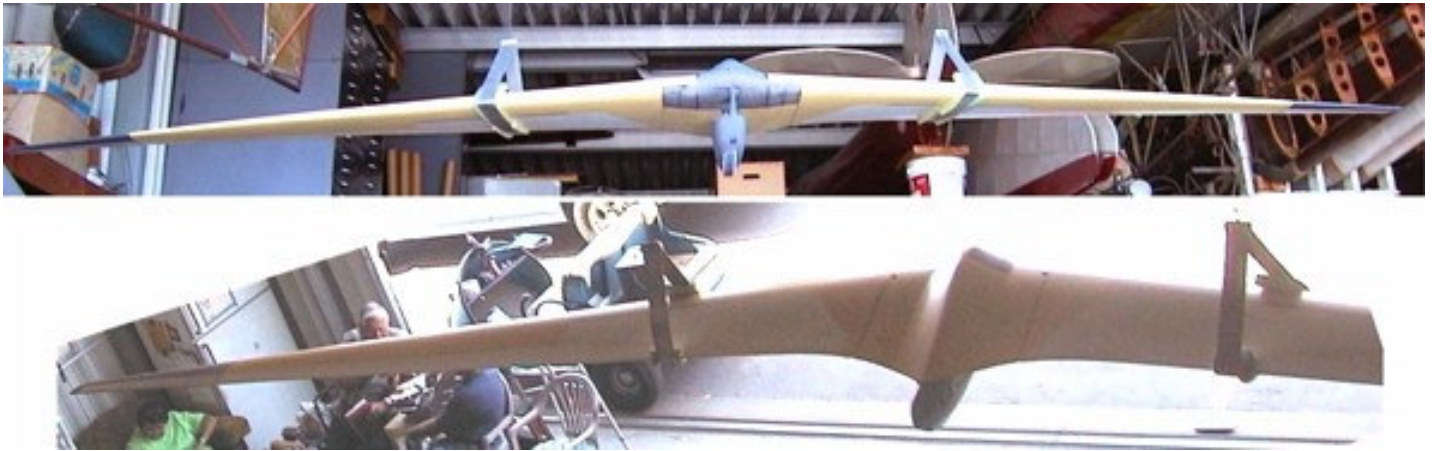


T.W.I.T.T. NEWSLETTER



HORTEN IV SCALE MODEL SUSPENDED FROM THE CEILING OF THE TWITT HANGER SPACE. FOR MORE ON HOW THIS MODEL CAME ABOUT SEE THE MEETING RECAP SECTION ON PAGE 2.

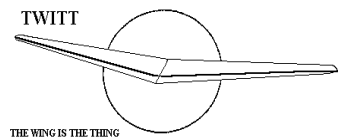
T.W.I.T.T.

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., 0308 means this is your last issue unless renewed.

Next TWITT meeting: Saturday, September 20, 2003, beginning at 1:30 pm at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row on Joe Crosson Drive - Southeast side of Gillespie).



**THE WING IS
THE THING
(T.W.I.T.T.)**

T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is affiliated with The Hunsaker Foundation, which is dedicated to furthering education and research in a variety of disciplines.

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Meetings are held on the third Saturday of every other month (beginning with January), at 1:30 PM, at Hanger A-4, Gillespie Field, El Cajon, California (first row of hangers on the south end of Joe Crosson Drive (#1720), east side of Gillespie or Skid Row for those flying in).

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PRESIDENT'S CORNER

Yes, the newsletter was late this month. I got behind and didn't change my calendar over so thought I had another week to pull it together. Sorry for the delay.

I am always amazed at the fact that even when we don't have a formal program planned, the meetings seem to take on a life of their own and work out just fine. Such was the case with the July meeting where a select group of flying wing enthusiasts gathered to talk about all things Horten and, many other subjects as you will see from the meeting recap starting on the next page.

Bob's Horten IV scale model looks great hanging in the front of the hanger, as you will see from the pictures accompanying the recap. If you haven't had a chance to come by the hanger in a while, make a point to drop by any time, even if it's not a meeting day, and take a look around. Bob and June usually are there from mid-morning Saturday through early afternoon on Wednesday (they take Thursday/Friday off). Call the daytime number shown in the left column to make sure someone is there and come on down.

Don't forget about the SHA Western Workshop at Tehachapi's Mountain Valley Airport over the Labor Day weekend. There will also be a week of vintage sailplane activity before the workshop, so if you are interested in that area of soaring history take some time during the week and head on up for look. By the time you read this, hotel rooms may be gone in the local area, but there a lots of them in Mojave, which is just a 30-minute drive away, plus there is an on-airport campground with most services. I have posted the speaker schedule later in the newsletter. Quite a program Bruce Carmichael has put together this year.

If you have cable television, keep an eye open for "Breaking the Sound Barrier" on the History Channel, Discovery or TLC. It includes pieces with Al Bowers from NASA Dryden explaining shockwaves around a wing shape.

Andy



**SEPTEMBER 20, 2003
PROGRAM**

Just like a broken record, we will inform you that as of our publication date we did not have a firm commitment on the September program. We are continuing our efforts to put together a speaker-oriented program for your enjoyment.

**JULY 19, 2003
MEETING RECAP**

Andy called the hard-core group of TWITT members together and sat them in a small circle so everyone could communicate easily. He opened the meeting explaining that things had not worked out quite as originally planned. The group was supposed to put the pieces of Bob's Horten IV scale model together and then assist in hanging it from the rafters of the hanger. That task was taken out of our hands two-weeks prior when Bob's son assembled the model and with the aid of others around the airport and a loan of a very tall stepladder, put it up. This turned out to not be a easy as it would appear at first glance and turned out to probably be the best thing for everyone.



ABOVE: This is a shot of the Horten model now hanging in the front section of the Fronius hanger. As you can see there is quite a collection of airplanes and parts attached to the walls. The V-Tail is the old Robin and the red/white tail is to the Lil Doggie. The T-Tail behind the Horten belongs to the Waterman.

The question was asked if the original Hortens were still in Germany. Andy answered after WW II many of Horten's aircraft were brought to the US and studied by

various groups. Some of these ended up in the Smithsonian to be studied and re-built. However, as with most government agencies the lack of money probably got in the way of these projects and over time the aircraft languished in the storage facilities. Several years ago the Smithsonian worked out a deal with the Technical Museum in Berlin to rebuild some of the aircraft and return them to the Smithsonian. Payment would be a Horten III to be retained in Berlin. This project is well on its way to completion as can be seen in some of the photos available on the TWITT website. It is our understanding that the Museum is also preparing sets of technical drawings for these aircraft.



ABOVE: Part of the group discussing the Horten designs. Left to right are: Evan Stover, Walter Scott and, Bob Chase.

Bob also noted there is a Horten IV at the Planes of Fame museum located on the Chino airport in Riverside. This is the same one that was tested at Mississippi State University by Raspert and his staff, and flown by Rudy Opitz and Georges Dez-Falvy. It was also flown by Ray Parker at Elsinore, California, with Parker experiencing the same problem of the hatch cover coming off as happened at least once while at Mississippi.

From some recent reading it appears that Northrop had an opportunity to study the Horten designs while he was developing his first series of test aircraft leading up to the B-35 and YB-49. Apparently Northrop dismissed most, if not all, of Horten's work in designing the Northrop wings. There is some speculation that the Northrop wings may have turned out differently had he incorporated some of the lift distribution ideas.

The discussion went on answering another question about why the interest in the Horten designs. Andy offered that they performed very well for the time and, that some feel with modern day materials and new airfoils that they would make excellent sailplanes today. However, without detailed construction plans it has not been possible to produce similar type sailplanes.



ABOVE: Center section of the Horten IV with the framework of the Waterman in the background.

Bob passed around some of the older pictures he has of the Horten IV he was using for the scale model. We would have included some of them in the newsletter, but Bob assured his source that they pictures would not be published, so we will continue to honor his promise. The general public has seen similar pictures over the years on various websites and in the books written about the Hortens. However, there were some pictures of the trailer that I do not recall ever making it into any publications. Basically, it looked very similar to our modern day covered trailer except that the rear and front sections had to be pulled off by hand and, the mid-section rose up like Mercedes gull-wing doors. Bob is no longer working on his scale trailer.

Bob discussed the bell shaped lift distribution briefly for the benefit of a couple of new members joining us. His main point was the lift distribution created a down load on the tips based on the Horten twist distribution. He noted that they were stable machines, but would bite you if flown improperly.

At this point we sort of started straying from discussion about the Horten designs. A question was asked about the bi-plane hang glider hanging from the rafters. This is Doug Fronius' Waterman glider designed by Waldo Waterman around 1972 by adapting the 1909 Popular Mechanics glider to fly better. Doug built it from the plans and flew it about 250 flights from various slopes around the Southern California area. It was originally designed for just tip rudders with the tail rudder fixed, but this was changed to include a moveable tail rudder later on for better directional control. The tip rudders are linked to the tail rudder for better-coordinated turns and it uses weight shift for pitch control.



ABOVE: This view of the Horten gives you a better look at the outboard spoiler/deflectors on the Waterman glider that Doug described. Just barely visible behind the Robin V-Tail is another flying wing concept model that didn't work out to the designer's satisfaction.

Doug's version has about 6' more span than the original and the tail boom has been modified for more strength and stiffness following a 3/4 turn spin into the ground that broke the glider up a bit. That is one of the reasons for the moveable rudder. It is no longer flyable since the fabric is so old and probably wouldn't stand the tear down and move to a flying site.

Bob Chase brought up the subject of Nicholas Cafarelli's idea on building a flying plank with only rudder and elevator (no aileron control) as published in this month's newsletter. He had some experience in a couple of airplanes without ailerons like the Flying Flea and Quick Silvers that use only dihedral. Doug asked how Nicholas intended to roll the airplane and Bob

explained he would use rudder and general dihedral. Bob found it works in calm air and you can land directly into the wind, but this configuration becomes a problem when you have to land in a crosswind. Gavin mentioned Bob Storck's comment on the Sky Pup in terms of construction techniques and, that there had been one on the Gillespie Airport for a while, but apparently it is now gone.



ABOVE: More of the Horten IV with the Robin wings (dark wood) and Super Bowlus wings (white). This is also a good shot of the Gottingen airfoils.

Doug noted this is the 100th anniversary of flight this year and what we are celebrating is the use of 3-axis controlled flight. People flew before the Wright Brothers, but not with 3-axis systems, including powered ones, however, they weren't considered controlled flight. Pat Oliver noted that one of the things the Wright's invented was the isolating of each individual problem and then solving them in a methodical way. Doug noted that some of their ideas were wrong, but obviously they were able to work through them with this approach to engineering.

Bob Chase also talked about a recent flight he had at El Mirage dry lake in a two-place trike. They had taken off early in the morning to avoid the thermal turbulence normally associated with later in the day. At about 9 AM they found themselves kicked up to about a 45-degree angle by a short, unexpected burst. It got him to thinking that you can handle light turbulence in an ultralight, but what about if you hit a rotor. You can hit a horizontal rotor and perhaps not have the control authority to recover from the upset. There have been recent cases of very experienced trike pilots being killed in such conditions.

Pat noted that this is one of the reasons why trikes are so popular in Northern Europe and England because they don't have the level of turbulence we have here in parts of the US. In answering another question from the group, Pat noted that flying in turbulence in a trike can be very tiring since you are trying to overcome the mass of the trike and the two pilots with every input through the control bar.



ABOVE: From this view of the Horten you can also see the framework of the Waterman glider. The middle triangular bay in the tail boom was added after the spin accident to provide additional strength and stability to this section of the structure.

So the bottom line to all this discussion was that you can build these light aircraft with no ailerons, but you have to realize their limitations in terms of the kinds of weather conditions in which you fly. Owners of Flying Fleas have told Bob that they are great little airplanes to fly in calm air, but if you have "bad" air just stay on the ground. Pat offered that many ultralight pilots who get into trouble are those who have received the minimum amount of training to be cleared solo. They get into situations where they don't have the "air sense" to understand what they are getting into, often with disastrous results.

Bob Fronius asked his other son, Floyd, to come over and talk about some the more recent developments in hang gliding. Floyd started by talking about the world record camps that have been held at Zapatta, Texas (near El Paso and Brownsville) for the past couple of years. This area near the Mexican border has an excellent dry line that would maintain conditions for long straight-line flights. The convergence of the Gulf moist air and the drier desert air created cloud streets for hundreds of miles long to

the north and northwest. The flights are started from aero tow as with conventional sailplanes and launch times are determined by weather conditions as with any soaring flights.



Last year's camp resulted in some record flights in both paragliders and hang gliders. There were at least two flights over 400 miles, some of which lasted until almost sunset to accomplish. There are times when the sunset rule is pushed to the limit in order to get the most distance without violating it and voiding a record attempt. Sometimes the flights can reach altitudes up to 18,000' so many of the pilot's carry supplemental oxygen.

Bob asked Floyd to describe some of the other equipment that is carried on these types of flights. For record flights you need a barograph and most used are the new electronic type. There is also a lot of instrumentation that has been designed for hang gliding, like small electronic units that contain all the normal flight parameters of airspeed, altitude, rate of climb, etc. Some units also have a inter-connect to a GPS to give you a flight computer for calculating the final glide or speed between thermals. They also have units that record all this information during the flight and allow you to download it into you home computer for analysis, including a 3-dimension map of the flight.

In San Diego there are two primary cross-country sights, Horse Canyon (Buckman Springs) and the eastern slope of Mt. Laguna (Sunrise Highway). These are on either side of the local convergence area that on good summer days create cloud streets which favor launching from the Laguna site. If you can't get

off until later, then the Horse Canyon site is more favorable.



ABOVE: A closer shot of the fuselage pod of the Horten IV. This was supposed to be LA-AC, but through a miscommunication the model builder, Harald Buettner labeled as LA-AA.

Bob told the group about starting a local hang glider club a number of years ago called the Ultralight Flying Organization (UFO). It grew to over 400 members from the San Diego area and promoted flying from all the local sites, some of which still exist today, like Horse Canyon and Mt. Laguna.



ABOVE: This is the group that has grown by the addition of Floyd Fronius telling the group about some of the records that have been set by hang gliders over the past year or two. Left facing is Floyd, then clockwise is Bob Fronius, Gavin Slater, Pat Oliver, Evan Stover and, Walter Scott.

From this point on the discussion sort of wandered off onto a number of different subjects not necessarily related to flying wings, flying or airplanes. So at that point Andy announced that cake and ice cream was being served and told everyone to get the cold stuff before in melted in the heat of the day.



ABOVE: This is the cake you missed to go with the strawberry ice cream. The photo is the cover from the very first TWITT newsletter cover that I believe was edited by Richard Miller. Thanks to Bob for a very topical theme on a very good cake.



LETTERS TO THE EDITOR

July 7, 2003

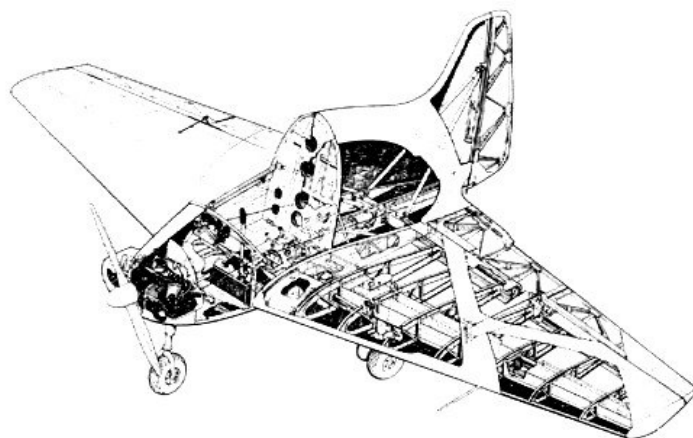
TWITT:

I have been able to acquire a working set of construction drawings for the Fauvel AV60 Leprechaun developed by Fauvel and George Jacquemin during the early 60's. The aircraft was based around the Jodel D 9 sizes and wing spar and a prototype was built in Texas and test flown very successfully. The aircraft can be built as a tail wheel aircraft or tri gear. I have also be able to acquire original 16 m.m. color film footage of the first taxi trials and take-off shot on the day. The aircraft was powered by a 1300 c.c. VW. Cut away drawing

attached. I have plans for building an example and also selling the drawings.

Thanks,

Rob Germon
rjg@paradise.net.nz



(ed. – Rob also sent along several messages to people who had been asking questions on our website, so I have also included them.)

Hi.

Does anyone know a documentation source for the Horten IV and VI, such that scale models can be built? Please write and let me know.
Thanks.

Steven Seim
sseim@microsoft.com
Redmond, WA USA

Hello Steven.

I have some of the original drawings from Germany of the layout and construction of the Horten wing. I also have a large file of accurate Horten lift and airfoil data.

Rob

(ed. – Steven replied with this message and Rob passed along some more information.)

Thank you for contacting me Rob.

Would you be willing to share your findings? If they are digital, I can handle any format. I would be happy to share what little I have as well.

My intention is to use my CNC miller to recreate the Horten IV-A to quarter scale, down to every rib. I'd

like to recreate the control system as well, and place all slave motors in the cockpit area.

I'm thinking of using one of the EH 3.x series airfoils at the root, to a 2.x series to the $\frac{3}{4}$ span. From that point to the tip, the wing becomes symmetrical. I'll use the same washout schedule as the original, which interestingly enough is duplicated in a set of quarter scale plans I've obtained from a contact in Germany. What do you think? (this is my first flying wing)

If you can handle .dxf drawings, or if you have Rhino or AutoCad, I'd be happy to share my drawings.

Many thanks to you.

Steven

Contact Richard Fraser at Richard Fraser <rcfraser@pacbell.net> He has some excellent forward loaded reflexed airfoils.

Rob Germon

I am an Fauvel AV 36 owner and I have a special request. Is there anybody who knows of plans to change the skid against wheels. Or to install a rear engine to the Av 36? If there is anybody with an idea please mail.

Andreas Baumann
Mühlleitnerstr.40,2301
Gross Enzersdorf AUSTRIA
baumanna@laudaair.com

Hello Andreas,

I see that you have a Fauvel AV61. I have plans to construct the Fauvel AV60. The single seater VW powered fauvel aircraft developed by George Jacquemin and Fauvel in the US in the early 60,s. I would like to get a bit more detail on control runs. I wonder do you have any AV61 plans.
Thanks

Rob

July 11, 2003

Hi,

I saw that Richard Avalon, from U.S. Pacific, finally posted the article about his trip to Europe. Unfortunately my wing was not ready to fly when he came, so there is no photo of it. Here is a photo of one of the flights in October 2001 - feel free to add one of them to the article. I am also in the process of setting some pages with more Mitchell pictures under <http://johanprins.free.fr>
Bye for now

Johan Prins
johanprins@free.fr

(ed. – Here is the picture Johan included with his e-mail. I will add it to the website in the days ahead as part of the article on Richard's trip to Europe.)



July 16, 2003

Nicholas:

I have read the discussion in the current TWITT newsletter and feel that I need to add the following comments; I have a fair amount of experience in flying full-scale planks with full three axis control systems and RC models with rudder, elevator only. I have a really good flying model with rudder elevator that is a delight to fly. In fact this model will be published in Flying Models in the near future as a building article.

As much as I like to fly this model, I would not consider using the same thing in a full-scale machine. Adding full three axis controls would marginally increase complexity and building time. When I think of

the problems with rudder elevator only in full-scale I would not consider it.

Al Backstrom
albackstrom@attglobal.net

(ed. – Thanks to Al for his experienced commentary on Nicolas' proposed project. This supports the comments made during the meeting on the need for 3-axis controls in the event you end up in unexpected turbulence.)

July 23, 2003

Peter:

Reference your questions/assumptions posted on the TWITT site. You could do no worse than looking into what the Lippisch design the Me 163 had to offer, although like all flying wings, it is a point design, and therefore with some limits, but for single seat use they are fine. The sweep was 23.5 degrees at the 1/4 chord. The wing was wooden, and has been all the way to Mach .84 or some 620+ mph.

Use the Me 163 wing plan and forget the rest of the machine, be sure to include the wing slots fwd, at the tips. Stalls will occur tip first otherwise. That takes care of whatever decisions are needed for sweep/taper.

It had a split flap situated under the wing, but it was only useful as a brake, remember this was a rocket aircraft with some 7 minutes fuel, that would have to glide back to the field. Low speed performance was suitably good.

I think the optimum thickness /strength of a wing is 13.75%. In this way you have just one wing and a fuselage to build, a single seat would work out at between 600lbs to 800lbs. Engines from 40hp and up but governed by 25% of the gross as engine weight.

Regards,
Rob Scott
pcservices@adam.com.au

(ed. - This was a recent response to a request for information we posted on the website from Peter Chopelas, pac@premier1.net. His original question was: "I was wondering if any of you know of a good positive pitching moment airfoil to use. I was planning on using a moderate amount of sweep (20 to 30 deg at LE) and taper, wing loading and speeds would be consistent with ultralight aircraft. Because of the low speeds drag is not as much an issue, but I did want to

keep the wing size down so a fairly high Cl max would be nice (without high lift devices). And anywhere from 10 to 14 percent thick. It seems to me there should a perfectly suited airfoil for such a aircraft readily available.")

July 23, 2003

Greetings Mike and Rose:

On my information no plans for the Facet Opal were ever on offer, I have been trying for 5 months to find even a 3 view of this machine. For some time the surviving Winton brother (Dean) produced scale models of the facet, but he was out of production before I could make contact with him.

If you are not aware, Scott Winton was fatally injured when the Facet crashed back on Mothers day in 89. The aircraft was a total loss, and it seems the design died with the designer. The crash report is curiously ambiguous, and myself and an American designer have grave doubts to the veracity of the ATSB and BASI generated report. No amount of probing these departments has released any worthwhile detail, and in my view, they do not have any. And countless forays on the net have only gained a 1/2 dozen photos and some unconfirmable technical details.

So there it is, I can tell you all about the crash, something of Scott Winton, I have some details and a dozen photos. And of course the crash report. If any of this stuff is of any use to you, you are welcome to it.

Regards,

Rob Scott

PS - If you managed to score a 3 view, we are desperate for one.

(ed. – I can't find the original message that Rob is responding too, but the fact that he was talking about the Facet Opal was enough for me to add it to the letters section.)

August 5, 2003

TWITT:

I was doing some research, and came across your website updated till December of 2002 tonight.

I have been thinking along the lines, which your association thinks with regard to flying machines, and was enchanted by the information on the web site.

Is there another site with more up to date information. I appreciate the work you fellers have put into the theme.

Having devoured most of what the site has to offer, I want more. Thanks for the effort It is appreciated.

My problem with this topic, (and lots of interests) is that I have too many.

I just have to get involved, and DO rather than think about doing things, and it is great to see people who have got stuck into their hobby/lifestyle.

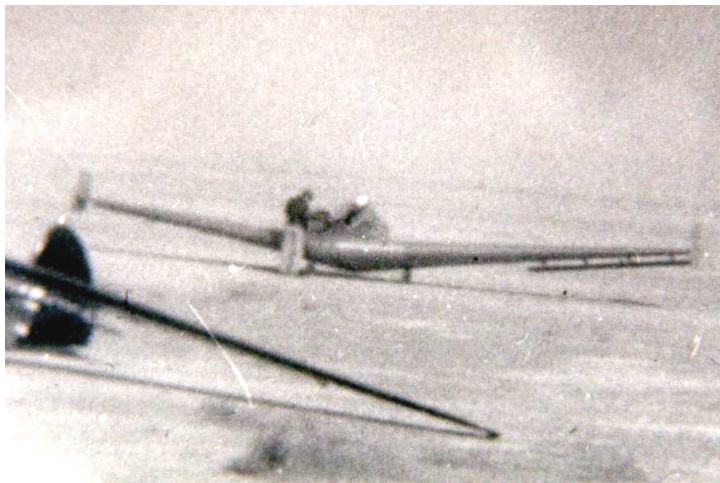
Mark Goddard (Aus)
kadmow@iprimus.com.au

(ed. – I wrote to Mark and let him know he was probably looking at the older version of our website that I can't stop the search engines from showing. I haven't heard back from him yet, but hope he found more of what he was looking for and enjoyed it.)

August 7, 2003

TWITT:

I just happened on to your website by accident. What I found there threw me back 35 years to a barn in Washington State. In that barn was a magical thing of beauty and engineering.



On your website links area is a header for a 'Northrup/BowlusFlyingWing'. The photograph is not very clear, but it is clear enough that I recognized the wing I had admired as a kid. That wing still exists. It is hanging in the barn of one Mr. Jack Laister.

Jack was, if I am not mistaken, one of the people on the design team for the flying wing. He also designed and flew most of the troop transport gliders that were deployed during the war. I have no idea where Mr. Laister is now but I am sure that some one from the DOD could help you find him.

George Longshore
longshore@cmn.net

(ed. – I responded to George letting him know I could probably find a phone number or address for Jack through Doug Fronius, since he owns an LK, along with all the other things you have seen in the pictures of the meeting hanger. Jack also appears at the Tehachapi SHA workshop every once in a while, so I will be looking for him this year. Here is the picture he was referring too.)

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.
3114 Edgehill Road
Cleveland Hts., OH 44118

skrauss@earthlink.net
(216) 321-5743

Personal Aircraft Drag Reduction, by Bruce Carmichael.

Soft cover, 8 1/2 by 11, 220 page, 195 illustrations, 230 references. Laminar flow history, detailed data and, drag minimization methods. Unique data on laminar bodies, wings, tails. Practical problems and solutions and, drag calculations for 100HP 300mph aircraft. 3d printing. \$25 post paid.

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SAILPLANE HOMEBUILDERS ASSOCIATION 2003 WESTERN WORKSHOP SPEAKER SCHEDULE AS OF JULY

SATURDAY, AUGUST 30th

8:30	Barry M. Garrough	Woodstock 25th Anniversary
9:30	Mike Sandlin	Bug Biplane and Monoplane Update
10:30	Jim Terry	Progress on Self Launch Carbon Dragon
11:30	Doug Fronius	25,000 Pound Self Launch Motor Glider
1:30	Dennis Brackett	GPS Controlled R/C Experiments in the White Mnts.
2:00	James Perle	Instrumented R/C Sailplane Model Dynamic Soaring Experiments.
2:30	Mike Allen	Ridge, Thermal, and Wave Soaring Without Human Control
3:00	Jim Hansen & Al Bowers	The Wright Brothers Contributions to Soaring
3:30	Semine Short	The First To Experience Soaring Flight
4:30	Marty Hollmann	Flutter in Sailplanes

SUNDAY, AUGUST 31st

8:30	Pete Plumb	Glue Joint Testing Demonstration and Glue Comparisons
9:30	Bob Gains	Covering Techniques in Cotton, Polyester or Muslin
10:30	Taras Kicenuik	Dynamic Soaring Theory
11:30	Gary Osoba	Micro Lift Soaring
1:30	Bob Kuykendall	The HP-24 Sailplane
2:30	Rick Searfloss	Flying The Space Shuttle
3:30	Greg Cole	Sparrowhawk News
4:30	Joe Alvarez	R/C Model for an Ultralight Tow Plane

Note: Any other speakers who require less than a full hour, please contact Bruce Carmichael 949-496-5191, brucecarmichael@aol.com. We have 4 presently unconfirmed possible speakers engaged in ongoing important developments.

(ed. – This schedule was provided by Bruce Carmichael. If you have any questions about the speakers, or would like to contribute to the program, please contact him directly at the phone number or e-mail address provided. If you have attended previous workshops you will also notice a slight change in format, with several shorter presentations in order to pass along more material and give a greater variety to the program. This is an excellent opportunity to talk with other pilots and builders about your pet project, so don't pass up the chance to visit the workshop for at least one of the days.

Jeff Byard's Genesis is usually outside his hanger and there are often several hang gliders around of the flying wing variety. Last year Norm Castagneto had his Mitchell Stealth wing on display and was flying his powered SWIFT. At that time he was looking to sell the Stealth, so if you are interested in anything by Don Mitchell, it might be worth coming up and seeing if Norm is there and seeking an offer.)





VIDEOS AND AUDIO TAPES



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
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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.

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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 Aerovirement project led by Dr. Paul MacCready.

Cost: \$8.00 postage paid
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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 Aerovirement'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
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