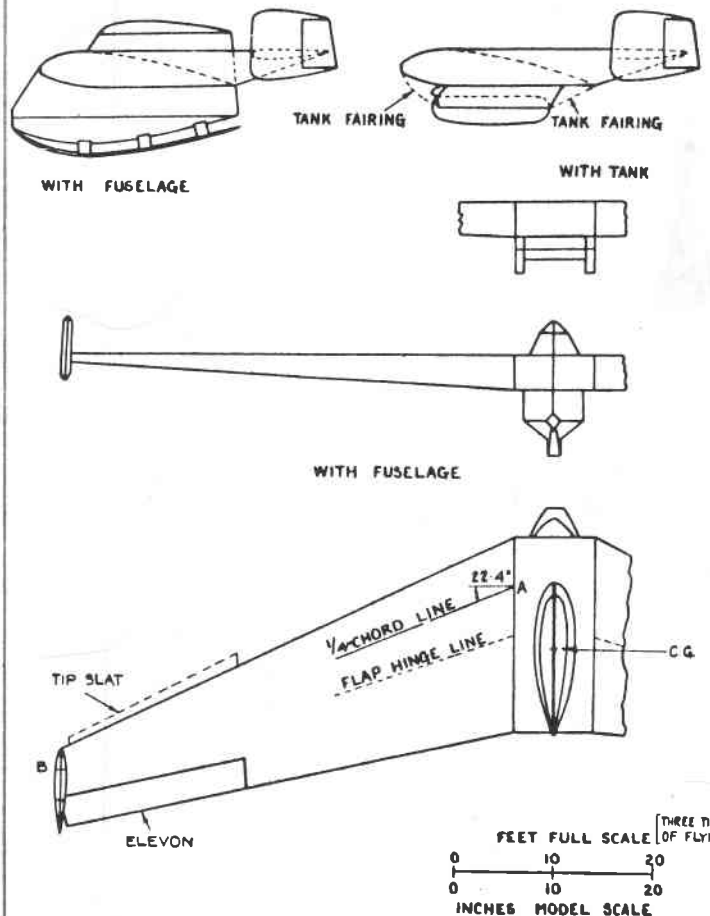
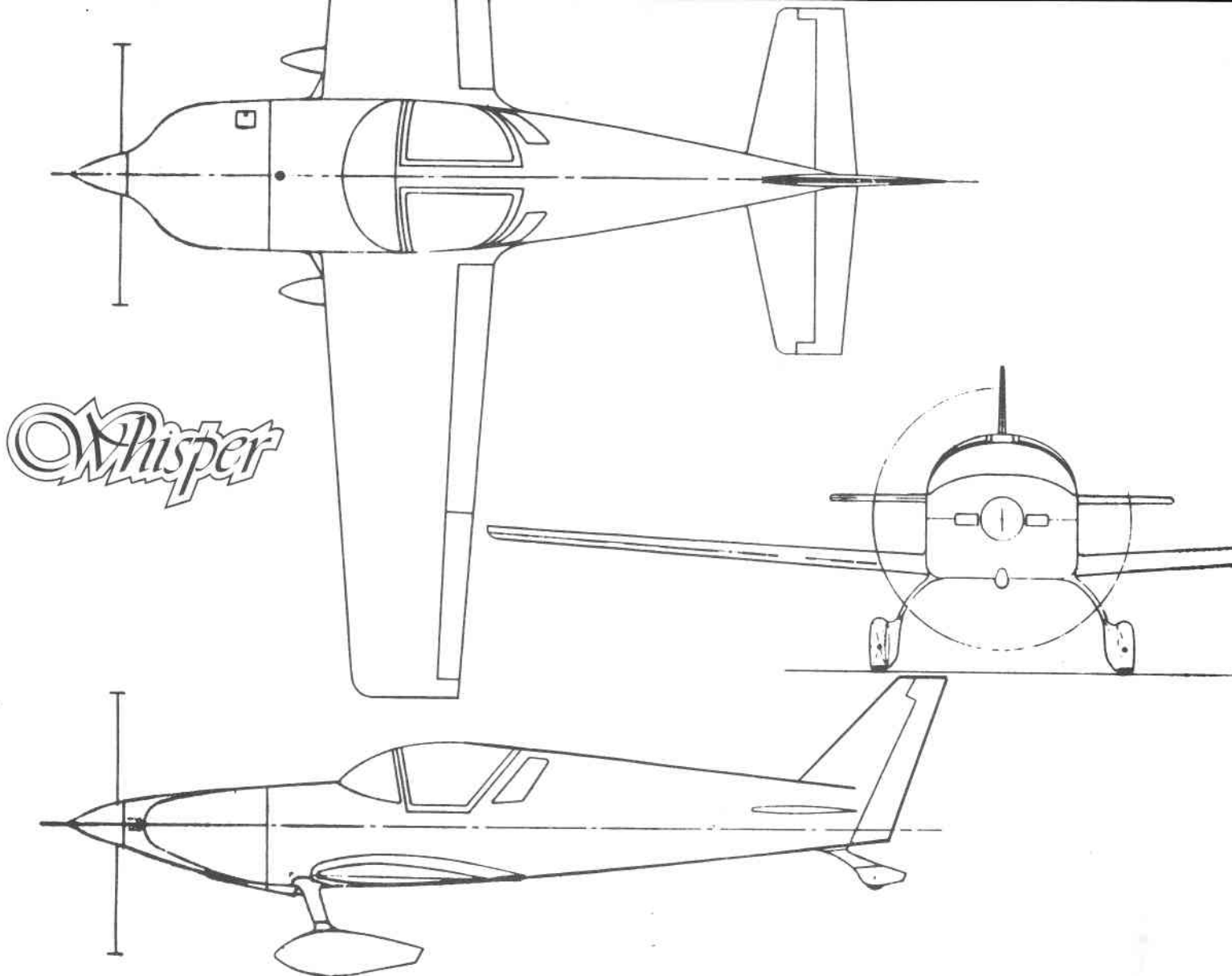


FIG. 10. Baynes carrier wing—1/12th scale model.



- Cruise speed of 225 mph.
- Comfortable side by side seating.
- Will take any of the Lyc 0-320 series engines.

- Climb rate of 2500+ fpm.
- Constructed using the tried and proven method of moldless composite.
- Over 1000 mile range.

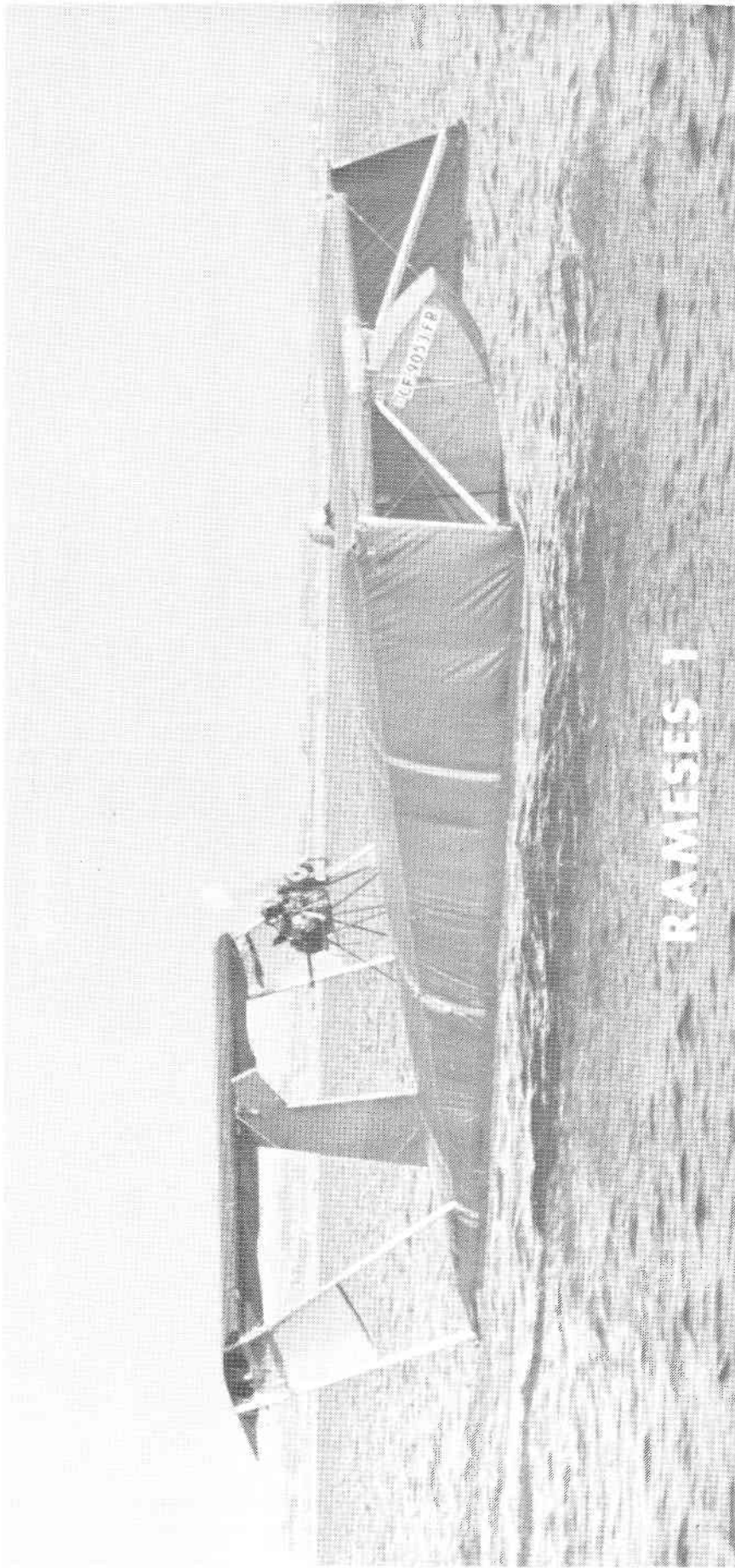
The Whisper was designed to be the ultimate in cross country travel. With its roomy side by side seating it can carry two people plus 100 lbs. baggage over 1000 miles on just 40 gallons of fuel. With the reliable Lycoming 160 H.P. 0-320 engine the Whisper will never be short of takeoff or climb performance. In short, the Whisper is the ultimate in private transportation. The Whisper is not just another home built. It is high performance at its best.

**Whisper**

For more information send \$10.00 for an info pack to:

**Grove Aircraft Company**

8736 Verlane Drive ■ San Diego, CA 92119 ■ (619) 562-1268



The above machine is called a Ram Wing. Rameses is the result of five years of information searching and the building of seven radio controlled models. The models were constructed with the help of Dr. Alexander Lippisch. Rameses was built with the help of Major Roger Gallington, who taught aerodynamics at the U. S. Air Force Academy in Colorado Springs. He had student help to build models and do the wind tunnel testing. My only contribution to this art has been applying the Rogallo wing construction to Major Gallington's model dimensions.

Rameses is powered with an old 36 h.p. VW engine. Lift off speed with a pilot only is about 35 miles an hour. It will cruise at greatly reduced power. Rameses does not want to turn by the single rudder because of the side wall and fuselage "keel" effect. The installation of two canard rudders will probably cure this trouble.

By installing the rear wing, Major Gallington has cured the wild pitch-up problem which has plagued all ram wing builders. In design, the rear wing lift x its moment arm to the aero-dynamic center has to equal the leading edge lift x its moment arm to the aero-dynamic center. This is because as the Rameses raises above the water the bubbled pressure diminishes due to the increased leakage around the skirt. Without the rear wing, this leaves a predominant positive moment caused by the lift of the leading edge and this results in a few degrees pitch-up. This few degrees only aggravates the positive pitching moment. This pitch instability is so severe that our radio controlled models would be headed for the sun in about one second after detecting the first pitch-up.

JC Pemberton, Scanivalve Corp.