NO. 41 NOVEMBER 1989

TWITT
NEWSLETTER

TWITT
(The Wing Is The Thing)
PO Box 20430
El Cajon. CA 92021

The numbers to the right of your name indicate the the last issue of your current subscription, e.g. 8911 means this is your last issue.

Next TWITT Meeting: Saturday, November 18, 1989, Beginning at 1330 h ours. The location is Hangar A-4, Gillespie Field, El Cajon, CA in the first row of hangars on Joe Crosson Drive.

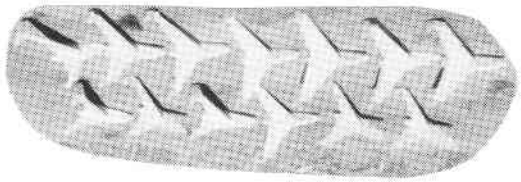
MINUTES OF THE OCTOBER 1989 TWITT MEETING

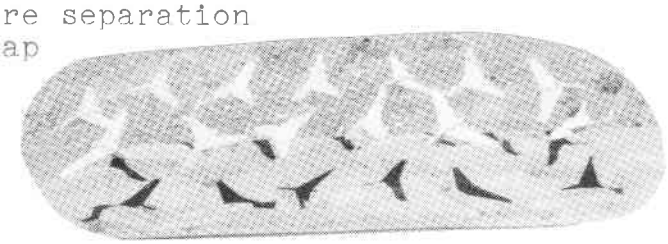
Andy Kecskes called the meeting more or less to order at 1347 and asked first-time visitors to introduce themselves. Craig Roberts rose and confessed that he works at Ryan (he's a structures man and a colleague of Doug Fronius). He is also a model builder and amateur aircraft builder. A gentleman whose name your humble correspondent did not catch introduced himself as a friend of Bob Fronius, who taught him to fly ultralights. Randy Burgem (sp?) participates in Sailplane Homebuilders' Association (SHA) activities and is a hang glider pilot. He is now building a 1/3 scale model of a high-performance foot-launched glider. Andy resumed with a report that Don Hunsaker now considers TWITT an affiliate of the Hunsaker Foundation, based at San Diego State University. We will need to make minor changes to our Bylaws to emphasize the education and research aspects of the organization. The proposed changes will be submitted to members for approval. Andy noted that Hunsaker seems to have been especially impressed by the Newsletter as a means of disseminating information; efforts are underway to gain access to the Foundation's extensive computer facility in order to upgrade the appearance of the Newsletter. Information on tax status, deductions, etc. will appear in the Newsletter as it becomes available.

Harald Buettner had his latest project drawings on display, demonstrating his skill as draftsman and illustrator as well as his design flair. Beautiful!

Andy then introduced our featured speaker, Bud Love, founder of Airlove (La Jolla, California, USA) and inventor of the HIAM (High Internal Air Mass) Wing, a powered lift scheme capable of achieving extremely high lift coefficients. Bud began by giving the reason for his interest in what he calls "ultra-STOL" airplanes by citing the steady increase in air traffic and the equally steady and ominous disappearance of airports. The result is fewer airports serving larger areas, resulting in congestion on the ground and in the air. Bud's solution is to establish small airfields near the traveler and to decentralize short-range air transportation. In order to overcome objections to the establishment of new fields inside built-up areas, the airplanes that serve those fields must be quiet and must be able to operate from very short runways. The ability to climb out at steep angles and to make steep approaches is important in keeping down noise and avoiding obstacles. For the last ten years or so, Bud has proposed the HIAM wing as a solution to this problem. He is now assembling a team to design an airplane that will prove the concept. The HIAM wing integrates propulsion, suction boundary layer control (BLC) and a jet flap to achieve lift coefficients as high as 12, more than twice the best figure achievable with conventional high lift devices. In one version (Bud's favorite), compressed air fed to ejectors inside the wing induces secondary air from the boundary layer through slots in the wing. The mixed stream of primary and secondary air is then expelled at the trailing edge as a jet flap. High lift coefficients are achieved three ways:

1. Through BLC, by preventing premature separation
2. By direct reaction from the jet flap





3. By entrainment of air past the wing, increasing both mass flow and circulation.

The key to the scheme is an ample supply of compressed air. This would come either from a special turbojet with an enlarged compressor, or from a more conventional turboshaft engine driving a separate flow-type compressor. In the second case, the flow of compressed air would never be turned off, and the jet flap would serve to propel the airplane. Bud showed slides presenting both theoretical and practical results suggesting the scheme was feasible. The difference between the HIAM and other similar-sounding schemes is the very high internal air mass flow required; this is only possible now that gas turbine powerplants are available. Bud noted that the theory behind HIAM comes straight out of standard textbooks.

Bud's talk was followed by a break, then by the raffle drawing. There were three prizes, won by Bob Fronius, Mark Motley (!) and an unidentified visitor. Next month's raffle prize will be a two hour flight in Doug Fronius' four-seater Stinson for three lucky people--the winner and two others of his choice. Having had the pleasure of one such joyride, your humble correspondent recommends this prize highly.

PRESIDENT'S CORNER

Another month has gone by and we are just about finished with the plans to become part of the Hunsaker Foundation, Inc. The initial paperwork was sent in about a week ago, and should be back for signing the the next few days. The only action necessary by the general membership is to approve a small change to the Bylaws, the wording of which is presented elsewhere in the newsletter. It is necessary to show our organization has goals and purposes which comply with those of the foundation, mainly education and research. This does not mean construction cannot be undertaken, but instead it becomes a secondary fuction of TWITT.

Rather than ask everyone to mail back a proxy showing approval of the change, we feel it is such a minor change that a negative type of voting would serve the same purpose, and the Bylaws do not prohibit this procedure. For it to work, we must hear from a majority of the currently paid-up members casting a disapproval vote of the change. If this does not occur, then the change will be included.

Although Marc did an excellent job in putting the minutes together AGAIN this month, he made one minor error in the raffle winners. As I recall Bob one the first draw and deferred choice of a prize to the second person. That happen to be Mark Motley, a two consecutive month winner, who then graciously declined. Another ticket was drawn and Jim Neiswonger won, choosing the utility light leaving Bob with the fire extinguisher (yep, only two prizes, not three).

I was a little disappointed this month to find out we did not have any Letters to the Editor to publish. We need to hear from all of you out there. Tell us about your latest model, attempts to design or build any type of flying machine, or ask questions that someone might be able to answer for you. As the Bylaws purpose states, we are here to spread the word about flying wings, but that does not mean other aeronautical subjects cannot be addressed for you the members. so KEEP THOSE CARDS AND LETTERS COMING.

Just a reminder to those in the Southern California area, that we will not be having a meeting in December, since so many people are already maxxed out with parties and other holiday events. The newsletter will be published so we can pass on more good information from our library.

Have a good Thanksgiving Holiday.

Andy

NOVEMBER'S SPEAKER

It is with great pleasure that we will be hosting the current Formula One National Champion, Ray Cote. The 1989 Formula One race at Reno, Nevada, was his 12th Championship, and was won with his highly efficient "Alley Cat" rather than the familiar "Shoe String" which is now in the San Diego Aerospace Museum. The "Alley Cat" is a George Owl design highly modified by Ray. Robbie Grove, one of the founding TWITTs, made the new composite wing of greater span and aspect ratio. Skidrow people (Gillespie Field, taildragging, aeronuts), led by Dan Newman, pulled a last minute, all night rebuilding job on the balky engine so Ray could compete and win again.

As of publishing date we were not sure what his subject will be, but are certain it will be quite interesting, since he has a wealth of tales covering a great many years of aviation.

DON'T MISS THIS ONE!!

NOVEMBER RAFFLE PRIZE

Doug Fronius has donated a two hour flight to the raffle winner, and two other people of his/her choice, in his four place Stinson (the one we move outside for the TWITT meetings). This also makes the meeting well worthwhile attending, since I know many of you are without wings and would like to get back into the air, if even for a little while. THANKS DOUG

ODDS AND ENDS

The Torrey Pines Gulls, a local model glider club, will be sponsoring a Scale Fun Fly at the Torrey Pines Glider Port on November 24-26, 1989. This should prove an interesting event, with lots of great scale machines flying the updrafts on the famous cliffs. If you have some spare time over the holiday weekend, make sure you drop by for a while and watch the action.

Addition to T.W.I.T.T. library:

1) Research Needs For Human Powered Vehicles by David G. Wilson, April 1 1983
2) Racing With The Sun--Solar Powered Vehicles, January 1988.
These were published in Mechanical Engineering and donated by Vic Millman.

PROPOSED BYLAWS CHANGE

There is a need to change Section 1., paragraph (a) to include wording that will enable TWITT to incorporate under the auspices of the Hunsaker Foundation, Inc. Since the Foundation's primary purpose is education and research, the following is the purposed paragraph (a), which will be placed before the current one. The current paragraph (a) through (d) will be relettered to (b) through (e), respectively.

IF YOU ARE A CURRENTLY PAID-UP MEMBER, AND DISAGREE WITH THE PROPOSED CHANGE, PLEASE FORWARD A STATEMENT TO THAT AFFECT TO TWITT BEFORE THE JANUARY 20, 1990, MEETING. IT WILL TAKE A MAJORITY RESPONDING NEGATIVELY TO DISAPPROVE THE CHANGE.

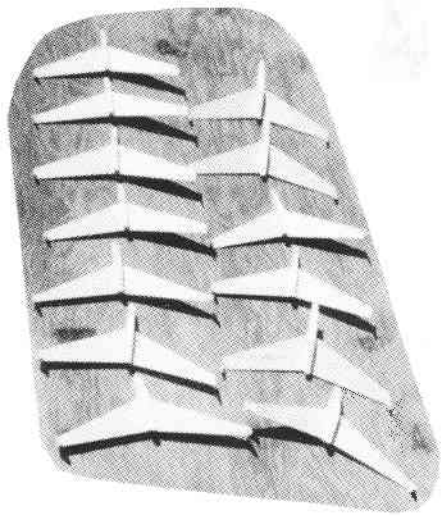
Current (a): to promote the research and development of a high-performance, self-launching flying wing sailplane.

Proposed (a): to conduct research, engineering and relted activities to promote the use of flying wing technology and to disseminate this information by means of a newsletter for the education of interested persons and organizations throughout the world.

H H B II

"G o o n e y b i r d "

Verwendung / Type	Hochleistungssegler / Hi-performance sailplane
Bauweise / construction	GfK / GRP
Besatzung / crew	1 Pilot
Spannweite / span	18.0 m
Wurzeldicke / root thickness	14%
Wurzeltiefe / root chord	1.36 m
Fluegelflaeche / area	14.5 sqm
Streckung / aspect ratio	22.3
Pilotenlage / pilot position	liegend / prone
Breite Mittelstueck / width centersection	6.3 m
Cockpitbreite / cockpit width	0.75 m
Cockpithoehe / cockpit heighth	0.75 m
Leermasse / empty weight	250 kg
Nutzlast / payload	100 kg
max. Flugmasse / gross weight	350 kg
Flaechenbelastung / wingloading	24.1 kg/sqm
beste Gleitzahl / best L/D	40-45/1 bei / at 24.1 kg/sqm und / and 100 km/h

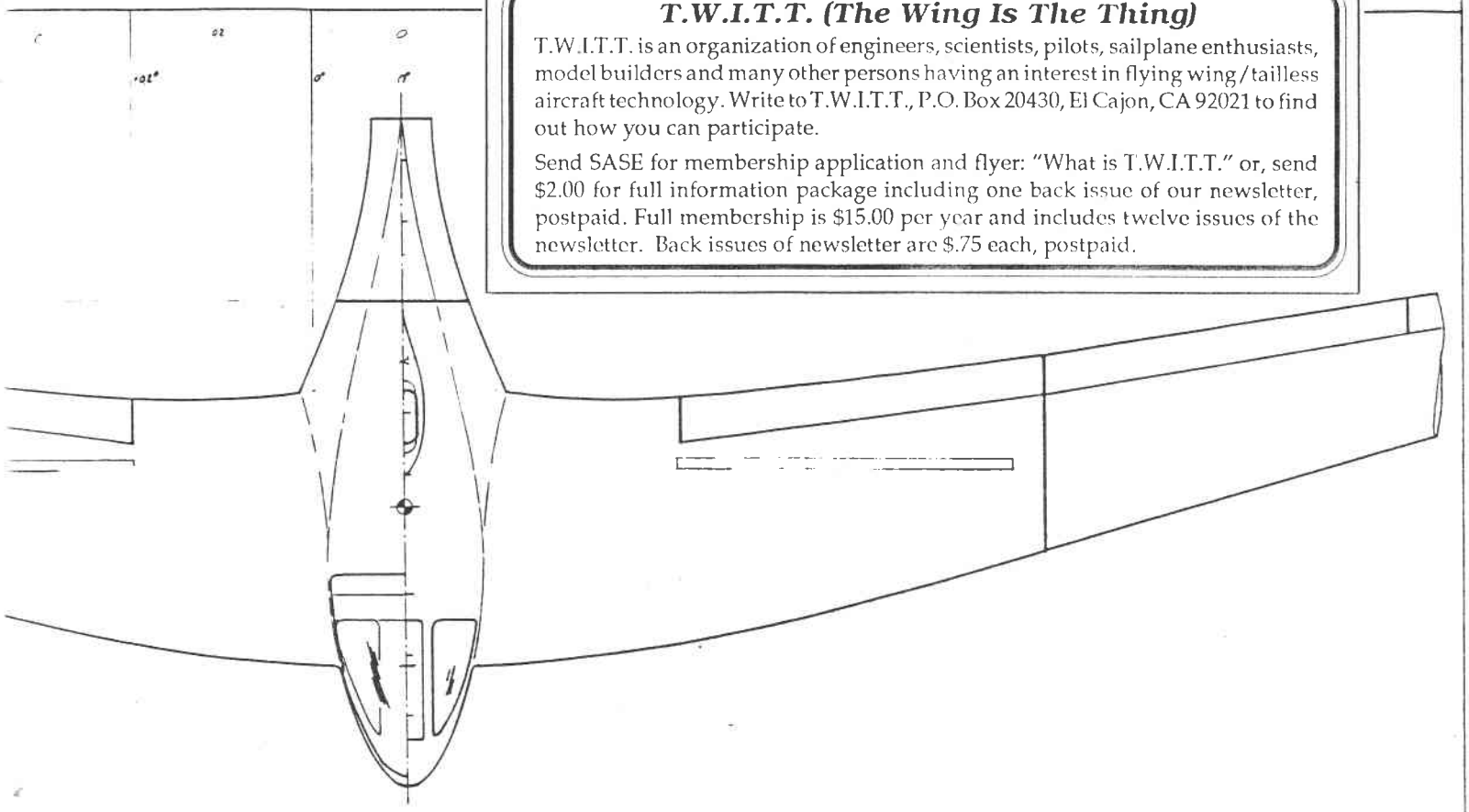


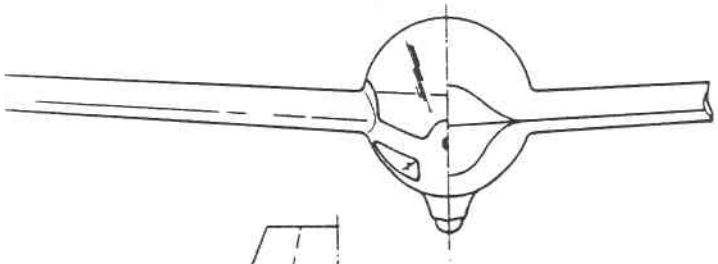

HARALD BUETTNER
PILOT, DESIGNER, CAMERAMAN

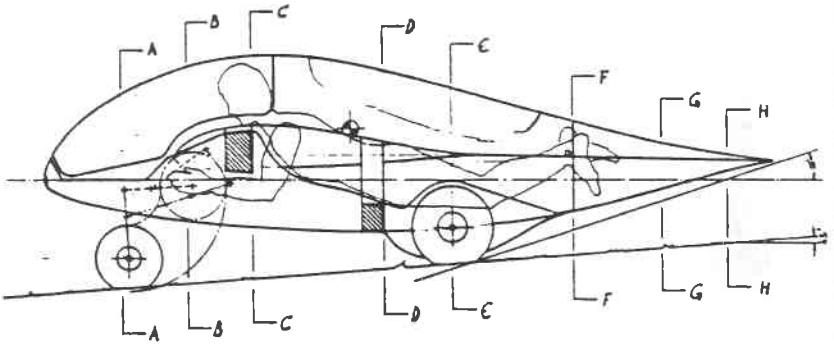
T.W.I.T.T. (The Wing Is The Thing)

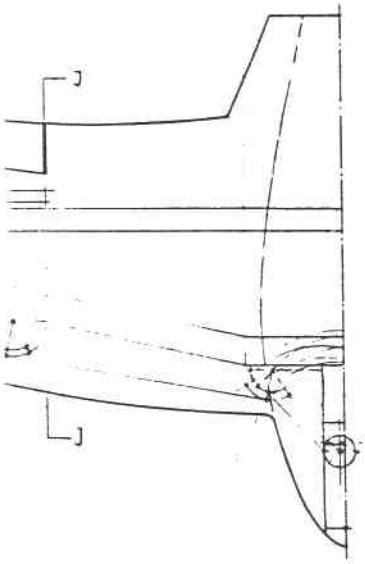
T.W.I.T.T. is an organization of engineers, scientists, pilots, sailplane enthusiasts, model builders and many other persons having an interest in flying wing/tailless aircraft technology. Write to T.W.I.T.T., P.O. Box 20430, El Cajon, CA 92021 to find out how you can participate.

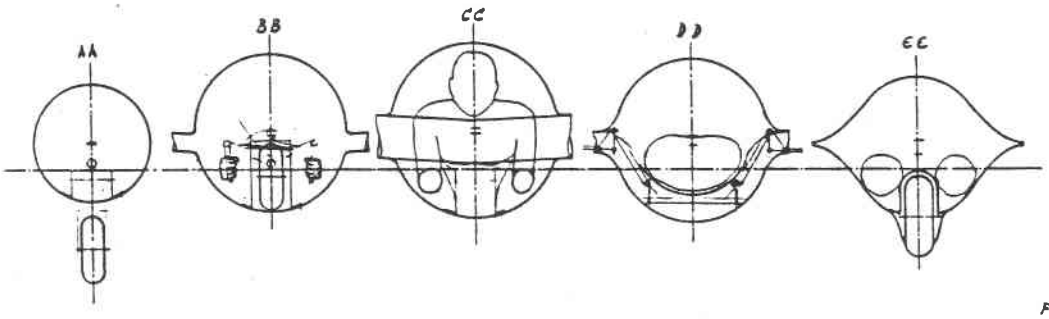
Send SASE for membership application and flyer: "What is T.W.I.T.T." or, send $2.00 for full information package including one back issue of our newsletter, postpaid. Full membership is $15.00 per year and includes twelve issues of the newsletter. Back issues of newsletter are $.75 each, postpaid.

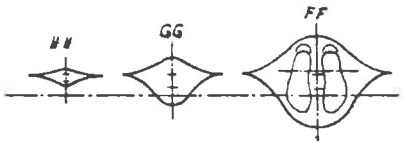












PRECOMTEC R+D

(The following article was reprinted from the March 1989 R/C Soaring Digest, published by Jim Gray for the model glider enthusiasts.)

ON THE WING

by B^2

The show stopper of the scale slope meet in Richland last May was a model of the Northrop YB-49. Many people take pride in recounting the experience of seeing the original YB-49 in flight, and anyone who has seen its graceful shape in the science fiction movies of the fifties can readily understand their awe. It was an absolutely beautiful airplane in the air, and the model at Richland was just as impressive. It was hard to imagine that it was a glider.

Nearly everyone now knows that the B-2 "Stealth" is a flying wing, and, based on the demise of the YB-49, there are of course questions as to the suitability of a flying wing as a bombing platform. To see the B-2 in proper perspective, it is wise to first get some facts about the YB-49. Along the way, perhaps we can learn something about the design and stability of our tailless models.

The YB-35 (propeller driven) and the YB-49 (jet powered) proved the span-load theory for large aircraft. In a conventional airplane, the fuselage and tail assembly produce a large weight and inertia load on the wing-fuselage junction. Since there is no fuselage and tail assembly on the flying wing, the weight and inertia distribution is along the entire wing, and the bending moments are much smaller. Surprisingly, maximum loads on the flying wing may occur during landing rather than maneuvering in flight or gusts. If an airplane is to always land and takeoff at the same speed, then its weight can increase only with the square of its size. The bending moments, however, increase by size cubed, as does weight. You can thus build a bigger airplane, and obtain the effects of increased Reynolds Number and greater payload, by going to an all wing design.

Some of the quirks of full sized flying wings don't appear in RC models. The primary example of this is elevon loading at high angles of attack. A wing stalls from the trailing edge forward and so the pilot of a full sized flying wing would feel the elevators/elevons being lifted by the vacuum. If he did not keep forward pressure on the stick the rising elevators would contribute to an even higher angle of attack and a worsening stall condition. During such a stall, the pilot would view the airplane as being longitudinally unstable. It is felt that the crash of the N9M (the one third size plywood forerunner of the YB-35) was due to just such a condition. The servos in our models don't perceive such feedback from the control surfaces, and we, as pilots, are infinitely removed from flight forces by virtue of the fact that we are on the ground rather than in the cockpit. The YB-35/YB-49 had devices installed which prevented aerodynamic forces from being transmitted to the pilot.

The designers of the YB-35/YB-49 provided a means of achieving high lift for takeoff and landing. Although the airfoils used were symmetrical (NACA 6513-019 at the root, NACA 6513-018), the wing twist was 4°. This placed the root section at a positive angle during flight, with the wing tips exerting a small down force behind the CG. Flaps were used during take-off and landing to provide the high lift needed, and they could be lowered 50°. Since they were close to the CG their effect on the pitching moment was quite small.

Both the YB-35 and YB-49 were stable and controllable. The crash of the YB-49 piloted by Glen Edwards occurred during flight #25 of the testing program, while investigating low power stalls at high altitude. The airplane, whether due to excess weight, Edwards' piloting it outside the safe flight envelope, or another factor, flipped during a stall and somersaulted until crashing into the ground.

The demise of the YB-49 program probably was not due to the crash. Jack Northrop stated that while the YB-49 had won the competition with the B-36, the Air Force wanted the production lines to be at General Dynamics in Texas. There was a merger demand from

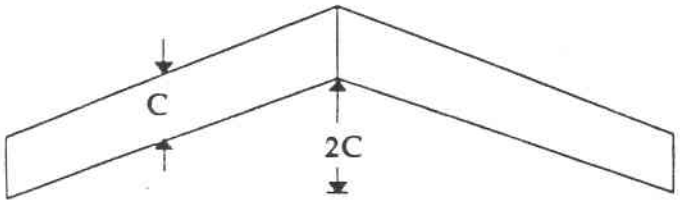
the secretary of the Air Force, Northrop claimed the terms to be unreasonable, and the YB-49 contract was cancelled. Why the Air Force crews with torches destroyed all of the remaining YB-49s, even those on the assembly line, is not known.

The B-2 "Stealth" takes advantage of many new technologies, including computer designed airfoil sections, composite construction techniques, and active flight controls. The resulting design is a high speed long range airplane. Add to all of this the fact that an all metal flying wing without radar defenses produces one tenth the radar image of its conventional counterpart. Constructed of low reflectivity composites and endowed with a unique outline the B-2's radar image will be very small, if it exists at all.

What, of all of this, can we apply to our tailless models?

Any fuselage parts should be eliminated, if at all possible, to both reduce drag and take full advantage of span loading.

Problems that full sized flying wings have with a shifting CG don't show up in our sailplanes. We have no fuel to use, no bombs to drop. If we're careful with CG placement, wing sweep and wing twist we needn't worry too much about instability. In an article in TWITT newsletter #4, Irv Culver (of Lockheed "Skunkworks" fame) promoted the idea outlined in the drawing below. Simply put, to assure that a flying wing doesn't get caught in its own lift circulation, make sure that the "crotch" is DOUBLE the average chord. (The YB-49's ratio was only 1/3 of this.) When properly designed, our aircraft have no need for "black boxes" to maintain stability.



Our aircraft are remotely piloted, meaning that flight loads are not transmitted to us; we navigate our models by their orientation in the sky, not by our perception of the horizon from inside the airplane. This can be an advantage.

Wings are very fast, considering their wing loading, and flaps are a very effective way of getting them to slow down. Flaps can and should be used. Remember to keep the flaps close to the CG, and use flap/elevator mixing if your transmitter has that capability, otherwise you may need to make provisions for a mechanical device.

One item which we have not addressed here is wing twist. There are three methods for achieving the twist required for stability. The first is the simple method that we use in making a foam core wing which results in a straight leading and trailing edge. The second method places most of the twist in the outer portion of the span. The third method, supported by Irv Culver, puts most of the twist at the wing root. This at first seems a rather strange thing to do, but it does optimize span loading and may porovide other benefits. We'll discuss all three methods in a future article.

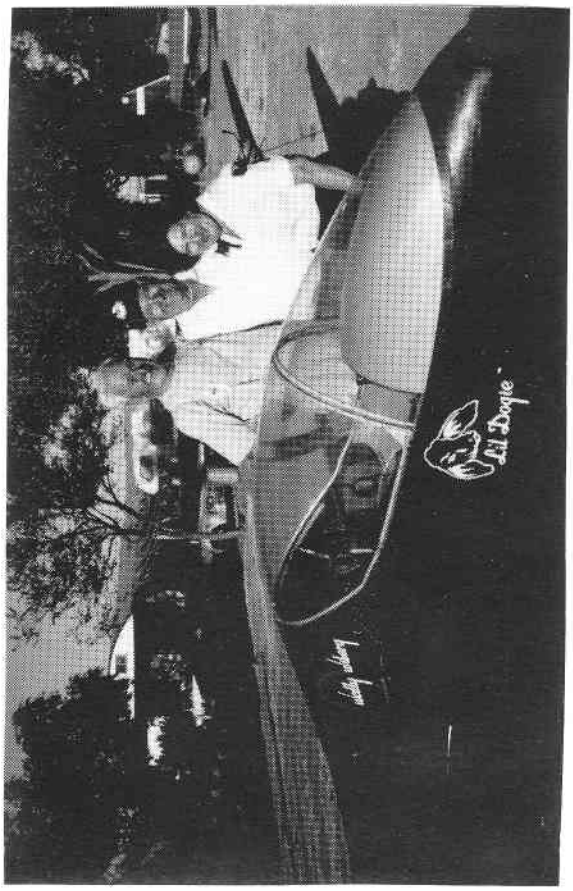
The YB-49 model that appeared in Richland was constructed of foam and covered with fiberglass and epoxy, spray painted aluminum. The fins that project both above and below the wing were made of lite-ply. Small diameter dowels extending from the lower fins were inserted in brass receiver tubes in the wing, holding them in place but allowing them to be knocked off during landing. The flight performance, as mentioned above, was sensational. Jack Northrop would have been proud!

Most of the information on the YB-35/YB-49 was found in an article by William R. Sears, a professor in the Department of Aerospace and Mechanical Engineering of the University of Arizona, and published in Aerospace America, July, 1987. Aerospace America is

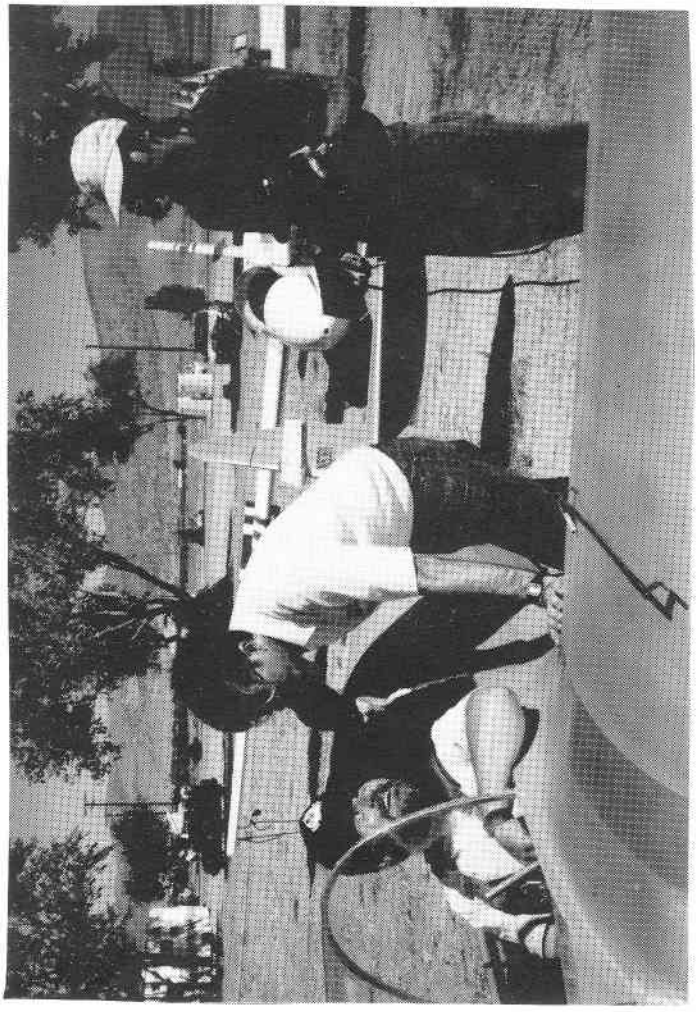
the publication of the American Institute of Aeronautics and Astronautics. TWITT (The Wing Is The Thing), P. O. Box 20430, El Cajon, CA 92021. Back issues are still available and the article by Irv Culver should be required reading for all those interested in designing their own flying wings. Full size plans for the Icarosaur, a flying wing with flaps and great flight performance, are available from the designer, Gene A. Dees, 2309-B Walke Street, Virginia Beach, VA 23451. Woolridge's Winged Wonders is also an excellent source off information about the Northrop designs and flying wings in general. (Bill & Bunny Kuhlman)

NOV 1989 SPORTS AVIATION

Left: Alex Stojnik's latest design, the S-4 "Laminar Magic," was started in 1986 and made its first flight on May 15, 1988. The S-4 is a scaled down version of Alex's S-2 motorglider but incorporates a number of refinements in the wing and fuselage sections. Alex, of 2337 E. Manhatton Dr., Tempe, AZ, says, "The purpose of this 28 hp project has been the search for a simple 'minimum drag' manned airplane (not a drone!), the ultimate goal being an aircraft flat plate equivalent area of only one square foot - approximately the size of this page."



BOB FRONTIUS, BERNIE & EVA GROSS
BERNIE BUILT AND FLIES A MARSKE FLYING WING



TEHACHAPI: SHA-VSA '89
BUETTNER, DOUG & FLOYD FRONTIUS

SECTION 6. ACTION BY UNANIMOUS WRITTEN CONSENT WITHOUT MEETING

Any action required or permitted to be taken by the Board of Directors under any provision of the law may be taken without a meeting, if all members of the Board shall individually or collectively consent in writing to such action. Such action by written consent shall have the same force and effect as the unanimous vote of the Directors.

SECTION 7. VACANCIES

Vacancies on the Board of Directors shall exist (1) on the death, resignation or removal of any Director, and (2) whenever the number of authorized Directors is increased.

Any Director may resign effective upon giving written notice to the Chairman of the Board, or President, or Secretary or Board of Directors, unless the notice of resignation specifies a later time for the effectiveness of such resignation.

Vacancies on the Board may be filled through appointment by a majority of Directors then in office, whether or not less than a quorum, or by a sole remaining Director. Vacancies created by the removal of a Director may be filled only by the approval of the members. The members of this corporation may elect a Director at any time to fill any vacancy not filled by the Directors.

A person elected to fill a vacancy shall hold office until the next annual meeting of the Board of Directors, or until his/her death, resignation or removal from office, which ever comes first.

SECTION 8. NON-LIABILITY OF DIRECTORS

The Directors shall not be personally liable for the debts, liabilities, or other obligations of the corporation.

SECTION 9. PLACE OF MEETINGS

Meetings shall be held at the principal office of the corporation unless otherwise provided by the Board or at such place within or without the State of California which has been designated from time to time by resolution of the Board of Directors. In the absence of such designation, any meeting not held at the principal office of the corporation shall be valid only if held on the written consent of all Directors given either before or after the meeting and filed with the Secretary of the corporation or after all Board members have been given written notice of the meeting as hereinafter provided for special meetings of the Board. Any meeting, regular or special, may be held by conference telephone or similar communications equipment, so long as all Directors participating in such meeting can hear one another.

SECTION 10. ANNUAL & SPECIAL MEETINGS

Annual meetings of Directors shall be held on the third Saturday of June at 12:00 P.M.

Special meetings of the Board of Directors may be called by the Chairman of the Board, the President, the Vice-President, the Secretary, or by any two Directors, and such meetings shall be held at the place, within or without the State of California, designated by the person(s) calling the meeting, and in the absence of such designation, at the principal office of the corporation.

SECTION 11. NOTICE OF MEETINGS

The annual meeting of the Board may be held without notice. Special meetings of the Board shall be held upon four (4) days' notice by first-class mail or forty-eight (48) hours' notice delivered personally or by telephone or telegraph. If sent by mail or telegram, the notice shall be deemed to be delivered on its deposit in the mails or on its delivery to the telegraph company. Such notices shall be addressed to each Director at his/her address as shown on the books of the corporation.

Notice of meetings not herein dispensed with shall specify the place, day and hour of the meeting. The purpose of any Board meeting need not be specified in the notice.

SECTION 12. QUORUM FOR MEETINGS

A quorum shall consist of a majority of the Board of Directors.

Except as otherwise provided in these Bylaws or in the Articles of Incorporation of this corporation, or by law, no business shall be considered by the Board at any meeting at which a quorum is not present, and the only motion which the Chair shall entertain at such meeting is a motion to adjourn.

The Directors present at a duly called and held meeting at which a quorum is initially present may continue to do business notwithstanding the loss of a quorum at the meeting due to a withdrawal of Directors from the meeting, provided that any action thereafter taken must be approved by at least a majority of the required quorum for such meeting or such greater percentage as may be required by law, or the Articles of Incorporation, or Bylaws of this corporation.

SECTION 13. MAJORITY ACTION AS BOARD ACTION

Every action or decision done or made by a majority of the Directors present at a meeting duly held at which a quorum is present is the action of the Board of Directors, unless the Aritcles of Incorporation or Bylaws of this corporation, or provisions of the California Nonprofit Public Benefit Corporation Law require a greater percentage or different voting rules for approval of a matter by the Board.