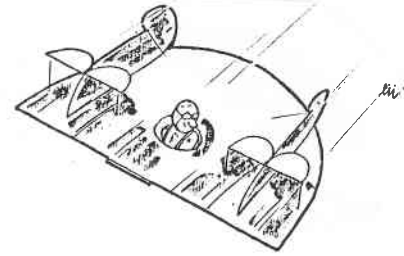
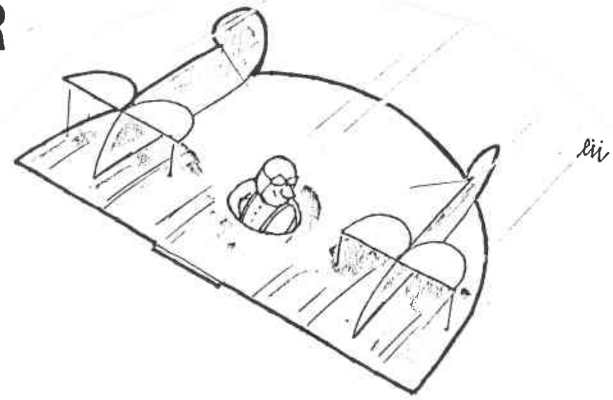


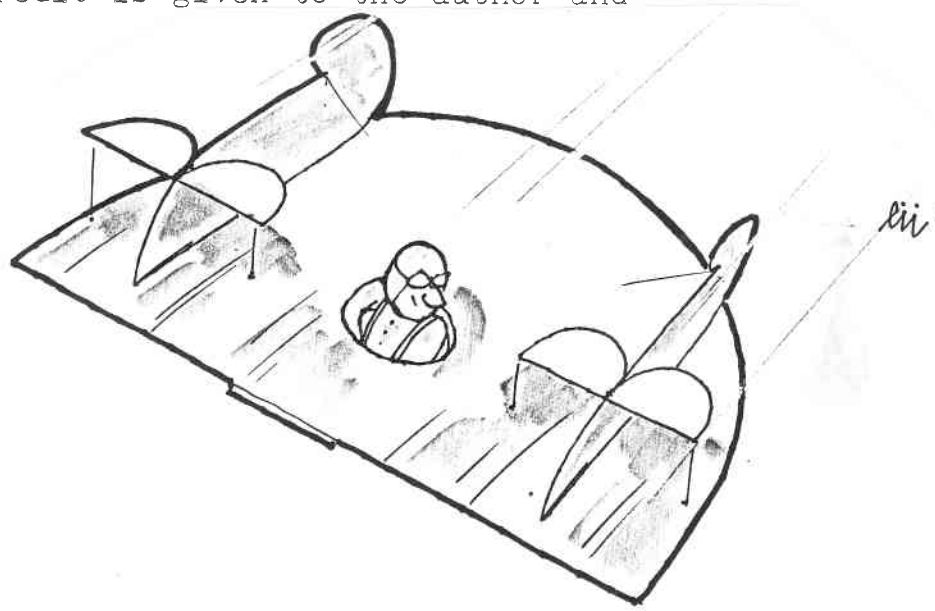
No 17, November 1987

TWITT

NEWSLETTER



F. Marc de Piolenc,
Editor and Publisher



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

NEXT MEETING: Saturday, 21 November 1987, 1330 hrs, Hangar A-4, Gillespie Fld.

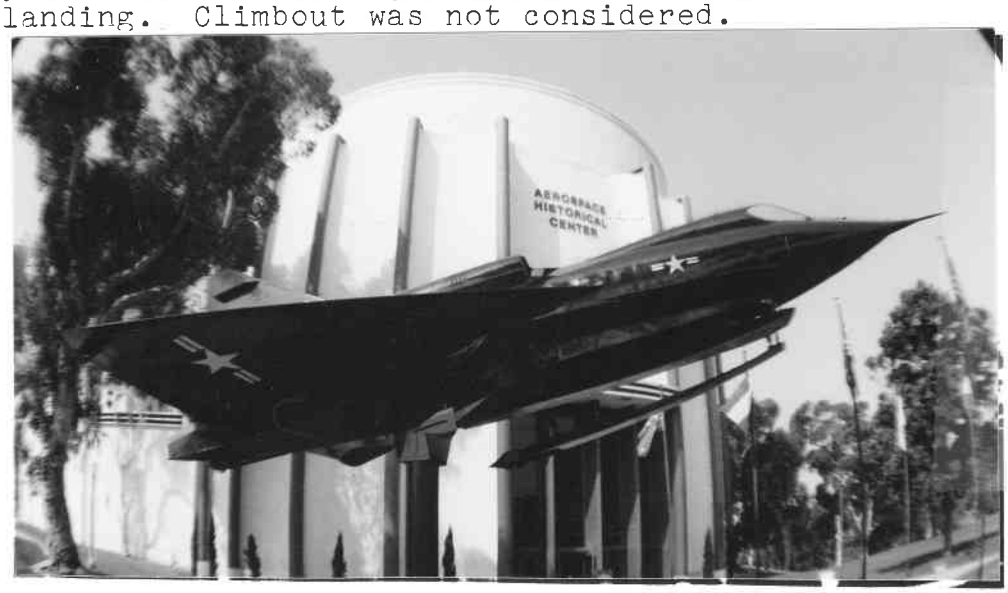
Telephone: (619) 224-1497 before 10 AM or after 10 PM

MINUTES OF TWITT MEETING, 17 OCTOBER 1987

The celebrants convened in the absence of your Editor, who was in Oregon "building a blimp," according to Bob. Actually, I was debugging a blimp, cleaning up minor oversights like the fact that the the internal suspension system load analysis that we inherited from our predecessors did not correspond to the ship as she was built! Anyway, these minutes are compiled from an audio tape provided by Bob, plus a series of telephone conversations. Present were June Wiberg, Bob Fronius, Tim Rosauer, Phil Burgers (with microTWITT Francisco Burgers), Fortunato Figueroa, Jerry Blumenthal, Jim Neiswonger, Andy Kecskes, Reg Finch, Harald Buettner, John Chalmers and Karl Sanders.

Our featured speaker was Reg Finch, an airline pilot, aeronautical engineer and airplane builder based in Coronado... and a frequent and enthusiastic participant at TWITT meetings. His topic was a comparison of airplane configurations, and was based on a series of talks given at EAA Chapter 14 meetings. By introducing some simplifications (equating gross weights rather than payloads, equating fuselage wetted areas, assuming that the airfoils operate in their linear lift range, ignoring interactions), Reg was able to compare configurations based on the amount of lifting-surface area required to achieve a fixed stall speed. The configuration with the lowest wing and stabilizer area would, all other things being equal, have the lowest drag at high speed.

The canard did poorly, but the winner was...the conventional airplane. The flying wing did not win, because of its lower maximum lift coefficient. [The result is not too surprising, since the method of analysis puts a premium on high lift coefficients and does not credit the flying wing with any structural weight or wetted area reduction. Readers should also note that only the conventional configuration was allowed landing flaps--Ed.] Hernan Posnansky commented that Reg was taking only parasite drag into account, and ignoring induced drag and pressure drag. Reg replied that he was considering drag only at high speeds, where parasite drag is the major drag component. Reg considered only lift at low speeds, arguing that drag is not a disadvantage in landing. Climbout was not considered.



CONVAIR SEADART

2.11.87

T.Bircher
Buckstr 23
8302 Augwil
01 813 32 44

T W I T T
POB 20430
El Cajon,CA 92021
U.S.A.

Dear Marc,

Living far away in Europe,I quite the same follow your activities closely. Thanks for sending TWITT.
The Article by Tasso Proppe is VERY VERY close to my own feelings,the first result: PROMETHEUS has all Qualities,but helas,it's just unaffordable.

So let me give you first Information about

L E A : (Low Energie Aircraft)

LEA 1 Model flew in 1986,giving correct results,whatever Horton and Soldenhoff where concerned off.

It was a PURE flying Wing with span 3 Meters,radiocontrolled flew some hours on slopes.

LEA 2 Model flew first flight October 31st 1987. It is a Motorglider,powered by a 6,5ccm Pusherengine,has 4,2m Span. First Flight was successful,regarding all aspects of the flown Flightenvelope.

What does the concept look like:

It is a "super-Delta",so to say:
A pure flying Wing,with a high lift Center,Hortontype outerwings,and Winglets.

The Cabin is a selfcontained sort of a solarmobile, you hang under the Wing,like the man hangs under the Wing of a Delta. The System works fine,now the Questions:

- Anybody has a Engine Which might fit ? Combining Power to the Propeller inflight,Power to the rear wheels on Ground.
- Anybody has a Battery of enough storage Capacity and Lightweight,to design the whole LEA on Electromotive Engine??

The Devil lies in the Details,and many many hours more we shall have to work,to figure it out !!!.
Contacts please over Hernan Posnanski.

Sincerely yours

EFF Der Praesident

Thomas Bircher

Thomas Bircher

F. Marc de Piolenc
PO Box 1549
La Jolla, CA 92038

11 June 1986

Dear Bob,

Sorry I won't be at the June 14th meeting. Here--for what they're worth--are my thoughts about the design. I have also taken the liberty of writing a design flowchart.

I don't think the Hortens have even come close to the limits of achievable performance in a fixed-geometry, statically stable design. For that reason, I don't think that the first wing need have variable sweep or active controls in order to break new ground. The right combination of materials and design philosophy should make even a "conservative" wing noticeably superior to its predecessors. My first recommendation, then, is to build a modular fixed geometry machine, with a separate centersection. Later, based on experience with the first machine, you may choose to substitute a variable sweep centersection, Pterodactyl style. The H XIV planform would be a good starting point.

This doesn't mean we should slavishly adhere to Horten design formulas. We should, for instance, substitute aerodynamic for geometric twist to reduce the off-design performance penalty (actually, if you use flow codes to design an optimum wing camber distribution, this will happen automatically). We need to pay very close attention to the effect of control-surface deflections on off-design performance, an area where I believe a good deal of improvement is possible.

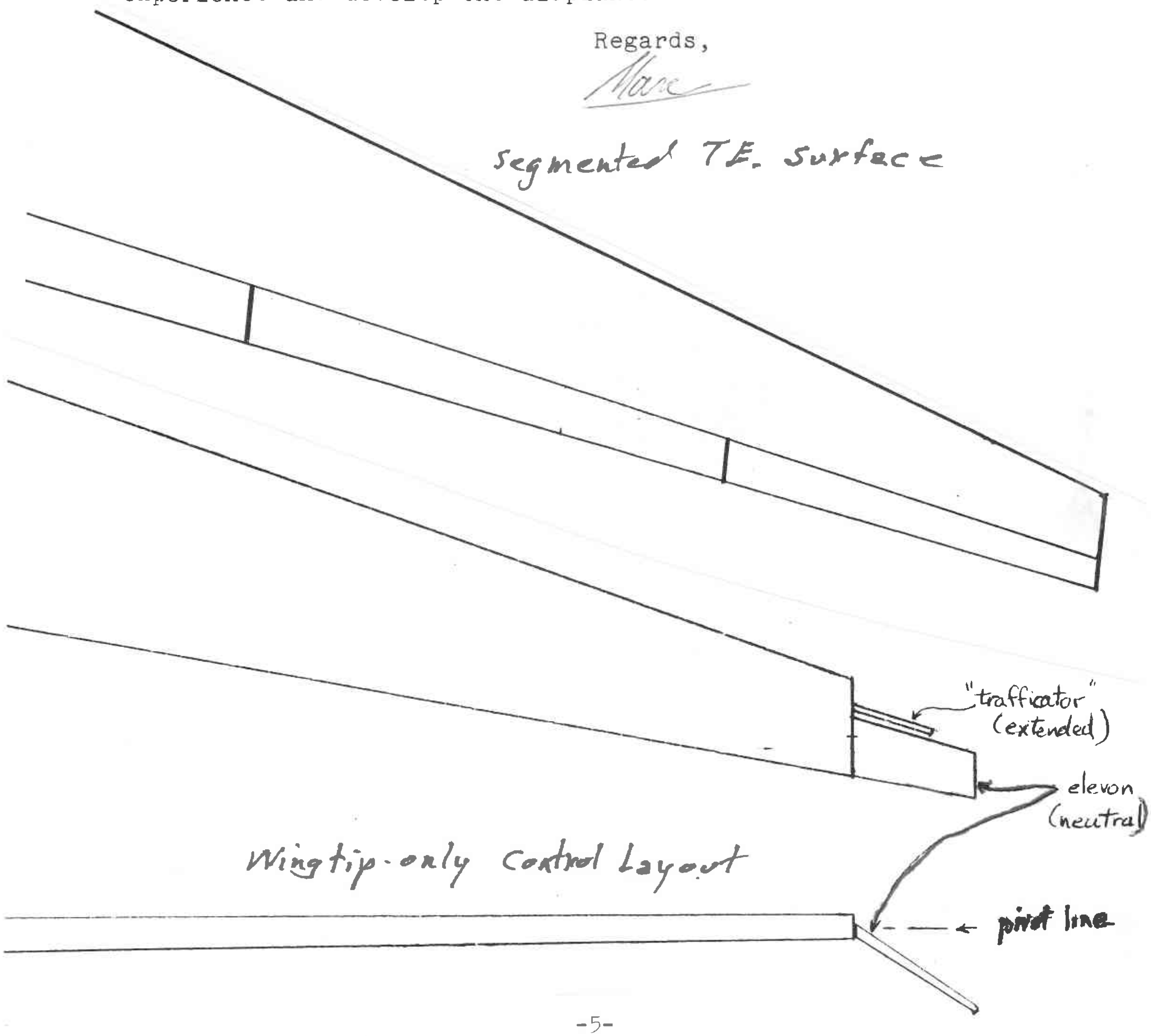
Since this is intended to be an experimental machine, it makes sense to suggest aspects of the design which are ripe for development. From Lippisch's work, as well as that of Horten and Northrop, it seems to me that there is more to be gained by improving control systems than through development of any other single feature of flying wings. I suggest that the structure of the wing be designed to accommodate the widest possible variety of control surfaces so that we can experiment freely in this area. In particular, provision should be made for t.e. control surfaces and lift flaps along the entire span, and the tips should be designed to accept fins, winglets and moveable surfaces.

Two specific control systems we might try lie at opposite extremes: one is a scheme employing no t.e. surfaces at all--only anhedral, all-flying surfaces at the tips serving as elevons--and of course the Horten "trafficator" drag rudders; the other uses a segmented full-span t.e. surface with its kinetics optimized to preserve efficiency and stability through the widest possible lift-coefficient range. Note that by pivoting the wingtip controls about an axis other than their own, we get a fore-and-aft shift as well as an angle-of-attack change; this is a sneaky way of getting some of the features of Horten's experimental "waggle tips" without some of their problems.

Referring now to the attached design flowchart, note that step 5 is heavy on computation, since it involves calculating the pressure distribution of an arbitrary, discontinuous wing. Step 7 is also comp-heavy; it's really an extension of 5. Steps 8 and 9 will of course be repeated as we gain experience and develop the airplane.

Regards,

Marc



The Flowchart is being republished because the letter refers to it.

F. Marc de Piolenc
PO Box 1549
La Jolla, CA 92038

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FLYING WING DESIGN FLOWCHART

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1. Choose planform and basic airfoil thickness form (symmetrical section).

2. Calculate optimum mean camber surface based on design conditions:

    straight flight
    design lift coefficient
    design lift distribution
    stability criteria (Horten 1983)

but ignoring:

    control surface design
    fabrication constraints

3. Calculate the aerodynamic efficiency of this reference or "ideal" airplane.

4. Impose fabrication constraints:

    maximum length of foam slabs
    hot-wire cutter limitations
    practical core shapes
    structural limitations

Approximate the ideal camber surface with linear-transition sections.

5. Calculate the actual pressure distribution of a wing with a practical mean camber surface as determined in (4). Calculate its efficiency and stability and compare to reference airplane. Revise design to yield performance as close as possible to the reference machine.

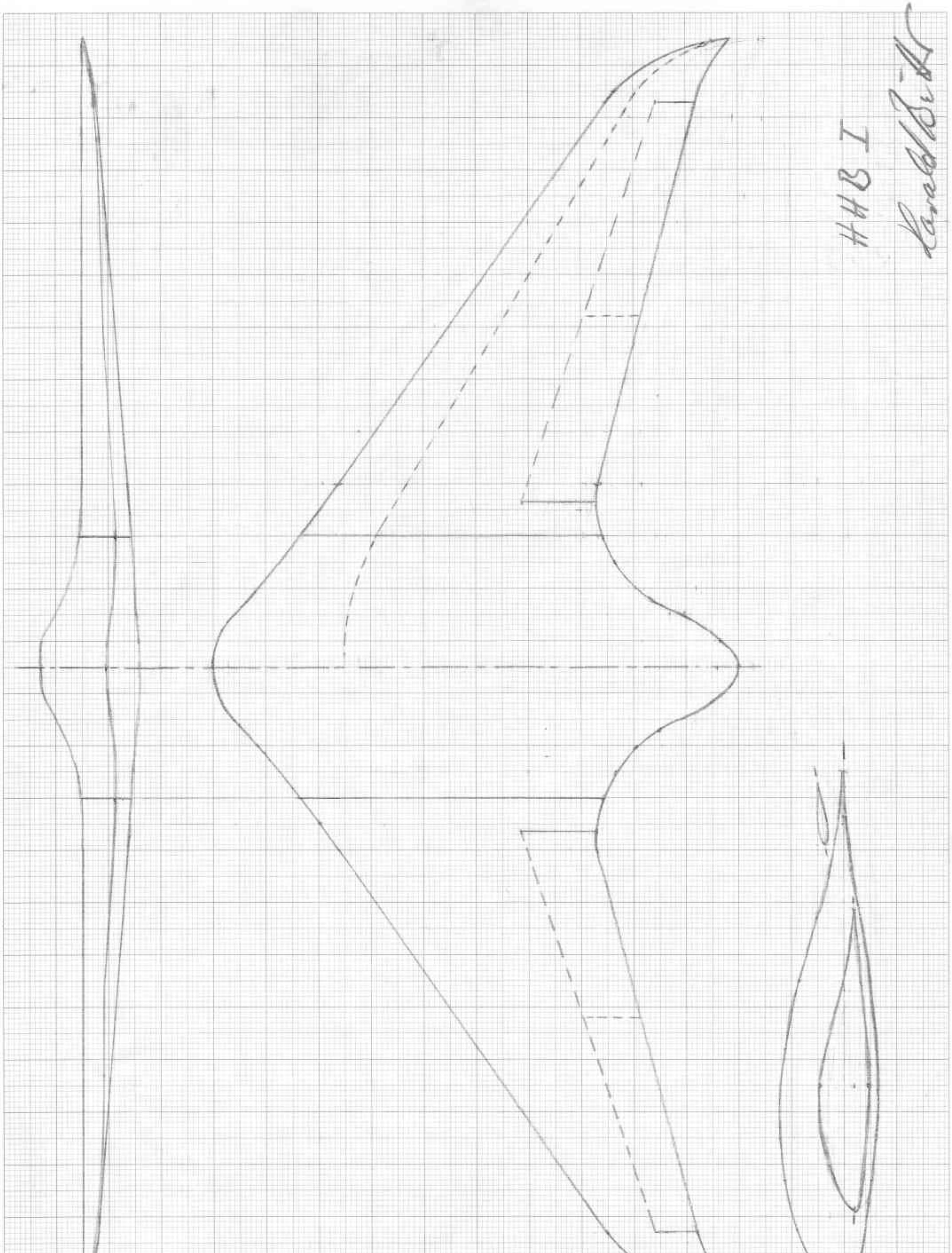
6. Calculate the structure weight including fittings. Revise initial gross weight estimate. Repeat steps 2-5 if revision is significant, say greater than plus or minus 5%.

7. Lay out control surfaces. Calculate the effects of control deflection on stablility and efficiency. Compare to reference airplane.

8. Freeze design. Prepare shop drawings and templates.

9. Build!

THERE WILL BE NO DECEMBER MEETING. There will be a newsletter published. Your next meeting will be 16 January 1988.



HARALD BUETTNER

Fascinated by flying since I went into model airplanes, I finally decided to design and build my own one. The three view you see here is a result, based on Horten's developments during WW II in Germany, especially the types H V and H IX. First I took the H V and scaled it down by $\frac{1}{4}$ from 16m to 12m. Then, in order to create enough room for a two place, side by side, I had to add a canopy like the "Urubu" had. Next step was a 1/10 free flight model out of foam and fiberglass.

There a funny thing happened--it would only fly at one certain speed; any faster and it wouldn't fly straight at all; and slower and it took a nose dive straight into the ground--the flight path looked like it went into a vacumized area once it slowed down enough. When I removed the canopy and taped the hole shut to would fly beautifully.

My conclusion: If a true flying wing with bell shaped spanwise lift distribution is to perform, there cannot be anything attached to the airfoil in the center section because the life produced there is crucial.

This made me change to the planform of the H IX. Here we have the extended chord in the center which takes care of two problems. First it creates enough room for the cockpit, and second it takes the kink out of the $\frac{1}{4}$ chord line, therefore adds lift to the center section. Now back to the three view. It presents all the considerations up to this point, but still has two additional drawbacks. One is the by far too large wing area, and the other is connected to propulsion. A tractor system is out of the question because of its destablizing effect. The only solution is a pusher system. Jet power is far too expensive in any aspect. Ducted fans are only good at their design speed, so all that's left is a prop. The problem here is the necessary diameter. You cannot put it under the trailing edge where it would be most effective--you couldn't land or taxi without killing the prop. The same problem is valid behind the trailing edge plus pressure differences creating high vibrations. Putting it above the trailing edge solves all those difficulties, but brings the drag line and thrust line too far apart, producing an unwanted pitchdown moment.

I was working on those two problems for quite a while and believe that I was able to come up with a reasonable solution. Right now I'm working on a $\frac{1}{4}$ scale model for first test flights of the the new solution. SorryI can't supply you with a three view of the new shape at this time, but will in one of our future issues. I certainly will, hopefully with some real pictures as well.

Last May, with the help of Bruce Carmichael, I was able to interest Todd Hodges in computer analyzing a set of airfoils I developed out of a group of Wortman airfoils in combination with Hortens original one. As soon as results are available and I prove them useful you will get to know about them too.

The idea here was to come up with a good lifting, very low pitching moment, and as far as possbile laminar airfoil for flying wings.

Now some basic data:

Span	12 meters
Area	20 square meters
Aspect Ratio	7.2

Two place, side by side, semi reclined
180 hp rotary engine
Sweep back at leading edge--28 degrees
wing tip washout--7 degrees.

Differing data on three view:

Area	25 square meters
Aspect ratio	5.76

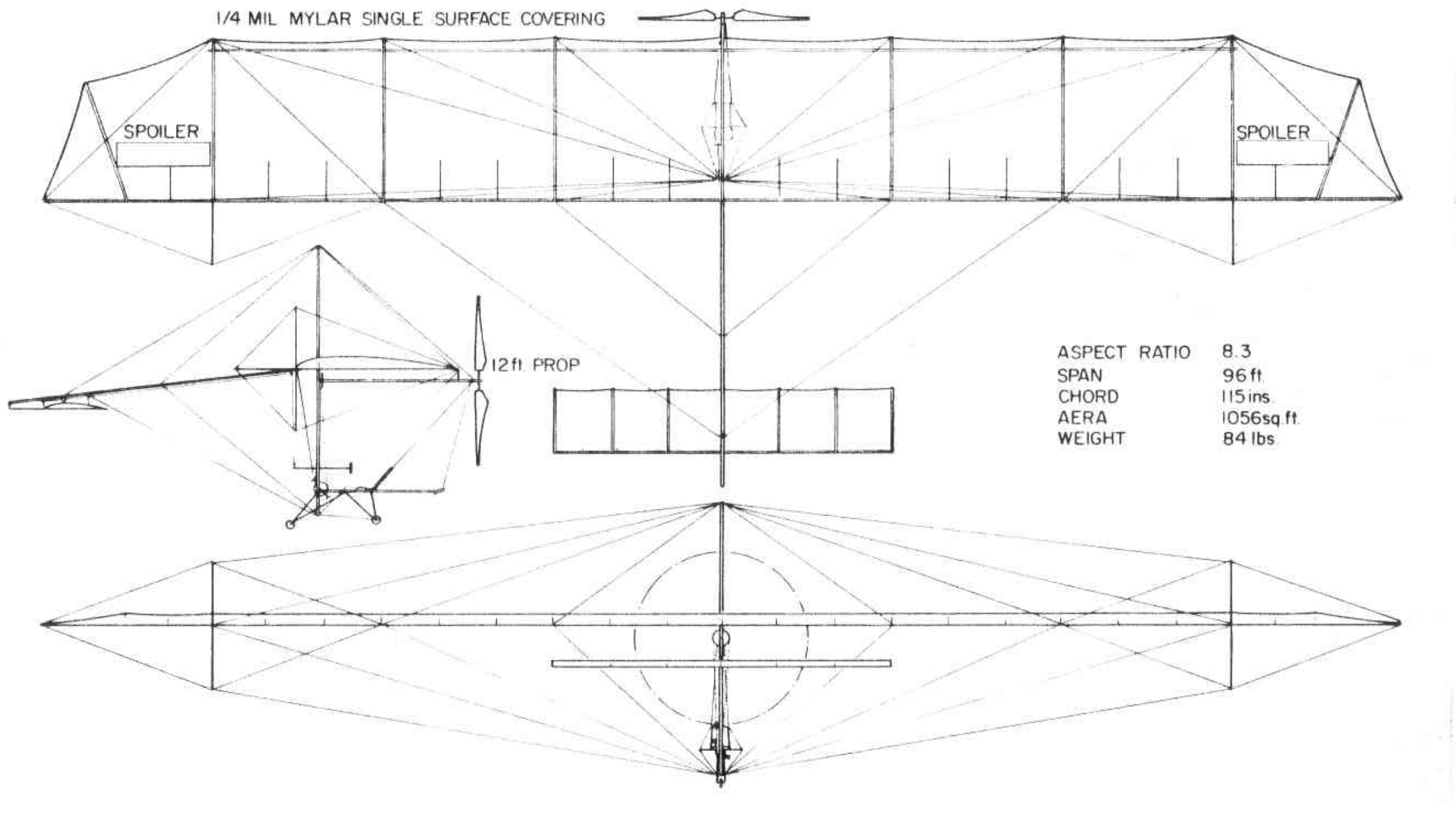
Sweep back at leading edge--30 degrees.

If you are interested in any further information or have questions feel free to talk to me. My mailing address is: Box 635, Santee, Ca. 92071

MACCREADY SPEAKS!

After more than a year of effort, TWITT has secured Dr. Paul MacCready as our speaker for the meeting of 21 November. One of Dr. MacCready's virtues (from a TWITT's point of view) is that he is an excellent public speaker and is willing to speak to interested groups. The yearlong effort was needed, not to persuade him to speak, but to find an opening in a very crowded schedule. Dr. MacCready became well-known outside the aviation community in 1977, when the Gossamer Condor, a human-powered airplane built by his team, won the Kremer Prize for successfully flying a prescribed closed course. In 1979 a more advanced machine, the Gossamer Albatross, crossed the English Channel with Brian Allen providing both navigation and motive power. More recently his company, AeroVironment, was involved in the construction of the Sunraycer, the solar-powered car entered victoriously by GM in the 2000-mile Pentax Solar Challenge race across Australia. But Paul MacCready was well known in aviation circles long before 1977 as a champion soaring pilot, gifted writer and aviation booster. He won the US National Soaring Championship in 1948, 49 and 53, placed 2nd in the 1950 World Championship in Sweden and became World Champion in 1956 in France. He has received numerous awards, including the Soaring Society of America's Lilienthal Medal (1950), considered the highest soaring award, the Richard C. duPont Memorial Trophy (1948-49), the Warren F. Eaton Memorial Trophy for outstanding contribution to soaring (1950) and the Paul F. Tuntland Memorial Award for a published article about one of his own soaring flights (1956). In 1956, the directors of the Soaring Society of America elected him to the Soaring Hall of Fame.

Your Editor had the pleasure of hearing him speak at a joint meeting of the EAA (California) Design Group and EAA Chapter 41 in Van Nuys, CA some years ago, and I curse the fact that I will be playing Blimp Nurse in Tillamook on the day of the meeting. Don't miss this speaker if you can help it.



GOSSAMER CONDOR I (Mojave version.) 332 FLIGHTS