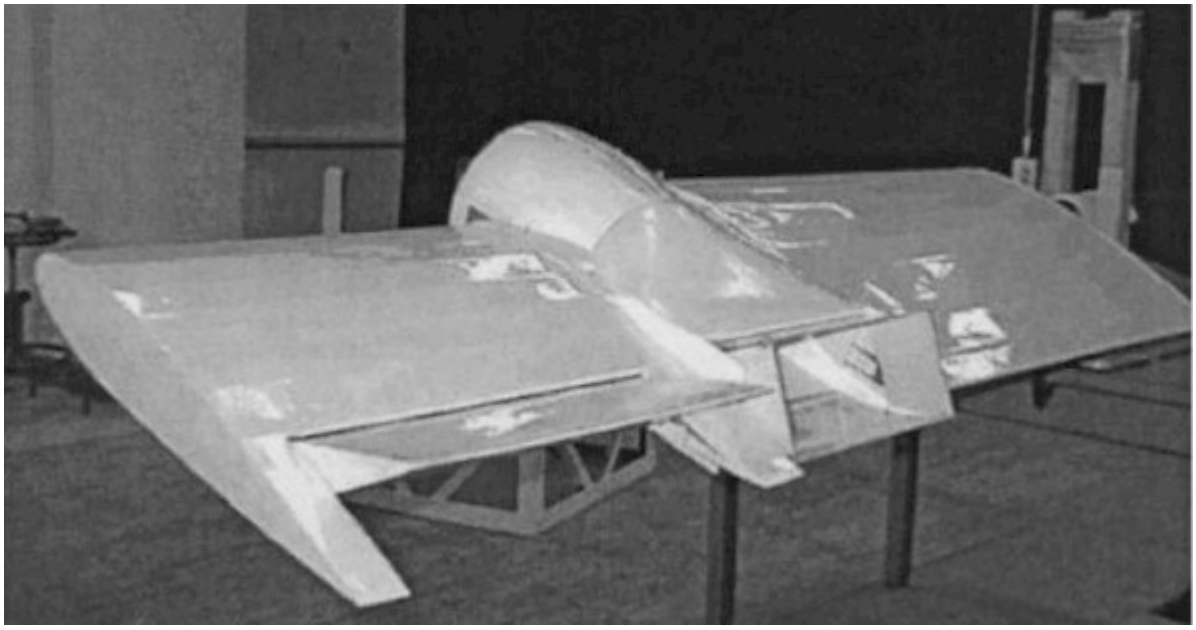
No. 254 AUGUST 2007

T.W.I.T.T. NEWSLETTER

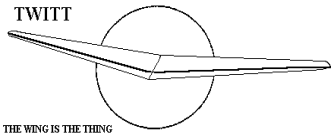


This wing was redesigned to improve thrust vectoring. Extracted from: “Control of a thrust-vectored flying wing: a receding horizon--LPV approach” by Ali Jadbabaie and John Hauser as published by INTERNATIONAL JOURNAL OF ROBUST AND NONLINEAR CONTROL, Int. J. Robust Nonlinear Control 2002; 12:869–896 (DOI: 10.1002/rnc.708) Source: http://www.seas.upenn.edu/~jadbabai/papers/JHijrnc.pdf

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., **0708** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, September 15, 2007, 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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Wt/#Issues	FRG	AUSTRALIA	AFRICA
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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).

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PRESIDENT'S CORNER

Well I have gone ahead and scheduled Dan Dougherty for the September program although I haven't heard from very many people. I have posted it on the web site, which sometimes produces additional people who are interested in flying wings and aviation topics.

By the time you get to the next meeting you will see a much different arrangement in the hanger. Doug Fronius, Gavin Slater and myself have been working on Saturdays to move things around to the point we can consolidate the TWITT archives and library into the main hanger. It will also free up the hanger next door so it can be used to restore the Stinson that is currently torn down. Moving the library will also put it in a position where there is better light for reading and keeping everything organized.

Since we are having a program in September it would be nice to keep it going for November, so if anyone knows someone who could put on a program, let me know. I will try the gentleman from the community college in Orange County and see if his class schedule would enable him to do his talk on composites. But I still need other names and numbers for the future.

Don't forget that Labor Day weekend is the annual ESA Western Workshop at Mountain Valley Airport in Tehachapi, CA. Saturday and Sunday are loaded with technical sessions covering topics like boundary layer controls, regenerative soaring design, low drag concepts, electric launching, and building in wood. Speakers include Taras Kiceniuk, Jack Norris, Bill Otto, Bob Hoey, Al Bowers, Bruce Carmichael and Ilan Kroo. There are a number of motels in the area as well as a camp ground right on the airport. I have included the schedule on the last page of this issue. Mark you calendar and plan on attending one or both days and be enriched with lots of good information.

Andy

SEPTEMBER 15, 2007 PROGRAM

DAn Dougherty is part of a team from California State University Long Beach that developed a flying wing for the SAE Aero Design West competition in March. This is a heavy lift competition with a 100 ft takeoff distance requirement. They won the open class - the first flying wing to win this competition to their knowledge.

Here is a link to a video of their winning flight with Dan releasing the aircraft:

www.youtube.com/watch?v=-v7IDrsQWNI

Write up in the school newspaper:

www.csulb.edu/colleges/coe/mae/views/news/news_2007/student_accomp_3_07.shtml

Dan has agreed to share the details of his aircraft at the September 15th TWITT meeting. He has a slide presentation put together for an oral report as well as a 30 page written report that goes into further detail on the design. Unfortunately, he cannot bring the airplane since it crashed in the SAE 'East' competition in early May (radio problems!).

He is currently working on a promising airfoil section for tailless airplanes. It provides positive pitching moment without reflexed camber, thus one can attain positive lift at 0 deg AOA while still maintaining the positive pitching moment required for trim. This could possibly provide increased takeoff performance and cruise performance. He is also working on a flap design that increases Clmax for BWB designs that trims with trailing edge down deflections (thus providing an advantageous shift in zero lift AOA). These concepts will also be a part of the program ensuring a lively discussion of their merits and any possible limitations.

The meeting and presentation are open to anyone interested in attending (not restricted to members only), so please mark you calendar and come visit us in El Cajon in September.

LETTERS TO THE EDITOR

July 12, 2007

Gentlemen,

I have been reading with considerable interest some of the material on your website, and my comment relates to the research presented by Dr. Philip Burger. I've an experience to relate which I believe confirms his bird flight conclusions regarding upwash.

For many years I lived and worked in the New Orleans, Louisiana area and had occasion to cross the 24-mile Lake Ponchartrain Causeway, making two trips daily. The posted speed limit on this twin bridge is 55 MPH, but the 'unofficial' speed normally required to keep from getting overhauled by the vehicle following you is between 65 and 70 MPH. Back in this pre-Katrina period, there was always a lot of traffic load in both directions at any given time, so there was always plenty of traffic, fairly closely paced, to create a stream of high speed vortices pretty much the entire distance across the bridge, in either direction, at any given time of the day.

The bridges themselves are topped with continuous concrete retaining walls approximately 4 feet high, which itself is capped with a low metal railing, providing a distance from the water surface to rail height of about 45 feet. At regular intervals there are radio antennae for call boxes and light poles approximately 35 taller than the railing.

Time and time again I would watch pelicans and gulls effortlessly gliding just outside, and only very slightly above this railing, and usually doing so at speeds far in excess of what one would ordinarily expect them capable. They would do so one after the other, spaced some distance apart, and always in the direction of the

prevailing traffic for that bridge and always on the outside (i.e. 'right hand' lane side) of the bridge railing.

The most exceptional example of this effect was observed while traveling southbound one afternoon during the approach of a tropical storm. At that point, the Causeway was in the northwest quadrant relative to the storm's center, and experiencing dry gales in the range of 25 to 40 MPH. I know this to be the case because the Causeway safety regulations required it's closure to vehicular traffic when monitored wind speeds reached 45 MPH, and heard of the bridges' closure for that reason just as I completed my transit that day. Being in the north west quadrant of an approaching tropical weather system brings winds from the North to North East slowly intensifying and shifting to the East as the storm approaches more closely. At this time, the winds were from the North to North North East, almost the same orientation as the Causeway spans.

I had been driving along preoccupied with the weather news on my radio for some time, moving at about 65 MPH, when I realized I had been watching a pelican gliding effortlessly keeping about the same distance ahead of me for over 15 minutes. He was not flying in the normal low 'just over the rail' 'trackway' that I was used to slowly overtaking the birds encountered in normal commutes. This bird instead was just above the level of the recurrent light poles, and a little farther 'right' of them than birds in the 'normal' 'trackway'. I watched this pelican for at least 10 additional minutes before overtaking him, and estimated his true ground speed to be somewhere in the range of 60-65 MPH based on my own speed and the length of time required to overtake the bird. In all my time observing him, only an occasional 'correctional' flap of the wings was ever noted, and these were always accompanied by the bird's corrections back towards the bridge as apparently the prevailing wind was not completely aligned with the 'trackway' line formed by the Causeway. The pelican's altitude never varied during the entire observation.

Obviously all these birds were employing available upwash, no? In the case of the usual 'trackway' just above and to the right of the railing, I believe the upwash was being provided by the nearly continual stream of high-speed traffic traveling parallel to the bird's flight path. In the case of the 'super pelican' flying along at vehicular speeds for an extended period of time, I believe it was the existence of sustained subtropical gales, and the upwash created when those gales encountered the barrier of the bridge spans, which permitted the observed behavior.

I may be totally wrong, but I think what I observed validates everything Dr. Berger has postulated.

Jack Blalock
<Jnblalock@sundt.com>

(ed. – I forwarded this message to Phil for his comments but he has been on vacation and couldn't get back to me in time for the newsletter. I look forward to printing his comments next month.)

July 15, 2007

Andy, here are a few idle comments on the letters etc. in the July TWITT Newsletter.

The elevons on the Boeing 306 were located aft of the wing to try and increase the elevator power. Incidentally my friend Mike Isermann has built a good flying rubber scale model of the single engine version. You can find pictures of the model and some of its construction in the Small Flying Arts web site. Look in Scale Model Cookups for the flying wing thread. The basic website is:

http://www.smallflyingarts.com/cgi-bin/yabb2/YaBB.pl?num=1153927747

Al Bowers assessment of the Facetmobile is correct, it was an experiment of what would be possible. It produced a marginal aircraft. I know Barnaby and during his flight to Oshkosh I took a case of oil to Lubbock TX for him. Lubbock is at 3000' elevation and he had to takeoff before the temperature got to 85F to get the aircraft to a comfortable cruise altitude.

I test flew my plank airplane from the Lubbock area with a less powerful engine and never had any problem with temperatures and regularly went to a few thousand feet AGL. I doubt that the Facetmobile was much over 1000' AGL when it went out of sight at the airport.

Al Backstrom
<albackstrom@austin.rr.com>

(ed. – Thanks to Al for the information on the Small Flying Arts web site and for the first hand account of a Facetmobile adventure. The link takes you to a discussion group type page so you may need to join the group in order to find out more information about participating in the cookup.)

July 16, 2007

You recently requested TWITT members to indicate their commitment to attend a 9/15/07 presentation by Dan Dougherty, a student at CSULB, at El Cajon.

I am definitely interested in Dan's presentation but, at this time, prefer a different site and, as noted below, a different date.

I discussed this subject with Bruce Carmichael yesterday. I suggested that we approach Dan to see if he could instead make his presentation at Tehachapi over the Labor Day weekend in conjunction with the already planned ESA program. Bruce indicated that the latter program already was quite full but that Dan might fit into Friday's schedule. I think that such a change would serve a larger audience and be in the best interest of both groups and to Dan Dougherty.

Thank you,

Edward Labahn
<elabahn@att.net>

(ed. – I agree with Ed that this would make a good presentation at the ESA workshop as there have been other students using more conventional designs giving talks to the group.

However, I am also trying to keep the interest of flying wings alive for this group and not loosing the idea of meetings altogether. There are a small number of TWITT members who attend the ESA workshops, but I would like it to reach a larger flying wing oriented group who would be in a position to ask relevant questions. This process often provides much more information than just having a presentation within a specified time frame.

I haven't had very much response on who would commit to attending the September meeting, but I have gone ahead and booked Dan for September so please mark your calendars and plan on attending.)

July 23, 2007

Dear Sir,

I want to ask you if do you know if it is possible to get a copy of the BKB1 plans, and if so, where and how I might order them?

Best regards,

Miguel-Àngel Rodríguez
<marpbcn@hotmail.com>

(ed. – I responded to Miguel that to the best of my knowledge there are no publicly available plans for the BKB-1. With the recent passing of Stefan Brochocki, I doubt very much there will be any plans developed for the original version or perhaps one geared to more modern materials and building techniques.)

Nurflugel Bulletin Board Threads:

Software

July 14, 2007

Is there anything like Compufoil or RealFlight for the Mac?

Doug Halverson
<dholverson@cox.net >

The answers depends on two things...

Are you using an Intel Mac?
Are you running OS 10.2 or above?

Bill & Bunny Kuhlman
<bsquared@themacisp.net>

Yes.

Doug

Doug:

Profili2 (http://www.profili2.com/eng/default.htm) is the best of them all, in my opinion, and with the addition of DevCad and Isiplot makes life easy and gives excellent printouts and designs in CAD files. The professional version is even better and certainly inexpensive, comparing it with similar products.

I was speaking yesterday to the creator of this software, Dr. Stefano Duranti, for whom I have often worked as a professional translator, and he told me that several MAC owners use Profili2 through a Windows emulator

http://www.microsoft.com/mac/products/virtualpc/virtualpc.aspx?pid=virtualpc.

A close friend of mine, here in Melbourne, is using it from a few years on his MAC and is completely

satisfied. It works perfectly and I can definitely recommend it.

Cheers from Bruno
<msmprod@optushome.com.au>

Horten Questions

July 18, 2007

Gentlemen,

After reading the wonderful Horten publication Nurflugel (well at least Peter Selinger's concise translated extracts) a couple of intriguing questions have arisen.

I was left wondering if anyone has taken the translations further? In particular, the papers written by Reimar Horten and included at the end of the book.

Secondly are the coordinates / polars for the airfoils used / developed by the Hortens available?

Many thanks

John
<johntenhave@yahoo.com>
Sydney, Australia

Hello John,

Try this,

Horten Ho229 "Spirit of Thuringia": The Luftwaffe's All-wing Jet Fighter by Andrei Shepelev and Huib Ottens (Hardcover - 29 Sep 2006) Publisher: Classic Publications Language English ISBN-10: 1903223660 ISBN-13: 978-1903223666 Available from www.amazon.co.uk

Go to www.amazon.co.uk and type Horten into the search box. You will get up a list of books.

The book by Andrei Shepelev and Huib Ottens is by far the best I have seen on the subject and the best starting point for accurate information.

Kind regards

Andrea
<brownar@eircom.net>

Go to <www.profili2.com>, follow the link "online airfoils", then search for profile name "horten". At least the 10% symmetrical and the 13% standard sections are there.

Regards,

Joachim Bergmeyer
<jbergmeyer@t-online.de>

If you plot the table of numbers on page 238 you'll get a very fat reflexed airfoil oriented with the chord vertical

Norman Masters
<nmasters@acsol.net>

Hello Norman,

Am I right in assuming that you are referring to the data contained in the data Andrea has shared with us all?

Regards,

John

Hi Joachim,

Thank you for the link. I typed it in, full of the joys of anticipation and quick as a flash - nothing happened. Frames with no data. What am I missing? (- apart from a few IQ points?)

Regards

John

No. The table I was referring to is in the partially translated version of "Nurflügel", not "Spirit of Thuringia". I plotted it and saved the drawing as a .png some time ago. If you don't still have the book I can post it

Norm

John: Try this link. There are 2 Horten airfoils.
http://www.profili2.com/eng/lista_profili.asp

Rick Page
<rick-page@shaw.ca>

John,

It does work properly for me only if I use Internet Explorer. Neither Firefox nor Opera (which I generally prefer) do the trick. Maybe it's this. Otherwise, you're welcome.

Regards,

Jochen

Hi Norman.

An excellent lead! I have flashed up solid works and will see if I get the same results. Forgive my antipodean reticence for daring to skim through the original German text...

Regards

John

Joachim,

You are absolutely correct. I blew the dust off IE and lo and behold the images emerged.

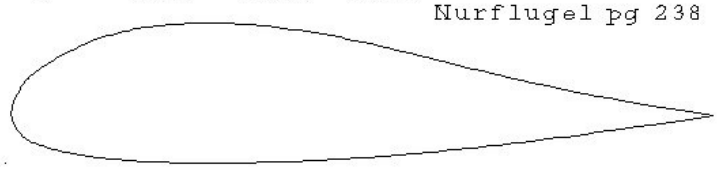
Thank you!

John

ProfilaufmaBe der Wurzelrippe H III.
(Durch Multiplikation mit 3.50/3.25
erhalt man die AufmaBe der H II.)

X	Z	Y oben	Y unten
0.0	0	218.2	218.2
0.025	81.2	374	113.2
0,05	162.5	442	78
0.1	325	535	37.9
0.15	487.5	594.5	17.4
0.2	650	629	6.5
0.25	812.5	640	1.1
0.3	975	650	0.0
0.4	1300	623	5.4
0.5	1625	563.2	22.6
0.6	1950	482.9	49.1
0.7	2275	401.5	82.7
0.8	2600	329.8	123
0.9	2925	269.5	170.1
1	3250	218.2	218.2

Nurflugel pg 238



ABOVE: Norm's plot.

Ok but it was drawn in Qcad. Qcad doesn't do poly-arcs very well and it doesn't have NURBS. If you snap a NURBS to it or change the poly-line to arcs you'll get an accurate curve. As is there are two B-splines and a poly-line. One B-spline is stretched so that the line hits the vertices but it's still a B-spline so I'm not sure the tangents are right.

Norm

Boeing Flies Blended Wing Body Research Aircraft

July 25, 2007

My current favorite aircraft project – they can't move fast enough on this for me. My belief is a Blended Wing Body aircraft will provide advantages in all aspects of air transport without significant disadvantages for both passenger and cargo application. The airlines are standing on the sidelines rather than pushing for this because it's too different, but military interest only looks at efficiencies, not public opinion. When the concept and savings are proven by the military the airlines will go to work reshaping public opinion.

Boeing flies Blended Wing Body research aircraft

The 21-foot (6.4-meter) wingspan, 500-pound (227-kilogram) unmanned X-48B test vehicle takes off for the first time Friday at Edwards Air Force Base in California. It climbed to an altitude of 7,500 feet (2,286 meters) before landing 31 minutes later. (NASA photo)

The Boeing Blended Wing Body research aircraft -- designated the X-48B -- flew for the first time Friday at NASA's Dryden Flight Research Center at Edwards Air Force Base, Calif.

The 21-foot (6.4-meter) wingspan, 500-pound (227-kilogram) unmanned test vehicle took off at 8:42 a.m. Pacific time and climbed to an altitude of 7,500 feet (2,286 meters) before landing 31 minutes later.

"We've successfully passed another milestone in our work to explore and validate the structural, aerodynamic and operational efficiencies of the BWB concept," said Bob Liebeck, Phantom Works BWB program manager. "We already have begun to compare actual flight-test data with the data generated earlier by our computer models and in the wind tunnel."

The X-48B flight test vehicle was developed by

Phantom Works in cooperation with NASA and the U.S. Air Force Research Laboratory to gather detailed information about the stability and flight-control characteristics of the BWB design, especially during takeoffs and landings. Up to 25 flights are planned to gather data in these low-speed flight regimes. Following completion of low-speed flight testing, the X-48B likely will be used to test the BWB's low-noise characteristics, as well as BWB handling characteristics at transonic speeds.

NASA Dryden Flight Research Center Photo Collection
http://www.dfrc.nasa.gov/Gallery/Photo/index.html
NASA Photo: ED06-0198-37 Date: October 24, 2006 Photo By: Tony Landis

This closeup of Boeing Phantom Works' unique X-48B Blended Wing Body technology demonstrator shows off its unusual engine placement and supercritical airfoil.

Two X-48B research vehicles have been built. The vehicle that flew Friday is Ship 2, which also was used for ground and taxi testing. Ship 1, a duplicate of Ship 2, completed extensive wind tunnel testing in 2006 at the Old Dominion University NASA Langley Full-Scale Tunnel in Virginia. Ship 1 will be available for use as a backup during the flight test program.

Three turbojet engines enable the composite-skinned research vehicle to fly at up to 10,000 feet (3,048 meters) and 120 knots in its low-speed configuration. Modifications would need to be made to the vehicle to enable it to fly at higher speeds. The unmanned aircraft is remotely piloted from a ground control station in which the pilot uses conventional aircraft controls and instrumentation while looking at a monitor fed by a forward-looking camera on the aircraft.

The Boeing BWB design resembles a flying wing, but differs in that the wing blends smoothly into a wide, flat, tailless fuselage. This fuselage blending helps provide additional lift with less drag compared with a circular fuselage. This translates to reduced fuel use at cruise conditions. And because the engines mount high on the back of the aircraft, there is less noise inside and on the ground when it is in flight.

"While Boeing constantly explores and applies innovative technologies to enhance its current and next-generation products, the X-48B is a good example of how Boeing also looks much farther into the future at revolutionary concepts that promise even greater breakthroughs in flight," said Bob Krieger, Boeing chief technology officer and president of Phantom Works.

While a commercial passenger application for the BWB concept is not in Boeing's current 20-year market outlook, the Advanced Systems organization of Boeing Integrated Defense Systems is closely monitoring the research based on the Air Force's interest in the BWB's potential as a flexible, long-range, high-capacity military aircraft.

"The BWB concept holds tremendous promise for the future of military aviation as a multipurpose military platform in 15 to 20 years," said Darryl Davis, Boeing IDS Advanced Systems vice president and general manager of Advanced Precision Engagement and Mobility Systems. "Its unique design attributes will result in less fuel burn and a greatly reduced noise footprint, which are capabilities our Air Force and mobility customers desire."

NASA's participation in the project is focused on the fundamental, edge-of-the-envelope flight dynamics and structural concepts of the BWB.

The two X-48B research vehicles were built by Cranfield Aerospace Ltd., in the United Kingdom, in accordance with Boeing requirements.

Larry Witherspoon
<ssspoon@aol.com>

This is a model right?

http://www.coasttocoastam.com/gen/page2137.html?theme=light

It looks like that thing from that old sci-fi classic "Things To Come" with Raymond Massey.

Best,

Greg
<evolbaby@aol.com>

Greg,

Yeah, it's a model. 1/10th full size. The one that's flying is the #2 model. #1 was tested in the full size NASA wind tunnel at Langley. There's a photo page for the latter at http://www.dfrc.nasa.gov/Gallery/Photo/X-48B/HTML/ED06-0070-2.html

Bill & Bunny Kuhlman
<bsquared@themacisp.net>

Of course it's a model albeit a very large and sophisticated one.

http://www.designation-systems.net/dusrm/app4/x-48.html
http://img341.imageshack.us/img341/7586/slide14azx8.jpg
http://www.newscientisttech.com/channel/tech/aviation/dn8310
http://www.agingaircraft.utcdayton.com/pages/B-2.html

Norm

Any chance of a real life full sized one ever being built?

Doug

Thanks Doug:

Saw it on the news. Can't wait for more coverage. Not gonna hold my breath waiting on a full scale to be built. Normally when we the public are informed that means the project is at least 20 years old

Best,

Greg

Threads from the U-2 Bulletin Board

July 14, 2007

Re: KFM107 engine

I also have a KFM 107. with the belt redrive. What prop do I use?? It now has a very small prop.

I am thinking of selling this B10, It has a new KFM 107 and is made very nicely. It is complete and has nevr been flown. I need 2000$ for it. the covering my have to be redone, as it is too tight and has tweaked the trailing edge. It may be OK or not. I don't know.

Thanks,

Mike Ogren
352/428/8983 cell. FL. USA
<msogren7@peoplepc.com>

July 29, 2007

U2 Wing for Sale

Hi group:

I have a U2 wing in excess of 90% complete, that health problems will not allow me to complete and fly this bird. I feel devastated, but things do happen. I will consider to just recoup my material costs. I am open for comments.

I am located just off I-75 about halfway between Chattanooga, TN and Atlanta, GA. I am having trouble sending the pixs on my comp. Will try on the other half's. Have two people that seem interested, so hope everyone gets to see the pixs.

Russ Russom
<ghgidf@yahoo.com>

"Harry's Handy Hardware"
Blunder Beaters for the Bungling Builders

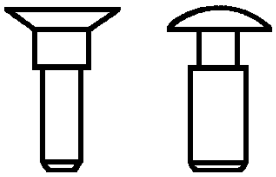
By Lloyd Bungey

(ed. – Reprinted from Free Flight magazine 1982 by permission of Tony Burton, editor.)

Most homebuilt aircraft are the only aircraft ever built by their proud masters. One consequence of this is that they are usually quite unique, consisting of the accumulation of many examples of learning experience that would not be repeated on a second sample. Often these learning experiences result in the duplication of hours of labor re-fabricating some weird and wonderful (and expensive) contraption which was ruined by a slip of the drill in the final stages of fabrication (in accordance with the principles of Murphy's Law).

With the experience of a number of years of such efforts, I have developed a great new advance in aircraft hardware, specifically for the ham-fisted amateur. Never again need the fumbling first-timer be forced into re-manufacturing a part. Instead all he needs to do is reach for a piece of "Harry's Handy Hardware" and fit the pieces together, blunder and all. Here then is a great advance for the Aviation Community.

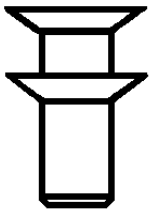
Harry's "FIT-ALL" Tiered Rivet



Have you ever reached in haste for your 1/8" drill bit and commenced to chew halfway to China through the left wing spar web only to realize that you were somewhat careless?
Normally you leave the 1/8" bit in the 9/64" hole (it slips in easier) but this time the hole actually held a 9/64" bit, so you now have an oversized hole. What to do? You could solve the problem by finishing off the hole oversize and using an oversize rivet, but that would require extra work. Up to now, however, it would be the only way to solve the problem, but with the development of the FIT-ALL tiered rivet (available in universal and flush styles) you can now fill the stepped hole and avoid all this extra bother.

FITALL rivets are available with the larger diameter either on the top or the bottom to suit your preference.

Harry's "DOUBLE-TROUBLE" Biflush Rivet



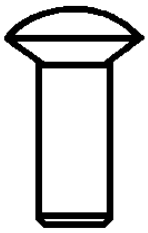
Did you do some countersinking in the middle of an argument with the wife and now just discovered you have countersunk the wrong piece? Harry has the answer with his DOUBLE-TROUBLE biflush rivet. Just go ahead and countersink the skin as you should have originally, then pop one of these trouble solvers in the hole and buck away.

Harry's "INVISIBLE MENDA" Hidden Rivet

Did you get overenthusiastic with your drilling and wind up with a bunch of holes where you don't really need rivets? No problem with Harry's INVISIBLE MENDA. You don't have to show your keenness with a great mass of pimples protruding out of the skin, just countersink the underside of the top skin, place in INVISIBLE MENDA in the

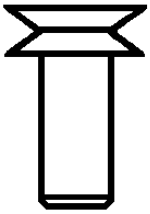
depression and buck it from underneath the second skin.

Harry's "O-MY-GOD" Dual Head Rivet



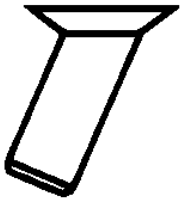
So you put in a hard day at the office and let the problems carry over while you countersunk your skin, only to find it was not supposed to have countersunk rivets? Once more Harry to the rescue with his special O-MY-GOD dual head rivets. Now there is a rivet with a universal head built right onto the countersunk head, so nobody (except you) need ever know what you did. These rivets are available to suit skins countersunk on both top or bottom side.

Harry's "DOUBLE-FLUSH" Rivet



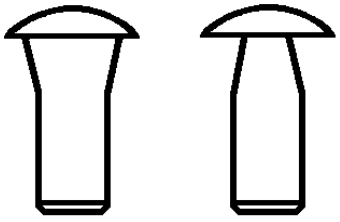
Did you wind up with both sides of the skin countersunk because you answered a call of nature after countersinking it the first time, thereby leaving the sheet on the bench instead of setting it aside? Now you have a problem. Thanks to Harry, who pulled this trick once too often, we have a way out. Use a TWO-SIDER DOUBLE-FLUSH rivet with its unique double-countersunk head and you'll save your skin.

Harry's "BENDER-MENDER" Angled Rivet



Were you having to steady yourself against the wall when you drilled the latest hole and your degree (or so) of list conveyed itself into the hole? Don't go racing off to the hardware store for a hole straightener, it's not necessary. Harry has come up with a whole range of BENDER-MENDER angled rivets (both universal and flush) to handle this problem. Just select the angle to fit your need.

Harry's "CRATERFILLER" Expanding Rivet



Stuck with a cone-shaped hole caused by a wobbly drill? Or did you just lose control of the situation when your lit cigarette slid from your lips and down your shirt at the critical moment? No problem. The hole may look like a miniature edition of Mount St. Helens, but Harry's CRATERFILLER will fix it, available in two styles to handle both top and bottom side craters (Note: the bottom side CRATERFILLER is a little awkward to fit)

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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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.

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COMPANION AVIATION PUBLICATIONS

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The purpose of SHA 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 coop-eration as a means of achieving their goal. Membership Dues: (payable in U.S. currency)

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So/Cntrl Amer.	$36 /yr	Europe	$41 /yr
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(includes 6 issues of SAILPLANE BUILDER)

Make checks payable to: Sailplane Homebuilders Association, & mail to Secretary-Treasurer, 21100 Angel Street, Tehachapi, CA 93561.

ESA Western Workshop Presentations

Saturday, September 1, 2007

Light Hawk Progress – Danny Howell
Sailplane Suction BLC – Bruce Carmichael
BUG Progress – Mike Sandlin
SparrowHawk Developments – Greg Cole
Geodesic Construction – Dean Sigler
Steel Carbon Dragon Progress – Jim Terry
How Propellers Really Work – Jack Norris
Regenerative Soaring Design – Taras Kiceniuk
Low Drag Business Aircraft Concept – Bill Otto

Sunday, September 2, 2007

Practical Computer Graphics for Sailplane Design – Phil Barnes
Pteranodon Model – Robert Hoey
Electric Launch Considerations – Dan Armstrong
Early California Soaring – Jeff Byard
Building in Wood – Wayne Spani
Limits to Open Span Performance? – Al Bowers
Soaring Birds and Ultralight Sailplanes – Bruce Carmichael
Sailplane Energy Extraction form Gusts – Ilan Kroo

Friday Evening – Potluck BBQ at Jeff Byards' hanger
Saturday Evening – Potluck BBQ at Jeff's hanger
Sunday Evening – Banquet at Jeff's hanger

Flying available on all days with your own ship or rentals from the airport.

See this link for more information and contact points.

http://www.esoaring.com/calendar2007.htm