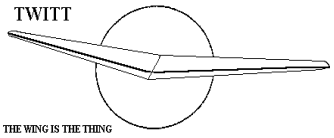
No. 323 MAY 2013

T.W.I.T.T. NEWSLETTER

Horten Xb on dislplay at the "Museo Nacional de Aeronáutica" in Argentina. Photos by Ronaldo and Chantal Jones while visiting in Argentina (near Buenos Aires). See more on this and other Horten photos being made available through Koen Van de Kerckhove. Source: http://www.nestofdragons.net/new.aspx

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., **1305** means this is your last issue unless renewed.



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.

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Wt/#Issues	FRG	AUSTRALIA	AFRICA
1oz/1	1.75	1.75	1.00
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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

We have a very nice mix of items this month and I have made sure to include a lot of pictures from the various web sites that are linked to the e-mails. If you don't want to type all the URLs into your computer, don't forget that every issue is available in the members only section of the TWITT web site. The ID and password for access are in the left column of this page so they are always handy. You can then just click on a link and automatically open your browser and go to work scrolling through the images.

Since I am on the subject of the members only section I will once again offer to provide the newsletter electronically to you each month so you wouldn't even have to access the web site. The other advantage is that you see everything in color which really is a great option even though the B/W images are now coming out very clear.

The annual dues for this option are only $10 and I can do a proration of your current dues to establish a new expiration date. I will also notify you by e-mail when your subscription is about to expire plus you can pay for multiple years, if you like.

It is up to each individual to decide which option best suites their needs. I will not stop publishing the hard copy so don't think you have to switch, I am just offering electronic delivery as a choice since it has certain advantages.

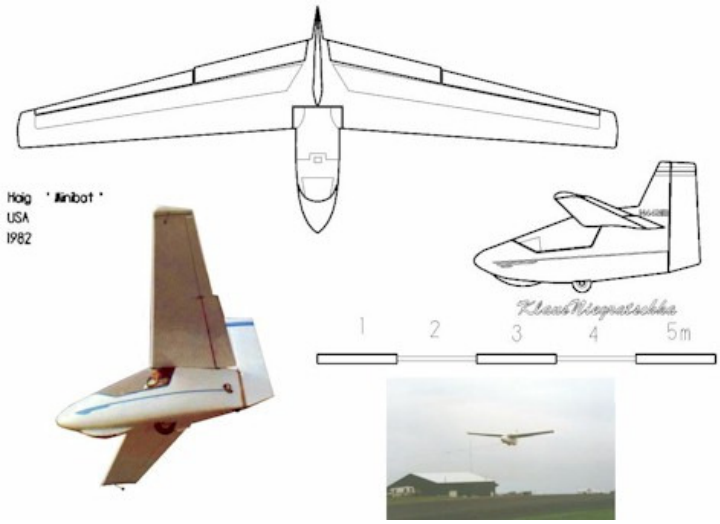
LETTERS TO THE EDITOR

(ed. – The following was sent to us by Syd Hall back in March but I overlooked it when putting the April issue together. My apologies to Syd for the delay.)

Dear Andy,

I have been snowed in, literally, and have used the impacted time to dig into a file that turned out to be larger than I recalled. Bruce Carmichael, whom I met in Truckee will verify, but I note that he seems to be dropped from the TWITT masthead. I hope it is that he is only goofing off at home. *(ed. – Bruce is still a TWITT member but no involved in the overall operation thus not in the masthead listing.)*

I thought I had a fairly extensive file on the MiniBat by Larry Haig, but now that I have counted it, it amounts to 25 pages by Haig, formerly published by GLA, Incorporated sold for $10 as a sailplane information brochure with two introductory pages by Bruce Carmichael plus more pages from the March 1981 Soaring and, the December 1981 Soaring by Jim Marske on the Monarch.



Source: http://www.reaa.ru/cgi-bin/yabb/YaBB.pl?num=1200089796/540

Can you find out from Bruce what happened to Haig? Did he turn sour after the GLA folded or die he become ill, die or whatever. After the American Eaglet this very prolific designer disappeared. What happened? (My suspicion is that when he selected the wrong airfoil – pressure recovery – he couldn't live it down but several modern airfoils could make the Bat GO!

Now I will lay all this on TWITT if you will take it 5 pages at a time – all as printed by GLA Inc., plus the Soaring add-ons. Perhaps TWITT can upgrade it dimensionally.

(ed. – Syd, we are always looking for items to add to the TWITT archives so we certainly could see what can be done with the pages. So send along what you can in package sizes that are convenient for you.)

Submitted by Larry Witherspoon, our member at Boeing.

The Boeing X-48C research aircraft flew for the 30th and final time Tuesday, marking the successful completion of an eight-month flight-test program to explore and further validate the aerodynamic characteristics of the Blended Wing Body design concept.

All 30 flights were conducted at NASA's Dryden Flight Research Center in California. The X-48C typically flew for approximately 30 minutes on most flights, reaching speeds of up to 140 miles per hour (225 kilometers per hour) and attaining an altitude of about 10,000 feet (3,048 meters). X-48C flight testing began Aug. 7, 2012.

"Working closely with NASA, we have been privileged throughout X-48 flight-testing to explore and validate what we believe is a significant breakthrough in the science of flight -- and it has been a tremendous success for Boeing," said Bob Liebeck, a Boeing Senior Technical Fellow and the company's BWB program manager.

"We have shown that a BWB aircraft, which offers the tremendous promise of significantly greater fuel efficiency and reduced noise, can be controlled as effectively as a conventional tube-and-wing aircraft during takeoffs, landings and other low-speed segments of the flight regime," Liebeck said.
Don Winter, Boeing Research & Technology vice president of Flight and Systems Technologies, said the team has gained immensely from testing the aircraft.

"The most important artifact of this historic program is the wealth of knowledge gained on flight characteristics and handling qualities of BWB aircraft,"

said Don Winter, Boeing Research & Technology vice president of Flight and Systems Technologies. "Our team's performance has been exemplary in the face of many challenges, and they are to be congratulated for a job well done."

The X-48C, designed by Boeing Research & Technology, built by Cranfield Aerospace Ltd., and flown in partnership with NASA and the U.S. Air Force Research Laboratory, is a scale model of a heavy-lift, subsonic vehicle that forgoes the conventional tube-and-wing airplane design in favor of a triangular tailless aircraft that effectively merges the vehicle's wing and body. Boeing believes the concept could be developed in the next 15 to 20 years for military applications such as aerial refueling and cargo missions.

The X-48C is a modified version of the X-48B aircraft, which flew 92 times at NASA Dryden between 2007 and 2010. The X48C is configured with two 89-pound (40-kilogram) thrust turbojet engines, instead of three 50-pound (22-kilogram) thrust engines on the B-model. In addition, the wingtip winglets were relocated inboard next to the engines on the C-model and the aft deck was extended about 2 feet (61 centimeters) at the rear.

"With the completion of X-48C flight testing, we have accomplished our goal of establishing a ground-to-flight database, and proving the low-speed controllability of concept throughout the flight envelope," said Fay Collier, director of NASA's Environmentally Responsible Aviation project. "Both very quiet and efficient, the concept has shown promise for meeting all of NASA's environmental goals for future aircraft designs."
By Thomas Koehler

ABOVE: The Boeing X-48C research aircraft flew for the 30th and final time April 9 at NASA's Dryden Flight Research Center in California. The airplane is shown here during its 22nd flight on Feb. 28, 2013. NASA photo by Carla Thomas.

ABOVE: Designed by Boeing Research & Technology, built by Cranfield Aerospace Ltd., and flown in partnership with NASA and the U.S. Air Force Research Laboratory, the Boeing X-48C research aircraft was used to explore and further validate the aerodynamic characteristics of the BWB design concept. The airplane is shown here prior to a test flight in fall 2012. Photo by Bob Ferguson.

(ed. – My thanks to Larry for providing this material. He has also submitted it to the Nurflugel group so there are some comments from them later in this newsletter.)

Subject: Birds of Paradise Project

All, enjoy this precious, vanishing resource while we still can.

https://www.youtube.com/embed/REP4S0uqEOc

Phil Barnes
<pelicanag@aol.com>

(ed. – This is a very good five and half minute narrated video by The Cornell Lab of Ornithology of some very unusual bird life in its natural habitat.)

(ed. – The following letter and accompanying article came through my ESA e-mail address but has to do with the discussion on lift theory. Since I have been carrying the discussion in both newsletters I am including it here for your comments. My thanks to the ESA member for passing this along to John and to John for his contribution even though he is not a

member of either group. All relevant material is always welcomed by this editor. He agreed to including his e-mail address so you can respond directly but I ask that you please copy me so I can share it and his re-response. Thanks for any comments you may have.)

Your reader showed me the January 2013 issue of Sailplane Builder for my comments on "The Wing Lift Wars". I have written a short article on the subject (attached) which I offer for publication in the hope that your readers would be interested.

I began gliding in 1947, was an instructor for over 20 years and retired from active flying in 2009. On technical matters, I was employed from 1952 to 1992 at the English Electric aircraft company, later BAE etc, working on the flight controls and handling qualities of five RAF Service fighter and strike aircraft, two of then fly-by-wire, and three fbw research aircraft, and then completing a few years of occasional consulting work for them. (I even met Mary Schafer, though we did not discuss Lift Demons.)

An aeromodeller in my youth, I absorbed plenty of what I eventually realized were simply aeronautical myths, also becoming amazed at how deeply entrenched these were in aviation folklore. Though not a theoretical aero-dynamicist, my work was in our aerodynamics department in a fruitful collaboration with our test pilots, making it possible to eradicate all the popular fallacies from my personal internal library, of which lift fallacies were about the last to go.

All the usual fallacies appeared in the "Wing Lift Wars" pages of the magazine. I took the opportunity to write in simple terms on how lift actually works. If you publish it, I would ask that if you receive any comments needing a response I could be sent a copy in time to write straight back.

With best regards,

John Gibson
<john.gibson@orpheusmail.co.uk>

Press Release 25.03.2013

Vision of a Danube flight: the idea of the “Tailor of Ulm” lives. Evaluation criteria for the City of Ulm Berblinger Competition 2013 now published.

With the Berblinger Competition 2013, the City of Ulm is once again calling for innovative ideas for civil aviation to make flying more environmentally friendly. The Berblinger Jury, which includes renowned aviation experts, has now published the evaluation criteria that will be used to judge the 2013 competition entries. Applications may still be submitted up to 30th June 2013.

Is it possible to perform a long-distance flight using environmentally friendly construction, components and propulsion systems within 10 years time? The City of Ulm believes: yes – and for the Berblinger Prize 2013 it has committed itself to promoting visions and developments in the field of general aviation, which aim to meet this goal.

In 1811, Albrecht Ludwig Berblinger had the vision of crossing the River Danube from one bank to the other using a hang-glider. In the spirit of Berblinger, and continuing his vision, the City of Ulm aims to promote innovative developments in general aviation that makes it possible to perform an environmentally sustainable long-distance flight. The long-distance objective is a competition flight following the course of the Danube along its whole length from source to mouth, as free of noise and emissions as possible. Therefore, the motto of this year's competition: “Vision of a Danube Flight” completely in the spirit of the legendary Tailor of Ulm.

The objective of the Berblinger competition 2013 is to show in theoretical projects the approaches that could be pursued in order to achieve this goal of environmentally sustainable long-distance flight.

We are looking for ideas for an innovative, manned aircraft or for individual components that can contribute towards the realization of this “Vision of a Danube Flight”. Aspects of environmental sustainability such as energy consumption, exhaust and noise emissions, will play a particularly important role. The prize money amounts to €25,000.

The Berblinger Competition 2013 will have its own stand at the AERO aviation show in Friedrichshafen from 24th – 27th April. Visitors will be able to find out all about the current competition and pick up the entry packs. The latest information on the 2006 and 2011 competitions is being prepared in time for the AERO and will be available at the show. The book also contains a media CD, which is an impressive record of the 2011 Berblinger Flight Competition.

The evaluation criteria, the entry form and other information on the competition are all available at http://www.berblinger.ulm.de/.

(ed. – I have included this announcement as I do almost every year so those of you who might be interested in such design competitions can participate. If you should submit a proposal for this event could you also please share it with the group within any such limitations that may be imposed by the competition organizers. Thanks.)

Wing Lift: Peace for 120 years
John Gibson

Practical lift theory began to emerge 120 years ago, experiment and theory each constantly developing and confirming the other up to the highly advanced state of today's knowledge. Nobody in the aerodynamics community fights wars over it. A hundred years ago there was little theory in the public domain, so the aviation community invented its own and has taught many of them to succeeding generations without seriously checking against current knowledge. The superb Lift Demons lampoon by Mary Shafer may have been prompted by Jeff Raskin's discovery in 1994 that the equal transit time notion (ETT) coupled with the Bernoulli Principal could not explain lift. He was right but the popular conclusions that followed were wrong.

It has always been part of lift theory that the upper surface flow passes the trailing edge well in advance of the lower (at negative lift the reverse applies). Despite this, it is now commonly asserted that lift theory had always been wrong (often in the form "Bernoulli was wrong!") and that the huge advances in aviation were achieved with no knowledge of how aircraft flew. Does anyone really believe this? ETT is wrong but aerodynamicists did not invent it. The Bernoulli Principle was right in the 1750s and is so now, but it was not a lift theory. It defines the fluid pressure and velocity relationships in pipes, with a constant mass flow rate independent of the diameter, and it does not apply in a free fluid stream. In aerodynamics it is applied along the flow streamlines in which by definition the mass flow rate is also constant.

Lift and Circulation

Submarines at neutral buoyancy and wings in flight are supported only by the pressures on their skins with a downward force on top, which is lower than the upward force underneath. Submarines passively use the natural water pressure gradient, and current examples need to be scores of feet deep to obtain the necessary pressure range. Wings generate their own pressure field to modify the wing surface pressures with a lift force equal to the wing loading. The 5 to 6 lbs/sq.ft of many gliders is a mere 0.25% of the low altitude static pressure, but however large the aircraft, circulation explains its lift. There is no other source.

The theory was derived in the 1890s by three researchers, each unaware of the others. They were Lanchester (U.K.), Joukowski (Russia) and Kutta (Germany). Its roots lay in the 1750s hydrodynamic theory but it was sparked by the mid-19th century Magnus theory explaining the drifting trajectory of rotating cannon balls and the vortex theories of Helmholtz. It says:

In upright flight, a vortex is generated around the wing, increasing the streamline flow velocities on its upper surface and decreasing them on the lower. The respective zero lift surface pressures decrease and increase in accordance with the Bernoulli Principle. The net forces act upwards on the lower surface and downwards on the upper, the net vertical components being the only lift force. The fundamental lift theorem is:
"Lift per unit span = circulation strength x air density x velocity"

Derived by Joukowski in 1906 and found implicitly in Kutta's work in 1910, this theorem was later confirmed by physical lift and circulation measurements. It led Joukowski to the generic form of modern aerofoils with rounded leading edge and thin sharp trailing edge, both of which perform necessary functions for efficient lift. Kutta found methods to calculate lift on a simple Lilienthal circular arc aerofoil, explaining the mystery of lift generation at zero angle of attack (AoA). Before the 1920s, the basic low speed theory had been established by Prandtl and his Goettingen team with the viscous boundary layer, which is the cause of skin friction, form drag and the stall but without which lift would be impossible, and with the additional lift-induced drag of a complete wing, described below. Very highly developed for many decades, the theory served aviation well and still underpins the design of

low speed aerofoils and wings. The complete 18th century Euler inviscid fluid hydrodynamics and the 19th century Navier-Stokes viscous flow theories have become increasingly used in the last half-century, but they were insoluble prior to high powered digital computing.

Techniques developed in early experimental aerodynamics for flow visualization allow no argument about the nature of airflow around aerofoils and wings. Most people are familiar with the Magnus effects of a curveball struck or thrown with spin. With no spin there is no lift force. With spin, the adjacent air carried round by it creates pressure changes with a force normal to the spin axis. The deviation from the zero-lift ballistic path is controlled by the spin rate and its direction. The effect is better envisioned in lift theory by a spinning cylinder, which given a diameter equal to the chord can produce four times more lift than an aerofoil with high lift flaps.

The same circulation principle applies to aerofoils and wings despite the lack of mechanical rotation. At the zero lift AoA, pressures above and below are mostly suction (or static pressure on flat plates) that cancel each other out. As the AoA is altered, lift begins to be generated by initiation of a vortex around the aerofoil triggered by separation of the boundary layer at the sharp trailing edge, continuously sustaining and adjusting the vortex strength to maintain a smooth flow off the wing. It adds to the velocities and the suction above and decreases them underneath, creating lift proportional to AoA and speed squared. For negative lift the reverse effects ensue. All sections lift in the same basic manner whether cambered, or symmetric, or flat plates (inefficient) or curved plates (good for small slow model aircraft).

False Lift Explanations And Their Correction

The common fallacies about basic lift theory are clearly marked by any or all of the following typical features. They are often found in "pilots' literature", whether official teaching or not, and some are found in unreliable Wikipedia entries.

There is no mention of circulation (though the current PHAK attempts to describe it but gets it wrong while also retaining the common fallacies).

It invokes Newton's 3rd law. This refers to opposing force pairs, not motion. It says that lift equals weight in steady flight but it cannot explain the lift. Newton used the 2nd law of solid body momentum (which is inapplicable to a free stream of fluid) to suggest a drag formula for spheres in a fluid, but when it was later adapted to flat plates at small AoA the predicted lift was so poor that scientists ridiculed ideas of winged flight for most of the 19th century. (Try kicking a ball carved out of air.)

The "Newtonian reaction" fallacy is coupled with pushing air downwards. Testing of aerofoil in two-dimensional flow wind tunnels (on model wings spanning the tunnel to eliminate tip effects) proves that air approaches in an upwash followed by a reversal to the original level with no net downwash. A wing with tips generates a downwash, but it decreases lift and causes lift-induced drag. It results from the two trailing vortices rolled up from the fragments of the lift vortex shed across the full span. The flow between the tips is depressed in a downwash from a point ahead of the wing by the vortex pressure field, reducing the AoA which must be restored with a nose up pitch attitude increment. The horizontal component of the aft-tilted lift creates a lift-induced drag. An upwash is also created extending out laterally, vital to birds migrating in V-formation skeins.

It may refer to a wing pulling the upper flow down. Pressure cannot be negative, and "suction" is just a positive pressure that is less than static. The pressure gradients across the flow from the undisturbed static pressure above to the reduced pressure on the wing surface push the flow against the wing. It may be said that viscosity "sticks" the flow to the surface, but it is not a glue and it ultimately causes flow separation. On the lower surface the pressure may quite typically be mostly a "suction" as noted earlier, though weaker than on the upper, but it will be raised a little at high AoA or considerably near a high lift flap even at low AoA. Aerofoil profiles act like bounding streamlines, and streamlines meet at an angle only at a stagnation point and do not "bounce off" another.

The principle of the venturi may be offered as a wing lift analogy. Usually it will then be cut in half and an unidentified imaginary restriction is added to the flow above it, thus removing the possibility of a venturi effect and of circulation. Because the mass flow rate is constant in a closed tube, a venturi throat velocity is fixed by the throat to inlet area ratio. The Bernoulli Principle, also valid only in a closed tube, gives the pressure. Streamlines are notional closed tubes by definition, containing constant particle mass flow rates and with velocities determined by circulation. They self-adjust their cross sections to maintain the mass flow rate and the Bernoulli Principle gives their

pressures. As a result they move closer together as velocity increases and pressure decreases, or move apart as velocity decreases and pressure increases. So a streamline is like a flexible venturi in which the flow conditions control the diameter.

The Significance Of Aviation Fallacies

Apart from wasting effort on teaching/learning/ arguing about them (for 100 years!), the common lift fallacies discussed briefly above have been of little significance to pilots because they do not influence flight safety. That cannot be said for other fallacies, some equally old, concerning the flight mechanics of aircraft behavior and how to handle them. The one about reflex wing sections on tailless aircraft that appears in the February issue is almost universal among pilots, but it has no influence on stability. Who now knows that the correct techniques developed by the Wrights in a few flight hours up to 1905 were ignored by aviators until the 1950s? Pilots even today are still having the same stalling accidents that killed and injured large numbers of early pilots. But that's for another day.

References

Some trustworthy references are:

"Aerodynamics for Naval Aviators", HH Hurt, 1960. Simple language and good diagrams, readily available as a PDF.

"Theory of Wing Sections", Abbott and von Doenhoff, 1949/1959. Very comprehensive by two NACA staffers, with plenty of easy narrative reading (for this the maths can be ignored).

"A History of Aerodynamics", JD Anderson, 1997. All-narrative, no maths, goes back 2000 years to Aristotle and Archimedes.

Nurflugel Bulletin Board Threads

Space Ship Two flew today, under rocket power for the first time, and went supersonic. Good flight. My friend, Mark "Forger" Stucky was pilot in command. ;-)

http://cosmiclog.nbcnews.com/_news/2013/04/29/17969959-spaceshiptwo-lights-up-its-rocket-for-first-time-and-goes-supersonic

Al Bowers
<Albion.H.Bowers@nasa.gov>

Wow! Just wondering: To exit earth you need more than Mach 1? What speed did the Apollo-rockets have? What speed does the Space Ship two need?

Koen Van de Kerckhove
<nestofdragons@hotmail.com>

mmm Why is it we always hear of such things after it's over?

Dan Field
<danfield@roadrunner.com>

In the nature of complex systems, there are many many attempts before success happens. And in a volatile environment, it's better to be tight lipped until success is already past. I don't blame them in the least, the Scaled folks have been working really hard...

Al Bowers

Koen,

SS2 only needs to go about Mach 3 to make 100 km (or miles for that matter) altitude. For Low Earth Orbit, it's about 25,000 kmph (18,000 mph). Apollo getting to the Moon it was about 40,000 kmph (25,000 mph)...

Al Bowers

Now if we could get Rutan/scaled interested in nurflugel...I would volunteer to sweep floors at the place and work my way up to engineer...Perhaps it is better they don't, at least for my marriage.

Nick Strum
<grindelsturm@yahoo.com>

In the late 70s/early 80s, I was invited by my good friend Bruce Carmichael to attend a symposium on low speed/low Reynolds aero at the National Institute of Sciences auditorium, and was delighted to find that it included Burt, Paul MacCready, John Roncz, Mac ? from North American and a couple recent grad students, deep thinkers, sailplane guys, then @ NASA.

Bruce asked if I could arrange a visit to NASM's Garber facility, and we spent hours there, going

through all the closed buildings. Burt quickly emerged as the lightning rod and leader of the group, and while captivate by the Ho229 and unrestored HoVI and many HoIII projects, was most captivated by the XP-55, the V173 and the Bv155a.

Many of you don't recall that in his early post VariViggen days, Burt worked in Newton, KS for Bede, on the flight testing and stability of the BD-5. He was also the leader on the BD-2 modified SGS2-32 globe circling a/c, "Project LOVE." He spoke of being driven by the Breguet formulas for range and efficiency.

We spent a long afternoon at a pizza place, kicking thoughts around, the most memorable being Burt crystallizing his concepts, joined in by Paul. Burt emphasized that he too was initially focused on all wing designs, but IIRC, stability over a wide speed range was the bugaboo. Paul indicated that resulted in his experience in his Condor, essentially a "one speed" design, and soon we'd see that reflected in the faster, but speed range limited Voyager, etc.

Note that Paul returned to the all wing concept with his long endurance Helios, which fell victim to stability/structural issues.

I wish I could recall more of the sailplane focused grad students, One was Dan Sommer, and the otherdid summer internships @ Miss. State, with Dick Schreder, and Dr. Paul IIRC.

Bob Storck
<bstorck@sprynet.com>

Burt built the Viggen while still working for the Air Force, but didn't fly it until working for Bede. Evidently, the model flew very poorly. For his account, go to:

http://www.youtube.com/watch?v=OzYPaWMI-do

watch the rest of the 8 parts of the speech - very entertaining.

On the very first business trip I took with Burt, and I hadn't officially started working at Scaled so I barely knew him, we flew to Wichita and had dinner at some restaurant on the top floor of a hotel next to the airport. On the way up the elevator, I asked Burt, "How was it working for Jim Bede?". Burt told the most hilarious Bede stories for the next 3 hours.

Burt always emphasized that the most important thing at work was to have fun, and he certainly did that.

I hope he writes memoirs, because the stories I've heard are priceless, and I'm sure I only heard a few.

Dennis Olcott
<dennisolcott@hotmail.com>

A few pictures of Boeing X 48 C

http://ar.images.search.yahoo.com/search/images?_adv_prop=image&fr=sfp-yff20&;va=Boeing+X-48+c

Doug Russell-White
<dear_w2002@yahoo.com>

And what a load of pix! Thank you Doug.

Note that the X-48B has three engines, and the X-48C has two turbofans, and loses the tip winglets.

Bob Storck

http://www.designation-systems.net/dusrm/app4/x-48.html

http://strangevehicles.greyfalcon.us/Espenlaub%20Experimental.htm

Not sure but I can't see a tail in that picture. Look at the set of 3 pictures after the text:
"Testing of the solid fuel black powder rockets is conducted in 1928 extensively at Düsseldorf. On October 22, 1929 Espenlaub flies the rocket glider but disaster strikes as it begins to burn. He manages to land it safely without injury."

Koen

At http://www.amicordoba.com.ar/ala_volante.html you can see a 3/4 view from the front of the Horten glider. And ...I noticed that bizarre screen below the already known screen. Euh ...what is the reason for this second screen??? It looks like you can only see the gliders nose through it.
Keep that brain spawning wings.

Koen

Koen,

The two screens are for the pilot and the instructor. This was the first trainer that Horten designed. The second was the I Ae 41 Urubu (aka Ho Xvc) which used side-by-side seating.

Al Bowers

Al, I meant the one that is placed on that page in color. I recognize the trainer in the black and white photo. But ...in the color photo you also see two transparent parts. The lower one is rather tiny. Euh ...a transparent part to let the sun shine on the feet of the pilot ??? I really see little usability for that transparent part. Why is it there?

Just curious.

Koen

Al,

Koen is drawing attention to the "banner" photo near the top of the page with "ALA VOLANTE" in

blue and white lettering superimposed at the right bottom corner. The windscreen he's talking about wraps around the front of the cockpit, meeting the wing top surface at both ends. This is positioned well forward of the pilot and at an angle that seems to be right in line with the pilot's eyes; the pilot would be looking across the front surface, not through it. It looks more like an inspection window used during assembly as it seems to be over the main spar connection.

Bill and Bunny Kuhlman
<bsquared@centurytel.net>

I don't know if, in the original tandem seat configuration, the rear cockpit was equiped with an instrument panel. Perhaps this front screen is just to give some light from the rear seat to the forward instrument panel???

Philippe Vigneron
<retrofitprsp@yahoo.com>

It was common on some a/c with panels forward under a cowl and small bubble canopies, often filled with big heads. I flew a LK flat top, Ka6BR and a Bowlus Baby that had clear or translucent panels above the
instruments.

Bob Storck

I was really surprised when I looked in my mailbox this week. The director of the Department of aviation of the UNC University of Cordoba contacted me. He gave me lots of pictures of the foot-launched gliders of Reimar Horten. I got permission to place it on my site. So ...go see here ->

http://www.nestofdragons.net/new.aspx

Keep that brain spawning wings,

Koen

Fantastic! There is a lot of interesting stuff. If we look carefully to some of the Ho Xa pics, we can see the twist distribution from the trailing edge distance to a reference line.

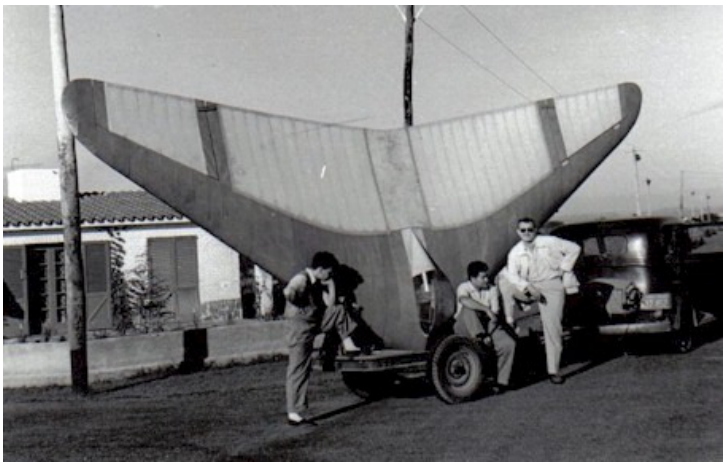
These pictures are a valuable source of design solutions. What a luck we have somebody inspired by your efforts, thanks a lot.

As you (almost) say "keep that dragon site spawning flying wings",

Mario Campanella
<mcc@xs4all.nl>

Thanks for sharing these pictures. Interesting spar design and construction. It just seems so different from what I've seen in the other wings. These are awesome pics!

Bill Sharpe
<sharpeb62@yahoo.com>



See one more sample picture on the next page.

AVAILABLE PLANS & REFERENCE MATERIAL

Tailless Aircraft Bibliography

My book containing several thousand annotated entries and appendices listing well over three hundred tailless designers/creators and their aircraft is no longer in print. I expect *eventually* to make available on disc a fairly comprehensive annotated and perhaps illustrated listing of pre-21st century

tailless and related-interest aircraft documents in PDF format. Meanwhile, I will continue to provide information from my files to serious researchers. I'm sorry for the continuing delay, but life happens.

Serge Krauss, Jr. skrauss@ameritech.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.
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 $250 US delivery, $280 foreign delivery, postage paid.

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