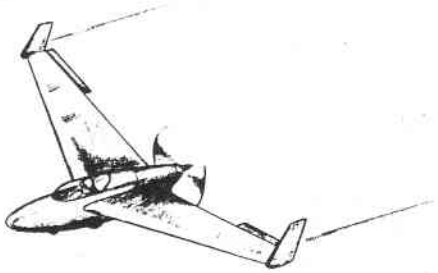
TWITT NEWSLETTER



PROPOSAL
FOR
GOODYEAR TROPHY RACE
Designed By
DON S. MITCHELL

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

NEXT TWITT MEETING: Saturday, 18 June 1988, beginning at 1330 hours. As always, the location is Hangar A-4, Gillespie Field, El Cajon, California.

MINUTES OF TWITT MEETING, 21 MAY 1988

BOB FRONIUS opened the 23rd meeting of TWITT by noting that attendance was lower than usual, possibly due to competition from the Air/Space America extravaganza at Brown Field. He noted that a raffle to benefit TWITT will be a feature of every meeting from now on, and held up the May prize, a battery charger complete with rechargeable cells of various sizes. Henceforth, too, the Newsletter will include advertising, which will be free to TWITT members and subscribers. The Newsletter will also reprint tailless-airplane-related advertisements from other aviation publications. The Vintage Sailplane Association will hold a meet at Hemet, California on Memorial Day weekend, 28-30 May; Bob will be there with two vintage sailplanes. The Sailplane Homebuilders' Association will meet at Tehachapi, California on Labor Day weekend, 3-5 September. Last year, four tailless airplanes were there; this year more are expected. The closing date for submissions of material to be published in Newsletter 24 is 8 June. At Bob's request, ANDY KECSKES reported on the status of TWITT's plan to incorporate. We will probably incorporate as a Public Benefit Corporation under provisions pertaining to scientific, educational or charitable organizations. Officers need not be elected, but can be appointed instead, and the organisation need not be membership-based. Andy is working from information supplied by Wayne Williams, who has provided similar advice to Experimental Aircraft Association Chapter 14. Bob Fronius then introduced MARK WOLLEN of Flow Physics, our first speaker. Mark began his presentation by noting that he and Jim Witham had begun work on a small open-circuit wind tunnel of their own design after noting the high cost and generally poor quality of existing small wind tunnels. Theirs is intended to appeal to a market consisting largely of colleges and universities, besides satisfying their own research needs. He reviewed the basic requirements which a wind tunnel must satisfy: it must produce known, uniform flow conditions about the model, and it must be instrumented to produce accurate data. Low turbulence is desirable, as is a sufficiently high flow velocity to allow adequate Reynolds numbers and model detail. An unobstructed view of the model in the test section is also helpful in flow visualization studies. The tunnel has a 20 x 12 inch [50 x 30 cm] test section and a flow velocity of about 200 miles per hour [320 km/hr], allowing full-scale Re simulation of a 30 inch chord wing flying at 40 mph. Mark reviewed basic wind-tunnel instrumentation: pitot/static probe, hot-wire anemometer and force/moment balance. He displayed a 6 degree-of-freedom strain-gage type balance which he and Jim had built. Because of the transparent test section, the tunnel is also well suited for flow visualization using tufts or smoke injection. Errors due to the wind tunnel walls, whose magnitude increases as the size of the model approaches the test section dimensions, are:

horizontal buoyancy resulting from the longitudinal pressure gradient in the tunnel, which decreases the apparent drag of the model,

blockage, which accelerates the flow around the model,

flow curvature, which exaggerates the effect of airfoil camber, and

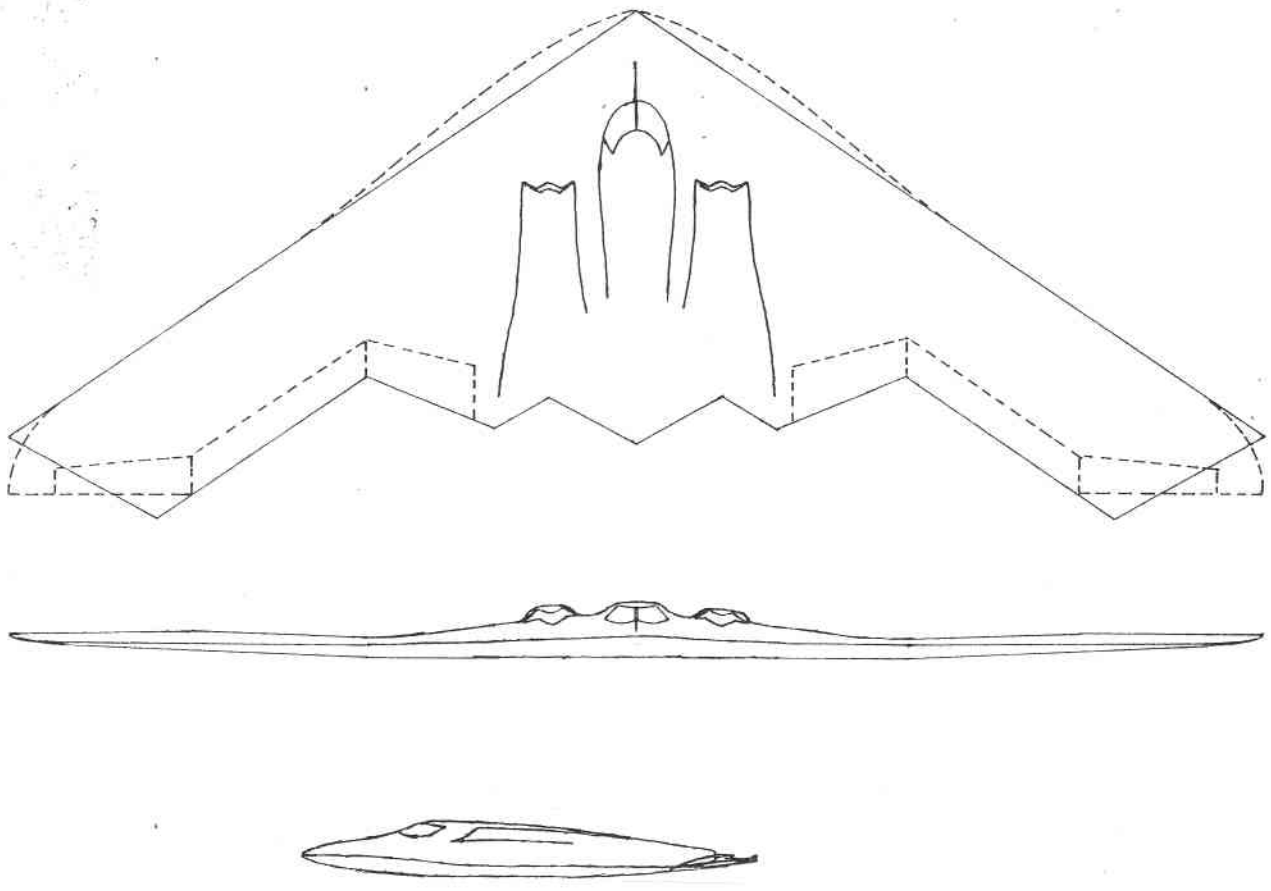
downwash/induced drag interference on three-dimensional models by the interference of the wind tunnel walls with the development of shed vortices.

The tunnel features a contraction ratio of 10:1 and a profile in the entrance section designed for the fastest possible contraction without separation. The result is minimal turbulence and boundary layer growth and a fairly compact tunnel. The test section shape, two semicircles separated by a rectangle, avoids the flow problems of sharp-cornered sections while providing two flat walls for convenience in mounting airfoil models for 2-D tests. The nozzle and diffuser are built of molded glass-fiber -reinforced plastic; the test section is thick acrylic sheet. Mark noted that while the design of the diffuser was fairly simple--the half-angle of the cone must simply be kept small enough to avoid separation--the design of the propeller section was much more difficult than anticipated, both structurally and aerodynamically. They have a satisfactory design which uses a 20 hp AC motor with an inverter type speed control, driving a 2-bladed fan through a V-belt. Flow Physics has had some "bites" from potential customers, and have performed tests on towed target designs in support of a proposal by Scout Industries. Bob then declared a ten minute break. When TWITT reconvened, Mary, the hangar manager, was drafted to pick the winning raffle ticket. Ticket number one was the winner, making your Editor the owner of the battery charger. As your Editor already owns a battery charger, he donated his winnings back to TWITT. Bob then briefly introduced Scanivalve Corporation, its founder J.C. Pemberton and its Chief Engineer Bud Klayser, our second speaker. BUD KLAYSER then took the floor, explaining that Addison Pemberton was supposed to be the speaker but had to make a sales trip to Europe instead. He, Bud, was basically an electronics engineer and was not as well acquainted as Addie with the mechanical and fluid-dynamic aspects of Scanivalve's products. Having said this, he delivered a lucid and very interesting talk on Scanivalve's history. J.C. first became interested in the possibility of applying pressure transducers to replace water-tube manometers in wind-tunnel instrumentation while working for Boeing in the Fifties. Because of the cost of transducers, the only practical way to apply them was to connect a single transducer sequentially to each pressure port through a sort of rotary pneumatic switch. Other workers had tried to build scanning valves but had been unable to solve the problems of wear, leakage and excessive "traveling volume" which led to long settling times and limited scan rate. J.C. went into business for himself with Boeing's consent and solved the problems; scan rates of 20 ports/sec are now possible. If a reference pressure is connected to one port, the transducer can be automatically recalibrated once per cycle, allowing the use of silicon strain-gage transducers, which are temperature-sensitive. In time, a

purging feature was added which allowed ports not being scanned to be automatically blown free of contaminants once per scan cycle. This in turn allowed the use of scanning valves in dirty environments and extended their use to engine testing and process control. Special rotary scanners were designed to be built into propeller shafts rotating at 20,000 to 50,000 rpm, allowing their use for propeller and impeller development. As transducer prices dropped dramatically, Scanivalve developed ZOC modules (the acronym stands for Zero, Operate, Calibrate). These had a dedicated transducer for each port and a series of pneumatically-operated valves which allowed all ports to be simultaneously purged, isolated or calibrated by remote control. The ports are scanned electronically, allowing much higher scanning rates, but the scanning has to be stopped for calibration. Bud gave each TWITT present a bound pamphlet explaining Scanivalve's product lines, and exhibited sample rotary scanners, ZOC modules and electronic equipment. A ten-minute break ensued, following which JERRY BLUMENTHAL took the floor. Jerry has been employed by General Dynamics/Convair since 1958, most recently in the "display shop," which builds models for marketing purposes. He was, however, associated with the low speed tunnel for many years and was involved in the tunnel upgrade project, recently completed. The tunnel is a closed circuit facility, with a perimeter of about 350 feet [108 m], a test section 8 feet high, 12 feet wide and 15 feet long [2.5 x 3.7 x 4.6 m], powered by a 20 foot [6 m] diameter six-bladed fan capable of producing an airspeed of 270 mph [430 km/h] in the test section. The test section has two force balances, one a six component strain gage unit mounted in the tip of the "sting" and another more conventional pylon-type unit. About three years ago, Convair decided to retire the original fan blades, which were showing signs of age. A new set was made at Convair after careful study and were very efficient aerodynamically. Unfortunately, an error was made in mounting them to the hub and they followed their predecessors into retirement. A company in Britain was then contracted to make a new set; these proved to be structurally sound but rather rough. Nevertheless, they were installed and are working satisfactorily, albeit with a somewhat higher power consumption than the old blades. All blades have so far been made of resin-impregnated wood, still the best material for this application. Jerry noted that until recently the old manometer board was still standing in the control room; it could be tilted for greater sensitivity in making low pressure measurements. He displayed a model of a model of a delta wing, delta canard jet fighter, made entirely of aluminum, by hand, at a cost--ten years ago--of $ 100,000. Running such a model in the low speed tunnel costs Convair about $ 600/hr. Jerry noted that, many years ago, the US aerospace industry had gambled on a rapid replacement of model testing by computer simulations, and had therefore failed to maintain a staff of experienced model builders. Computers having failed to develop as fast as predicted, they had lately spent a great deal of money for model work. Jerry added some anecdotes from his own wind tunnel experience, but your Editor was too busy listening and laughing to take any more notes.

TWITT INTELLIGENCE COUP!

Most of our readers probably know that the US Air Force recently published an artist's sketch of the long-awaited B-2 "Stealth," bomber, scheduled to make its first flight later this year. It is of course a flying wing design. One mystifying aspect of the airplane in the Pentagon sketch is the sawtooth design of the trailing edge. Radar expert Don Woodward explains that the reason for the peculiar edge shape is that it is very desirable, in an object designed to have a small radar cross-section, to eliminate parallel edges, as radar returns from these edges tend to form an interference pattern, reinforcing each other at certain angles. The sketch shows no two edges parallel to each other. Harald Buettner, to whom we owe the three-view drawing that appears herewith, has taken the liberty of correcting the planform in the center-section to provide more internal volume and a smoother airfoil thickness distribution, and at the tips to increase the effective span of the wing, which he feels is reduced by the forward trailing edge rake. Don counters that this gives us parallel edges--a no-no. Even a little aft sweep would help. As soon as photos of the real ship are available, we'll publish them and see how close we came to the actual layout.



This letter is from frequent contributor and (as you will see) long-standing flying wing devotee Don Mitchell.

Dear Bob and June,

Hope everything is going O.K. with you two and Doug also. I sure enjoy "TWITT"--I look forward to it but know that it is a lot of work--but please keep at it.

Inclosed are some "wings" I have worked on in the past. The model 130 is a sketch of a 2-place wing that was going to be developed into a "roadable airplane." During WW-II I worked directly under Hawley Bowlus on the XCG-16 cargo glider. I was "Director of Projects" for General Airborne Transport Corp. Besides the XCG-16, I had three other projects going.

1. My 2-place flying wing
2. Conversion of another boomtailed glider to flying wing, and
3. The model 130.

I had two engineers working on the engine-transmission-propeller unit. After four months the project was given up--much too complicated--Hell!! It is hard enough designing and building a good airplane or auto, but when you try to join them you end up with a poor airplane and a poor auto. The airframe for the 130 was never started. All of the three projects were flying wings using my external control system. I will send you pictures and info on the (1) and (2) soon.

When I worked on the building and design of the original "Hummingbird" with Ted N. [?] and H.P., I started to build the "Goodyear Trophy Racer." This project was all mine and not connected with any Co. or other person. I started the construction in my garage. The pod and bulkheads were laminated spruce and were completed ready [?] to skin the pod. It was a single spar and drag spar--the pod and wing were all one unit because it was only 16 foot [5 m] span. The pilot sat in a steel tube truss seat attached to the main spar and the souped up 100 hp engine attached to the rear of the spar with a steel tube mount. The way all the loads went directly into the main spar. A short extension shaft went from the engine to the prop. There was to be a fluid coupling between the two. Cooling air went in at the leading edge of the wing at the roots and out around the prop spinner. Tandem gear was used to meet the regulations and was not retractable. The wing was to have 1/4" [6 mm] plywood ribs every 4 [?] inches [10 cm], and completely covered with 1/8 inch [3 mm]-45 degree 3 ply mahogany plywood. The airfoil was a 12% symmetrical section--no twist--no slots. After building the bulkheads I decided that it was too much for a garage homebuilt operation. It was just too much for one person and I couldn't get anyone else to help, either in time or money. When I tried to get money or help the reaction was "WHAT!!! A flying wing? You must be nuts." Today if I built it I would go with foam and "carbon," thin the wing to 6%, put some twist in the wing with "C" slots outboard, clean the pod up some more--and I think it

would be a winner. If you know someone with 75 G that they want to put up it could be built today and make all other ships look sick. I was going to name the ship "Miss Ima Wing."
The other ship is the Osprey. This wing I designed and did build--this was in 1950, after the "Hummingbird" had been completed. Once again it was done in my garage and a lot out in the open. The span was 50 feet [15 m]--single spar with a drag spar. The wing was three piece; the center section and pod were all one. The ribs were 1/4 inch [6 mm] plywood every 4 inches [10 cm] and the skin from LETOTE was 1/8 inch [3 mm]-45 degree 3 ply mahogany plywood. The airfoil was a Goettingen 549, modified at the trailing edge to make the c.p. stay in one place. The gear was tandem. The pod took all of the pilot loads and delivered them to the main spar and leading edge. The drawing and my four pictures will give you some idea of the ship. There was 3 degrees of twistk and the outboard sweepback panels--no slats or slots. I once again used my external surfaces for control. The pictures are not very good but they are the only ones I have. I made four auto tows at Hayward Airport in 1950 to an altitude of 25-30 feet. Everything seemed to be o.k. so I got Paul Tuntland to come up from L.A. to have a look and see if he would test fly it for me. Paul had done a lot of the flying in 1945 in my 2-place wing and also the #2 project at G.A.T.C. (see above). Paul was satisfied and said he would come back and fly it in about one month. This was not to be, however. Paul got killed in a "P[?]" glider in the desert (I don't believe it was a fault of the ship) and the "Osprey" went up in smoke when the building where it was stored burnt to the ground. I should have built another "Osprey," but John Sawyer put up money for a conventional glider and I started and completed "Nimbus I" for him. Maybe before I die I will make another one using foam (hot wire foam for a taper wing sure beats wood ribs every four inches) and glass and carbon with "C" slots at the tips.

I know this is getting pretty long, but I don't write often and when I get started I like to finish.

In regard to Tasso's talk to the members at the March TWITT meeting: I or Mitchell aircraft know of no accident caused by adverse yaw as indicated in the first paragraph of his talk.

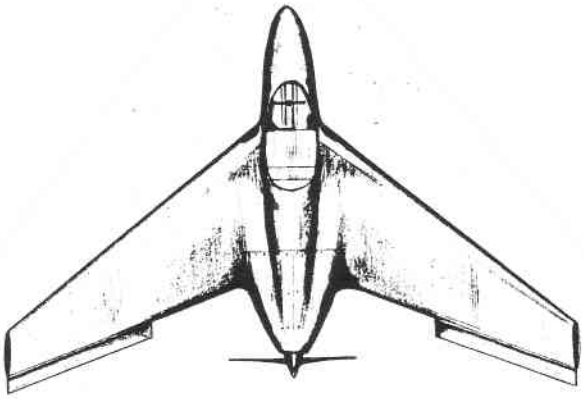
I used spoilers on a few of my first Mitchell Wing hang gliders, and also on the first B-10 power wings. My experience is that they should not be used for anything other than glide control. I found that, when used for roll control, they are dangerous. When flying level at low speed and you make a fast turn, the down wing stalls out and you are in a spin, and spins close to the ground are not good news. Also in one of the hang glider wings we found that in landing 8-10 feet from the ground and at low speed, if you drop a wing and try to pick it up by opening the spoiler on the high wing, the high wing goes <u>up</u> rather than down. It seems that at certain speeds close to the ground the air goes over the spoiler, thereby increasing the camber and the lift rather than destroying the lift. It was probably the design of the spoiler, but I went to tip drag plates

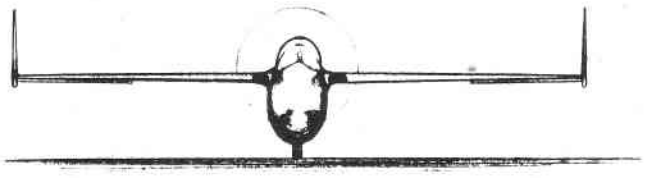
instead of spoilers.

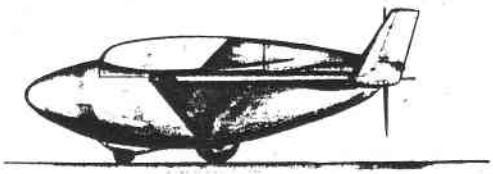
I agree with Tasso that there is nothing in this world as nice as electric starters, and when you add up all the weights the electric start is almost as light as the pull start. Sustainer engines are a waste of money and time. I do not agree with Tasso on the problems with reduction gears. I believe reduction gears are a must and belts are o.k. and gears are also o.k. I have used Rotax engines with "gear reduction" and never had any problems. Belts are o.k. for hundreds of hours as are the gear drives. Folding propellers are o.k. and the wave of the future, thanks to Alex S. Modern 2 cycle engines turn up 6000-6500 or more rpm. That's better than 100 power impulses per second and I don't think the prop knows whether it is a 2 cycle, 4 cycle, rotary, electric motor or what it is that's making it go around. The big advantage is that you can have a good engine with a god reduction gear, swing a big prop at a speed compatible with the ship speed, and when you turn the engine off you have a very clean installation with the folding prop.

There is a way to get differential aileron control in a flying wing without changing the pitch of the wing; this I will go into at some other time. Thanks for your good time reading all of this; I wish I lived close so I could come to every one of your meetings.

Don S. Mitchell







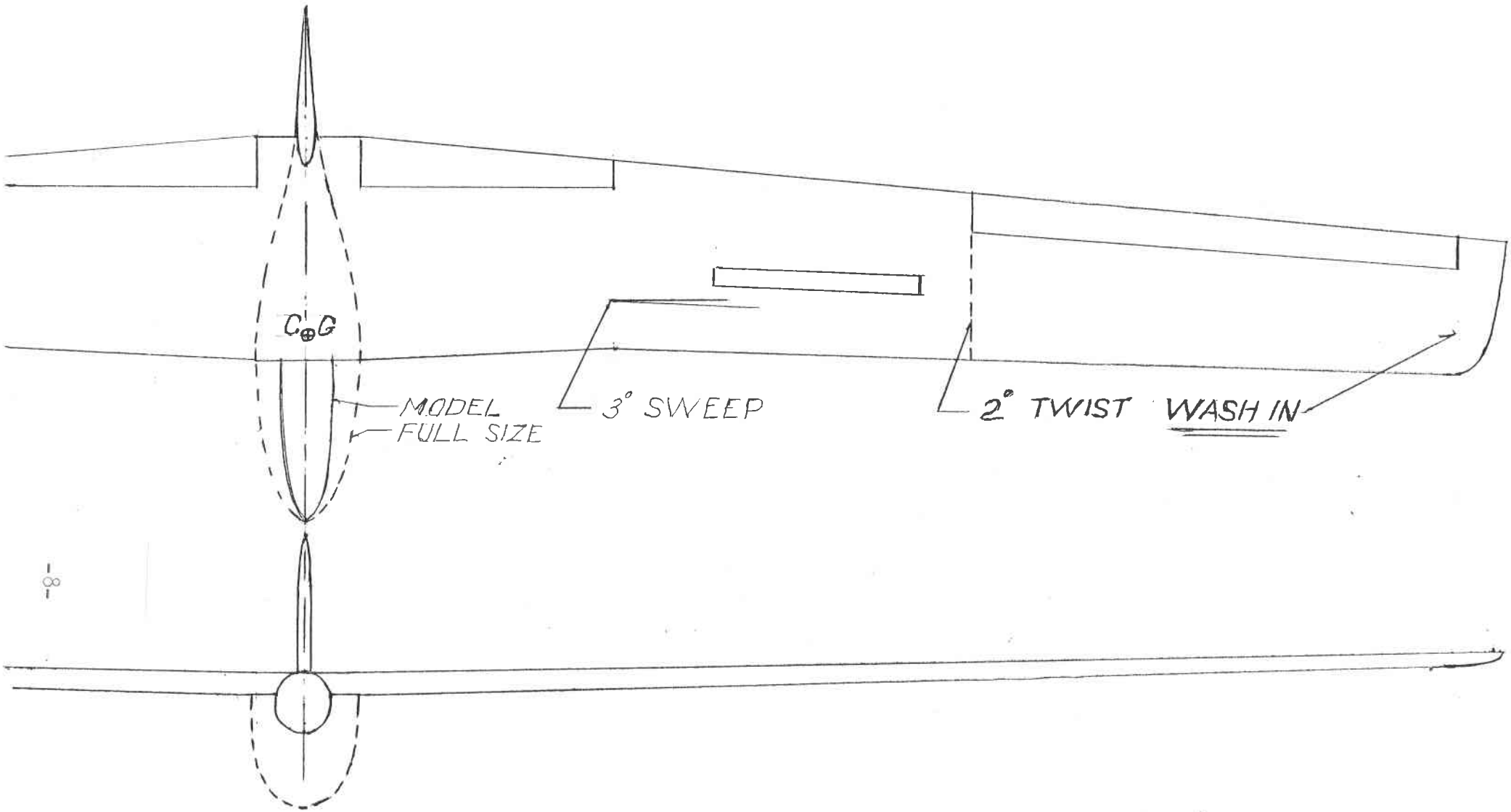
PROPOSAL

FOR

GOODYEAR TROPHY RACE

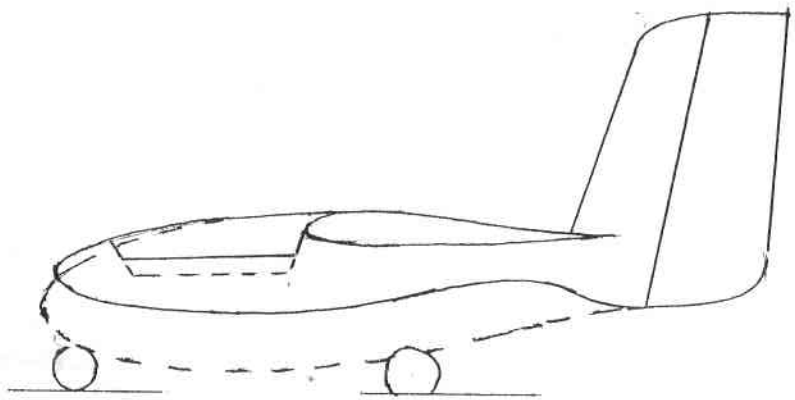
Designed By

DON S. MITCHELL



THE GENERIC BIRD

By VERN OLDERSHAW



Tempe, May 5, 1988

Dear Bruce,

Would you, please get the following CLARIFICATION into the next TWITT , in order for the HISTORY be served well.....

C L A R I F I C A T I O N

In the No.22 issue of TWITT Newsletter, page 2, right column, a statement has been attributed to Tasso Proppe regarding the foldable propeller- with me being the only known person with a working foldable propeller. While this statement qualifies Tasso as my West Coast propeller selling agent , it is also, and fortunately, incorrect. There are a number of well designed foldable propellers flying, notably in West Germany, where the LBA (German equivalent of FAA) has recently certified the TOP principle and mechanism for two commercial sailplanes, the ASW-20 and the Mistral (KIWI) , manufactured by Fisher & Entwicklungen Co. German professional press is also enthusiastic about the Stemme 10 with its foldable propeller in the fuselage nose. The little single cylinder two stroke " turbo " engine, developed by a West Berlin Technical University Professor and purchased by Holighaus for his "turbo" Ventus and Nimbus has, naturally, foldable propellers and Tasso Proppe can see several such Ventuses on USA gliderports. While the aeronautically less developed California may be too backward, Tasso is welcome to visit our Arizona gliderports to persuade himself that foldable propellers installed on commercial German sailplanes have not heard of his condemnation of foldable propellers. The West German tiny motorglider Piccolo, manufactured by Borowski , has a SOLO two-cylinder engine and a foldable propeller and has been successfully unaware of its impossibility ever since designed by the famous Swiss designer Albert Neukom and recently adapted to German Regulations. There are several French motorgliders with foldable propellers, but my sources are not quite as reliable as my German sources. Lest you think that the USA is, as usually in sailplanes and motorgliders, crawling behind, I may mention that a small series production of my design foldable propeller is about to begin.

Sincerely,

FOR SAILING

Horten HIV Flying Wing. Incomplete original drawings on 18" x 24" blueline, 21 sheets. $25.00, pp. Airfoil coordinates, 44 pages, $10.00 pp. Manuscript--223 pgs, $50.00. Write: Flight Engineering & Development, P.O. Box 667, Dallas, GA 30132.

Marske Pioneer Model P-11-C Kit. Have plans, fuselage and metal parts. Kits with all welding completed. Rudder and skid complete and installed. Also have landing gear, tow hooks and leading edge wing ribs. well over $3000.00 worth of parts all for $1000.00. Reason for sale; I have two kits and only plan to build one ship. Call Lew Johnson 301-495-5757.

Mark Wollen of Flow Physics describes their wind tunnel system.

For Your Information:

July 29-Aug 5
Oshkosh '88, Wittman Airfield, Oshkosh, WI.

Aug 5-7
Eastern SHA Workshop, Bryan, OH. Contact Bruce Weber @ 201-944-6529

Sept. 2-5
Western SHA Workshop, Tehachapi, CA. Contact Jim Mills, 110 Ojai Dr. Oak View, CA 805-669-8944 or Howie Burr, 1426 Hillcrest Ave, Glendale, CA 91202.

SHA is Sailplane Homebuilders Association. TWITT needs to hear from you when you attend the Eastern Workshop. The West is covered.

Travellers:
Our editor, Marc de Piolenc is in France. Our control system expert, Hernan Posnansky is planning to be in Spain and Switzerland. Andy Kecskes, who is working on the details of organizing TWITT, is back East. Phillip Burgers, with son Francisco and wife Monica, are in Argentina. Phillip is a friend of Reimer Horten. Our illustrious Bruce Carmichael is back at the wind tunnel at NASA Langley. Ed Lockhart is off to the Aeronca Fly-In in Middleton, OH.

Vertical Traveler: Jeff Byard was at the Hemet, CA Vintage Sailplane Meet. Jeff was at 9500' in his Austria. A shirt box and a newspaper sheet outclimbed him and entered the cloud base. Good vertical penetration.

Raffle:
Marc de Piolenc won the battery charger raffle prize and said he had one already, so he donated it back to TWITT. This will be raffeled at our June meeting.

Schweizer TG-2 wing used as bulliten board.

Jerry Blumenthal from Convairs' low speed tunnel.

An expensive tunnel model that never flew full scale. Editor Marc de Piolenc takes notes.

Bud Klaser, Chief Engineer of Scanivalve explains wind tunnel transducers.