No. 307 JANUARY 2012

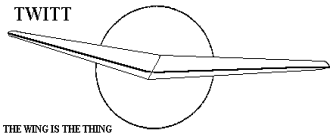
T.W.I.T.T. NEWSLETTER

George Cornelius of Dayton, Ohio, was a staunch advocate of the swept-forward wing concept, which lent itself well to this experimental tailless aircraft (Mallard above) of the 1940s. Cornelius claimed that the combination of variable incidence wing and forward sweep resulted in an aircraft that was virtually stall-and spin-proof. Source: http://www.century-of-flight.net/Aviation history/flying wings/usa.htm

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., **1201** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, January 21, 2012, 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.

T.W.I.T.T. Officers:

President: Andy Kecskes (619) 980-9831
Treasurer:
Editor: Andy Kecskes
Archivist: Gavin Slater

The **T.W.I.T.T.** office is located at:
Hanger A-4, Gillespie Field, El Cajon, California.
Mailing address: P.O. Box 20430
El Cajon, CA 92021

(619) 589-1898 (Evenings – Pacific Time)
E-Mail: twitt@pobox.com
Internet: http://www.twitt.org
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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

Lots of interesting stuff this month with some coming from members and other coming from the bulletin boards I monitor. I have also added another one that is dedicated to all things related to Al Backstrom's plank designs. Not a lot of content but they appear to be active in terms of short questions and answers. I will know more about what will be of interest as I review a month's worth of digests.

I hope everyone had a joyous holiday season with family and friends and that you had a safe and sane New Year's celebration. My wife and I hosted a night of three tables of bridge leading up to the big moment with a potluck of food and beverages. This is an older group so most were up past their normal bedtime so by 12:15 the house was empty and quiet again.

With the winter in full swing and snow on the ground in a large part of the country I would image you are restricted to working in your shops on your projects. How about taking a few minutes and putting together a short piece on what you are doing and throw in a couple of pictures. I know some of you are physically working on something, especially proof of concept models, so everyone would be interested in seeing your progress.

My Schweizer project is moving along nicely with work on the left wing nearly complete. Hoping to have it in the air by this summer, then look for another project to keep me occupied during retirement.

Andy

LETTERS TO THE EDITOR

December 24, 2011

Are you aware of the Plank forum on Yahoo that started up recently? Tommy Thompson wants to build a current generation Backstrom Plank. Someone is designing one in X-planes. It's a fun conversation.

I'm the curmudgeon who thinks that 3 fps is too high a sink rate. He thinks that anything more than 28' span would compromise crisp aileron response. He clearly is not a glider pilot.

One of the members of the Plank forum is playing with designs on X-plane. He has drawn some pretty images.

Merry Christmas,

Peter King
<pc.king@comcast.net>

(ed. - I have joined this group that appears to have about 80 members with only a very small number also being TWITT members. So as I see interesting threads develop I will be able to pass them along without duplicating information. If you are interested in joining the group you can use this link:

http://groups.yahoo.com/search?query=flying+planks).

December 30, 2011

Please find here-attached some more information concerning the Eaves Sting Ray, mentioned by Stephen Sawyer in the December newsletter.
The description comes from Jane's but I forgot which year. The two (bad) photos come from "Kitplane" magazine dated October 1986.

Best regards and.....God Jul and Happy New Year.

Philippe Vigneron
<retrofitprsp@yahoo.com>

(ed. – I have transcribed the description that came along with the photos to make it easier to read. I couldn't find any better pictures on the Internet and couldn't really clean these up for better clarity. It does appear you can order an electronic version of this back issue directly from Kitplanes web site as a nominal cost.)

EAVES STING RAY

As a follow-on aircraft to the Skeeter, Mr. Eaves designed al all-aerofoil proof of concept monoplane known as the Sting Ray, of which construction started in the early 1970s. It was flown for the first time in the mid-1970s. Differing substantially form the Skeeter, the Sting Ray has reverse delta wings, a T-tail and an airframe skinned with metal. Weight and performance figures have not been released by Mr. Eaves although it has been reported that the Sting Ray is in the 272 kg (600 lb.) empty weight and 87 knots (161 km h, 100 mph) class. It is being used as a test bed for Mr. Eaves conversion of a Corvair air-cooled motorcar engine. Flying time by early 1986 was reportedly less than two hours.

Type: Side by side two-seat homebuilt cabin monoplane.

Airframe: All-metal airframe without wing spars, constructed mainly of welded square and angle tubing with stressed aluminum alloy skins. Drag and anti-drag tubes fitted internally to wings. Wing section NACA 64415 at root and 64412 for outer panels. Short ailerons on trailing edge of outer panels, replacing original spoilers. T-tail with constant chord one-piece elevator on fixed tail plane and small fin and rudder with dorsal fin.

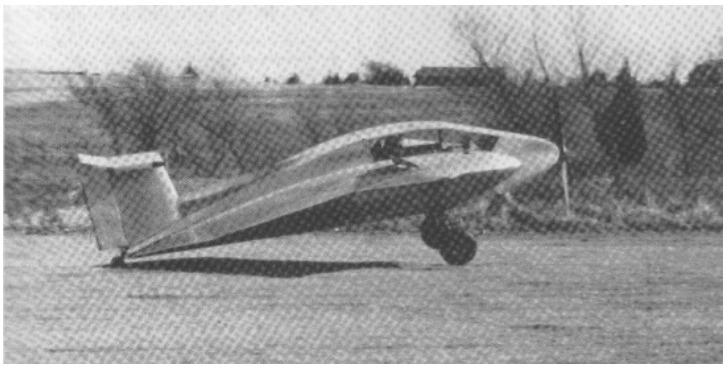
Landing Gear: Tail wheel type with 6-00-6 main wheels, which are designed to retract mechanically into the wing center section wells but are currently locked down. Steel tube main wheel legs. Steerable tail wheel.

Power Plant: One 63-4 kW (85 hp) Corvair modified motorcar engine with 1.39:1 reduction gear to two-blade propeller. Fuel tank in forward fuselage, capacity 57 liters (15 US gallons).

Accommodation: Two seats side by side in enclosed cabin. Entrance via port glazed door panel, which is integral with glazed roof panel and hinged on centerline. Baggage space.

Dimensions External:

Wing Span	5.49 m (18')
Wing Chord at root	4.88 m (16')
At tip	.203 m (8")
Length overall	5.49 m (18')
Propeller diameter	1.63 m (5'4")



(ed. – There weren't any other letters but as I was putting together this issue I was watching a National Geographic program on future weapons systems being developed by DARPA. One of these was Aerovironment's WASP micro air vehicle. As you can see from the picture it is a flying wing in line with the ideas put forth by Dr. Paul MacCready (founder) over the years. If you search for other micro vehicles you will also find that many of them are based on tailless designs, so even though we don't see flying wings in the general aviation arena, we do see they have definite advantages at these sizes. Here is a brief description of WASP:

"The hand-launched Wasp III has a 5 km range (Line-of-Sight), operates continuously for approximately 45

minutes at 40-65 km/h and to altitudes of 1,000 ft (300 m). There is also a water landing version in development.

For system interoperability, Wasp uses the same advanced technology found in other AeroVironment small UAS systems, such as Raven RQ11-B, Swift and Puma - which recently set a 7 hour flight record for fuel cell powered MAVs - and is controllable through a common Ground Control Station.

The BATMAV program milestone comes less than a year after the US Air Force selected AV's Wasp III as the MAV for the Program in December 2006.")

Nurflugel Bulletin Board Threads

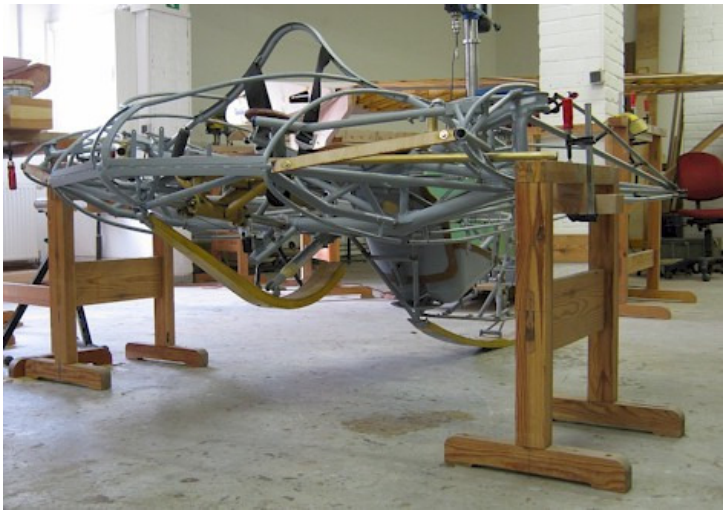
This site takes you to a picture of a uncovered HIV center section. I found that on Google, but ...if you change in the URL 99 to another number from 00 to 106 you can see a build up from scratch of the wings and probably a restoration of the center section. Wow! The details you can see are UNBELIEVABLE. I never saw this site before. Why is it not so known among us? Is it the restoration of the HIV or a rebuild?

http://holzleicht-flugzeugbau.de/Heuser_Dateien/H-IV/H-IV-dat/99H-IV.jpg

Koen Van de Kerckhove
<nestofdragons@hotmail.com>

(ed. – In looking at the fuselage center section it almost seems like this is an attempt to build a flying version from one of the remaining sailplanes. I seem to recall there was some type of agreement between the US and Germany on how to redistribute the units obtained after the war, so this might be one of the exchanges. Frank Weytjens sent this link that provides a more convenient way to view all the photos.
http://holzleicht-flugzeugbau.de/Heuser_Dateien/H-IV/Prj_H-IV.html

Here is a sample photo of the center section.



I think this is the new build that Herr Hauser has been working on for some years - and no wonder! I bet that wing is heavy. It should be near to completion. However, there are no pictures of the metal tips. The date on the last photo is 25 October this year (2011).

Chris Bryant
<chris@palanquin.plus.com>

IRC they wanted to build wooden tips instead of the original metal ones.

The following text, written by Prof Ewald, is an excerpt from the website:

http://www.horten-iv.org/DieTechnikderHortenIV.html

"An exact copy of the original metal wing tips is hardly possible. In sources on the Horten IV it is called an Elektron-Struktur, meaning a Magnesium sheet metal. On an original plan the sheet metal is specified as 3116.5., that is plated Al-Cu-Mg.

No. 26, currently standing in Deutsches Museum had once broken its tips in a crash. The tips have been rebuild as wooden tips, permanently connected to the base wing. It has been flown in that configuration in England and the USA after WW II.

For a reconstruction of the Horten IV two different ways of making the tips are being discussed.

Copy the wooden tips of the late No. 26, but make them removable.

Or redesign them using modern composite materials (also removable).

The latter one needs lots of design and certification work. At the moment we favor the wooden tip."

I don't know from what date the text is, or if it does still reflect the current status.

Andre Kubasik
<andre@kubasik.de>

(ed. – There were some messages in the bulletin board that asked questions about the downing of the RQ-170 that happened shortly after I put one on the cover of the December issue. This was just coincidental, I am sure.)

Is it me or does everyone else notice the similar characteristics of the "US drone down in Iran - RQ-170" as an BWB/nurflugel?

Interested in your thoughts.

Travis McQueen
Manager, Huntingburg Airport
<airport@psci.net>

The drone and the story

http://abcnews.go.com/Blotter/us-rq-170-sentinel-stealth-drone-shown-iran/story?id=15115781

Rick Page
<rick-page@shaw.ca>

I have never seen the real thing of course but it does look like a mockup in the video. If it is the missing drone, my suspicion would be that it lost power and glided to an uncontrolled landing. The real question is why the self-destruct didn't activate.

Rick Page

(ed. – I image that this will continue to breed various conspiracy theories in the coming months since the photos don't reveal the landing gear to show how it landed. The color was a little confusing at first, but considering it was working over desert terrain, the pale yellow color would be more appropriate. The other question is why didn't the "go home" function work when it lost contact with the controller?)

Just trying to tinker on a idea. It might need split elevons, but ...I am probably thinking too complex to make it. Are there easy ways? Scale or full scale, doesn't matter. All info is welcome.
Keep that brain spawning wings,

Koen Van de Kerckhove
<nestofdragons@hotmail.com>

Split elevons on a model nurflugel.

http://www.rcpowers.com/forum/showthread.php?3691-Split-Elevons!(DUCKERONS!) -Quak!

A different implementation of the same idea.
http://www.youtube.com/watch?v=9IV1yp1XCCE

Many of the references to "split elevons" by modelers are actually ailerons and flaps in the crow landing configuration.

Rick Page

(ed. – The first link might require becoming a member of the group, but the second link is a video of a unique way to create the split.)

I am interested in grasping the drag of the Backstrom EPB-1 planks. I have rudimentary questions.

This paper has specs
http://soaringweb.org/Soaring_Index/1957/PDF/1957_Jan-Feb_20.pdf

I assume they are accurate, coming from a university study. But some of the small subscript on the nomenclature I cant quite make out.

So if you start with the premise that half of the drag at best LD is induced, you get Cd0 of .0104. I assume the term Cd0 means all of the drag except induced, but not necessarily at the angle of zero lift.

He gives Cd0 of 0.0115. This is close enough I guess, this should be all parasite and profile drags. Maybe this really is at zero lift angle.

But then one wants to know the fuselage drag and to obtain this we need to deduct the profile drag of the airfoil. I can't imagine he gets laminar flow past the D-tube. What do you think? At a RN of 2 200 000 the profile drag looks like 0.0065. Apparently he got laminar flow on the bottom past the d-tube and up to 30% on top. Otherwise the parasite drag (fuselage, wheel and interference) would seem unrealistically low

So Cd0 of .0115 minus Cd profile .0065 is .005 which I assume is the other drag figure in the paper with barely legible subscript of .0048. If you multiply this by the wing area you get the "drag area" of .5 sq ft. Divide this by the cross section area of the fuselage and you get Cd 0.09. A mere 7% of the frontal flat plate drag. Doesn't this seem extraordinarily low considering it has in it the drag of the fin, the wheel and skids and all of the interference drag?

Anyway there is the last coefficient of drag mentioned which is Cdmin. Cdmin= 0.016. Shouldn't Cdmin be the total Cd at best LD? That would be .0208 or so. What's strange here is that if you add the Cd(?) 0.0048 to Cd0 0.0115 you get .0163, very close. But the fuselage drag is supposed to be included in the so called zero lift drag already. Anyway the drag of profile and parasite must be close to .011 since this is half the drag at best LD, the other half being induced as we said.

If you take the total Cd at best LD of .0208 and subtract the parasite (but not profile) you get .0156 which is close to the Cdmin .016 So I guess Cdmin means its the profile plus induced drag but no fuselage drag. But I think of Cdmin simply as the point where induced drag equals all other drag and this includes parasite.

I guess the question is what are the subscripts I cant quite read and what do they mean anyway? And it would be interesting to know what profile drag he actually got on his fabric covered modified Abriel airfoil, and what the actual parasite (fuselage and interference without wing profile) drag is for his little flying wing.

Later he claims that a Cd0 of 0.007 can be obtained based on test results. The NACA 8-H-12 he was thinking of using got Cd .0055 best case which leaves .0015 for parasite drag.

Al Backstrom seemed like a pretty down to earth guy. What mistake am I making?

Thanks

M. G. Perrault
<MGPerrault@AOL.com>

In this magazine they talk about a proposal for a flying wing glider. Not read yet.

http://www.lakesgc.co.uk/mainwebpages/Sailplane%20&%20Glider%201930%20-%201955/Volume%209%20No.%201%20Jan%201938.pdf

Koen

Koen- Thanks for the article.

That's an article that hadn't yet been listed in my bibliography, and when I looked in my file under Buxton, I found the bay empty. So that's my first article mentioning his tailless plane proposal, other than the A.R. Weyl series and perhaps something in one or two Italian magazines that might have reviewed his lecture.

On p.15 of that issue, you'll also find an interesting review of the reprint of Cecil Hugh Latimer-Needham's book on Gliders. It was interesting because of the then new developments in glider and general aerodynamic knowledge that the reviewer inserted in his lengthy criticism. Among concerns was the then newly discovered fact that wind tunnel mounting interference had significantly compromised Reynolds Number data at NACA. I've read subsequent reports that set up "equivalent Reynolds Numbers" as parameters. Lattimer-Needham was responsible for two noted

tailless efforts: the Halton Aero Club's "Meteor" and the Granger brothers' "Archaeopteryx" that flew successfully and was restored to flying condition in - I think! - the Shuttleworth collection. I believe it's out of commission now, but it was a noted design of it's time.

'Interesting history!

Serge Krauss
<skrauss@ameritech.net>

MITCHELL U-2 BULLETIN BOARD THREADS

Dear Friends,

Before all I wish You Happy New Year, strong health, luck and same number of landings as takeoffs :-)

Cause I have friends who are producing metal kits of ultralights and micro lights, am thinking if is good idea to make B10 and U2 from metal.

For this reason I am asking how differ metal A10 from B10 - weight, strength, specs, airfoils, aerodynamics - metal A10, T10 still produced?

Could anybody send photos of inner structure of metal A10 or T10?

Could somebody say if is good idea to make U2 from metal?

Kind Regards,

Jiri
<blue.kid@atlas.cz>

I took a ride in a T-10 some years ago. There were only two built, and the design needed some improvements. The A-10 was a metal design that had a foam underlayment to stiffen the AL airfoil. I read later that the foam delaminated from the metal in some spots and had to be re-glued. I don't think it is still in production, but a company called Ameriplanes was building them to order several years ago. This info may be obsolete so take it with a grain of salt!

Nolan
<nolanjm@juno.com>

Hi Nolan,

Thanks for info, I welcome any info about structure, airfoils, photos of it, to can see if it could be built by technology used my friends.

What improvements did you saw useful to T10 and A10?

Maybe could be metal useful for U2.

Best Regards,

Jiri

The T-10 had a very slow response to aileron input and had to be led with a lot of rudder. It was basically a B-10 with a 3ft increase in the center section, and a side-by-side cage for pilot and passenger. I suppose an increase in elevon length and chord would improve the roll or possibly a servo tab on the end of the elevons.

I don't think putting metal over a wood structure would be wise. It would increase weight over a fabric covering and would make inspection more difficult. Repairs also would be more expensive and labor intensive

There was a guy a few years ago that developed a B-10 that had a different cage and landing gear structure that was an improvement over the original in both looks and ground handling

The original A-10 was a good flying machine from most reports that I read. I also saw a few of them fly and they performed quite well with the small engine that was on them. (A 22hp Zenoah was one) but others were used. I think a single cylinder Rotax was also successful.

Nolan

Could you elaborate on the "B-10 that had a different cage and landing gear structure that was an improvement over the original in both looks and ground handling"?

Billj3cub
<billj@hevanet.com>

Metal-winged Mitchells were built in a deactivated missile base near Topeka, Kansas several years ago, but the operation disappeared a few years later. I flew in to an open house fly-in there once. They had two-seaters flying when I was there. The guys involved were very enthusiastic and dedicated, but none of them had any engineering background and they did not seem to welcome any discussion of possible shortcomings of the design.

The wing was built by wrapping sheet aluminum around hot-wired cores of foam. It was certainly not conventional built-up riveted aircraft construction. I don't think it even had a conventional spar, although it must have had some kind of hard-points for fuselage-wing joining and hinges for the folding mechanism. I have no idea how it compared weight-wise with the original B10. I can well imagine that delamination would occur eventually.

Dave Gingerich
<dgingerich@cox.net>

I saw it in an old Kitplanes magazine. I don't remember the details, just that I was impressed. The original B-10 had a main gear leg that was loaded in torsion that turned out to be too weak to handle any landing that was less than perfect too many times. It would collapse after the aluminum was fatigued to a point that it became brittle.

I don't know if Kitplanes is still even being published anymore. I will continue to look for the article.

Nolan

I too spent some time in that missile silo in Kansas. I took lessons in a T-10 there and purchased a T-10 from him also. There were many T-10's built as they were designed as the trainers for the people purchasing the A-10's the company was selling at the time. I had an A-10 that I was flying and traded up to the T-10 to gain the extra seat. Not legal to fly unless your either training in it or flying to and from a lesson. Such were the rules back then.

The A-10 was a hot little airplane to fly compared to the Quicksilvers and the Rotec Rallys and the Teratorns of the day. Compared to a Cessna the roll response may be slow but compared to the other ultralights of the day (and all others I have flown since) the response is quick. Yes you have to use plenty of rudder but those of us that have been around ultralights awhile remember when the rudder was connected to the stick and there were no ailerons!

As far as the delamination goes, yes it is a real problem with these things and there is no easy way to fix it either. I had mice get inside mine and they dig tunnels around in the foam core. I'm a huge fan of the wing but I hate the foam wrapped in metal design. I also happen to own an unfinished B-10 and I consider the wood and fabric better than the foam and metal skin. A better design would be to stamp the ribs out of metal and slide them on a tubular metal spar and then pop rivet the metal skin on. End of mice problems!

As far as motors go I like power as much as the next guy. I was very happy flying these wings with tiny motors as they still outperformed anything else I had ever flown with twice the horsepower.

You guys may have forgot that Chuck Yeager test flew the U-2 for Don Mitchell. Chuck looped it, rolled it, spun it and put it through all the things only a pilot such as Chuck would be willing to do in an unproven design at the time. The plane is far more capable than most of the pilots that own them.

The company was sold to a gentleman here in Iowa years ago. It's pretty much died a slow death since then. I think an all-metal wing in kit form or plan form would revive it to a limited degree.

The cage on the B-10 had the stick coming down out of the wing in front of you. The A-10 and T-10 have the stick coming up off the floor in front of you. People seem to like it off the floor better. (I'm one of them.) The landing gear legs were designed different on the A-10 and T-10 because people were having trouble rotating on takeoff with the B-10 configuration. They added the stinger on the back of the B-10 to prevent over rotation on takeoff and tipping over while parked as a few people ate a prop or two without the stinger.

The memory cells are foggy but I still remember a few things I learned about the Mitchell Wing over the years.

Happy Flying,

Brad
<camden_blue@windstream.net>

Safely bonding aluminum skins to foam ribs and metal spars is doable and has been done very successfully. One example is the Dick Schreder HP series of home-built gliders. Some are over 40 years old and the bonds are still holding strong. Proper bonding practice is critical.

Only Hysol EA-9430 glue should be used. The ribs must "fit" the aluminum skins (no gaps that allow glue starvation). PVC foam ribs are recommended over Styrofoam. The aluminum skin surfaces must be prepped properly using Comet cleanser and (non metallic) Scotch-Brite scouring pads. Rinse thoroughly with water and dry. Glue must be applied within 2 hours of surface prep to avoid oxidation.

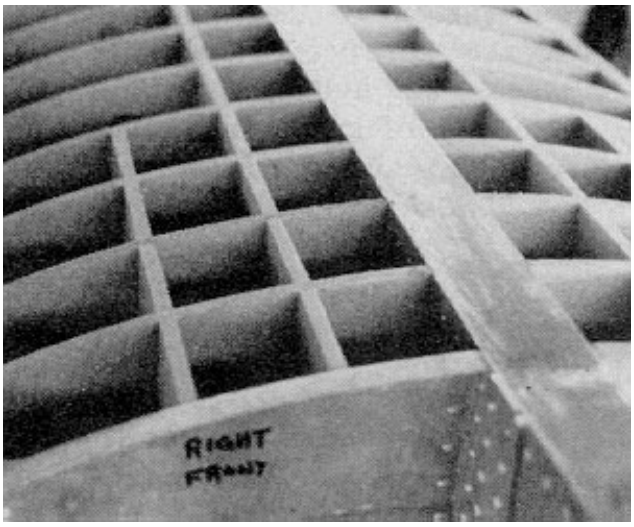
See:
http://www.soaridaho.com/Schreder/Schreder/HP-18_construction_3.html

As for mice, I don't know what to say. Seal all entrances into the wing? Mousetraps? The HP crowd doesn't seem concerned about this. (?)

Regards,

Doug Hoffman
<glidedog@gmail.com>

(ed. – Here is a sample picture from the Schreder article referenced above. There is a lot of construction information through this web site so it is worth the time to review other pages if you are interested in building.)



IMO for what its worth, the main problem with the A-10 was the foam leading edge. I have to admit I've never flown an A-10 but I have a B-10. The foam used on the ones I have seen was 1 lb. expanded bead foam, ie Styrofoam cooler foam. This foam has no place in aircraft structural applications because it has no peel strength and very poor shear strength. Also mice do seem to like it. Why they don't seem to like PVC or urethane foams is a mystery.

As an aircraft mechanic, I feel that the delamination / bonding issue is not a matter of if but when! I can only speculate as to why they used it as it was cheap and fast from a manufacturing stand point. Its not really that light but it is light enough.

If you used the proper foam, ie, PVC or urethane, you won't be able to use a solid shaped block as the weight would be unacceptable. This means the typical ribs bonded to the aluminum and the manufacturing costs go through the roof. You would probably need to use a thicker leading edge skin to prevent buckling between the ribs.

Now you're in the middle of the domino effect. If you study the B-10 you will find it will be extremely difficult to build it any lighter with any material and keep the strength the same. That Don Mitchell was one smart dude!

Bruce Thompson
<skydiveefs@gmail.com>

I am new to this group an am interested in the Mitchell U-2 flying wing. Like all newcomers, I have some questions. I realize this would be considered a light sport aircraft, but how does it compare to some of the other LSA's available? I was looking at the Excalibur as well, but I keep coming back to the U-2 primarily because of the enclosed cockpit. During the winter months, it would be nice to be enclosed rather than having open sides like the Excalibur. I also liked the looks of the U-2 built by Wolfgang Uhl. Can the U-2 be built as a 2-seat version? Also, according to the Mitchell Wing web site, it states that the U-2 can be powered by several choices of engines. What would the largest engine / power rating for this plane be? Also, what engines are recommended for this plane? Thanks

Vic Annas
<zyncsmail@yahoo.com>

I was going with 'powered glider' for the U2, not LSA.

Conestogaman
<conestogaman@yahoo.com>

Especially if you already have your glider ticket that is a smart way to go because you can have retractable gear in a glider(powered or unpowered) but not in an LSA non-glider.

As a non-LSA glider you are also not limited to 10,000 feet msl altitude.

Regards,

Doug Hoffman

Hi, I am rated IFR single engine land, so I know the ins and outs of the part 91 and 93 regs, but I don't know much about part 103. That said, getting a soaring ticket should be doable. What other advantages do you see in staying with a powered glider build?

Vic

Another advantage of a Glider over any Powered Aircraft is being able to fly up to 14,000' without oxygen. Seeing as it is assumed that a glider can not maintain height, this is more lax than the12,500' no-oxygen altitude limit of a power plane.

Additionally, the Bi-Annual Flight Review in the US for a glider should be cheaper than for a "power plane". As the Self Launch is just another Launch Method endorsement, you can renew for another two years in a two-seat sailplane, with a gliding instructor in single aero-tow flight. That is if you pick a good day and have the soaring skills to stay up for an hour (or offer the controls to the Instructor)!

Another alternative (and to possibly add Winch Launch Method Endorsement the first time) is to find one of the few US winch launching sites, and take three 5-minute sleigh-ride flights with an Instructor to renew every two years. Pretty cheap for airtime cost.

Andy Coles
<andydcoles@verizon.net>

Years ago on vacation in Colorado I read in the Morning Paper that the local short haul airlines were being required to replace all their old equipment with planes that had pressurized cabins if the route required flying above 10,000 feet altitude. What was funny to me was that I was reading the article and having lunch while seated on the fender of my Jeep in a pass that was 13,000 feet high. Plus I was watching one of those planes fly by way below me at the time.

Harold Burton
<kd5sak@sbcglobal.net>

People don't all react to pressure changes the same way and any given individual can have a different reaction depending on his health, what he ate in the last 48 hours, of any number of other normally trivial situations. A trapped gas pocket in the intestines or sinuses can become extremely painful with just a 4 or 5 thousand foot change in elevation.

When I was in college I got "swimmer's ear" a couple of times. Once it was removed at the campus clinic by an attractive young lady the other time it was done by a United Airlines pilot on a flight to Phoenix. She was very gentle but it hurt like hell anyway. He, on the other hand, had no idea what was happening in back and it hurt even more.

Norm Masters
<libratiger62@yahoo.com>

(ed. – The new oxygen systems are light (except for the tank) and only flow when you breathe in, which conserves oxygen and allows small tanks to last longer. Therefore, this shouldn't be a limitation any more.)

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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Cleveland Hts., OH 44118 (216) 321-5743

Books by Bruce Carmichael:
Personal Aircraft Drag Reduction: $30 pp + $17 postage outside USA: Low drag R&D history, laminar aircraft design, 300 mph on 100 hp.
Ultralight & Light Self Launching Sailplanes: $20 pp: 23 ultralights, 16 lights, 18 sustainer engines, 56 self launch engines, history, safety, prop drag reduction, performance.
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Bruce Carmichael brucehcarmichael@aol.com
34795 Camino Capistrano
Capistrano Beach, CA 92624 (949) 496-5191

VIDEOS AND AUDIO TAPES

(ed. – These videos are also now available on DVD, at the buyer's choice.)

VHS tape containing First Flights "Flying Wings," Discovery Channel's The Wing Will Fly, and ME-163, SWIFT flight footage, Paragliding, and other miscellaneous items (approximately 3½+ hours of material).
Cost: $8.00 postage paid
Add: $2.00 for foreign postage

VHS tape of Al Bowers' September 19, 1998 presentation on "The Horten H X Series: Ultra Light Flying Wing Sailplanes." The package includes Al's 20 pages of slides so you won't have to squint at the TV screen trying to read what he is explaining. This was an excellent presentation covering Horten history and an analysis of bell and elliptical lift distributions.
Cost: $10.00 postage paid
Add: $ 2.00 for foreign postage

VHS tape of July 15, 2000 presentation by Stefanie Brochocki on the design history of the BKB-1 (Brochocki,Kasper,Bodek) as related by her father Stefan. The second part of this program was conducted by Henry Jex on the design and flights of the radio controlled Quetzalcoatlus northropi (pterodactyl) used in the Smithsonian IMAX film. This was an Aerovironment project led by Dr. Paul MacCready.
Cost: $8.00 postage paid
Add: $2.00 for foreign postage

An Overview of Composite Design Properties, by Alex Kozloff, as presented at the TWITT Meeting 3/19/94. Includes pamphlet of charts and graphs on composite characteristics, and audio cassette tape of Alex's presentation explaining the material.
Cost: $5.00 postage paid
Add: $1.50 for foreign postage

VHS of Paul MacCready's presentation on March 21,1998, covering his experiences with flying wings and how flying wings occur in nature. Tape includes Aerovironment's "Doing More With Much Less", and the presentations by Rudy Opitz, Dez George-Falvy and Jim Marske at the 1997 Flying Wing Symposiums at Harris Hill, plus some other miscellaneous "stuff".
Cost: $8.00 postage paid in US
Add: $2.00 for foreign postage

VHS of Robert Hoey's presentation on November 20, 1999, covering his group's experimentation with radio controlled bird models being used to explore the control and performance parameters of birds. Tape comes with a complete set of the overhead slides used in the presentation.
Cost : $10.00 postage paid in US
$15.00 foreign orders

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BLUEPRINTS – Available for the Mitchell Wing Model U-2 Superwing Experimental motor glider and the B-10 Ultralight motor glider. These two aircraft were designed by Don Mitchell and are considered by many to be the finest flying wing airplanes available. The complete drawings, which include instructions, constructions photos and a flight manual cost $250 US delivery, $280 foreign delivery, postage paid.

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