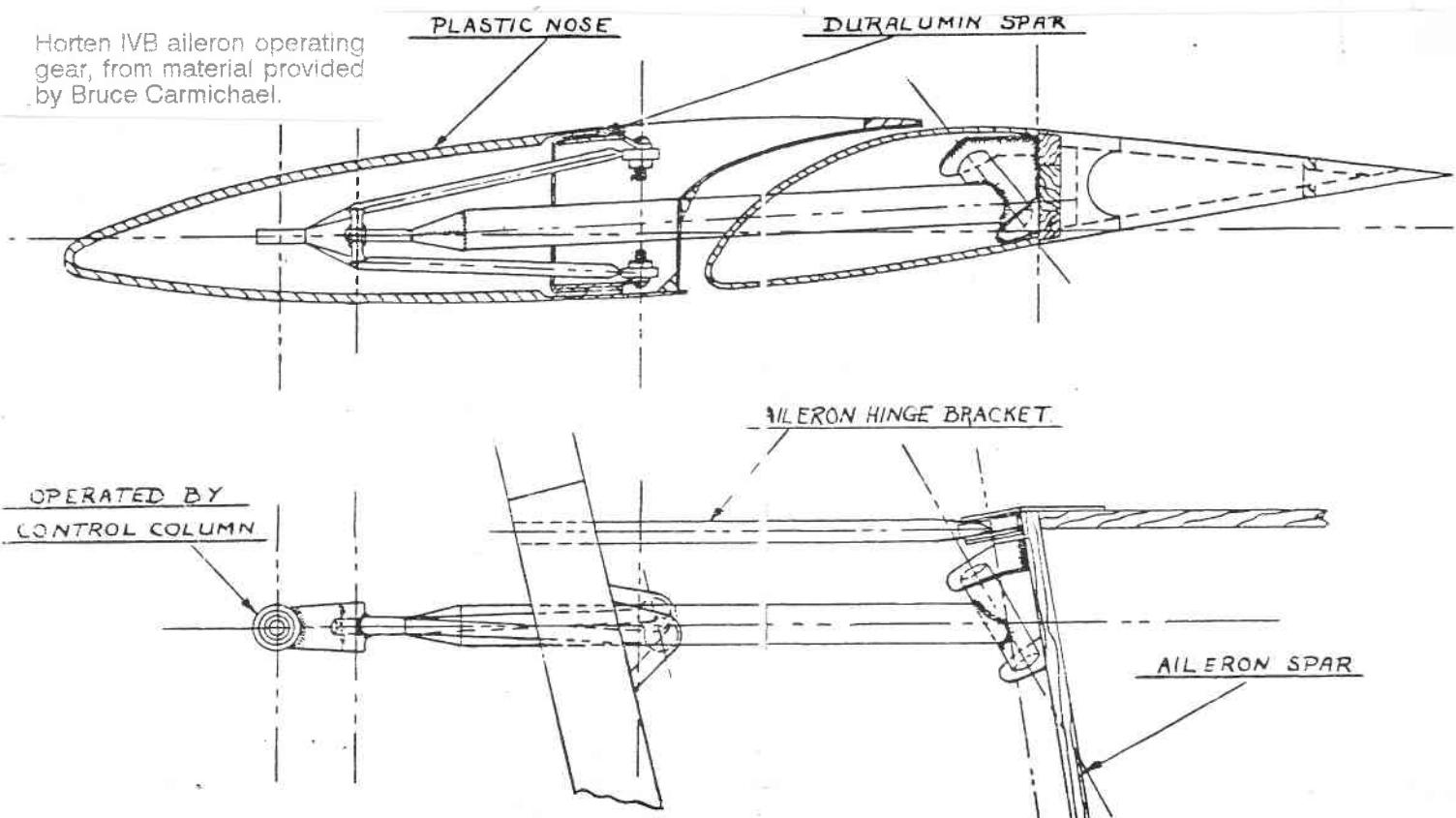


T.W.I.T.T. NEWSLETTER

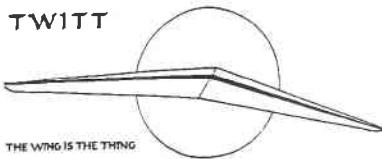
Horten IVB aileron operating gear, from material provided by Bruce Carmichael.



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., 9302 means this is your last issue unless renewed.

Next TWITT meeting: Saturday, February 20, 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.

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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
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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).

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PRESIDENT'S CORNER



As you will see from the meeting minutes, things didn't work out quite as planned last month. But, not to worry, since the program will be carried over to this month.

We do have one piece of bad news for the foreign members. The increases in postage for overseas mailing are forcing us to raise the foreign membership fee to \$22 US, effective with March 1993 renewals and initial subscriptions. This represents about a 15% increase, but it cannot be helped if we are to maintain a liquid cash position.

We have been lucky over the past years to be able to hold the line on costs and keep membership fees at a constant level. As of now, US and Canadian fees will remain at \$15, until the next round of cost increases due to either postage or printing charges.

Membership continues to remain stable at around 155 members. We now have a new TWITTER from New Zealand, as we continue to maintain an international base.

This month's issue will include some more material from the TWITT library as filler for the missing minutes. I hope you all enjoy it. We could sure use some pictures of what you guys are doing out there to help spice up small sections of the newsletter.

I would like to make another plea for anyone who might be upgrading an existing computer system to donate an HP Laser printer they are using for a trade-in. Don't forget that it is tax deductible, and we will be most happy to provide the necessary receipts and tax ID numbers for claims purposes. This piece of equipment would reduce costs by about \$10 a month in producing the newsletter at its current quality.

That is all I have for this month.

Andy

FEBRUARY 1993 PROGRAM

The program originally scheduled for January has been carried over for this month. **Bud Mears**, TWITT member and a National's level competition pilot, will be our featured speaker. When he received his LS-4 from the factory, it had zig-zag turbulator strips on the bottom of the wing. Curiosity led him to conduct a Dick Johnson style performance test of the ship, with and without the turbulators, using a drag rake. He will be sharing the results of these tests with us, including some charts and slides.

Bud will also be discussing the addition of a tail water tank to the LS-4 for CG control when loaded with water in the wings. The optimum CG location for various gross weight conditions may be explored in future tests. He is also planning a second series of turbulator tests to determine if similar effects are found on the horizontal tail.

Both of these areas of discussion are applicable to all types of aircraft, be they conventional or tailless. We encourage all of you in the Southern California area to attend this meeting if at all possible.

Bob Chase has provided a copy of flight footage of Tom Irwin's Swish II, however, it does not include the actual accident that destroyed the aircraft and took Tom's life.

We may also have some video tape of the Arup wing and flights of a working ornithopter.

MINUTES OF THE
JANUARY 16, 1993 MEETING

Andy announced that due to numerous circumstances, there would be no formal meeting for the day.

He then announced that Bruce Carmichael's wife Georgie had passed away earlier in the week after

a long illness. Today was the memorial service. A bouquet of flowers was sent in the name of all TWITT members.

For those of you who knew Georgie and were not aware of her passing or the service, memorial gifts may be directed to the Foundation of Palisades United Methodist Church for the Sunday School in which she taught and directed for so many years.

This sad event also caused a problem with the program, in that Bud Mears, a long time friend of the Carmichael's would be attending the service, along with Bob Fronius and June Wiberg, and several other TWITT members.

Although an alternate program of video tapes had been planned, the VCR refused to cooperate due to the high humidity in the hanger after all

the rain. This was just as well, since only 5 or 6 of the usual die-hard members braved the foul weather to attend.

The next hour or so was spent hanger flying and sharing tall tales, which everyone there seemed to enjoy just as much as if there had been a real program.

If Bob Fronius had been at the meeting he wanted to mention that if you look carefully at most issues they have aviation oriented stamps for the postage. These are obtained through the main post office, since the sub-offices don't always have as good a selection. If you are a true aviation "nut" and want your mail to reflect your enthusiasm, you might look into this in your local area.

Since the meeting was never really formally opened, there was no need for an adjournment, and everyone eventually headed for home and a warm totty.

EXTRA EXTRA

Shortly before the publishing deadline, we were informed that Don Mitchell had been admitted to a hospital in Bakersfield, CA, having suffered a heart attack. We didn't receive anymore detailed information than that, but will keep you informed through the newsletter as more information becomes available.

We all wish Don the greatest speed in getting well, and eventually a full recovery so he can continue with the work he loves best.

FINANCIAL DATA

BALANCE SHEET (12/31/92)

| | |
|----------------------------|-------------|
| Current Assets | |
| Cash | \$ 1,134.58 |
| Acct. Recvble. | 199.00 |
| Inventory | 267.60 |
| Total Current Assets | 1,601.18 |
| Fixed Assets | |
| Material & Equip. | 1,656.75 |
| TOTAL ASSETS | \$ 3,257.93 |
| Liabilities | |
| Acct. Payable | \$ 1,045.21 |
| Equity | 2,212.72 |
| TOTAL LIABILITIES & EQUITY | \$ 3,257.93 |

(continued on page 4.)

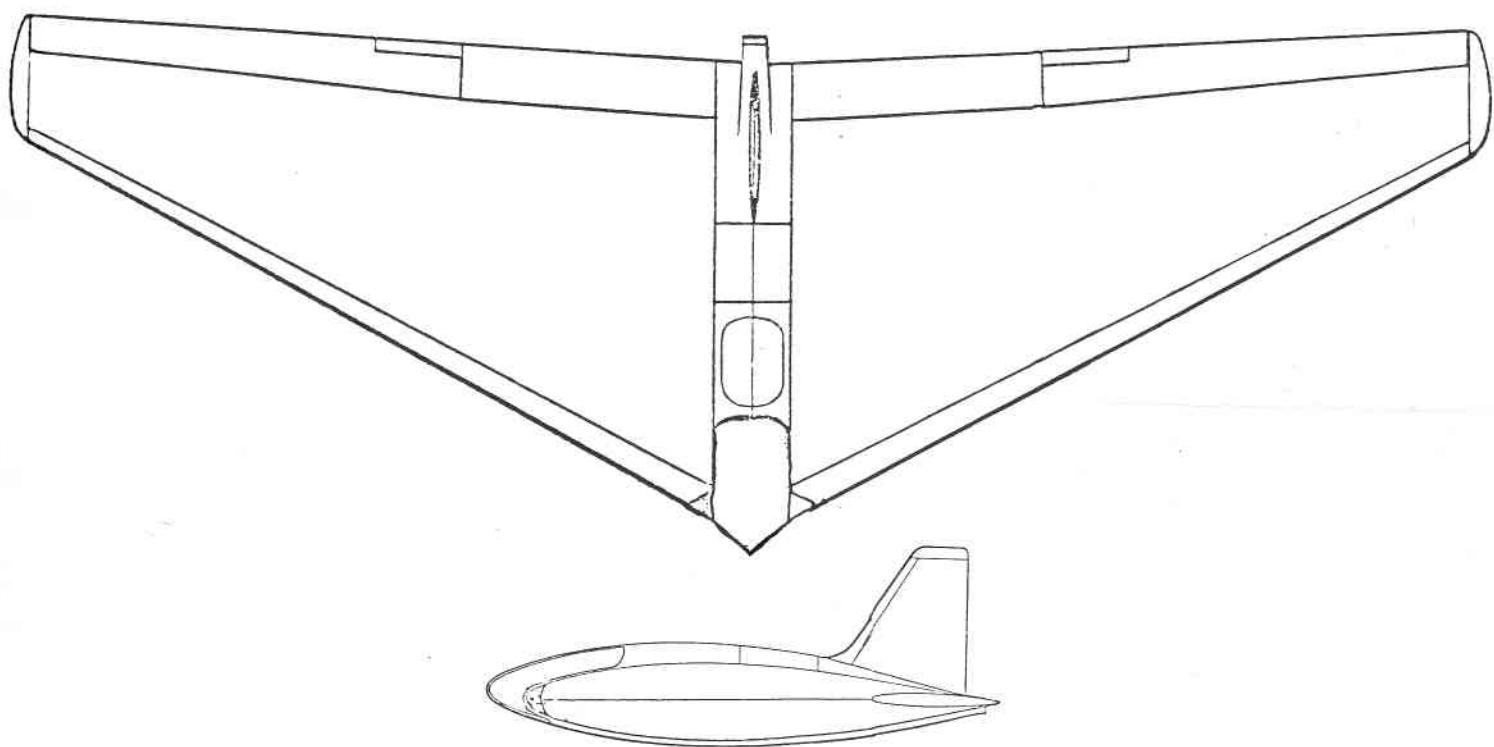
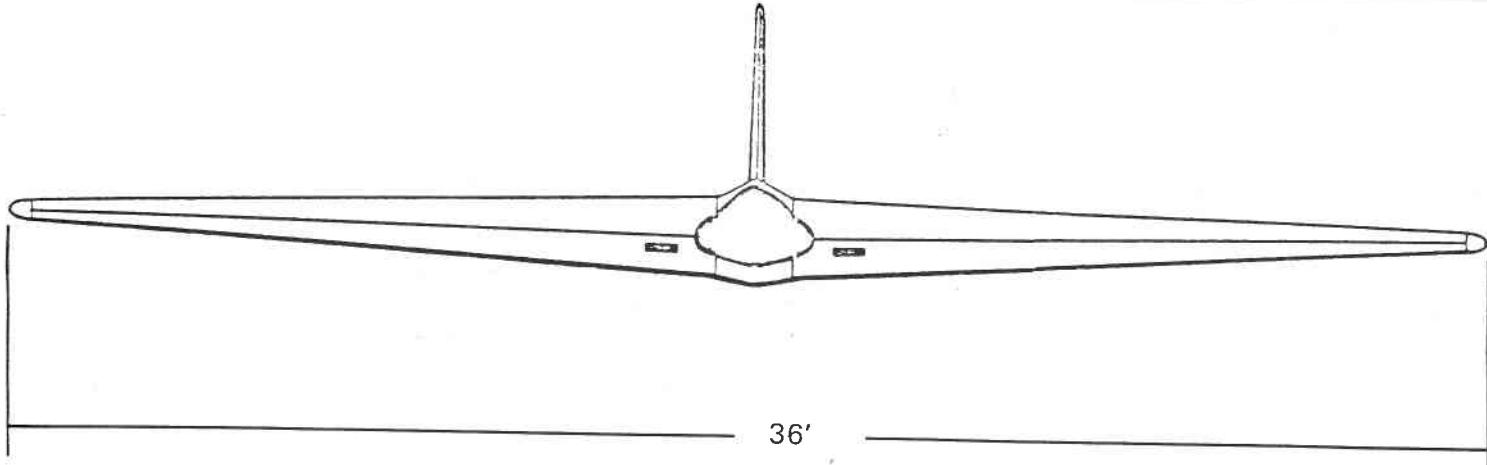
BELOW: Northrop XP-49 - In 1942 work had begun in the U.S. on the development of a rocket-driven interceptor of advanced flying wing design. In January 1943, procurement of 3 prototypes was initiated and 3 full-scale flying models.

It had an aspect ratio of 5.07, area of 255 sq.', and a loaded weight of 11,400 lbs. All moveable control surfaces consisted of elevons

for pitch and roll extending over some 60% of the wing and split-type maneuver brakes extending outboard from the center-line over approximately 40% of the semispan.

(Source: Maloney, Edward T., Northrop Flying Wings, World War II Publications, Corona Del Mar, CA, 1975, pp. 16-17, & 48) Contributed by Karl Sanders.

(Good, easy to build R/C model??)



| YEAR | MODEL | ENGINE | POWER | WING SPAN | LENGTH |
|------|-------|-------------------|-------------------|-----------|--------|
| 1943 | XP-79 | Aerojet "Rotojet" | 2,000 lbs. thrust | 36' | 11'4" |

INCOME STATEMENT (12/31/92)

| | |
|-----------------------|-------------------|
| Membership Dues | \$ 895.00 |
| Raffle Tickets | 124.50 |
| Back Issues | 72.75 |
| Information Packs | 10.00 |
| Donations | 3.00 |
| Miscellaneous | 110.35 |
| TOTAL INCOME | <u>1,215.60</u> |
| Less: | |
| Newsletter Expense | 670.86 |
| Mailing Expense | 438.92 |
| Raffle Expense | 65.01 |
| Miscellaneous Expense | 63.64 |
| TOTAL EXPENSES | <u>(1,238.43)</u> |
| NET INCOME (LOSS) | \$ (22.83) |

LETTERS TO THE EDITOR



TWITT

1/13/93

I have been a flying wing enthusiast from the beginning. It seems like one of my earliest memories was/is that of a formation of Northrop flying wings in the early 50's when I was 3 or 4.

On July 4, 1974, I made my first hang glider flight. It was a simple Rogallo flying wing I built from a kit. Some of my greatest experiences have since been accomplished on this type of wing.

I am now building an unpowered ultralight flying wing intended to be launched and landed like a hang glider, but using wingtip control surfaces to augment control by weight shift. The design is very natural and organic in appearance - the sweep is the result of a very large curve at the nose rather than a sharp angle, and the dihedral is the result of a smooth curve from about 1/2 the wing half span out to the tip. My biggest challenge is probably going to be fabrication of the tip control I most desire - an aerodynamically streamlined Kasper tip.

Witold Kasper is one of the flying wing visionaries I admire along with John Northrop. Another is Richard Miller from whom I learned much about diffusor tips. I have lost touch with Richard; he is no longer in Escondido, CA. Can anyone please provide me with information?

Larry Witherspoon
4260 W. 182 Street
Torrance, CA 90504
(310) 370-9793 or 522-3107

(Ed. Note: First of all, welcome to TWITT Larry. Secondly, the information provided in a letter from Bob Chase later in this issue might be of interest to you on tip control rudders. And lastly, Richard's address, which is a year old, is: 134 Dakota Ave., Apt. #113, Santa Cruz, CA 95060.

We hope you enjoy your membership and learn what you need for the final phases of your new design. If you have any particular questions, send them in so we can put them out to the members for possible answers, while helping everyone learn more.

When you finish your design and have test flown it, we would appreciate an article on the design, building and flight performance, again so our other members can benefit from your experiences.)

1/31/93

TWITT

Enclosed is my check for membership in TWITT.

I am a private pilot and an A&P mechanic, and am building a Van's Aircraft RV-4. My hobbies also include building and flying all types of model aircraft (R/C, U/C, F/F, etc.), but I have always had a special fascination for flying wings.

I am looking forward to membership in TWITT, and will try to attend a monthly meeting sometime (I work for a major airline and can travel fairly economically).

Sincerely,

Bill Leasure
2375 Horizon Circle
Shakopee, MN 55379-9601

(Ed. Note: Welcome to TWITT, Bill. I am sure you will enjoy the organization, and we hope that if you build any type of flying wing as part of "one" of your hobbies you will share the experience with us.

We all envy you the ability to get around the U.S., and do hope you can arrange to attend a meeting. Hopefully, you have enough flexibility to pick a particularly good one. You might consider calling one of us shortly before any the chosen meeting to make sure nothing unusual has happened to affect a program you might attend.)

IDEAS ON JIM LOYD'S DESIGN

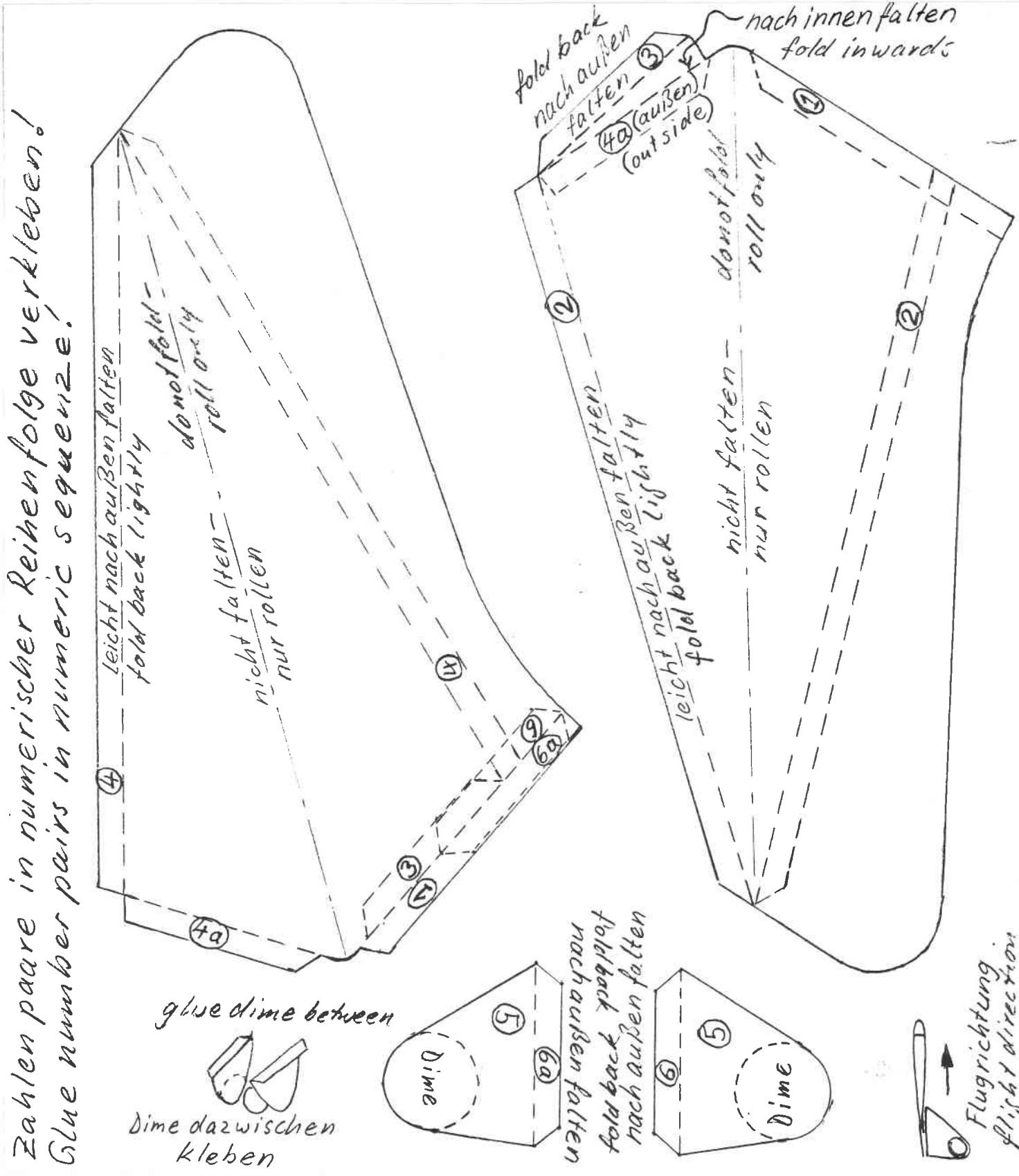
by Bob Chase

(Ed Note: The following was offered by Bob Chase in response to Jim Loyd's request for comments on his latest design variation. It

(continued on page 6.)

BELow: This piece of "origami" was contributed by Harald Buettner. Originally designed as a school project for his daughter, he has added English instructions for those of us who cannot

understand German, although it looks rather self-explanatory. Use of 20 lb. paper looks like it works okay since you ROLL the leading edge, providing stiffness.



has been a little delayed due circumstances beyond Bob's control, but he has sent a copy of it directly to Jim. Since there is room this month, it seemed appropriate to publish the letter in its entirety so the general membership benefits or has other comments pro or con to Bob's.)

January 15, 1993

Jim Loyd

I was unable to attend the November 1992 TWITT meeting to comment on your "Boomerang" design, so I would like to do so now. My apologies for the delay.

My qualifications to address this design are based on many years of designing model wings plus owning, flying and crashing an ultralight aircraft of similar configuration (pusher with constant chord swept-back wing, elevons, tip rudders and tricycle landing gear). No specific recommendations will be made, but I will cover problem areas for your perusal.

Fuselage: The high wing pusher with tricycle gear is an excellent choice. Too many small airports have obstacles lying about to snag the wings of small, low wing airplanes. This also gives excellent visibility to the pilot and passenger. My one reservation is the tandem seating arrangement and its effect on center of gravity and lateral area. Any lateral area forward of the CG must be balanced by similar effective area aft of the CG. The aft section of a short fuselage is often in turbulence at low speeds and therefore ineffective. This means larger vertical fins are required.

The CG problem is related to the short coupling of tailless aircraft control surfaces. The late Waldo Waterman once told me, "A tailless airplane is nothing more than a conventional airplane with the tail surfaces moved to the trailing edge of the wing where they are less effective." This translates to a bird very sensitive to CG changes. If you are going to climb into the front seat weighing exactly the same and wearing the same clothing during all seasons, you will have no problems. Otherwise, be prepared to use moveable ballast or other means to balance the aircraft for each flight. Let me illustrate. During first test flights of my ultralight, a slight tail-heavy condition existed. A switch of shoes from my light Hush Puppy type to military Brogans was enough to cure the problem. Thereafter, I always flew with the same shoes.

Landing Gear: The tricycle gear is a wise and logical choice for this design. I disagree strongly with you intent to move the main gear rearward behind the empty CG. This would result in excess weight on the nose gear and a tendency to slam down on the nose during anything but the best of landings. A simple tubular tailskid will prevent the airplane from falling on its tail.

The thought of extending the nose gear to take off without rotation bothers me. First, the extra drag of the wing will extend your take-off distance. Secondly, a swept wing at a positive angle of attack can be a real bear to handle in crosswinds, taxiing or take-off. Lastly, the possibility of a hot landing in a crosswind putting you down nose-wheel first is a thrill you won't want to even contemplate.

Wing: I like it all the way.

Elevons: They appear possibly undersize, but I am not qualified to comment. You might try contacting TWITT member Don Mitchell, for an expert opinion.

Rudders: I am convinced the wing tip is an inappropriate place for the fin and rudder. I admit to being prejudiced in this opinion, but let me explain it as simply as I can. It has to do with the little tornados called wingtip vortices. They are caused by high pressure air under the wing trying to interact with low pressure air above the wing at the tip. On a low aspect wing at low speed, vortices can account for one-half the total drag.

TWITT member, Al Backstrom, when asked why the elevons on his EPB-1 plank stopped short of the wingtips, said the last foot or two would be ineffective because it is in the wingtip vortices. Steve Wittman said much the same when asked about the ailerons on his famous "Tailwind." Jim Marske doubled the L/D on his XM-1 sailplane by removing the wingtip fins and rudders.

Now for a personal experience. While flying my ultralight with tip rudders at about 100' above a dry lake, I made a gentle turn to wave to a friend. When I attempted to level out, the turn continued. Full rudder and full down elevon were insufficient to stop the turn and I realized I was in a spin. I thereby joined a very exclusive group of people who have spun an airplane into the ground and walked away. It was later surmised the vortex drag on the wingtip inside the turn overpowered the full deflection of the outer rudder.

Center of Gravity: This is not a comment on your aircraft, but a cautionary note applicable to any tailless aircraft. As the CG is moved aft, the wing tends to become more efficient and less controllable. First test flights are best made with forward CG using ballast, if necessary. The CG can then be gradually moved aft to find the optimum control response. Attempting to find the aft CG limit by test flight can be very dangerous. A tail-heavy flying wing is no fun to fly.

I certainly hope my comments do not discourage you, because you have the basic elements for a very nice aircraft. Any criticism is intended to assure myself that you are aware and have given thought to the problem areas. The opinions above are my own, and if some TWITT members disagree, I welcome hearing from them. I am including my telephone number and address. Please contact me if you have any question.

Sincerely,
 Bobby E. Chase
 824 So. Third Avenue
 La Puente, CA 91746
 (818) 336-5485

(Ed. Note: Two additional comments. First, TWITT was originally formed to find a way of flying a tailless aircraft at extreme aft CGs to achieve the optimum flight performance. One part of the concept included some type of fast moving ballast to shift the CG forward if the augmented flight control system should fail in order to prevent the type of controllability problem noted by Bob.

Secondly, Bob's letter originally noted Jim Marske was a TWITT member. Unfortunately, he is not, but if anyone out there could convince him to join and participate in some of these types of dialogues, we would be most grateful.)

ACKNOWLEDGEMENT

The January 1993 newsletter, page 11, carried a 3-view of the Exdrone RPV. In the paperwork shuffle, the contributor and source got separated from the copy used in the newsletter.

The contributor was Karl Sanders, who sent us the following source material in its entirety: AIAA Conference Paper 90-1261, "Wind Tunnel and Flight Test Investigation of the Exdrone Remotely Piloted Vehicle Configuration," by L.P Yip (NASA LRC) and G.M. Makowiec (Viguan Associates).

The editor apologizes for the administrative slip and thank Karl for the reminder.

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.

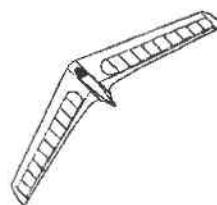
Published by B² Streamlines, P.O. Box 976, Olalla, WA 98359-0976, or (206) 857-7249 after 4pm Pacific Time. Price is \$38, postage and handling included (also applies to Canada and Mexico). Orders shipped elsewhere will be sent surface mail unless an additional \$10 is included to cover air mail postage. Washington residents must add 7.5% sales tax.

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

Marske Aircraft Corp.
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 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

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.

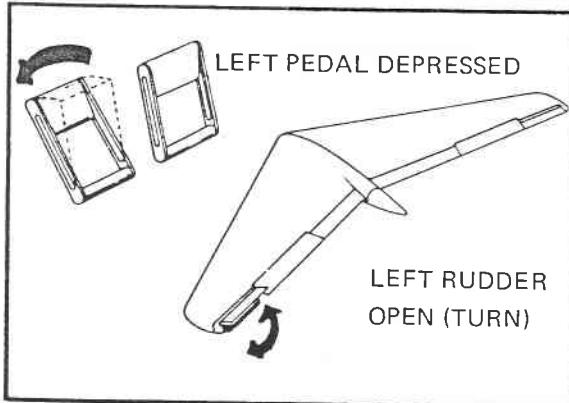
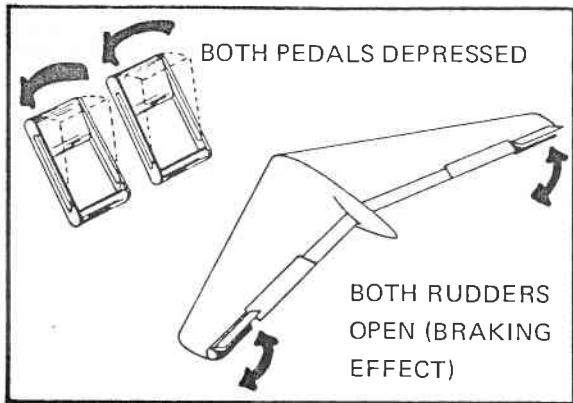
| | | |
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| Membership Dues: | U.S./Canada | \$17 USD/yr |
| | Other Countries | \$21 USD/yr |
| | Students | \$10 USD/yr |

(includes 12 issues of SAILPLANE BUILDER)

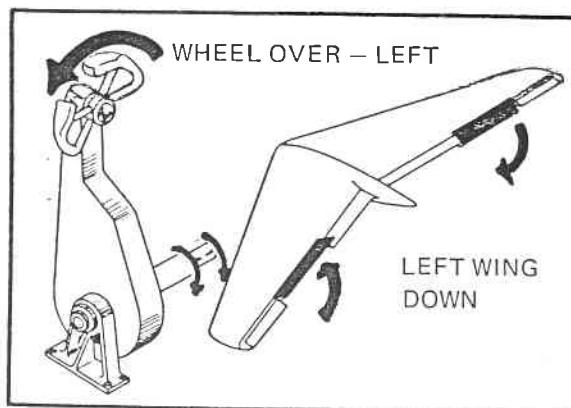
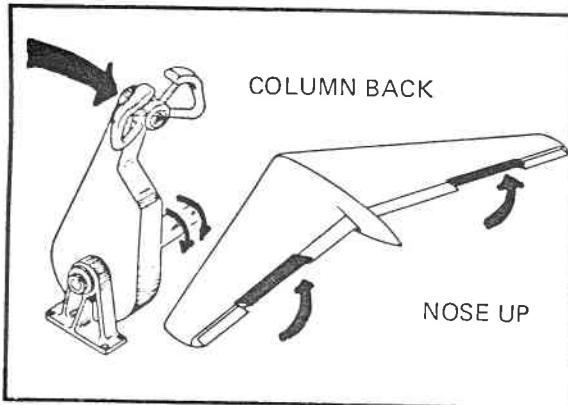
Make checks payable to: Sailplane Homebuilders Association, & mail to Secretary-Treasurer, 545 McCarty Drive, Furlong, PA 18925.

BELow: Flight control operations described for the Northrop YRB-49A. Source: Maloney, Edward T., Northrop Flying Wings, World War

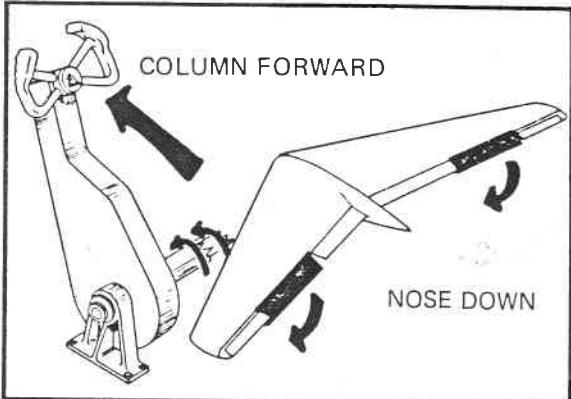
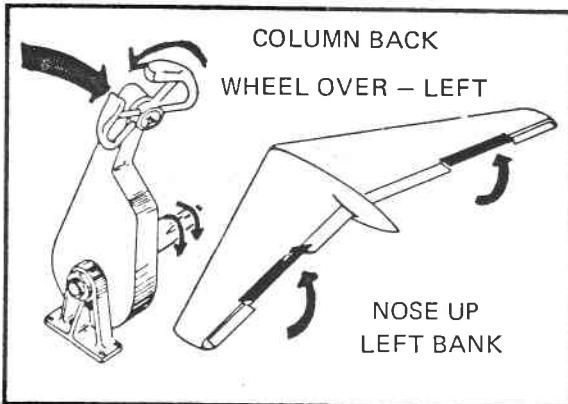
II Publications, Corona Del Mar, CA, 1975, pp.37-38. Contributed by Karl Sanders.



Foot pedals operate the rudders which consist of double split flaps (something like dive flaps) located at the wing tips. When rudder pedal is depressed the flaps open to produce drag at the required wing tip. Both pedals may be pushed to open both rudders to increase the gliding angle or reduce the airspeed. The rudders form a portion of the trim flaps, which are located at the wing tips, and are adjusted up or down to trim the airplane longitudinally in the same manner as one would use an elevator trim tab, or an adjustable stabilizer.



Elevons, combining the function of elevator and aileron are located along the trailing edge on each wing inboard of the trim flaps. Deflected together in the same direction by moving the control column fore and aft, the elevons cause the airplane to descend or climb as with normal elevators. When moved in opposite directions by rotating the control wheel to right or left, they cause the plane to bank in a fashion identical to that caused by conventional ailerons.



BELOW & Pages 10-11: This piece of "origami" was contributed by Bill Spencer and looked like an interesting "quicky" project, but we generally haven't had the necessary 3 pages to get all the sketches into one issue. With the introduction of Harald Buettner's design

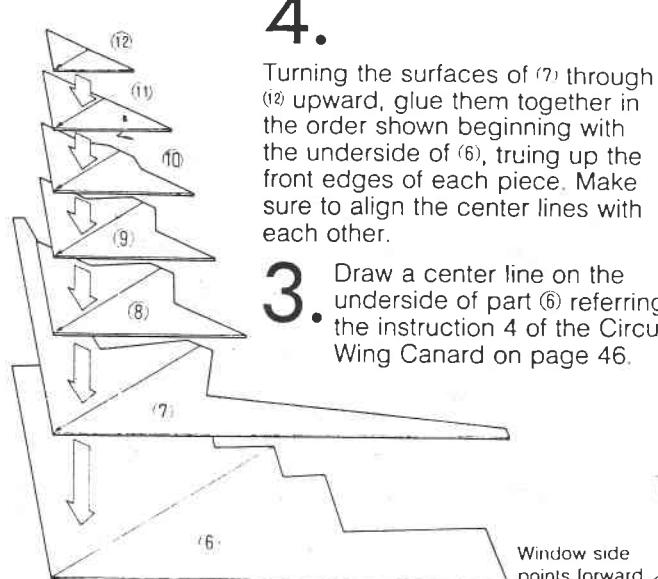
this seemed like a good time to put you all to work "building" while there is still snow on the ground. Bill commented that CARDBOARD FROM A MANILA FOLDER WORKS BEST.

Source: Whitewings, 1990, pp. 63-65.

Northrop B-2 Stealth bomber

GLUING INSTRUCTIONS

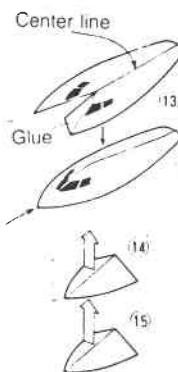
Glue the parts together in the order indicated.



4.

Turning the surfaces of (7) through (12) upward, glue them together in the order shown beginning with the underside of (6), tucking up the front edges of each piece. Make sure to align the center lines with each other.

3. Draw a center line on the underside of part (6) referring to the instruction 4 of the Circular Wing Canard on page 46.



1.

Fold all tabs outward.

2.

Glue (1) through (5) together.

FINISHING TOUCHES

- Give the finishing touches to the plane after it dries thoroughly.
- 9. View the main wing from both the front and the back and flatten it with your fingers. (Don't camber it.) Then, bend the right and left trailing edges of the main wing (shaded portions) slightly upward 1.5 – 3mm (1/16 – 1/18").

TEST FLIGHT

- Test fly the plane according to the Test Flight instructions for Tailless Planes on pages 11 to 14.

5.

Glue the fuselage to the underside of the main wing (6) – (12) aligning each center line.

6.

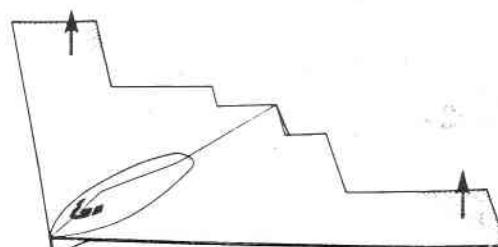
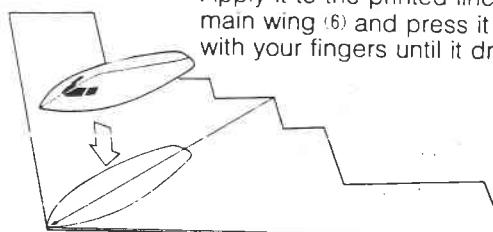
Fold the cockpit (13) slightly inward along the dotted line. Swell the whole of the cockpit into a curve to complete its oval shape. Then, glue the tag as shown.

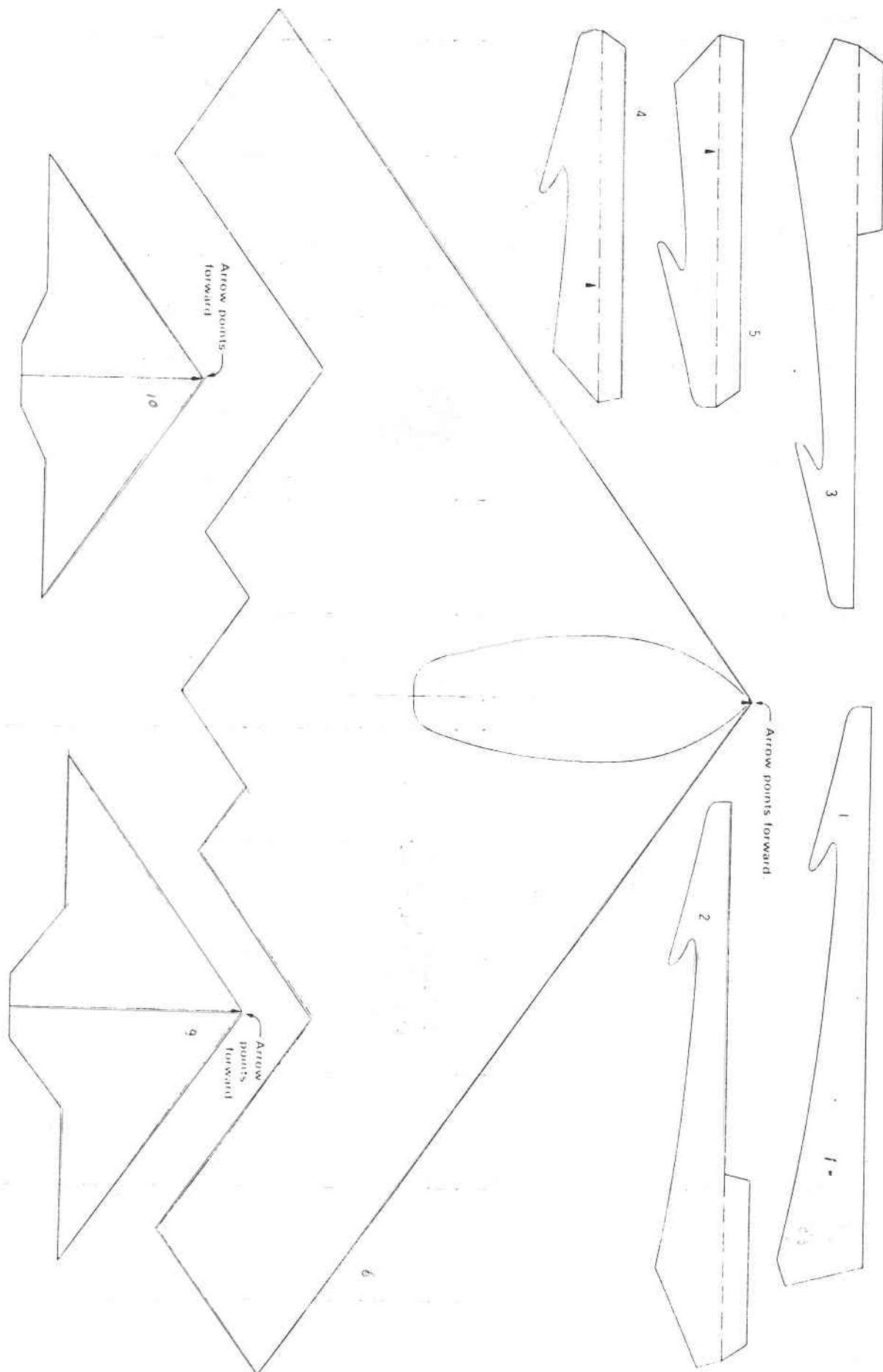
7.

Fold (14) and (15) slightly along each dotted line. Prepare to glue (14) to the front edge of the inside of (13) and (15) to the underside of (14). When gluing, slide (14) back from the nose of (13) approximately 0.8mm (1/32") and slide (15) back from the nose of (14) approximately 0.8mm in order to avoid (14) and (15) protruding from under (13).

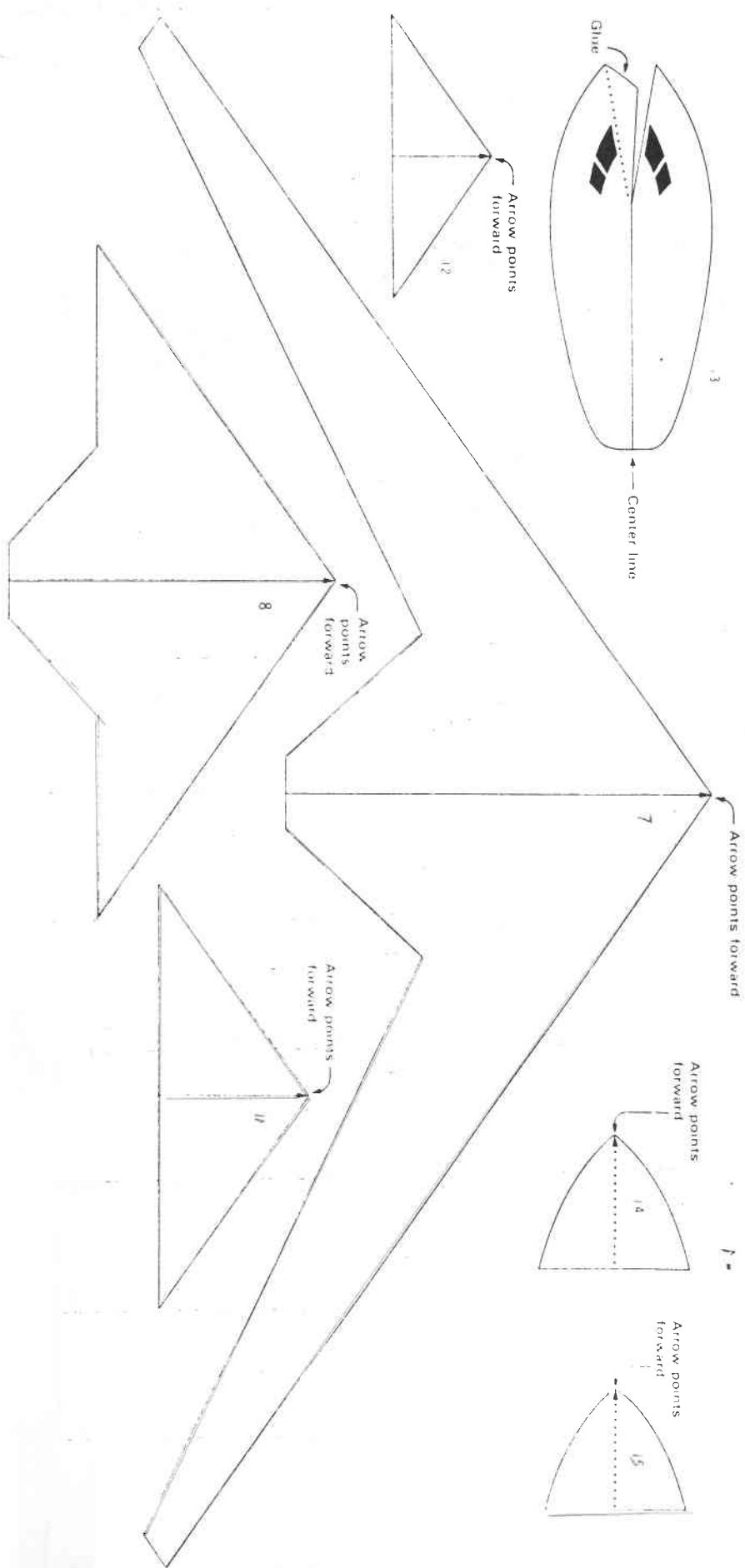
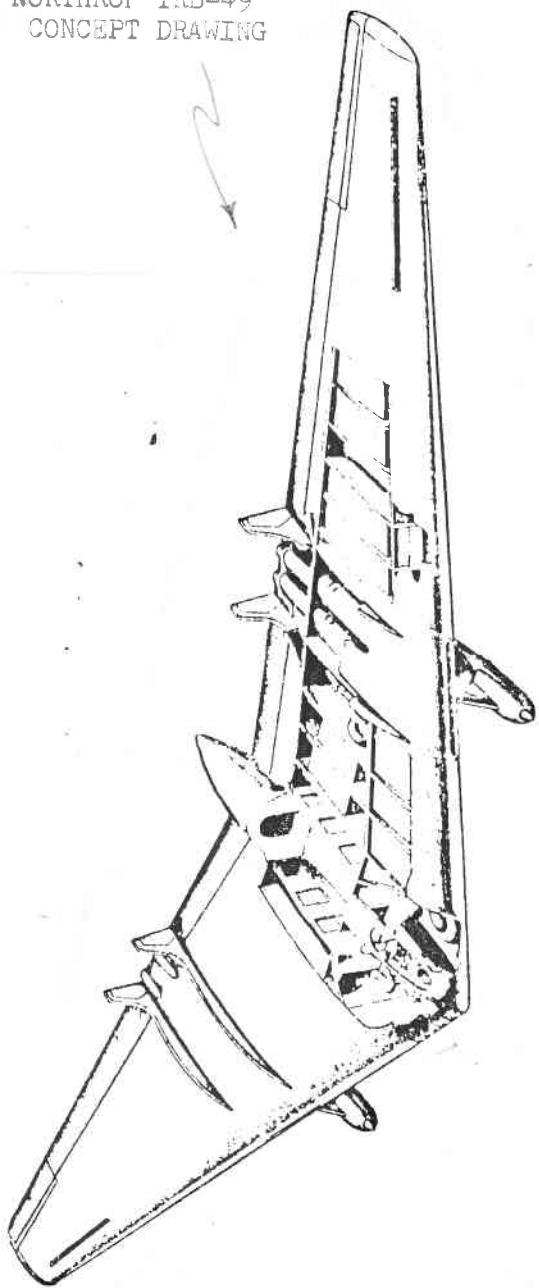
8.

Spread glue around the bottom edge of the cockpit (13)+(14)+(15). Apply it to the printed line on the main wing (6) and press it down with your fingers until it dries.





NORTHROP YRB-49
CONCEPT DRAWING



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