No. 198 DECEMBER 2002

T.W.I.T.T. NEWSLETTER

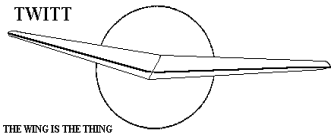
Left is the Farrar flying wing being readied for a flight at the TSA airport. This one of the many flying wings Bruce Carmichael discussed at the November meeting. Right is Gerry Heflin's "Skyler" flying surfboard with an experimental tail section in place. For more on both of these, go the meeting recap inside.

HAVE A JOYOUS HOLIDAY AND HAPPY NEW YEAR

T.W.I.T.T.
The Wing Is The Thing
P.O. Box 20430
El Cajon, CA 92021

The number after your name indicates the ending year and month of your current subscription, i.e., **0212** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, January 18, 2003, beginning at 1:30 pm at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row on Joe Crosson Drive - Southeast 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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Meetings are held on the third Saturday of every other month (beginning with January), 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 (#1720), east side of Gillespie or Skid Row for those flying in).

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PRESIDENT'S CORNER

Well, despite not having a program planned, the November meeting turned out to be really great. We had lots of things going on at the same time and everyone really seemed to enjoy the casual atmosphere of being able to participate where then wanted.

I would like to thank Gerry Heflin for bringing this Skyler surfing glider over for everyone to look at again and, Bruce Carmichael for stepping in again on short notice and giving us a short program on flying wings. This just proved once again that sometimes the unplanned ones work out as well as the planned ones.

I hope everyone is enjoying the members only section of the website. I did have a couple of requests for the user ID and password, so apparently they missed seeing it in this section. Here it is again and they are case sensitive:

User ID: twittmbr
Password: member02

I also got some requests from non-members trying to sneak their way into "our" section. I wrote back to them and perhaps we now have some new members.

I would also like to personally thank Bob Chase for donating the book More With Less to the TWITT library. I am waiting for Bob Fronius to finish reading it so I can have my turn. It looks like it is very interesting and has some sections we can relate to based on our past programs.

I am working on getting a program together for January and hope the UCSD students come through with something on their AIAA project. I don't know if they are trying a flying wing again for the 2003 competition, but we will try to find out and let you know.

Andy

JANUARY 18, 2003 PROGRAM

Although not confirmed as of publication date, we are trying to get the students from the University of California San Diego (UCSD) aeronautical engineering school to make a presentation on their AIAA contest attempt with a flying wing. They didn't win with the wing, but did take fifth place with it in a tough competition. Their conventional design won first place, so they did a great job of engineering to meet the complex specifications of the tasks.

Hopefully, we will have some good news with the January newsletter, so please mark your new 2003 calendar for January 18th.

NOVEMBER 16, 2002 MEETING RECAP

The informal meeting was opened as we looked at three distinct parts. Throughout the day we bounced back and forth from Gerry Heflin's "Skyler" project, to Bob Fronius' question on trailing edge structure and, finally Bruce Carmichael's slide presentation on a series of flying wings either flown or proposed over the years.

ABOVE: Here is Skyler undergoing some refinishing. It is mounted on Gerry's transport trailer, which includes the all flying horizontal tail that his is experimenting with.

Gerry brought over Skyler to show us the changes that he has made, including the start of a new paint job to better match the towboat. He has successfully flown it several times since we last saw it, but hasn't had a powerful enough boat yet to get up to the proper speed for more than just short hops. There were a lot of side conversations out around Skyler with Gerry answering questions about the construction, weight, span, etc., that didn't get recorded and yours truly wasn't a part of, so can't very well be related here.

ABOVE: Here is a bottom view that can be compared with the paint scheme as shown in the February 2002 newsletter. The colors are yellow around the outer edges with a bright red inside the triangle sections.

Bob Chase showed us a copy of the book, More With Less – Paul MacCready and the Dream of Efficient Flight, by Paul Ciotti, Encounter Books, 665 Third Street, Suite 330,San Francisco, CA 94107-1951, 2002, pp. 259 (ISBN 1-893554-50-3) he had recently purchased. It is a biography of Paul MacCready and includes many chapters of his various achievements over the years and, his dealings with many people, including former and present speakers at TWITT. Bob donated this copy to the TWITT library and we gratefully accepted it. It is available from Amazon.com for those of you who like to order things on-line. It has a 4-Star rating and is priced at $18.87, plus shipping and handling.

Walter Scott, as docent at the Palm Spring Air Museum told us that the Northrop N9M is scheduled to be at their air show on January 13th to 18th, 2003. It will be flying in and out for those who would enjoy seeing a real wing flying. You can also learn more by checking www.air-museum.org. This should be good event for those of us who live in the southern California region.

Bob had a question for Bruce about the comparison between full span strip elevons versus the "barn door" type. He felt that a control surface should move air smoothly and gently, rather than abruptly. In his ultralight application he is not worried about maintaining laminar flow, so a barn door type surface of about 1/3 the chord shouldn't necessarily be a problem. Bruce confirmed we were talking about the ratio of the chord length of the flap compared to the chord length of the section. He then said there is test data over the range of that ratio from about 15% up to around 35% found that control deflection per degree will change the lift compared to

changing the angle of attack of the whole section in the ratio of the square root of the control chord to the chord of the wing. So if you have a 25% chord surface it will affect the lift half as much as changing the angle of attack the same amount as you deflected the surface (per degree). So as you go to larger and larger surfaces its not affecting this quite as much as with a shorter chord surface.

ABOVE: You can see from this angle how the Rigid Midget's trailing edge has an upward curve on the inboard section. You can also see that the ribs are solid wood, to which the comment was made that the glider couldn't be flown in lightening conditions since there were no lightening holes in the ribs.

Bob was looking to reduce overall trim drag so it looked like to him the larger chord surface would be the better choice. Bruce agreed with this, but qualified it with the fact that to a certain point the shorter chord, full span surface might be better to certain angles above which lower surface separation would start to occur. So I think Bob will probably go with the wider chord surface on his reflexed wing.

One of Bob's long term projects is to try and develop a formula for flying wings of a particular type that would use a wing tip configuration that eliminates the reflex in the wing. He things this can be done with a low drag wing tip on a swept back wing. Bruce pointed out that the Hortens with sweep back and a lot of taper and a lot of twist still had to use reflexed sections.

Andy asked everyone to introduce themselves at this point and we found we had some history making people in the group. One was Ray Coty of Formula 1 air racing fame, who was also the test pilot for the Ryan Cloudster. He gave us a short description of spin testing the Cloudster and amazed everyone. Also in the audience was Skeets Coleman, the Convair test pilot for the prototype Pogo Stick vertical takeoff aircraft. It never made it into production, but did successfully fly using counter-rotating props powered by a jet turbine. As with the Ryan VertiJet, the power to weight ratio did both of them in. There was a side discussion where it appeared Skeets had been working on a delta shaped flying wing model with a mid-section pusher engine. It seems to have some problems and is now only worked on occasionally.

We moved on to discuss Bob Fronius' problem of whether or not the trailing edge of his Culver designed Rigid Midget should be changed or left in it current shape. For some unknown reason, the builder decided that the trailing edge should have an upward curve starting at the root and extending out to the inboard end of the aileron. This curvature causes a constantly changing angle of incidence throughout this section of the wing. Bob wasn't sure what this would do to the performance, especially the stall characteristics and, was looking for some educated guesses or suggestions for changes.

ABOVE: Here you can get a good look at the rib placement and what is causing the curve in the trailing edge. Since they are mounted at this angle on the spar, they would have to be removed to correct the condition. The short ribs in between the longer ones only serve to smooth out the fabric coming off the D-tube section.

Bruce thought that maybe the aft camber might be setup to make the stall start at the inboard end and not outboard. When Bob asked what would be gained by leaving the trailing edge as it is, Bruce responded that it wouldn't affect the performance enough to be noticed, but could affect the handling characteristics. The current configuration looked safer with an earlier buffet upon approaching a stall. The two discussed the amount of washout, 7 degrees, at the outboard end, which seemed to confirm Bruce's assumption.

The stall characteristics of the Screamin' Weiner/Lil' Dogie, a sister ship to this one, were quite normal, according to Bob. It was built to Culver's plans, whereas, this wing was built differently for some unknown reason. It was flown only twice by experienced pilots and, both said they wouldn't fly it again. There was nothing in the logbook to indicate if this was a CG problem or that it might have something to do with the strange trailing edge.

He then asked whether he should go to the trouble of straightening it out as the original plans showed it. There

was a little eyeball rolling, but the final answer seemed to be leaving it like it is and go fly the glider to see what happens. If performance is degraded or unpredictable, then go through all the work of straightening it out. You can't really see it in the picture, but the job would involve replacing a lot of ribs since they were attached to the main spar in such a way as to create the curve.

ABOVE: Here is a tip shot that gives you a good idea of the thickness and how the wing appears to have washout (although that might just be the paint scheme).

Moving on, we spent some more time outside around Skyler, convincing Gerry to mount the tail section on it and then getting in his flying position. Since he is in the process of refinishing it, the small windshield was missing off of the front portion of the standing pad. He also has a small rope to use as a stabilizing handle to keep from being thrown off during acceleration.

We're still not real clear on the function of the horizontal stabilizer and the long balancing handle sticking out from the leading edge. From what Gerry was saying it is not really supposed to be true all-flying tail and would be used very little during flight. In fact, the last test flight didn't even use a tail of any kind, so it was really a big, flying surfboard being towed by a boat. This last test wasn't all Gerry wanted it to be, since it occurred right around dusk in an area not really conducive to this type of towing. He was satisfied that it would fly like he wanted, but really needs to get up to the proper speed and launch angle of attack before he will really know the full potential of this unique project.

ABOVE: Here is Gerry in the "flying" position with the tail section that hasn't been tried yet. Although he has a rope to hold onto, he indicated his testing so far has shown it really necessary, but a good safety item just in case.

ABOVE: This is the vertical attachment point. It sits in a box and is held in by 3 aircraft quality bolts going through the box and base of the fin.

ABOVE & BELOW: Here as close-ups of all flying tail surface Gerry is going to experiment with. The top photo shows the pivot point and the rib structure that allows him to shape the surface. The lower photo shows the shape. The "lever" sticking out the leading edge has a crude mass balance clamp and the length is necessary to allow for the pilot to make adjustments.

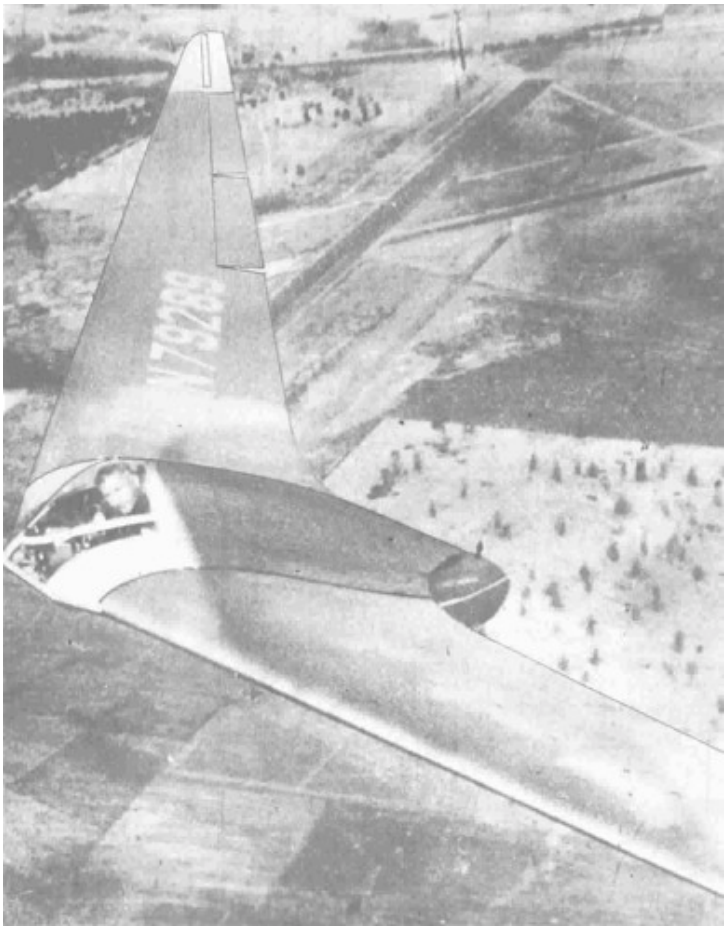
(ed. – Sadly we have to report that Gerry has lost his Skyler, along with almost all of his belongings, in a hanger fire about a week after the meeting. There are not a lot of details on the cause of the fire, but it apparently took out 3-4 hangers and several airplanes. We understand that the Skyler is now just a lump of melted foam and fiberglass.)

Once it appeared that everyone was done outside looking at the Skyler and pumping Gerry for information, we broke out the donuts and sat down for a short presentation by Bruce Carmichael on the history of flying wings. *(ed. – The following came directly from Bruce's text of his talk and copies of his view graphs. I would like to thank Bruce for this, since it made putting the newsletter together much easier.)*

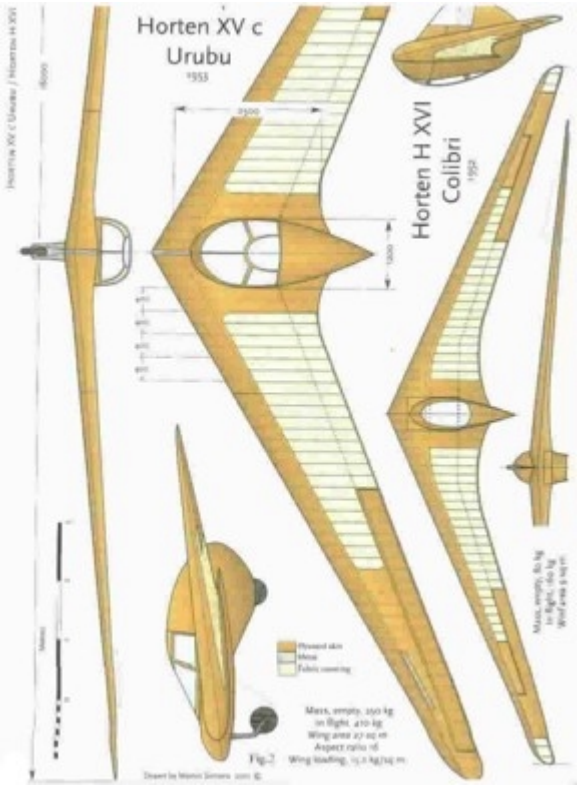
This lecture will discuss 19 flying wing and tailless sailplanes. Five are interesting concepts that did not progress beyond the model stage. Fourteen have been built, of which thirteen have flown. Seven were high performance attempts with wingspans between 49 and 82 feet. Three with spans between 40 to 42 feet were of moderate performance, while nine were designed for low cost, ease of construction, assembly, storage and transport, with wingspans limited to between 26 and 38 feet.

HIGH PERFORMANCE ATTEMPTS

The Horten IV was the best known and highly flown of the Brothers designs. Its prone pilot position, 66 foot wingspan with an aspect ratio equal to 20 made it the second highest performing pre-WW2 sailplane, second only to the Darmstadt D-30 Cirrus. One was brought to the United States after the war. I saw it flown by Rudy Opitz in Ohio and in the National Soaring Contest in Grand Prairie, Texas in 1950. In Figure 1 (below) we see Dez Georgfalvy flying it over Starkville, Mississippi. Dez and Dr. August Raspet wrote one of the finest sailplane reports of all time following extensive instrumented flight tests.



After the war, Reimar Horten immigrated to Argentina. In Figure 2 (below) we see his 59 foot span, two place, side by side H XV C Uruba and his 40 foot span single place H XV I Calibri. Note that they both featured upright seating in contrast to the prone position of the H IV. They

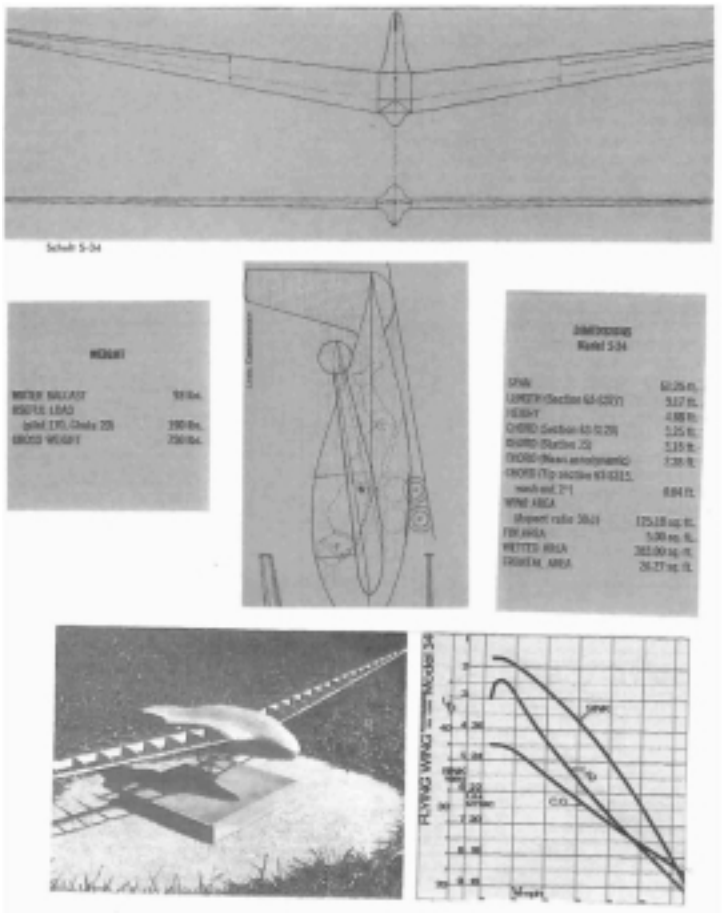


were both entered in International contests but did not win.

In 1972, I visited with an early American Aero Engineer, Bill Schult, now retired in San Diego. He had built and wind tunnel tested models of the Convair B-36 giant bomber. One 1.3 million Reynolds number test was of the isolated wing which, since it matched sailplane flight conditions, caused him to design a 61.25 foot span, aspect ratio 30 sailplane based on the tunnel data. He built a beautiful model, Figure 3 (right), but was not able to obtain help for a full scale craft. He planned a variable center of gravity to aid longitudinal control in contrast to the variable sweep concept of Hernan Poznansky and TWITT. He calculated an L/D of 46 and a minimum sink of 1.8 ft./sec. at a wing loading of 6 p.s.f. wing loading.

The Polish Wampir of 49 foot span, aspect ratio 15, Figure 4 (next page), employed 23112 reflexed airfoils with 4 degree washout and twin vertical tails 60% of the way out along the span. The wing loading was 4 p.s.f. It was an attempt to exceed the performance of conventional sailplanes of equal span. It was prone to ground loops on take off and landing and when intentionally spun could only be recovered by the pilot shifting foreword in the cockpit. Later a bailout was necessary when serious flutter developed. It was retired to a museum.

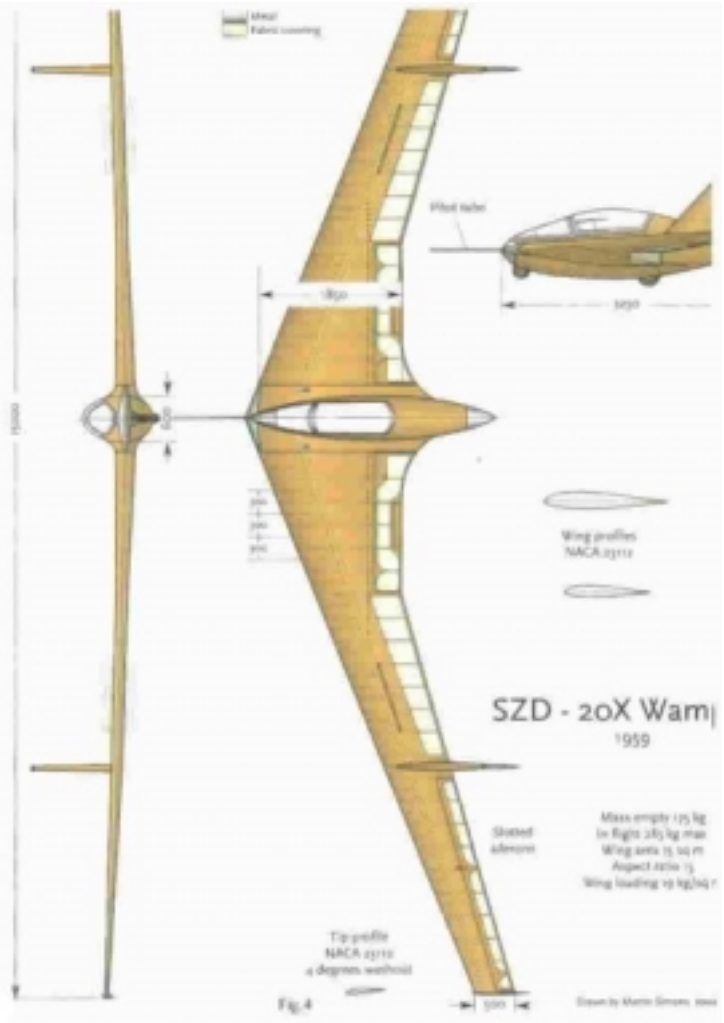
In 1981, John McMasters pulled out all the stops to predict the super sailplane of the distant future, Figure *5* (next page). It was a 10.5 degree swept back flying wing of 91 foot span counting the out-sloped winglets. The pod was mounted below the wing. Suction boundary layer control through perforated sandwich skin, powered by solar cells produced a 100% laminar wing. John also proposed leading edge decontamination by microwave. He also proposed a deployable horizontal tail, which caused his expulsion from TWITT.



In 1983, the Braunshweig Technical University in Germany began development of the tailless SB-I 3 (Figure 7, next page) designed for a 10% improvement over conventional sailplanes. A 1/3d scale R/C model demonstrated a wild pitching oscillation in flight. This was found analytically to he a coupling of the rigid short period pitch mode with the first symmetrical flutter mode. This caused a change in the root spar design and fiber reorienting. The 49 ft. span, aspect ratio 19.4 wing had 4 degree dihedral and 1.5 outer panel twist. HQ 34N14.83 and HQ 35N15.12 low drag airfoils were used on the wing with FX- 711150/30 section used on the aspect ratio 2.3 winglets. Fuselage was 10 ft. long 2.16ft. wide and 2.76 high. Expected L/D 43.5 and a min sink l.74 f.p.s.

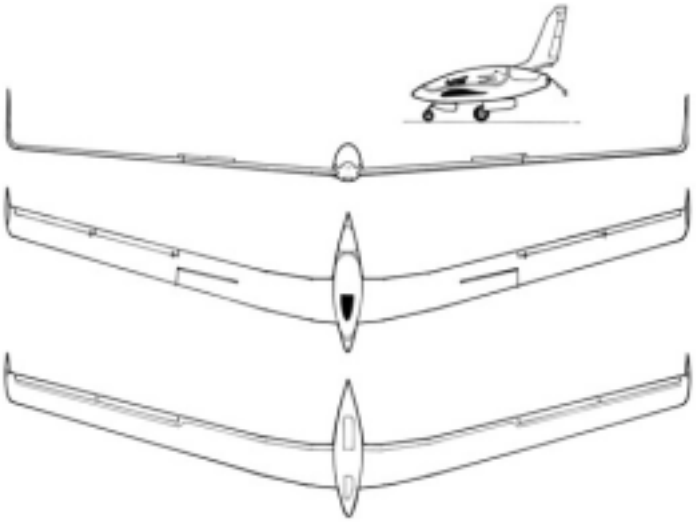
INTERMEDIATE PERFORMANCE ATTEMPTS

As in the case of the Horten XV 1. the 40 ft. span Polish Nietoperz, Figure 9 (page 9), was intended to provide a moderate performing tailless aircraft experience. The cranked wing configuration provided an improved vertical tail moment arm. Trailing edge controls were in 3 segments. The metal outboard ailerons could he split and used as air brakes. The ship was found to be stable in pitch, could be flown hands off and speed could be adjusted by the pilot shifting back and forth in the cockpit. With rudder locked, lateral control was weak. Applying ailerons produced nose down pitch and opposite roll followed by a spiral dive. Most pilots refused to fly it.



ABOVE: Figure 4 – The Polish Wampir now on display in a Warsaw Poland air museum.
BELOW: McMasters concept in radio controlled flight.

The 38 foot span canard Kaezka, also Figure 9, was found to be dangerous on tow if allowed into the slipstream. Pitch was sensitive and directional control almost non-existent. It bobbed unpleasantly in rough air. This was found on other prewar canard attempts, as it was in 1982 on the Rutan Solitaire Canard. Warning! Do not put the horizontal tail on the wrong end.



ABOVE: SB-13 3-view and concept model. This project resulted in a flying aircraft that we think is current still in operation.

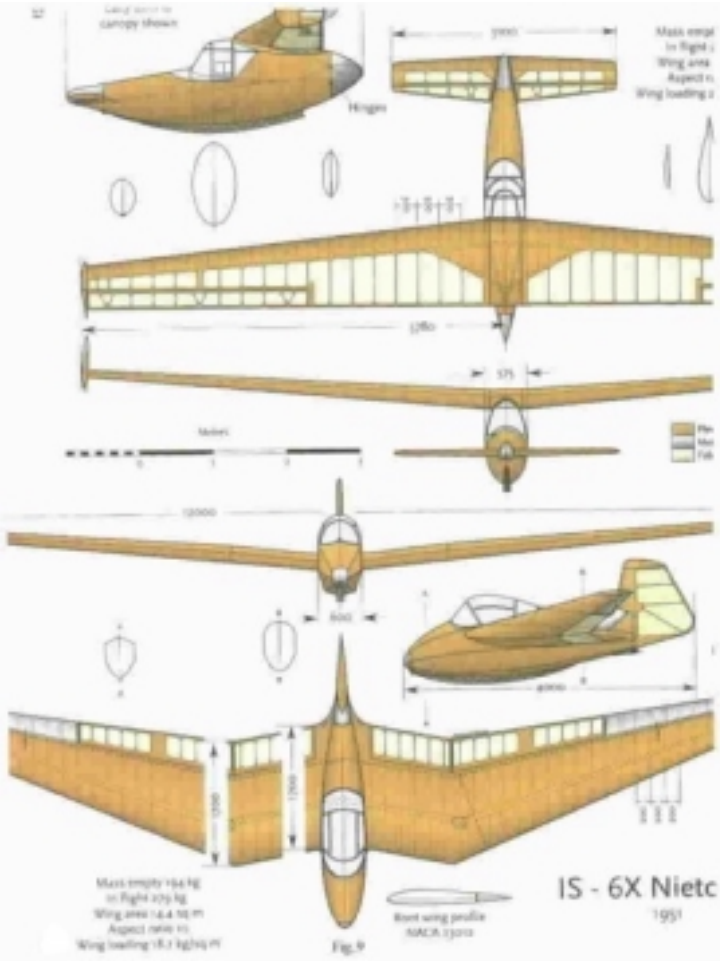
The 42-foot span tailless Fauvel employed a strongly reflexed airfoil on an unswept wing of aspect ratio 10 with tapered outer panels. (Figure 10, next page). Two fins with rudders were located a quarter of the span out from the centerline. The center section trailing edge elevator had a very short moment arm. At a wing loading of 3.7 p.s.f. it soared reasonably well. Jack Lambie flew it a lot and said it was fine in the air about like a 1-26, but that it was a ground looping S.O.B in takeoff and landing. There was insufficient longitudinal control power to stall it so no one ever spun one in. The French would turn students loose in it before trusting them with a tailed sailplane. It was built in one large chunk and transported on a special trailer after the metal nose cap, called Le Casserole by the French, had been removed.

SMALL, LESS EXPENSIVE, MORE CONVENIENT VERSIONS

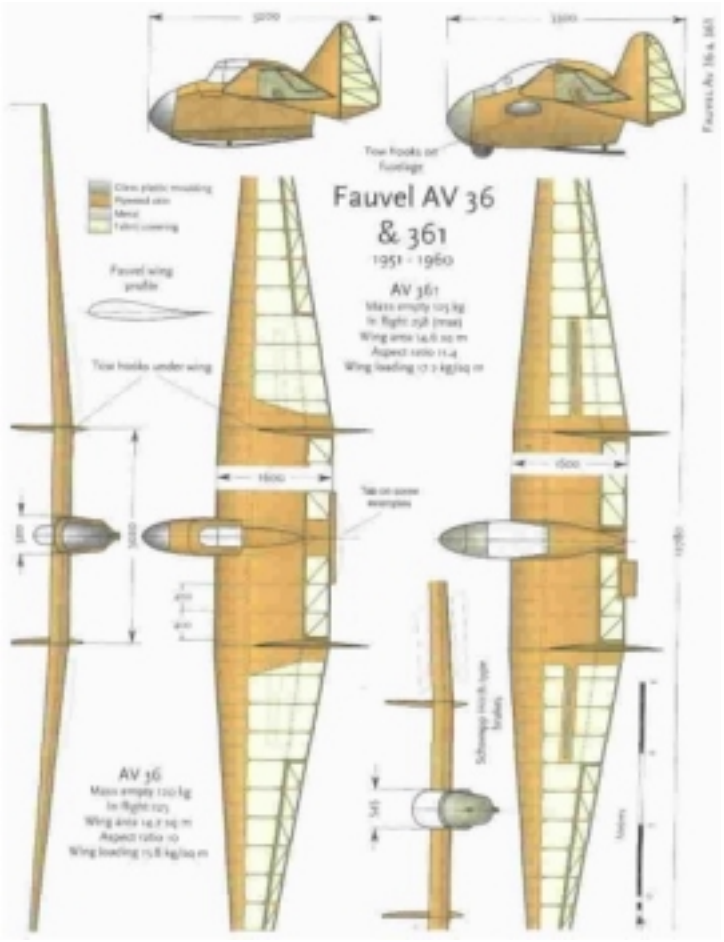
Al Backstrom was one of the first soaring people that I met in 1949 in Texas. I later met him on a visit to State College, Mississippi where he was a student and found him flying an unswept balsa plank model down the dormitory hall.

When he returned to Dallas he teamed up with Eisley and Powell to design and build a simple wood all in one chunk full scale plank sailplane with a span of only 26.5 ft. (Figure 11, next page). It employed the Fauvel reflexed airfoil with outboard ailevators and tip fins with outward opening rudders. Flight tests were conducted at Miss. State giving an L/D of just under 20 and a minimum sink of 4 ft./sec. Flight tests were conducted with wool tufts to discover regions of disturbed flow. Wing/pod intersection fairings and wing/tip fin intersection fairings were suggested. (Figure 12, next page). The original plank had the tip fins removed and an upswept tip shape plus large drag spoilers substituted for directional control. Test pilot, Powell, claimed it flew with wing tip leading at times. Al decided to drop it.

A second very clean 32 ft. span version with centerline fin and rudder, Figure. 11, employing a NACA 8-H-12 airfoil lead to negative stick force gradient and was not further developed.

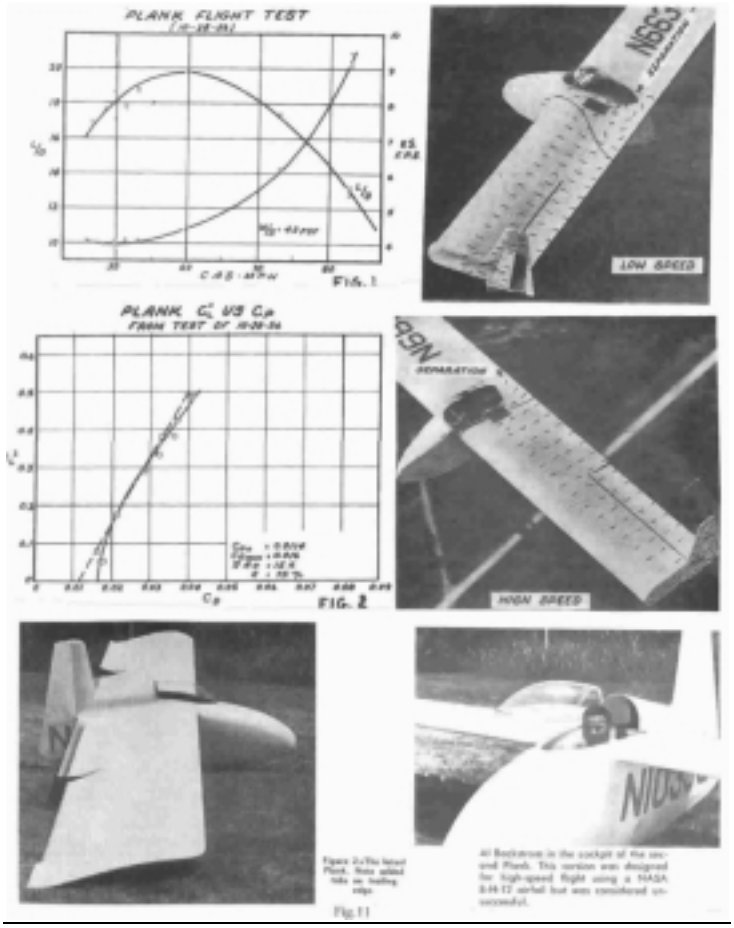


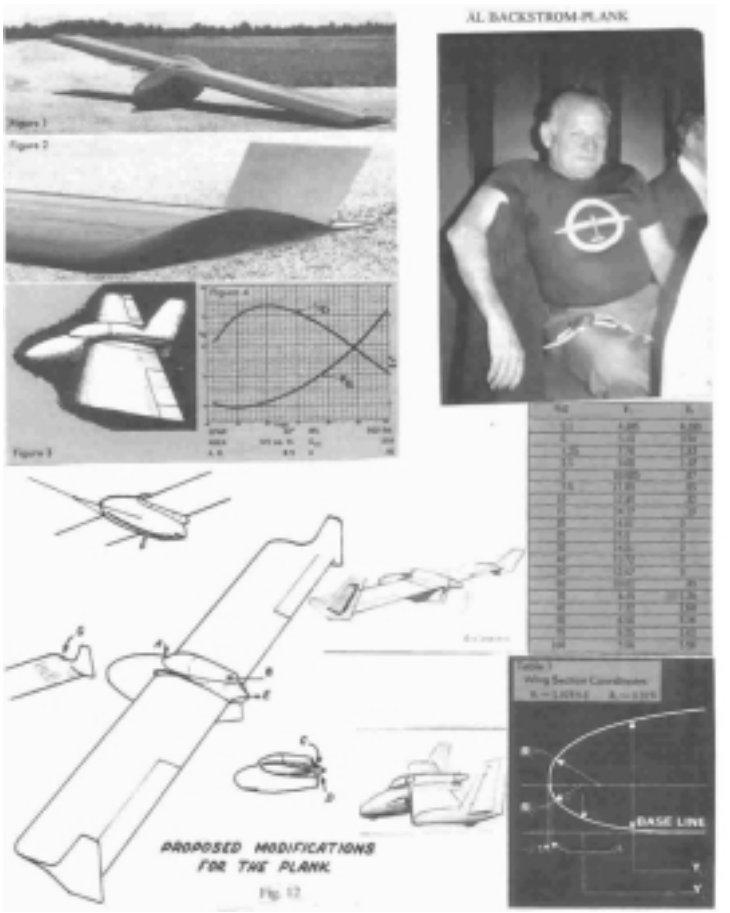
ABOVE: Figure 9, the Polish Nietoperz (bottom) and Kaezka (top). It is believed the Nietoperz is also in a Warsaw Poland air museum.

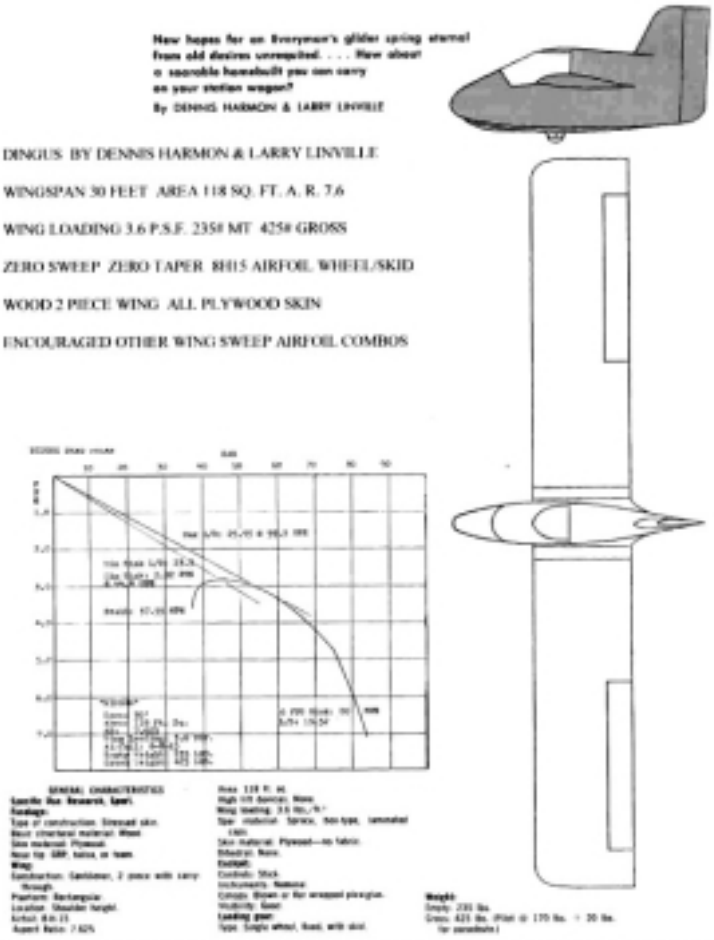


ABOVE: Figure 10 – Fauvel designs. Jack Lambie owned and flew the AV-36 for a number of years in southern California.

Does anyone remember Larry Linville from the MASH TV program? He teamed up with Dennis Harmon to develop a plank similar to Backstrom's. It had a 30-ft. span, aspect ratio of 7.6, zero sweep, taper and twist and an 8 H 15 reflexed airfoil. The skin was all plywood. (Figure 13, next page). They predicted an L/D of 26 and a minimum sink of 2.2 ft./sec. at a 3.6 #/sq. ft. wing loading. It had a 235# empty weight and a 2-piece wing. Fin and rudder were on the centerline. I have not heard whether it was completed and flown or whether its publication in Soaring was only a design study. They encouraged others to pursue small tailless types of other sweep and airfoil combos.







(ed. – The rest of Bruce's talk will be included in next month's newsletter.)

LETTERS TO THE EDITOR

November 27, 2002

TWITT:

You have an awesome web sight. Who would I get to help me with my wing design project. I would like to build an ultralight wing from an R/C combat wing as a glider.

This would be a single place, 35' wingspan, approximately 200' wing area, prone pilot, 25 to 30 mph stall speed, 60 mph cruise speed, foam and fiberglass construction, with a 30-40 hp engine. The model I would like to mimic is the R/C Combat wing XL wide body version. You can see it on their web sight. Any input would be helpful. I will be ordering the training manual from Aircraft Designs, Inc. to try to learn some of the design methods.

What I am basically looking for is someone to make templates for a hot wire saw method of construction. I do not wish to market this wing, it's just for my own interest. Or perhaps you know of a kit type or plans built ultra light flying wing that is on the market. Another wing that is close to what

I want is the Davis Wing. It is not yet available and it's way to expensive, to fast and to heavy for my needs.

Thanks,

Wes Peters
wweessp@hotmail.com

(ed. – I have included Wes' request in the special section of our website to see if there are any modelers our there that might be able to help him with the hotwire items. I have also mentioned the Mitchell B-10 or U-2 as starting points, but don't really think they are quite what he seems to be looking for.

Below is what I think he is referring to in terms of the Combat XL, although it is not shown as "wide body".)

November 27, 2002

TWITT (Guestbook):

Very informative site. Had hit it earlier searching for information on the Stabiloplan. Emailed Mike Minty and Al Backstrom, but have had no response from either as of this writing. I would like to get additional information on the Stabiloplan and build an R/C model of same.

Can I be helped?

Thanks,

Dick Miller
Wernersville, PA
rcm65@ptd.net

(ed. – We don't have very much information on the Stabiloplan, so couldn't be of much direct help from here. Perhaps others of you have more information or have possibly built one in the past and could offer some suggestions on where to get started.)

AVAILABLE PLANS & REFERENCE MATERIAL

Coming Soon: Tailless Aircraft Bibliography Edition 1-g

Edition 1-f, which is sold out, contained over 5600 annotated tailless aircraft and related listings: reports, papers, books, articles, patents, etc. of 1867 - present, listed chronologically and supported by introductory material, 3 Appendices, and other helpful information. Historical overview. Information on sources, location and acquisition of material. Alphabetical listing of 370 creators of tailless and related aircraft, including dates and configurations. More. Only a limited number printed. Not cross referenced: 342 pages. It was spiral bound in plain black vinyl. By far the largest ever of its kind - a unique source of hardcore information.

But don't despair, Edition 1-g is in the works and will be bigger and better than ever. It will also include a very extensive listing of the relevant U.S. patents, which may be the most comprehensive one ever put together. A publication date has not been set yet, so check back here once in a while.

Prices: To Be Announced

Serge Krauss, Jr. skrauss@earthlink.net
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