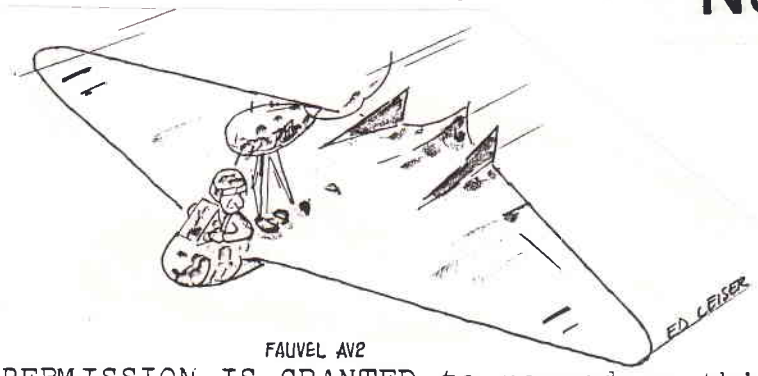
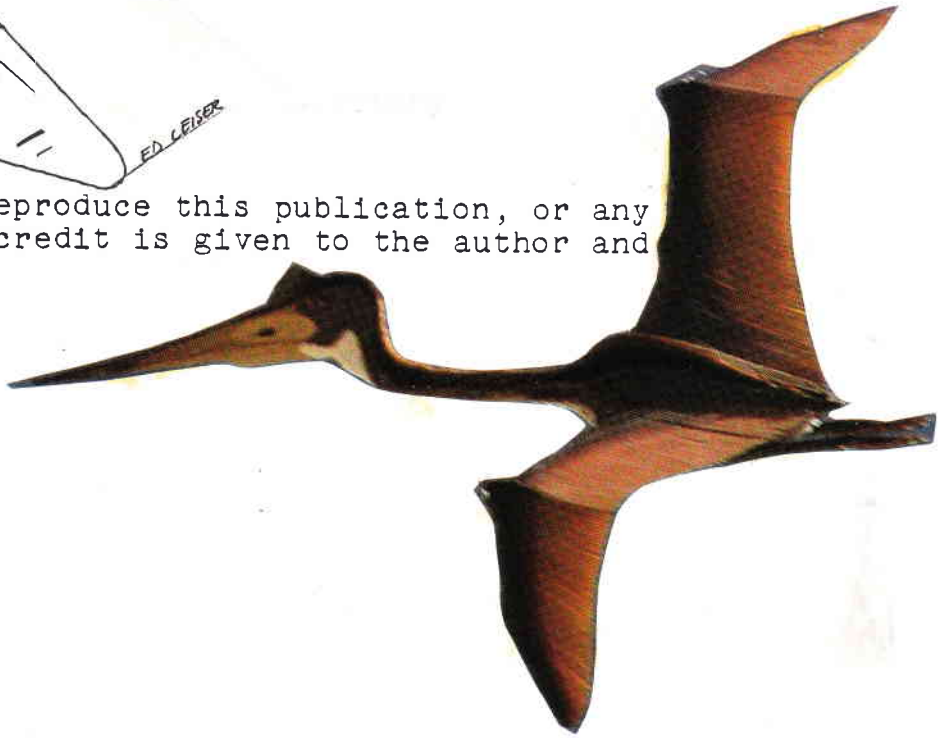
TWITT
NEWSLETTER

F. Marc de Piolenc
Editor and Secretary

No.9, March 1987



FAUVEL AV2



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

NEXT MEETING:
21 March 1987
1300 hours
Gillespie Field, Hangar

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

TWITT MEETING, 14 February 1987 at Gillespie Field, El Cajon, CA

Our featured speaker was Henry Jex, whose topic was the creation of a flapping, artificially stabilized flying scale model of Quetzacoatlus Northropi, the giant pteradactyl that soared over North America millions of years ago. That's Kwet-za-KWAT-lus NORTH-rop-eye, folks, the first living creature named retroactively after an airplane. The critter was completely tailless, just like its namesake, the Northrop XB-35 Flying Wing. Unlike its namesake, however, it was statically unstable. Henry's job was the design of a digital stabilization and flight-control system that had to fit in a tiny space, stabilize a configuration the likes of which Man had never seen and share power with a wing-flapping mechanism (also the first of its kind not produced by Mama Nature)! Your editor came in late, just as he was projecting a Viewgraph of a block diagram of the control system. It makes the system TWITT plans to build look infantile by comparison. Next in Mr. Jex' presentation was a videotape taken from a TV news program that chronicled the project from its inception, through the often frustrating test flights, to its triumphant unveiling by the Smithsonian in its film On the Wing. All this was done on a Stakhanovite schedule and an equally unyielding budget. He also had with him a Voyager promotional tape, which was shown during the break and after the meeting broke up.

After the ensuing break, Klaus Savier gave us an update on his projects. The modification work on his Mitchell U-2 is advancing; the outer wing panels are nearly finished. Klaus has obtained 235 mph from his VariEze as a result of his airframe cleanup and engine modifications. He ended up designing new pistons for the O-200 from scratch. The stock set were a loose fit in the bore, and the resulting rocking motion wore a radius in the edges of the compression rings, causing early loss of compression and high oil consumption. The stock design, certified in the 40's, also required many piston rings, causing friction losses. Klaus' pistons, cast and machined to his design, are completely satisfactory. Klaus also redesigned the exhaust to cross-over cylinders 1 and 3 and cylinders 2 and 4 to relieve the excessive back-pressure caused by the Rutan design. This gave him a 100 rpm static increase. Airframe mods included the new LongEze canard airfoil, employed despite a warning from Rutan that it was unsuitable, and new winglets. He now takes off with a 500 ft. ground run using a compromise propeller. One small problem: Klaus is now flying well over the airframe's design "red line" and is worried about flutter.

Next we heard from Don Cummins. Don is a student at Morse High, an aviation and aerospace "magnet school" and the only one of its kind in California. Don and his Aviation Technology classmates are building a Thorp T-18 under the supervision of instructor Steve Adams. Dan and a friend are looking into the effect of upper-surface blowing on the aerodynamic characteristics of an otherwise conventional wing and have wangled some time on San Diego State University's wind tunnel. Bob Fronius

continued on page 4

LETTERS

Recent publicity from Model Builder magazine has increased our correspondence. We've heard from nine US states and five foreign countries. Some of our recent mail has been especially gratifying, so we're sharing it with you.

Dear Marc,

I just read about The Wing is The Thing in Bill Hannan's column in Model Builder.

As a long time modeler and tailless aircraft nut I must join TWITT.

I have read and kept copies of everything I could find on tailless aircraft. Sources include Soaring, Hang Gliding, Sport Aviation, all the US and English model mags, most US and English aircraft and aerodynamic journals. I also have about a dozen books on model and full scale tailless planes, including private printings.

I would be glad to compile a listing of all my books and articles. If any would be of use to the club I could provide copies. Also, if any member has articles not in my collection, of an historical or technical nature, I would be interested in acquiring copies.

Are back issues of the newsletter available?

I anxiously await your reply.

Sincerely,
Warren A. Berger
Louisa, VA

...I am a kinetic sculptor, and a long tme model airplane builder who is just getting into radio control. My interest in tailless aircraft is probably mostly visual [it probabably starts out that way for all of us--Ed.]. I have the notion/fantasy that when I get good enough at flying, I can design flying objects that look the way I want them to.

I am an engineer and may someday contribute, but for the time being, I am probably mostly a parasite rather than a symbiote.

I am currently working on a kinetic commemoration of the Granville brothers of Gee-Bee fame for Springfield, they seeemed to feel that the engine was the thing and the less wing the better..may they R.I.P.

William Wainwright
Somerville, MA

Gentlemen:

Mention of your organization in V.S.A.'s "Bungee Cord" caught my eye, as I am looking for a set of plans for a Fauvel AV 222 tailless two-place motorglider. The last correspondence I had with Fauvel was in 1979. He mailed me a letter 10 days before he died and indicated that eleven 222's were under construction world wide. Circumstances prevented my building one until now. It appears I will have a six-month leave from work (July 87 through Dec 87) to devote to the project full time. I have placed ads in a number of sport aviation publications including "Les Cahiers du RSA," but am not very confident about the potential outcome. If you can be of assistance in locating 222 plans it would be most appreciated.

Very truly yours,
Kenneth B. Weyand
1815 Parkside Drive
Anchorage, AK 99501

[Mr. Weyand's address is reproduced in full so that any of our readers who can help him can correspond with him directly--Ed.]

Walt Mooney will be our speaker at the March 21 TWITT meeting. Walt is a power and sailplane pilot, also a CFIG. Until he resigned, he was authorized to conduct examinations for sailplane ratings. Walt is internationally known for his aircraft model building and contributions to aircraft model building. His subject will be the ducted fan delta wing pictured in this issue.

Ed Leiser is Curator in charge of exhibits at the San Diego Aero Space Museum. Ed served in the U.S. Navy on carriers as an enlisted man and retired as a Lieutenant. Ed contributes the Flying Wing art for our covers.

Minutes

invited Don to bring his classmates to the next TWITT meeting.

Ed Lockhart told the story of the inversion of his Piper Colt on the taxiway at Brown, the result of a sudden gust that hit him as he was taxiing away from the runway after a good landing. The "Media" reported it as a takeoff accident and reassured their viewers that Ed's passenger had escaped injury. Ed was alone in the airplane...

Bob Fronius then arose to announce the next meeting [see the cover of this issue; our thanks to Henry Jex for the suggestion that we post it there]. Our featured speaker is Walt Mooney, engineer, modeler and airplane designer, who will discuss a tailless design he elaborated for Rohr Industries. You'll find more on this remarkable machine elsewhere in this issue. We will also hear from Phil Burgers, but your Editor doesn't know what his topic will be. BE THERE.

A NEW MITCHELL PROJECT

Don Mitchell, well-known for his earlier tailless designs, is working on a new tailless hang-glider for a hang glider pilot who hopes to set new distance records with it.

Span	37 feet
Root Chord	2 feet
Tip Chord	6 inches
Area	148 sq. feet
Weight Empty	95 lbs.
Equipment Weight	32 lbs.
Pilot Weight	170 lbs.
Gross Weight	297 lbs.
Airfoil Section	NACA 23015

The structure is a single wooden spar, plywood web. The l.e. is .9 mm birch plywood backed by foam. Control surfaces are drag rudders at the wingtips and Mitchell's trademark: Flettner-style external elevons. He also has upper and lower surface dive brakes on both sides. Ribs are wood truss, spaced 12 inches. The removable 9 foot outer panels have fixed "C" slots on the l.e to prevent tip stall. The pilot flies prone and can adjust his c.g. in flight by changing the suspension point. The pilot has an elevons with this right hand, the drag brakes and rudders with his left. The hollow leading edge holds two 300 cu. inch 1800 psi oxygen bottle, one on each side of the pilot. A ballistically deployed parachute is attached to the steel tube suspension truss. A pencil sketch in the letter shows the pilot faired-in in flight and provided with an instrument panel, a skid and a small wheel! This machine has no twist, but Don plans to build some into the next one per Irv Culver's guidance. Don sent us several pictures, of which we are reproducing four.

Photo #1 is a general view of the machine, uncovered
" #2 shows the drag brakes on the left wing panel deployed
" #3 shows the suspension truss
" #4 is a detail shot of part of the control linkage

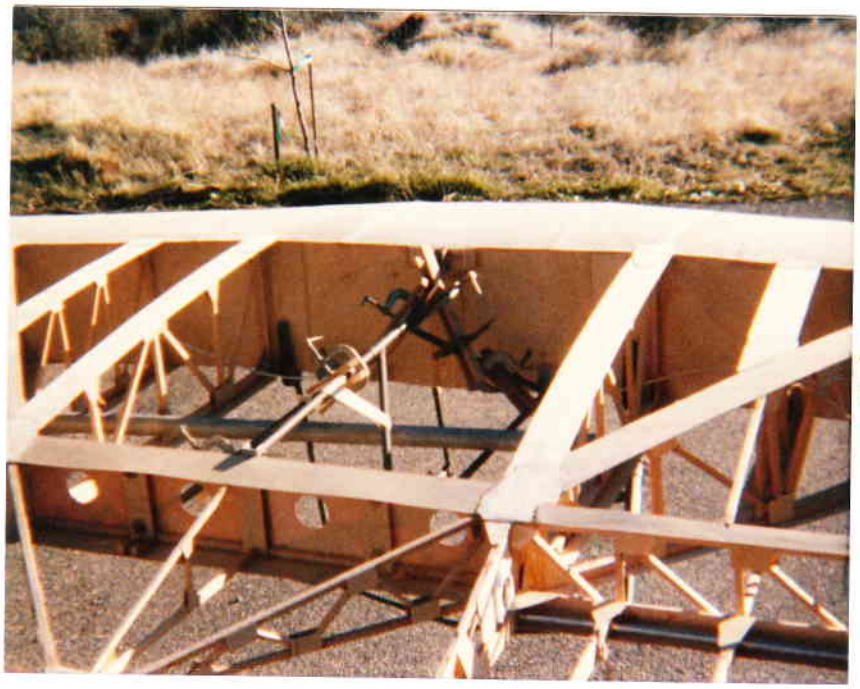
Don promises to keep us posted.

#1

"Top Floor."

#2

#3



#4

FEMALE MOLD

#6

#5

HARALD BUETTNER

FLYING WINGS by Bob Young

All aircraft need some kind of stabilization in order to be stable over a large range of speeds, weights, attitudes, etc.

All Flying Wing aircraft have some kind of stabilization, somewhere, somehow.

It apparently does not matter what form the stabilization takes, only that it is sufficient to keep the aircraft as a whole in neutral or positive pitching moments. All forms of stabilization produce drag, and given attention to detail, fineness ratio, etc. no form of stabilization appears to be the best. Additionally, the various forms can be mixed to produce a satisfactory result.

There are a large number of airfoils which have neutral or positive pitching moments and they will all work on a Flying Wing. The neutral pitching moment airfoils are all, or nearly all, symmetrical. The positive pitching moment airfoils nearly all have a reflexed mean line (in other words, an airfoil may not look reflexed, but when the mean line is plotted it is in fact reflexed). By washing-out the wingtips (wash in on swept forward 25% line) it is possible to give the wing as a whole a positive or neutral pitching moment. Horten, Lippisch, Northrop and used this usually with a non-uniform distribution of twist.

By using any airfoil at the tip that has a different pitching moment than that on the rest of the wing, an overall positive moment can be achieved. An extreme of this was to use an airfoil with a flat bottom and invert it on the outer 20% of the wing. Some flying wings have been flown with an airfoil shape change that made the overall pitching moment even more negative, and then compensating with even more washout, with good results.

A large area above the wing will stabilize it. Area below the wing tends to destabilize the wing. Area ahead of the aerodynamic center tends to destabilize, as does a fuselage.

So Fauvel does use twist in his wings. It is in the airfoil's mean line instead of the airfoil's angle of attack. Kites (hang gliders) actually achieve a reflex when loaded in the air.

Helicopter and autogiro rotor blades have the same problems and cures. Each blade is essentially a straight flying wing and must be stable as such over a large range of conditions.

Finally, if you retract the gear in a Fauvel, be prepared for an immediate pitch up. All flying wings with retracts had interconnections to the flaps, pitch trimmers, elevators etc. to compensate with the retraction sequence.

When using elevons it is very helpful to have an auxilliary pitch trimming surface so that one can trim the elevons to neutral at cruise conditions. otherwise it is possible sometimes to run out of elevator or aileron under full deflection conditions, with disastrous results.

FAUVEL INFO FROM AUSTRALIA VIA GERMANY AND VIRGINIA

The following letters were provided to TWITT by Jan Scott, president of the Vintage Sailplane Association. He in turn got them from Peter Selinger, co-author of Horten's Nurfluegel. The first is a letter from Aussie Alan Lewis to Peter; the others are enclosures to Alan's letter. One enclosure is a short exposition on Flying Wings by Bob Young, not further identified and the other is a letter from Charles Fauvel to Alan. Is that clear? Good; now explain it to me...

Dear Peter,

Thank you for sending your book some time ago. [1980] I am very sorry that it is in German only. I have just read The Sky my Kingdom in English and if it had been in German I would have missed most of it.

I enjoyed "Start in den Wind." Volume 2 would be of interest. Could you mail me a copy please. How much will it cost?

I have 4 copies of Dr. Ing. Reimar Horten's book Nurfluegel here. The English is just enough to make me try to read the German. Just German flying stories and not worth translating as Jan Scott said.

I have been playing around with Flying Wings. Building a Charles Fauvel AV-60. Slightly modified by Charles Fauvel. Wortmann FX 66H-159 airfoil and maybe Frise ailerons. Nose wheel & maybe retracting.

I will enclose 2 letters. One from Charles Fauvel & the other from Bob Young. Any comments welcome.

I have been flying a Trike (a very powerful 65 hp powered hang glider). Control-wise resembles a Taylorcraft (slow) but it has control. With 2 lbs. to the square foot it has lift. Yes it does fly hands off. The boys showed me videos of loops taken off the slope giving the hang glider lift.

The Antique Aircraft Ass, Hutter 17 is being built here in Australia, with success. It handles beautifully, years ago & today. How many, I do not know.

I do not fly professionally. I do hope to have a copy of your later books.

Best Wishes

Alan Lewis, EAA 1634
Paddington, New South Wales
AUSTRALIA

DR. NICKEL COMES ABOARD

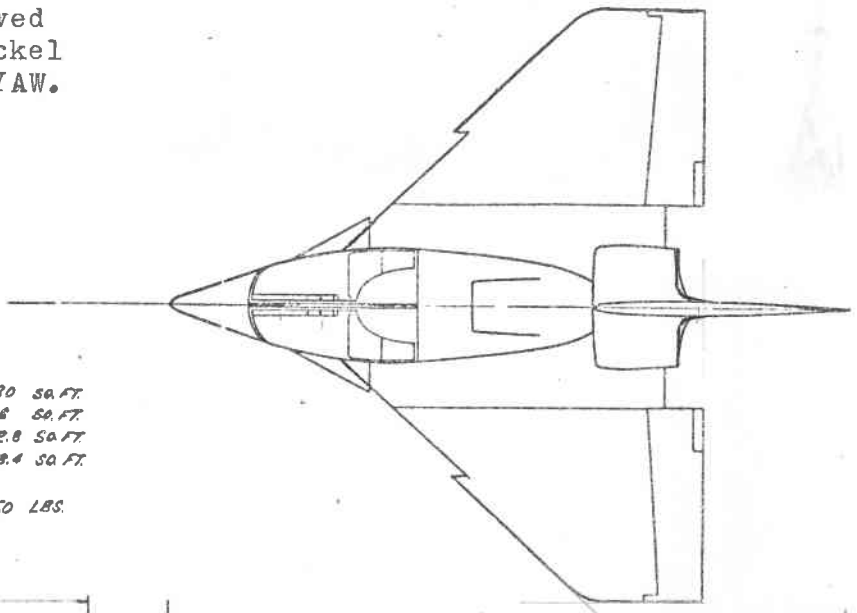
by Phillip Burgers

Some days ago we were delighted with a letter from Germany. A very good friend of Peter Selinger was telling us of his interest in our TWITT group. He is Karl L.E. Nickel, a mathematician, and was involved with the mathematical research on the bell-shaped lift distribution of Horten's flying wings. In fact, he flew the Horten II, III and IV. After the war he spent four years with Dr. Reimar Horten in Argentina. He presently flies ultralight aircraft when not working at the INSTITUT FUER ANGEWANDTE MATHEMATIK.

Under separate cover, he sent us a copy of a study he made on the MINIMAL DRAG FOR WINGS WITH PRESCRIBED LIFT, ROLL MOMENT AND YAW MOMENT or HOW TO FIGHT ADVERSE YAW. This is the title of the paper he wrote for a Technical Summary Report of the Mathematics Research Center at the University of Wisconsin, Madison, sponsored by the United States Army. All this information is enough for all the "valuable-data-hunters" that exist among us.

The objective of this paper is to show mathematically how to reduce the energy required in the process of correcting for adverse yaw by minimizing the resulting additional drag. The interest of Dr. Nickel in this subject comes from his work with tailless airplanes, where adverse yaw is a serious problem as we all know, and that's one more reason why we welcome his work. We will keep in touch with by mail. From now on, Dr. Nickel, we are distinguished by having you aboard the TWITT group and sharing all this experience in flying wing studies with you and vice versa...!!!

Phillip Burgers will discuss the information he received from Germany from Dr. Nickel on HOW TO FIGHT ADVERSE YAW.



GENERAL DATA:

AREAS

BASIC WING (INCLUDING SURFACES)	180 SQ.FT.
VERTICAL TAIL	16 SQ.FT.
ELEVONS	22.8 SQ.FT.
DELTA SLAT EXPOSED	9.4 SQ.FT.
GROSS WEIGHT	1450 LBS.