No. 269 NOVEMBER 2008

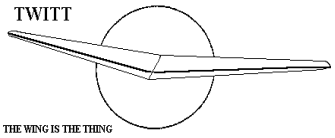
T.W.I.T.T. NEWSLETTER

The elegant de Havilland DH 108 was built to a E.18/45 to investigate the behavior of swept wings at low, medium and high subsonic speeds. The three prototypes built between October 1945 and July 1947 differed significantly in wing sweep and fuselage shape. The third, VW120, became the first British aircraft to break the sound barrier. Source: http://www.ipmsstockholm.org/magazine/2006/06/stuff_eng_hrubisko_tailless.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., **0811** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, November 15, 2008, 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) 589-1898
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) 447-0460 (Evenings – Pacific Time)
E-Mail: twitt@pobox.com
Internet: http://www.twitt.org
Members only section: ID – **twitt2008**
Password – **08member08**

Subscription Rates: $20 per year (US)
$30 per year (Foreign)
$23 per year US electronic
$33 per year foreign electronic

Information Packages: $3.00 ($4 foreign)
(includes one newsletter)

Single Issues of Newsletter: $1.50 each (US) PP
Multiple Back Issues of the newsletter:
$1.00 ea + bulk postage

Foreign mailings: $0.75 each plus postage

Wt/#Issues	FRG	AUSTRALIA	AFRICA
1oz/1	1.75	1.75	1.00
12oz/12	11.00	12.00	8.00
24oz/24	20.00	22.00	15.00
36oz/36	30.00	32.00	22.00
48oz/48	40.00	42.00	30.00
60oz/60	50.00	53.00	37.00

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).

TABLE OF CONTENTS

PRESIDENT'S CORNER

It appears that everyone seemed to enjoy the last issue with the Horten article and the material on Dan Dougherty's flying wing models. Sometimes it is hard to find good items for the newsletter and then there are months when it just seems to fall in my lap.

This month there were a lot of letters to get caught up on, plus some really good photos to go with them. I want to thank all those that stay in touch and provide their insights on a variety of subjects.

There won't be a formal meeting in November partly because I haven't come across anyone to make a presentation. The other part is that even when I have come up with a good program or one has been referred and we do it, there is so little attendance that it is not fair to the presenter. Therefore, I don't anticipate that there will be very many physical programs in the future. There will always so someone at the hanger on the third Saturday of every other month if you want to drop by and just visit. We are also there most other weekends working around the hanger trying to get it organized better and getting rid of decades of useless stuff that Bob Fronius accumulated.

Just in, the cover of the November Soaring magazine is the SB-13 in flight. If you don't get this magazine find a friend that does and get a really good idea of how advanced this sailplane was when it first flew in 1988.

We had a couple of returned newsletters this month so I want to remind everyone to please let me know when you change addresses. Apparently the first class postage is not enough for the post office to forward them and you don't want to miss an issue. You can always get a copy off of the web site from the members only section.

Andy

LETTERS TO THE EDITOR

September 6, 2008

Hi Andy,

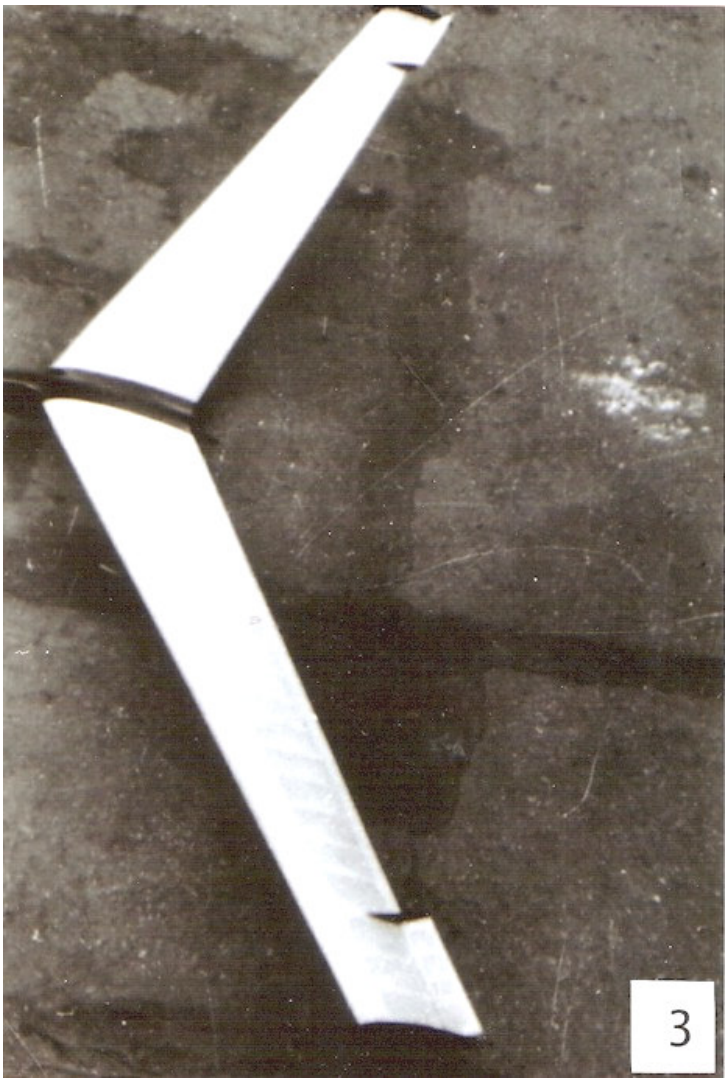
Here is a minor contribution from Italy. The tailless configuration has always enjoyed quite a popularity among the Italian model builders. The attached pictures show the tailless free flight glider built by Rinaldo Zona (from Naples, now living in Genoa) in 1950, after several experimental constructions of this type. Picture 1 and 2 show the final version, with adjustable external ailerons for fine trimming. The other picture refers to a previous version. Basic statistics are:

Wing span	3 m
Sweep (leading edge	25°
Weight	940 g
wing	545
fuselage	350
ailerons	45
Airfoil	Clark Y (Clark YH toward the tip)
Twist	3°
Sink speed	0,48 - 0,55 m/sec
Best duration	3'15" (hand tow with 50 m line)

The arrangement of the adjustable ailerons resemble that one of the Boeing Project B 306 (1935), at that time completely unknown in Italy.

An unusual spot landing: this hawk has selected the head of Guido Mascherpa a seasoned model builder from Camogli near Genoa (Italy). The picture was taken on the Eastern Italian Alps. The hawk has no vertical control surface of any kind: could we consider him a true tailless flying creature?

Keep up with your good work!!



Ferdi Gale ferdigale@alice.it
via Marconi 10
Apt. 13B
28831 Baveno VB Italy

(ed. – I would like to thank Ferdi for the pictures and specifications and apologize for not getting them published sooner.)

September 9, 2008

Hi TWITT!

I send a rather poor photo of one of the first hang glider flights with a Rogallo wing. 19963-64? Right of the runway from LA International! To the dunes down to the ocean!

The pilot in the picture, is a distinguished member from the Royal Swedish Aeroclub, Bengt Soderholm. White shirt, Club jacket, gray flannel pants and polished loafers! That is style!

The launchers were Dick Miller (no longer with us), Sylvia Colton from Soaring Magazine and myself: Ben Jansson (designer of the BJ-1 Dynamite sailplane)

This was the start of modern hang gliding! Our glides ranged from immediate crashes to 10 seconds flights and ranges up to 200 feet! We had a lot of fun!

I tried to develop a higher performance "glider" with a slot arrangement for pitch control, but the elasticity of the plastics made it useless. We still had not figured out how to effectively control the longitudinal control, so we clung "desperately" to the wing with our elbows under two parallel bars.

We had a lot of fun, however!!! I am proud to be part of the beginning of an era!

Ben Jansson
Sweden
hinna43@3mail.se

(ed. – Ben is a new member and I think maybe the first from Sweden. This is one of those great historic pictures we need to look at now and then to put all this modern technology in perspective. See the photo at the top of the next page.)

September 11, 2008

To Norm Maters:

I read your question on stagnation point in the TWITT newsletter and think that you got some bad information in reply. I've attached my take on it as a

MS Word document from Office97. If you cannot open it let me know and I'll send it as a .PDF (Adobe Acrobat). I'll try to remember to take a picture of the stall tab location on my Yak this weekend and send that to you also.

James McLellan
jwmcl@qwest.net

Norm's Reply:

Thanks, James--

I haven't got my copy of the TWITT newsletter yet. I was surprised that the replies I got from those Internet postings weren't more helpful and the one telling me to put it at the minimum pressure point was obviously wrong.

Fortunately I've gotten other responses confirming that my original assumption was close enough for a first cut and probably good enough to get within a few millimeters of optimum.

Thanks for your offer to find papers but I consider this project finished, or at least my involvement in it. I'd like to see a picture of the stall tab on your YAK. May I post it on HomeBuiltAirplanes.com along with a drawing of the vortilon? It'll kind of wrap up that thread and serve as future reference for other homebuilders.

Norm

Hi Norm:

Attached is another Word document with some pictures of stall tabs on my Yak-52 and on a Piper Warrior and a Mooney. If you have problems opening it I can send it as an Adobe Acrobat file. If you'd like the individual pictures I can send those also.

I've got no problem with you sharing the info. You may even take credit for it if you want, it won't bother me. I am going to send the two documents to TWITT since the editor was apparently interested enough in the question to put it in the newsletter.

I find that it is often hard to get good info off of the Internet. A person almost has to know the answer in order to determine that the info they are getting is correct.

Have fun,

James

Thanks, James--

I am using Open Office. It handles MS Word documents just fine. I am including some attachments and CC:ing this to Andy Kecskes so he can use it in the newsletter if he wants to.

Thanks for your advice and those pictures, especially the ones with the digital protractor on your Yak-52 and the Mooney with both the stall strip and the stall warning tab. The Mooney leading edge shot really shows how far the stagnation point moves from the cruise position at the stall strip to the stalled position bellow the tab.

I was told that the best description of them is in AIAA # 65-738, "Aerodynamic Design Features of the DC-9," by Richard Shevell and Richard Schaufele but, as you probably know, the AIAA doesn't freely share information.

I've been trying to do this without spending any money so AIAA documents are out. I wasn't able to find a cookbook explanation of how to design vortilons but several people have given me enough consistent information that I feel confident that I at least know where to start. NASA TM-101083 was one of the more useful papers that I found. It doesn't help much with the design of the vortilons themselves but it gives some very good data on the effects of different spanwise positions on stability. For instance it says that the one closest to the fuselage has the biggest effect on pitching moment at the stall. That surprised me because I expected the one closest to the wing tip to be the most important.

Everything I could find where a manufacturer or builder talked about the development of their vortilons it sounded like they just picked a likely position and

then proceeded by trial and error. For example I found a copy of the Raisbeck Learjet Newsletter that said they did hundreds of stalls with several vortilon shapes. They would stick a candidate vortilon on the wing and go out and do some stalls. Most of the vortilons that I've seen on planes extend quite far forward but I like the shape in TM-101083 and it would be simple to clamp nose extensions onto it for testing so that's what I'll start with if the subject ever comes up again.

Norm

(ed. – Now that the correspondence pieces have been completed I will post the various attachments and pictures sent along by James. I feel that this is good information for everyone to have regardless of whether or not it is associated with a flying wing. I will also include in the Nurflugel Threads area any additional messages that might add further to the discussion by both Norm and James.)

11Sept.08
I saw your question in the TWITT newsletter and was interested since the letter following it appears to have erroneous information. Your question was:

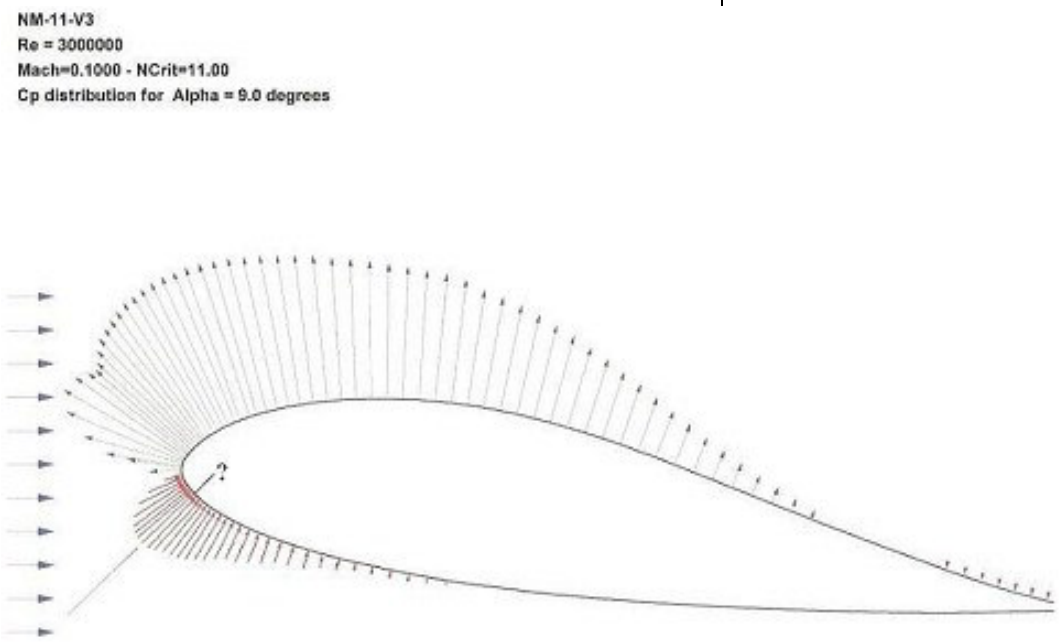
"Stagnation point and upwash angle?
I'm consulting on some modifications to a swept wing motor glider. One mod being considered is the addition of vortilons. Unfortunately there doesn't seam to be much published about how to do it (not that I can get easily anyway). As I understand it the idea is to block the spanwise flow of the leading edge stagnation point at or just before the stall AoA. So if I have the pressure distribution at the critical AoA my guess is that the stagnation point is at the point of highest pressure and the upwash angle is perpendicular to the surface at that spot. Am I right about that? If not could somebody give me a clue?" – nmasters@acsol.net

I think that you have it plotted correctly. The stagnation point is at the max Cp location as you have shown it. This is about the location of the stall warning tab on my Yak-52 (I'll try to remember to take a picture for you). I think that early Cessna's had a tab in this location before they went to the suction actuated horns.

What you have plotted is the coefficient of pressure. On page 116 of "Aeroplane Aerodynamics – ed.4" by Dommasch, Sherby, and Connolly this is defined as:

$Cp = (p - p_\infty) / q_\infty$
where: p = static pressure at some point on the airfoil
p_∞ = free stream static pressure
q_∞ = free stream dynamic pressure $(= \rho V^2)$

At the stagnation point, $p = p_\infty + q_\infty$, so: Cp = 1.0



Both the pressure and Cp are the max they can be at the stagnation point.

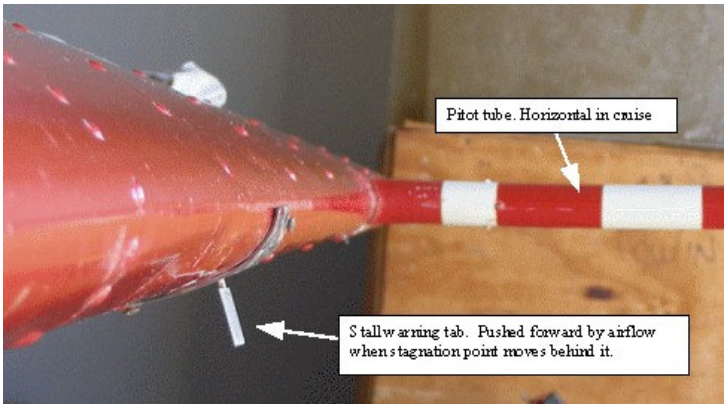
The plot assumes that the inside of the airfoil section is at free stream static pressure and shows the Cp arrow imitating what the pressure distribution would then be doing on the surface. If Cp is greater than zero it is drawn as pushing into the airfoil, if it is less than zero it is shown pulling on the airfoil.

At the stagnation point the airstream splits and either goes up over the top or down across the bottom. As the air starts to move, the pressure on the surface goes down (Bernoulli), so Cp goes down. If the Cp is above 0.0 then the static pressure at that point is above free stream static pressure.

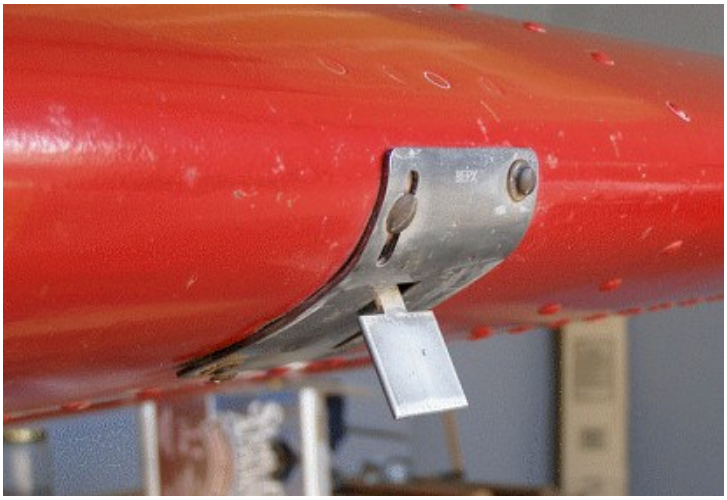
On the vortilon design: I've seen a number of fairly good papers on their placement and design

sometime in the last 30.yrs and will try to remember where and get you a reference you can track down. There may be some info from the NASA wind tunnel tests of the Vari-Eze.

This document contains some pictures of stall warning tabs on a Yak-52, Piper Warrior, and Mooney. These were taken to provide a visual reference of where the stagnation point on an airfoil is when the airfoil approaches stall angle of attack. These tabs are pushed backwards in normal flight. As the wing angle of attack increases the stagnation point moves down toward the bottom of the airfoil. The stagnation point defines where the flow splits and either goes over the top of the airfoil or under the airfoil. When the stagnation point moves behind the tab the flow moving from the stagnation point over the top of the airfoil pushes the tab forward and closes a circuit giving the pilot indication of an impending stall.



Yak 52 Stall Warning Tab (upper & lower)



I included the next two pictures to give you an idea of the angle that the flow makes relative to the wing when stall angle of attack is approached. The first shows the flat bottom of the Clark YM airfoil at 5.8 degrees. The second shows the tab at an angle of 68.2 degrees. The difference of 62.degrees is pretty impressive. The wing should stall around 18 to 20.degrees and it is a very gentle stall. Due to the local pressure distribution the flow angle close to the airfoil is quite a bit different than the airplane angle relative to its direction of flight.

In case someone asks, the stall warning does work and gives an audible and visible indication in the cockpit.

Stall warning on the Piper Warrior (previous page)

Above: Stall warning tab on a Mooney. You can also see the stall strip on the leading edge. The sharp edge on stall strips is often at the stagnation point at cruise angle of attack so that you don't increase cruise drag.

September 16, 2008

Norm-

Threads regarding Stagnation Point and Upwash Angle arrived with the rest of the newsletter. The following is what I can add to it all.

Given that you are considering Vortilons (I call 'em Wing Fences) to contain flow in order to offset or delay the effects of an overly enthusiastic angle of attack, that is, Boundary Layer Separation, please consider alternatives. As Rick's response mentioned in his anonymous quote (Clarence Johnson, I believe) regarding post-partem corrections as design crutches that are to be avoided. They add weight and a stress point to the wing. That they add to the complexity of the structure is as nothing along those lines to what I'm about to suggest. What of a wing slot? I'm not familiar with the Mitchell design, but I do understand that it isn't a high-speed design and that a fixed slot would be appropriate. Please peruse the following NACA papers for Brain Food. T.N. 598 is an enquiry into wing slots and T.N. 122 delves into lift and moment.

Farther down the thread mention is made of the addition of small wheels added at the wingtips in the interest of ground loop prevention. How 'bout a bit of built-up strips of Bamboo fixtures at the tips in order to keep spatial relationships friendly upon landing?

I'm a firm believer in dihedral, but wonder of the Dutch Roll effect as mentioned in a design where the preponderance of mass is already way low. All of my builds have been close to the same plane as the center section. I imagine that an empennage including engine suspended under the wing would pivot hard and take some time/distance to smooth out.

One fellow mentions having Horten documents sent to his hotel in Munich. I can't imagine not going to the Deutsches Museum if in the area. You might not want to sequence the trip in the order we did, save the Beer Halls for after.

Henry E. Whittle
Gulfrose@Juno.com

Henry,

A vortilon certainly can be considered a fence but it doesn't interfere with the wing's normal function nearly as much as a full blown fence. An upper surface fence modifies the lift distribution during the whole flight and produces both induced and parasite drag all the time.

A vortilon sits below the stagnation point most of the time and only produces a turbulent wedge on the lower surface so there is some parasite drag but not nearly as much as a full upper surface fence because of the reduced surface area, length of joints and just not being on the suction side. Most swept wings these days (including gliders) have stall prevention devices instead of large amounts of washout because twist limits the top speed and impairs the ability to perform aerobatic maneuvers (AKA recovery from extreme attitudes). Leading edge slots would also allow less washout but they add a lot of complexity and eliminate any possibility of extensive laminar flow. They also introduce the problem of airfoil hysteresis.

Vortilons on the other hand have no moving parts, have very small wetted area and sit in a favorable pressure gradient most of the time. The Mitchell U-2 motor glider does have a slot but it's at the elevon hinge line. As you've probably learned from NACA reports slots produce their greatest CL contribution near the leading edge but also their largest drag penalty. A slot at 80% has a small affect on lift but also a small drag price. The reason for the slot of a Junkers type control surface is to increase the effectiveness of that control surface not to increase wing lift.

I don't think a permanently open slot has any place on a sailplane bus since it's already there we have to make the best of it or design a new airplane. BTW the best papers I've seen on multi element airfoils are in sailboat books. Google for "Arvel Gentry" or go to <http://www.arvelgentry.com/> and look through his old articles. Norm

---

September 18, 2008

Here is a useful address for those TWITT readers, who are seeking information on the Horten H-IX V1 (= Gothaer 229): Dipl.Ing.Edward Uden, Horten Archiv, Gebruederstrasse 38, D-25355 Barmstedt, Germany, Rel. 0049-4123-3690. As far as I know, he has no E-mail address. One can easily correspond with him in English, as I did when I purchased his general catalog. This includes many construction drawings of the Horten H-IX, versions V1, V2, V3. Keep on with your good work.

Ferdi Galè
ferdigale@alice.it.

October 10, 2008

Your web site shows the BIBLIOGRAPHY OF WITOLD A. KASPER REFERENCE MATERIAL as being available for $15 as of 8/01. Since a few years have passed is this info still available at this price. It looks like I send a check to your address for this info. Is this correct?

I am an R/C modeler. Flying Models published an article for an 8' BKB-1 model in their 9/07 issue. I am planning to build this model this winter. Reports are that it is a good flyer.

Thank you for your assistance,

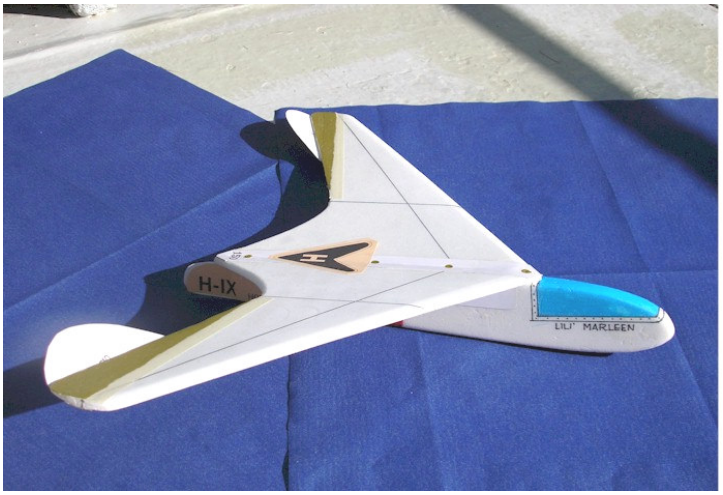
Stan Teleski
delsol77@peoplepc.com

(ed. – I continue to find it encouraging that pilots and modelers are still interested in the BKB-1 design. I hope he finds the type of information he is looking for to get his project started. However, much of the material is related to Kasper's vortex lift theories and aircraft subsequent to the BKB. There is one source for more BKB information and I know there are some plans somewhere for an R/C model, but can't put my hands on them right now.)

October 16, 2008

The attached shows a little Horten type HLG. (More about this later).Ciao !!!

Ferdi Gale'



October 16, 2008

Andy:

September past brings news in the October issue of still another worthwhile presentation. This of Dan Dougherty's work. Mention of the D12_28_2 airfoil in the newsletter raises some questions on my part regarding this foil, which appears to be a variant of the MH45. Is it possible to contact Mr. Dougherty re this?

Thanks for including the R. Horten Stability and Control article. I'd not read this one before.

Regards,

Henry E. Whittle
Gulfrose@Juno.com

(ed. – I put Henry in contact with Dan, but haven't heard anything from either one since then to pass along.)

MITCHELL U-2 THREADS

October 4, 2008

Hi all

My flying days are behind me now , but I still have a love of aviation which I fill by constructing computer models for Microsoft's flight simulator, nd I'm looking at the U-2 as my next project. I have found a good set of photos of Wolfgang Uhl's aircraft taken by Johan
Prins, but am lacking details of the cockpit layout . Anyone able to help?

Dave R
freshwaters@tiscali.co.uk

October 5, 2008

Looking for a Mitchell P38 Ultralight

If anyone knows of a wrecked one, rotting one, just looking for a Mitchell P38 Ultralight in any condition please have the owner contact me. Also looking for builder manuals for a Mitchell P38 Ultralight and if you have any or know of someone who has them please have them contact me or give me their contact info.

Thanks so much!

skyguynca@skyguynca.com

(ed. – I wasn't sure what a Mitchell P38 was so here is the only picture I could find for a Sun 'N Fun event.)

October 31, 2008

Guys

Just joined. Ifly a Kolb Firefly and am rebuilding an N3 Pup that I flipped when the landing gear collapsed.

My interest in the U-2 and Mitchell wing stems from my start, in the 70's, as a glider pilot. Always wanted a motorized sailplane. Doubt that this design can be wound up tightly in a thermal? The high efficiency cruise would mitigate that however

Any rate, I have a BD-5 Fuselage in the barn that looks to be ideal, if weight is not excessive, for the fuselage part of a U-2. I have three engines...447, Kawasaki 440 and a Rotax 532. The 440 looks like a good candidate.

My strips, here on the farm. are 1300 feet and 700 feet. 1300 strip is a bit bumpy.

By the way...I own the Thatcher CX4 list, the Tube, Stick and fabric and the EAA1165 list here at Yahoo.

Herb

PS I see that the plans are 150 bucks with shipping and will buy a set if I cannot find a set otherwise...

NURFLUGEL THREADS

September 2, 2008

Argentine Hortens

I have been meaning to upload these forever and just ran into them again. Pictures from a couple of trips we took to Argentina from the transportation museum in Cordoba and the Air Force Museum in BA: http://www.flickr.com/photos/23220522@N06/sets/72157607085049761/

Unfortunately the only person in the building...the janitor...wouldn't let us get any better pictures of the Ae 34 in Cordoba. I have a quick pan movie of the inside of the the Ho Xb, if anyone wants a slightly better look.

Enjoy, such as they are.

Nick Sturm
grindelsturm@yahoo.com

September 24, 2008

Former Employee Of The Horten Brothers?

Hi Everyone,

I have a short question can anbody get a connection between the name Keller, the date 1943 and the Horten Brothers?

Because somebody give only two things about the person to me. Sorry for the poor data.

Regards

Jörg Schaden
joergschaden@googlemail.com

I'll see what I can do. If it helps, the Horten family is a distant relation to me!

Brian
cbl2799@yahoo.com

October 6, 2008

Is there some advantage to having the winglets going down instead of up?

Most things I have read about winglets semm to imply that you would want the winglet to be ~70% above the wing or more with only 30% below, but this plane has the full winglet below the flying surface. Why is that?

Warren Bean
warren.bean@gmail.com

Aerodynamically, it doesn't matter, above or below. I suppose there might be an infinitesimal efficiency advantage to exactly 50-50 above and below.

Usually, the split gives advantage to above the wing to avoid ground contact, possible ground looping, damage to the surfaces, etc.

In a flying wing, if you have rudder surfaces in the winglet, below gives a minimum phase dynamic response to yaw control inputs. That is, you gain a proverse response in both yaw and roll with a yaw control input. This is similar to inverted V-tails.

Al Bowers
Albion.H.Bowers@nasa.gov

Models that are expected to see high angles of attack benefit form tips that extend below the wing to help maintain directional stabliity when the wing is 'blocking' the upper tip fins

Paul Westrup
p_westrup@hotmail.com

October 27, 2008

TsAGI/Beljajev BP3

Hello Everybody,

Does anybody have some information about the TsAGI//Beljajev /BP3 flying wing?

Regards

Jörg Schaden
joergschaden@googlemail.com

October 30, 2008

An amazing display of airmanship ...

... and power to weight ratio! Who needs wings?

http://www.chilloutzone.de/files/08102703.html

It was amazing to see an Israeli F-15 do this but ...!!
Cheers,

Bob Storck
bstorck@sprynet.com

(ed. – I included this since it is a real attention getting and you must watch it closely to determine if it is for real. There is some really clever editing going on throughout the video so check for which aircraft is real and which one is the model.

Toward the very end after the landing the model is taxing to the right side. You can tell it is the model based on the holes in the root section that take the circular spars typical of a model this size. If you watch closely you can see the size of the aircraft enlarge as it makes the left turn into the grass, then the pilot steps out hiding the right side so you can't see it still has its wing.)

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
3114 Edgehill Road
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.
Collected Sailplane Articles & Soaring Mishaps: $30 pp: 72 articles incl. 6 misadventures, future predictions, ULSP, dynamic soaring, 20 years SHA workshop.
Collected Aircraft Performance Improvements: $30 pp: 14 articles, 7 lectures, Oshkosh Appraisal, AR-5 and VMAX Probe Drag Analysis, fuselage drag & propeller location studies.

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

FLYING WING SALES

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 $140, postage paid. Add $15 for foreign shipping.

U.S. Pacific (559) 834-9107
8104 S. Cherry Avenue mitchellwing@earthlink.net
Fresno, CA 93745-9448 http://home.earthlink.net/~mitchellwing/

COMPANION AVIATION PUBLICATIONS

EXPERIMENTAL SOARING ASSOCIATION

The purpose of ESA is to foster progress in sailplane design and construction,which will produce the highest return in performance and safety for a given investment by the builder. They encourage innovation and builder cooperation as a means of achieving their goal. Membership Dues: (payable in U.S. currency)

United States	$24 /yr	Canada	$40 /yr
So/Cntrl Amer.	$40 /yr	Europe	$45 /yr
Pacific Rim	$50 /yr	U.S. Students	$18 /yr

(includes 4 issues of SAILPLANE BUILDER)

Make checks payable to: Sailplane Homebuilders Association, & mail to Murry Rozansky, Treasurer, 23165 Smith Road, Chatsworth, CA 91311.