No. 208 OCTOBER 2003

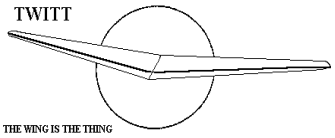
T.W.I.T.T. NEWSLETTER

Johan Prins' Mitchell B-10 on takeoff from his local airfield in France.

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., **0310** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, November 15, 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

There really isn't a lot to cover this month. For those of you who have access to the electronic super highway, I am going to try and get some updates done to the website after getting back from the SHA Central Workshop in Moriarity, NM. It has been a while since I did any major work on it and I have to add a bunch of new pictures, check some links, and rearrange the material. Make sure to take a look at in around the end of October.

Our thanks to Eugene Turner for the donation of the book More With Less – Paul MacCready and the Dream of Efficient Flight, by Paul Ciotti, Encounter Books, San Francisco, 2002 (ISBN 1-893554-50-3). We will add it to the library. It is a very interesting book on the life of Paul MacCready with many stories of his adventures over the years.

This issue is comprised mainly of letters and e-mails from members and others on a variety of subjects. If you have any opinions or something to add to the comments presented by these individuals, please make sure to write us and share them with others.

I have also included some of the pictures from the SHA Western Workshop held at Tehachapi over the Labor Day weekend. They may not be directly related to flying wings, but they do show things of general interest that could be used for any type of aircraft, like spoilers or wing stands to name a couple. It is sort of a demonstration that if you live in the western US and didn't attend the workshop, then you missed a great opportunity to learn many different things about building aircraft and what is going on in the world of homebuilding. If you are going to eventually build that pet project, it might be a big help to know what type of mistakes others have made and avoid them as you move along. Bruce found this when he used wood putty when he should have been using spackle for some of his filling and shaping needs.

Andy

SEPTEMBER 20, 2003 MEETING RECAP

There really isn't much to report about the September meeting. We had a few people show up and sit around talking about many different things, had a donut and wandered around the hanger area looking at some of the aircraft along the row. Those that did show up had a good time even though there was no formal program. Andy showed some video clips of the vintage sailplane double tow at Tehachapi during the SHA Western Workshop and, a little bit of his flight in Doug Fronius' LK cruising the valley around the airport. It was a pleasant two and a quarter hour flight and he got a chance to actually fly an hour of it. *(ed. – The stick time was great – thanks go to Doug for the opportunity.)*

Sorry there wasn't much to report on. As noted in last month's newsletter, it has become extremely difficult to find speakers on relevant subjects. We still have no concrete lead on a program for November, but will keep looking. WE could sure use your help in finding programs, as mentioned in pervious newsletters.

LETTERS TO THE EDITOR

September 10, 2003

TWITT:

I take the liberty to inform you that the book Flying Wings – The History of the Development of Tailless Aircraft in the World, has been published by Bernard & Graefe Verlag, Heilsbachstr .26, D-53127 Bonn (Germany). The cost is Euro 49 (about the same in US dollars). If you want a copy perhaps you have the capability to procure it from a bookstore without the high cost of postage from Europe. This can be as much as Euro 103 for UPS and 106 for FedEx – crazy!!!! It may be possible to get a quantity discount price of Euro 30 before postage if there are enough interested in the book.

Rudolf Storck

Deisenhofen, Germany

(ed. – Rudolf doesn't have e-mail, so if anyone is interested in purchasing such a book, please send your intention to TWITT by e-mail or snail mail and I will accumulate the information for him. I am assuming the book is in English or he would have made a comment about it being only in German.

Once I have several inquiries I will let him know the number of books that are needed and see what types of arrangements can be made to reduce the shipping costs.

I did a search of Amazon and, Barnes & Noble, but didn't find this book in their listings. I will continue to look on-line and see if it can be purchased through a US source which will mean lower shipping costs.)

September 15, 2003

Why I Like Airplanes Over Women:

1. Airplanes usually kill you quickly, a woman takes her time.
2. Airplanes can be turned on by a flick of the switch.
3. Airplanes don't get mad if you do a "touch and go."
4. Airplanes don't object to a preflight inspection.
5. Airplanes come with manual to explain their operation.
6. Airplanes can be flown at any time of the month.
7. Airplanes don't come with in-laws.
8. Airplanes don't care about how many airplanes you've flown before.
9. Airplanes and pilot both arrive at the same time.
10. Airplanes don't mind if you look at other airplanes.
11. Airplanes don't mind if you buy airplane magazines.
12. Airplanes expect to be tied down.
13. Airplanes don't comment on your piloting skills.
14. You can get a muffler for your airplane.
15. An airplane doesn't mind if you watch football all weekend.

16. However, they both have one thing in common -- when either one of them gets quiet, it's definitely not good.

Submitted by:

Alex Kozloff
avkozloff@earthlink.net

(ed. – Thanks Alex for reminding us why most of us love airplanes. That's not to say we don't love our wive's equally, and there are pluses & minuses to loving both.)

September 18, 2003

TWITT:

Dean Delta, Marske, etc.

I have put in some time on the Tailless Aircraft Bibliography again recently; the job is endless! Of course, there is more material being generated as we speak, but I am still bogged down in entering the great stuff I have on hand - especially the current collection from my pretty thorough patent search. You'd think that 450 pages would exhaust a limited topic, but as we know, there is a lot of potential there, as technology continues to catch up to the concept. Anyway, I'm plugging away.

I was also able to visit the Marske shop last month. Most of their current activities are well chronicled on their website, but I noted that Jim has made more progress on the Pioneer III; most mechanisms are complete and assembled. I think Mat Redsell is thinking positively about Jim's finally putting together a glass competition sailplane to prove once and for all the validity of the Pioneer configuration to the soaring community. Jim is enthusiastic about doing so. This to me is a change from his well established (several decades old) custom of developing low-cost sport sailplanes with fabric wings.

The Pioneer II that they have refurbished is apparently very potent, even though the airfoil could not be entirely corrected in profile, nor could excessive weight be corrected. Nonetheless, it continues to confound a few local critics by outperforming some of their more expensive stuff. The problem is that detractors continue to compare this old sport plane design with more expensive, newer glass ships. A glass, all-out competition Pioneer IV or V, with one of the new Marske wing sections, could and should clear up doubts about the Pioneer configuration's potential. Jim Marske speaks highly of the Genesis (feels that his set-up should be followed), but expects a comparably engineered Pioneer to perform markedly better. He is aiming toward making a separate set of laminar flow, glass wings to test for comparative performance on the Pioneer III. Then what is learned can be used on a purpose-built competition ship.

Well, the real purpose of this note was to comment on the ill-fated Herb Dean "Delt-Air 250", mentioned by Hakan Langebro in the September TWITT Newsletter. Its first and only (fatal) flight on 11/8/61 caused significant discussion and controversy in EAA's Sport Aviation, and some of its lessons seem to have been forgotten, judging from the recent crash of a sophisticated, composite BWB homebuilt in development. Surely, the "Delt-Air 250" episode was one of the most instructive ever concerning the physics of tailless aircraft flight.

First, however, while I do not remember what "Delt-Air 250" information you had on the site previously (sorry), the "several pages" mentioned by Hakan leads me to think you had posted the Sport Aviation article by Robert Pauley, then of Highland Park, Michigan. ('The Delt-Air 250 - A Tribute to Herb Dean'; SA, 2/62; cover [color photo], pp. 20-26). This article has 14 photos, a 2-page centerfold set of scale drawings by Pauley, with 3 fuselage sections and dimensions, and an obituary. The single most complete Dean delta article I have found, it also describes the flight/ crash. I can copy it in B&W or make scanned files, if needed. I also have the following items:

1) Construction photo; SA; 6/61; p.15.

2) Photo (taxiing); SA; 1/62; p.32.

3) Sammis, Al; "Comments on the Delt-Air 250 Mishap"; SA; 4/62; pp.32-33.

4) "Delta Afterthoughts"; SA; 2/63; p.20 (excerpts from 5 letters).

5) Chana, Bill; "More on Dean's Delta"; SA; 11/63; p.8 (has photo and Ed. comment that plane was being restored by F.D. Pittman)

6) Pauley, Robert; "A Progress Report on the Delt-Air 250"; SA; 11/64; pp. 20-21 (3 photos; notes intention to add canard surfaces; some serious reconstruction shown in photos, but I have never heard of this plane flying again).

7) Buben, S.L.; "Dean Delt-Air 250"; Model Aviation (AMA); 1/85; pp. 64-65, 90-91,167-168 (13" Peanut-scale, rubber-powered, stick-and-tissue model; 2-pg. full-sized plan).

8) Fujii, Teruo; "A Discussion of the Physics of Certain Delta-Wing Pushers During Take-Off"; SA; 3/67; pp.21-22 (about Dean Delta; photo, 3 diagrams; Mr. Fujii got strong criticism for handling moments about a rolling 'pivot' [l.g. wheel]).

9) Barnes, R.C.; "An Outside Opinion on Delta Wing Pushers"; SA; 10 or 11?/67; p. 25 (criticizes Fujii).

10) Morrill, George (Brown Univ.); "The Delta Wing Pusher Revisited"; SA; 12/67; pp. 35-36 (criticizes Fujii; 4 diagrams)

11) Fujii, Teruo; "Some Design Considerations of Delta-Wing Pushers"; SA; 8/72; pp.40-43 (No mention of Dean's delta, but obviously still attacking its dynamics; 14 figures; still takes thrust and drag moments about wheels)

I probably have noted other minor mentions of Dean's delta in my Bibliography, but I believe these are the major works on the topic.
If you hear of any others, please let me know the particulars for inclusion in the Bibliography.

The "Delt-Air 250" was a beautifully crafted, tailless, delta-pusher homebuilt, with sliding canopy and retractable landing gear. It had been wind tunnel tested at U. of Michigan at a time when Prof. Ed Lesher was there, turning out some of our best aeronautical engineers and setting distance-speed records for light aircraft. I do not know whether he was involved in the tests, and now of course it's too late to ask him. The flight characteristics were apparently satisfactory, but apparently no one caught the takeoff problems and possible elevator/prop interference.

I do not have time now to re-read the material I've listed, but I think I can briefly tell the gist of the story. First, the event: After successful high-speed taxi tests when the nose lifted at about 70 mph (probably not at full throttle), Mr. Dean attempted a first flight with full-power lift-off. As he passed through the rotation speed, the nose stayed stuck to the ground. When he finally chopped power at somewhere between 100-125 mph, the nose suddenly broke ground and the plane climbed quickly to 100-125 feet, where it porpoised in increasing amplitude with power alternatively being reduced and re-applied, finally stalling and falling off to the right in a dive to the ground.

Similar things have happened before and since (Heuberger 'Delta Stinger', Wingco?,...). This one was probably primarily caused by excessively aft-located main landing gear, leaving insufficient elevator moment to rotate the plane, especially against a negative pitching moment from its high thrust line under full power. An aggravating factor was the downward directed "lift" component from upward deflected elevators (plane had separate elevators and ailerons) in the attempted pitch up. This would further pin the plane down against the modest lift generated by its very thin, low-A/R airfoil at low a.o.a. Furthermore, the pusher prop was very close to and centered slightly above the elevators, leading to speculation that the prop might have scavenged some flow from these surfaces stalling them in separated flow. Anyway, the drawings show that the wing could only be rotated 8 degrees further from its resting a.o.a. when the wheels were still on the ground (prop had to be protected). Deltas attain maximum lift at a.o.a.'s twice those of "ordinary" wings. All in all, planes of this configuration must be real bundles of compromises, and despite its quality and sophistication, Dean's delta had fatal flaws with which a more experienced pilot might not have contended successfully.

What this episode does show is the classic (historical) problem of tailless aircraft development: not learning from other people's

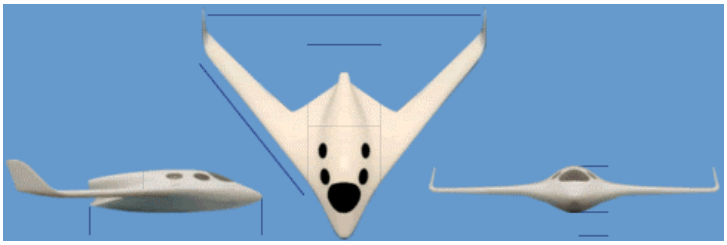
mistakes. The wheel keeps being re-invented with some loss along the way. With the better exchange of information today via the internet and publications like TWITT's newsletter, things seem to be better. Now if we could just contend more successfully with the bigotry and "don't confuse me with the facts" mentality found among some members of sister organizations...

Keep up the good work, Andy. It's all worthwhile!

Serge Krauss
skrauss@ameritech.net

(ed. – Super letter with lots of information on Marske and an answer to Hakan's inquiry. I have already sent this along to him via e-mail and he has ordered some of the material from Serge.

Below are two recent posts to Nurflugel on the fate of Wingco's Atlantica (3-view below) (www.wingco.com) and similar events that Serge briefly mentioned.



October 3, 2003

During a high speed taxi test, Alan tried to get the plane to rotate. (rotation problems.) He bounced the nose to try to get the plane to rotate and suddenly found himself looking at the sky about 50ft up. Instead of leveling off and continuing, he cut power and nosed over. The plane landed hard, broke the gear and bellied in.

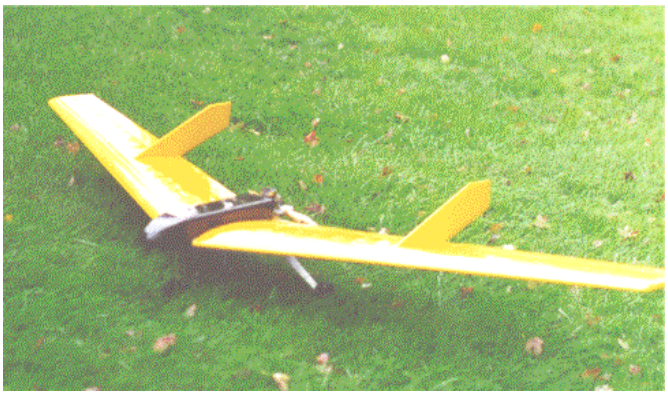
He has now followed my advice and built a 1/7 RC model that flies well and has been able to duplicate the accident. The next step is to build a 1/6 scale model, test and hopefully kit it early next year.

Jim Sparks
spider@candw.lc)

October 4, 2003

Nurflugel:

Fascinating discussion: I have had similar but less devastating experiences with takeoff of flying wings. I have designed and flown two RC nurflugel designs (see http://www.nurflugel.com/Nurflugel/Papers/Art_Kresse/art_kresse.html). Under certain conditions I have been unable to get both designs to "unstick" and in one or two instances got them off into a zoom, which took some doing with the stick to bring under control. After a lot of head scratching the conditions which led to the effect were: 1. Grass strip and 2. Bent nose gear. The grass strip rolling drag prevented accelerating much beyond normal rotation speed and/or the bent nose gear resulted in insufficient lift to rotate at the speeds obtained. One solution was easy- lengthen the nose gear to ensure positive lift near rotation speed. A second solution was more difficult - move to a paved field. Both solutions mitigated the problem.

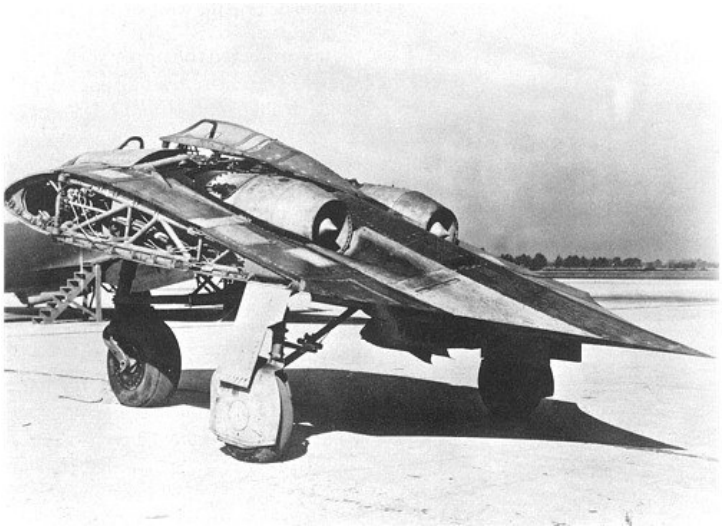


On reflection the physics of the problem is fairly straightforward. Just prior to takeoff the weight of the airplane is resting on the mains and to rotate the weight of the aircraft forward of the mains must be lifted by the moment of the elevators about the main gear. This moment is much less than that for a conventional configuration because of the short coupling of the nurflugel about the pitch axis. The longer nose gear solution puts the aircraft attitude on the ground at a positive angle and generates enough lift at lower speeds to allow normal rotation. The paved runway reduced the rolling drag so that the

aircraft can achieve higher speeds on the ground and consequently higher lift.

The zoom effect is the result of too much elevator to "unstick" the aircraft. When it becomes unstuck the required trim moments suddenly change to result in a strong nose up tendency. If not corrected immediately with down elevator (not!! throttle back) a stall will result unless there is sufficient thrust for vertical flight. Incidentally the designs in the article are capable of a limited vertical trajectory.

Art Kresse
akresse@comcast.net



Horten's solution to the rotation problem was to set the landing gear for a much higher angle of attach as shown above.

September 18, 2003

TWITT:

For many years I've read about the mysterious German Foo fighters seen by American airmen over the skies of Europe during WW II.

Recently I read some research done by William R. Lyne. He said that way back in the 1890's Tesla had secretly developed some prototype electrical flying machines (tailless). And that in the late1930's the Germans had further developed this Tesla technology. And that this implemented technology was later seen by American airmen during the 1940's and known by them as Foo fighters.

Could any of your knowledgeable readership tell me if William R. Lyne's explanation of Foo fighters is correct or not?

Thank you.

Edwin G. Sward
Worcester, MA

(ed. – Here you go Ed. Let's see what the members come up with on this question. The Germans had lots of secrets, but this is the first time I have heard of tailless aircraft flying that early, so it should be interesting to see what comes out.)

September 22, 2003

Hello,

I don't need to tell you your site is beyond great. I guess I've been isolated in that I never knew so much info existed on "the wing". I have over the years, developed a "special" airfoil shape for all my models. It seems to work equally as well for my negative aspect ratio "deltas", as well as on my very low aspect ratio flying wings. (short delta?)

Without divulging too much info, it involves flying wings and various "sorta deltas" that fly fine without any reflex. Been told this was impossible, and that is what led to my on-line search for info on such phenomena as the "Kasperwing".

At first I thought my delta's were just miserable failures that would only take off, and then go into a climb, until they were vertical, then hover if given enough power. I then, after several flights, realized they had too much reflex. I began "removing" the reflex, until against advice from "experts" I removed it all.

Now they all fly like trainers, in that they are very docile, hold a bank without further input, and can be flown almost too slow to believe. Basic aerobatics are easily done.

Now my question; Where, on-line, can I find some airfoil shapes for delta's and flying wings, to see if anyone else has this "shape" I use.

I'm under the impression that this "shape" has just been overlooked, because it makes no sense aerodynamically, and therefore may have never been tried.

Thanks in advance,

Joe
jetstarblue@yahoo.com

(ed. – As of our publication time I hadn't had time to do any searching for answers to Joe's question. Perhaps one of you know of similar airfoils in the delta planform that would show Joe he is not alone and why it seems to work like it does. If you respond to him, please include TWITT in your e-mail addressing so we can pass the answer along to the rest of the group.)

September 26, 2003

Hi,

I am looking for a flying wing sailplane that is, or can become a self-launching sailplane. The only current design I'm aware of is the Mitchell B-10 (which me and my wife currently fly), the U-2, the Marske set of gliders, and Fauvel. I was wondering if there was any other that have enough details and/or plans available to allow the construction of an aircraft. (The B-10 can only get about 18:1 glide and sinks rather fast for soaring.) I'm looking for either wood, tube, or aluminum construction (not a real fan of composites).

What is available? Is there enough info to build a plane like the Horton Ho Xb? Anything would be of great help. I'm a mechanical engineer with a specialization in aircraft, and have built a few before, but there just doesn't seem to be anything available, and starting a design from scratch is a bit difficult at this time in my life. Fill-in-the-blanks, mods, etc. I can do, but starting from nothing is just a bit too much time (kids & work).

Thanks.

Jim.
"The Gordons"
assie_jassie_gordon@sympatico.ca

(ed. – I think the answer to his question is that there isn't much out there to choose from for flying wing, self-launching sailplanes. The only other one I can think of is the SWIFT, but I'm not sure if it has any better of a glide ratio than the B-10.

Does anyone out there have plans for anything that he could use? We know there are none for the H Xb, unless someone has come across them in some obscure place.)

September 27, 2003

TWITT:

I am a builder and pilot of a Mitchell B-10 flying wing ultralight and have considered joining TWITT since the start of the restoration of my wing, but always was too busy with just that restoration. Now that the thing flies again, I'd like to know what the cost and benefits of a membership in Europe are.

I am in more or less close contact with Richard Avalon from U.S. Pacific, the current seller of Mitchell Wing plans, as well as most Mitchell owners and builders around France, Spain, and Germany. I sent you an email lately to point you to the missing photo of my wing in Richard Avalon's article about his trip over here in 2002.

Please feel free to contact me by email

Johan Prins
johanprins@free.fr

(ed. – I have included one of the pictures Johan sent in his earlier message. I haven't had time to get any work done on the website to add the picture to the Mitchell European piece, but will try to get going on it once this is in the mail.

I got this message back from him, so we can look forward to seeing and learning more about his Mitchell in the future.

"Thanks for the membership details, I will certainly sign up, and maybe contribute some articles to complete the Mitchell aspect of flying wings. Currently I try to dig up EAA articles on these wings that can help builders and pilots today to better understand these ships, since some information that was available first-hand from Mitchell Co. is now almost lost, in spite of Richard Avalon's activity.

Bye for now, I'll keep in touch with TWITT.

Johan)

September 30, 2003

TWITT:

I am interested in building a modified Horten IV. How much info survived? How much do you have and at what cost. I'm looking for things like airfoil polars & structural aspects. Any information would be greatly appreciated. What would the cost be for this material and how do I join TWITT? I stumbled across your website and it looks like there is much to learn from you guys. Thanks.

Jim Gordon
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(ed. – I wrote back to Jim to let him know there really isn't a lot of information on the Horten IV that could be used for construction of something similar. If there was, I think we would have heard about it by now and others would have been building aircraft in their garages. But, if anyone out there knows of drawings, specifications, etc., that might help with such a project please get a hold of Jim and include us as an addressee.)

September 30, 2003

Dear Lars--

I meant to e-mail you to tell you that your copy was in the mail but I've been too busy with the family to write anyone and I'm leaving again in a few minutes so I'll try to write more later. I'm not surprised the Delta IV had control problems. The inertia was probably a factor and putting the external surfaces above the wing meant that the low energy upper surface boundary layer was going into the slot, I doubt that that would have been helpful. I didn't try to analyze it because it was just mentioned as an example of other arraignments that have been tried and I believe that the other members are at least as educated as me and able to draw their own conclusions. I've been getting a few requests for the bibliography and have attached a copy. You've probably already seen all the references but it's a small file so it's not too bad a bandwidth hog.

Norman Masters
nmasters@acsol.net

Lars Sundin wrote:

Dear Norman, your letter arrived yesterday and I have started digesting your long article.

The reading of your article made me look in various books, for example in the autobiography of Gerhard Fieseler, where I remember how extremely dissatisfied he was with the "Fieseler Wespe" (Wespe is German for "Wasp") and Alexander Lippisch that had designed it for him. It seems Fieseler was somewhat under pressure from his finacial backer that wanted "something unusual" for a contest in 1932 about. The plane

was just unflyable! Fieseler blamed the large inertia from having an engine in each end while Douglas Bullard on Nurflugel has another explanation. I had planned to scan some pictures but I see Nurflugel has them. Lippisch then developed the plane to become quite good.

I also looked at the "Weltensegler" in my books but I think Nurflugel deals with this one too.

The Ju 52 was hardly a bomber even though it might have been used so, maybe in the Spanish Civil War in the late 30-ties. It was a transport, the main European civil airliner introduced a few years before the DC-2 and DC-3, and then used by Luftwaffe like USAAF used the C-47. By the way, the Soviets used their Li-2 version of the DC-3 as a bomber with an external bomb load. It could very well have been such planes that by accident dropped bombs near Stockholm in late February 1944.

I did not know of the NACA experiments with the Fairchild plane.

The news on dynamic soaring on the first page and mentioned also in "President's corner" were quite interesting. I have to confess that I have not quite yet understood the "energy pick up" but albatross birds do! I read about this 35 years ago

On page 8 a person tells he had heard of a "Fauvel" flying wing; it might be a French "Fauvel" AV-36 or other model (see http://www.nurflugel.com/Nurflugel/Fauvel/e_index.htm)

I note the reproduced photo at the bottom of page 8 shows some "extra airfoil".

I saw the name Håkan Langebro in the TWITT Newsletter! I had some contact with him on the Swedish Historical Aviation messageboard. He has a website over a rather little known Swedish WW2 fighter, the J 22. See http://www.anycities.com/user/j22/j22/index.htm He has also explained the choice of airfoil for the MFI 9B and MFI 15; he once was the assistant to Björn Andreasson who worked in California and there built the BA-7 plane that he later developed in Sweden to become the MFI 9B (Bölkow 208).

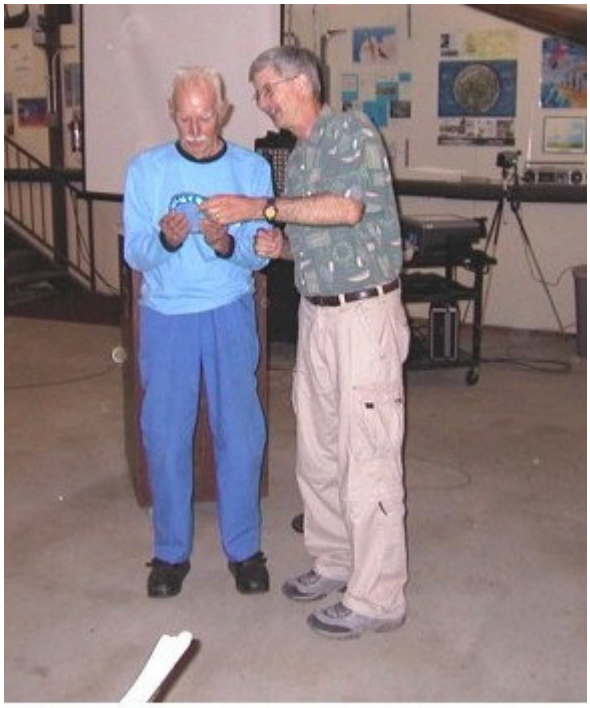
Håkan is an aerospace engineer. When googling for BA-7 I stumbled upon the following, which was quite new to me (and quite uninteresting to you): http://www.boelkow-junior.de/d/MFI11_Hakan.html

It is a small world!

All the best!

Lars Sundin
lars.o.sundin@mail.bip.net

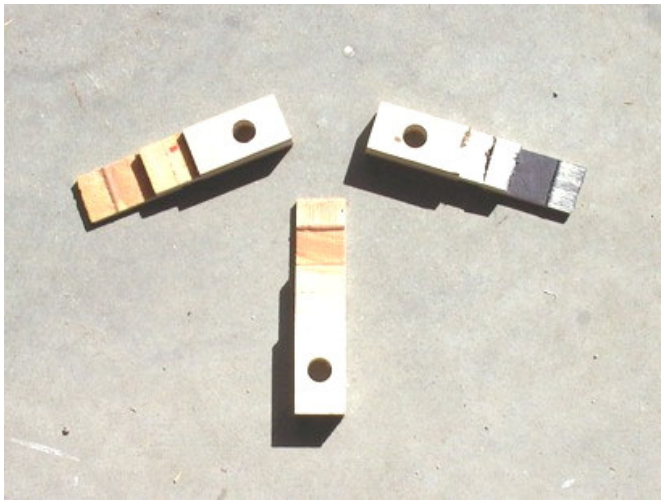
(ed. – Great exchange of information for everyone. In the next issue I will include the bibliography Norm sent along that supports last month's article. There is some good material there also.)



Bob Fronius (left) receiving an SHA volunteer recognition award being presented by his son Doug. Bob has been in many facets of aviation for over 70-years and still has many ideas of how to build that ultimate flying machine.

Pete Plumb's glue joint testing rig made out of simple materials welded or bolted together.

The above photo shows Pete reading off the tension gage results just as the test piece breaks under the load. He uses a small hydraulic auto jack to create the tension. In the photo below you can see some of the samples that were tested to failure during his demonstrations. In some cases the glue failed, but in many using modern glues the wood actually separated.



The photo at the top of the right column shows David Bezinque's Silent IN motorglider wing tip support dolly. It is painted bright RED so it can be readily seen and removed before takeoff, but is quite handy for one-man setup and moving the sailplane around on the ground. This is a kit built sailplane and has received good reviews for its quality and easy of construction.

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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.

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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 Aerovironment project led by Dr. Paul MacCready.

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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.

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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".

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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.

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