No. 155 MAY 1999

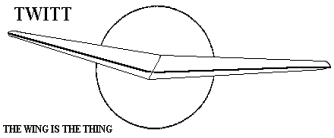
T.W.I.T.T. NEWSLETTER

Horton Wingless 1951 – 2pC flying wing; two 225hp Jacobs and extended driveshafts; sap: 40'. Not truly wingless, but essentially a highly modified Cessna UC-78 with a more airfoil shaped fuselage than wing. Although this innovative prototype flew successfully, no backers were attracted and the project was abondoned with the plane eventually being deliberatley burned.

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., **9905** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, May 15, 1999, beginning at 1:30 pm at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row on Joe Crosson Drive - Southeast side of Gillespie).



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

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

T.W.I.T.T. Officers:

President: Andy Kecskes (619) 589-1898
Vice Pres:
Secretary: Phillip Burgers (619) 279-7901
Treasurer: Bob Fronius (619) 224-1497
Editor: Andy Kecskes

The **T.W.I.T.T.** office is located at:
Hanger A-4, Gillespie Field, El Cajon, California.
Mailing address: P.O. Box 20430
El Cajon, CA 92021

(619) 596-2518 (10am-5:30pm, PST)
(619) 224-1497 (after 7pm, PST)
E-Mail: twitt@home.com
Internet: www.members.home.net/twitt

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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, east side of Gillespie).

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PRESIDENT'S CORNER

On May 1st and 2nd, Gillespie Field held its annual open house with a great gathering of aircraft, including the Northrop N-9M restored by The Planes of Fame Museum. It made some very impressive fly-overs during the weekend, much to everyone's enjoyment.

I need to remind everyone that effective in January, the annual membership rate increased to $20 for those in the US and $25 for our foreign members. It seems we have been getting renewals for the older rate, so please make sure to check the information in the left column of this page before sending in your next renewal.

I am almost at the point of doing some update work on the TWITT web site. I will be adding some new links to other pages and generally cleaning up some areas. So, if you have something you would like to share with other members and the world at large, please send it to me. It can be in the form of pictures, both color or black and white, articles you have written or have permission to release, or anything else you think would go well on the site.

Has anyone heard of any new developments in flying wing designs? It has been rather quiet the past several months, even on the Nurflugel bulletin board, although some are thinking of doing a joint project. This could either be an ultralight wing or a more conventionally constructed aircraft of composites. There seems to be a lot of talent out there in terms of analytical engineers and designers to maybe pull it off. However, as many of you remember we tried this when TWITT was first formed and there was always a lack of compromise. Perhaps this time, with the availability of e-mail and the Internet for communicating rapidly, it might be different. If you are interested in such a venture, join the Nurflugel list and jump right in.

Andy

MAY 15, 1999 PROGRAM

The program this month will have two parts and we are certain you will enjoy both.

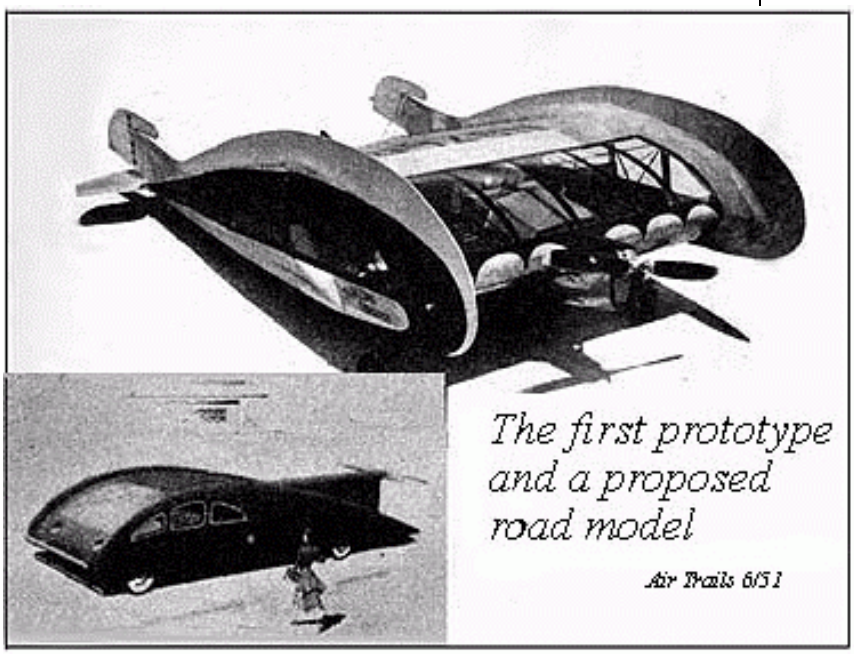
The first part will be done by **Russ Eckre**, who is going to bring us up to date on the Horton (yes, that's with an O not an E) Tailless development project. Russ gave us a good insight to this project in November of 1996 when he showed a film of the Horton Tailless prototype and explained the problems William Horton was having getting the necessary financial backing. Russ has been in constant contact with Horton since then and has some interesting new facts for us. (ed. - On this page and several others throughout the newsletter you will see some really nice pictures of the Horton I extracted from David Dodge's web site. For more go to:

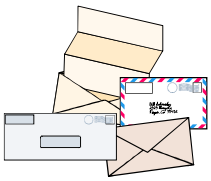
http://home.att.net/~dannysoar/Horton.htm)

The second part of the program will feature **Bruce Carmichael** giving a presentation on "Pusher vs. Tractor Propeller as Applied to Laminar Aircraft". He will cover the following areas (with illustrations):

Arguments for pusher propeller
Arguments against pusher propeller
Summary of papers on subject by Carmichael, Strojnik and Terri
Real world results: Lesher Teal, Arnold AR-5, Sharp Nemesis, Smith AJ2
The ultimate laminar attempt - Lars Geirtz V Max Probe

(ed. - I think Bruce has come to a conclusion on this subject, but you will have to attend the meeting to find this out or wait a month for the next newsletter. We aren't going to tell you now.)





LETTERS TO THE EDITOR

3/21/99

TWITT:

I recently discovered your web site and would like to subscribe to your newsletter.

I have a long time interest in flying and tailless, principally as an aeromodeller.

At present I am flying a scale model Lippisch Storch Ixb in indoor scale contests. Model has just been trimmed and flies great. It is a reduced scale version of Al Backstrom's design, so all credit to Al!

In outdoor competition we have a class for tailless models here in the UK and I fly John Pools design "Never Forget". Are you aware of the design? It has dominated competition here for many years. If of interest, I can get a set of plans to you. It is a 50" wingspan rubber powered machine.

Do you have a list of back numbers available?

I enclose $25.

Regards,

Chris Strachan
56 Way Lane
Waterbeach
Cambridge CB5 9NQ
United Kingdom

(ed. - Welcome to TWITT, Chris. It is nice to have another member from the UK where it sounds like flying wings are alive and well.

We would love to have a set of plans for the Never Forget to add to our library and offer to members who might be interested. We will publish the basic information and see how they respond.

As for a listing of the back issues, I assume you are referring to an index or bibliography of their contents. Unfortunately, we do not have such a listing at this time. It is a long story, but we hope someday to have one. We do have 154 back issues on file if you would like to order a block of the more recent ones and see if you would like to work your way backwards in small blocks.

Again, welcome to our organization and we hope you enjoy the information we publish in the newsletter.)

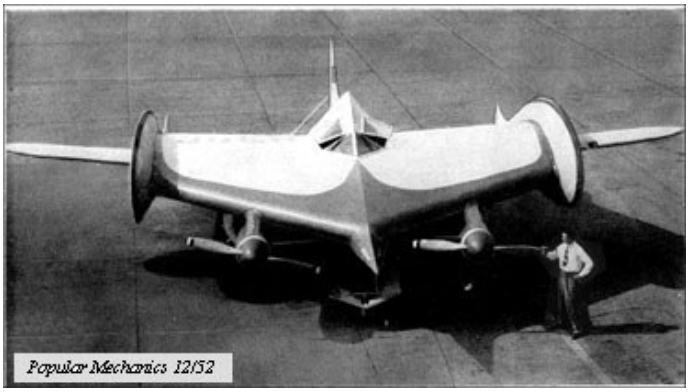
3/30/99

TWITT:

Glad to be receiving the newsletter regularly. I would like very much to frequent the meetings, but there is half a planet in between! (Hope they invent teleportation early!)

Herewith enclosed please find a bit of college work:

1) The “Inflatobird” seems to be (or almost similar to) the aircraft in an article of the March issue. In the book where I took the pictures it is written that this aircraft was used for the rescue of pilots in Vietnam. There are three interesting things: a. the astonishing self sealing capability and durability of the tissue (“Airmet”) - it could auto-seal 20mm machine gun shots); b. the final rigidity of the wing (a man standing up on each wing tip), and ; c. the total cost of about 9 million lire (Italian) in the mid 80s (about $6,000 in equivalent dollars back then). Let’s hope for the best!



ABOVE: The Horton Wingless prototype sitting on the ramp at Santa Ana. Notice the extended “speed brakes” from out of the end-plate type structure. These were supposed to be retracted in-flight. Propellers were on long extension shafts to get them away from the leading edge.

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2) Help is needed, please. I’m looking for information, dates or 3-views of the Northrop XP79B from the TWITT library/reference material. (I have a 3-view from Maloney’s Northrop Flying Wings, but it seems different from the aircraft in photos (nacelles/air intakes).

3) I’m interested in the following items: (ed. - he goes on to list a great many things from our library)

Is it possible for you to send all in one package? (I think if would come cheaper as one big one rather than more small ones; I don’t know.) Please specify cost of all this good stuff and the shipping costs or total overall cost. Herewith please find an international coupon for answering.

Hope to hear from you soon and thank you for the good work.

PS: What’s the matter? Somewhere I read/felt doubts about the wing: SURELY THE WING IS THE THING!

Giorgio Cavallo
V. Vespucci 3
56125 Pisa Italy

(ed. - Thanks for the information in your letter. I don’t recall ever reading that the inflatable plane was ever used to rescue a pilot other than in tests, since it required dropping the package into the pilots area. Then the pilot had to assemble it and, of course, have a sufficient area to launch from. In Vietnam there were so many trees and if a pilot were to get out into the open he would be a good target for the enemy. It is a good idea, but has limited uses.

By the time you get this newsletter we should have figured out how much everything will be and whether or not it can be put in one package. The letter from the postage you sent should be well on its way.

I think the doubt you were referring to was probably from the comments by Rik Keller who was playing word games with the group at a recent meeting. I think his final comments was something to the effect that perhaps the wing was the thing after all. So rest assured we have not given up on the flying wing.)

4/16/99

TWITT:

I've received the April TWITT newsletter. The article about how birds fly was very interesting, and it's great to have some pictures of the conference.

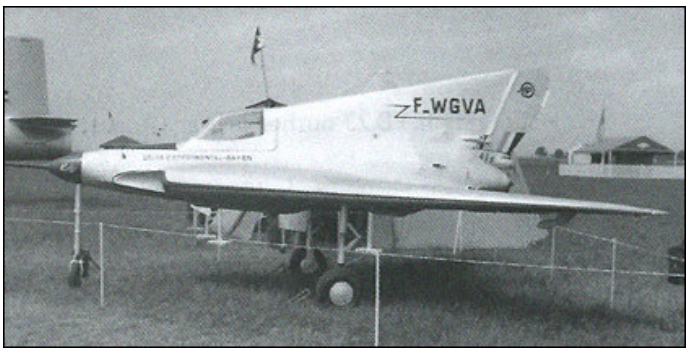
Some more elements about Payen aircraft :

The PA-100 (a racer) was one of the first delta wing to fly, in 1934. Alexander Lippisch, in Germany, previously built the "Delta1" tailless aircraft, but the large span (13 m) and high aspect ratio wasn't so close to the Greek "delta" symbol. The PA-100 wasn't a flying wing, it had tandem wings, the rear one being a delta.

The PA-49 tests had an influence on the design of the Dassault "Mirage" aircraft. This airplane is now displayed at the Paris - Le Bourget Musée de l'Air et de L'espace (Air and Space Museum - http://www.mae.org).

The PA-60 "Arbalète" (crossbow) was renamed PA-61B (F-WKVS) after serious modifications, concerning the engine cooling and the landing gear. Then, the PA-61 F (F-WSQA) "Arbalète II" was built with a more powerful Lycoming 0-360 engine. It was damaged during its first flight in Villaroche in June 1970 (source : "Les avions français 1965 - 1980", a book written by Pierre Gaillard (EPA editions), page 45).The landing gear was destroyed and the wing was severely damaged. Roland Payen had to find more profitable activities, and he designed several replicas of famous aircraft for movies, especially two Breguet 14, a French biplane of WWI (airfoil was modified to a NACA 23012). Then he designed the PA-161, a canard aircraft (tandem seating, looks like a "mini-

starship") for amateur builders, but I don't think plans were eventually available. (source : "Pilote Privé", n°131, dec. 1984. Article written by Roland Payen himself).



ABOVE: The PA-49 "Katy" as described by Christophe in this and other letters on Payen's designs.

I had the opportunity to speak with Roland Payen, about 10 years ago. He was one of the leading members of an organization dedicated to the preservation of a medieval castle, in the city where I lived. I wasn't aware of his work at this time but now I realize this man was one of those who contributed the most to the successful development of delta wings. But as many innovators he didn't have enough support in France. Surely it would have been different in the U.S. I don't know if he's still alive.

Christophe Bordeaux
32 route de Vaucelas
91580 Etrechy - FRANCE
bordeaux@citeweb.net
http://survol.ctw.cc

(ed. - In a follow-on message Christophe included three pictures of the aircraft he has mentioned above. I have included them in various parts of the newsletter this month, as spacing dictated. He also mentioned he wanted to scan a 3-view of the PA 61G from the "Pilote Privé" magazine, but unfortunately the quality of the picture was too poor for a good scan.

I would like to thank Christophe for the material on Payen aircraft, the pictures and his help with improving the quality of TWITT's web site. It is always nice to have someone with experience offer the right kind of critique on something like a web page, and you the members ultimately received the benefit of a more professional looking page.)

(ed. - The following was sent to the Nurflugel mailing list run by Doug Bullard and contained some interesting material.)

Date: Mon, 26 Apr 1999 15:21:08 +0200
From: "Christophe Bordeaux" <bordeaux@citeweb.net>
Subject: Fauvel flying wings - update

Hello Nurflügel friends,

I've updated my pages about Fauvel flying wings (http://survol.ctw.cc). You will find :

- a new homepage with a nice picture of the AV-22 in flight. You can download the whole site (Zip file) from this page (http://survol.ctw.cc/index.html) if you prefer viewing it off-line,
- two more pictures on the AV-22 page. Look at the AV-22 on the beach ! (http://survol.ctw.cc/AV22.htm),
- three more pictures of the Choucas flying wing. (http://survol.ctw.cc/choucas.htm),
- a new "archive" section (http://survol.ctw.cc/archives.htm): here I will try to put more "technical" documents about Fauvel flying wings and other unswept tailess aircraft. For the moment I have included the glider manual of the AV-36 and a text written by Charles Fauvel for the OSTIV congress in 1965, about self-launching sailplanes. Unfortunately those two documents are in French only so they won't be usefull to many people on the list. If you've more related documents in English, please send them to me so that I can include them.
- The biography of Charles Fauvel (http://survol.ctw.cc/e_biograph.htm) was translated into English by Marc de Piolenc. Many thanks Marc for the translation you've done in spite of your limited spare time.
- And, last but not least, stories in the "in flight" section (http://survol.ctw.cc/e_vol.htm) were translated into English, thanks to Jon G. Beeker. In this section several pilots recount their experiences about flying Fauvel gliders and other flying wings. One text was sent by Jack Lambie to the Nurflugel group and he gave me permission to add it to this page. (Thanks Jack. I'm looking forward to your other texts !). I hope you will enjoy those stories. You can send an e-mail to Jon (jon4927@juno.com) if you want to thank him for doing such fine translations and to encourage him. He isn't on the list but I'm sure he will appreciate your comments.
- the site map (http://survol.ctw.cc/Map.htm) shows you all the pages, and which sections are translated into English for the moment.

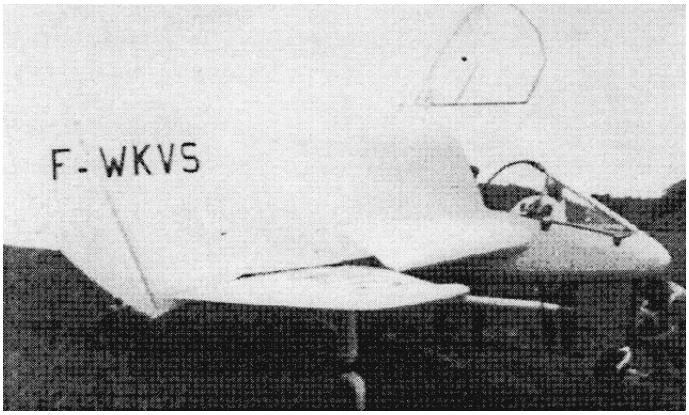
All the pages are also mirrored on our list manager Douglas Bullard's Nurflügel web site, www.nurflugel.com. It might be faster for those who live in America, and others. Thanks Doug. The main address on ctw is still slow but it should be better within a couple of weeks.

If you can help me translating the remaining French texts into English (I don't want to overexploit Jon, and Marc de Piolenc is at present rather busy with 3 important projects), any help is welcome.

If something displays strangely for you or if you have any question or comments, or want to send new documents, please send an e-mail.

Voilà ! That's all !

Christophe



ABOVE: The PA-61B described in Christophe"s earlier letter. It is difficult to determine the exact shape of the wing from this angle due to the loack of contrast in the picture. See page 7 for a better perspective on the PA-61F.

(ed. - Here is another piece from the mailing list which covers what Peter Selinger sent us and I published in the March newsletter. Obviously the information is a little old by this time, but I thought you might like it.)

Date: Wed, 21 Apr 1999 16:04:44 +0200 (CEST)
From: Berkant Goeksel <bgoeksel@physik.TU_Berlin.DE>
Subject: Re: Nurflugel Weg Site

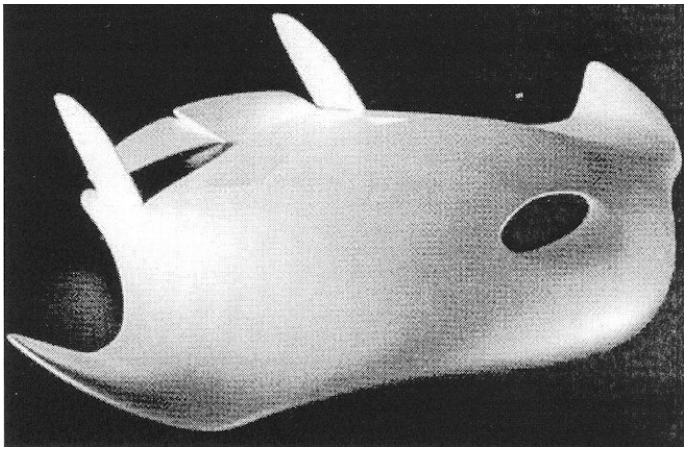
Hello,

Just heard that several weeks (maybe months) ago a new hybrid flying wing "STINGRAY" was discussed here. Some pictures can be found at: http://www.bionik.tu-berlin.de/user/berkant/wing/stingray.html.

The wing is going to be tested at a former military airport in the Switzerland mountains by a company which is sponsored by the Board of FESTO (world leading pneumatics company). The second generation "STINGRAY II" shall have a very special surface material based on Liquid Crystal Polymeres (ten times stronger than steel). Funny, such materials have ferroelectric properties which are very similar to biological or living cell membranes IMO. On the way to living machines with intelligent skin, maybe with a kind of charged barrier technology (transistors)?! However, IMO everything is living and so biological in the neutrino/antineutrino network (aether). Not from me. Just extracted it in the notes by Dr. Terence W. Barrett (leading advanced technology scientist with Boeing) at

http://www.physik.tu-berlin.de/~bgoeksel/propulsion/barrett.htm.

Yes, references and contact addresses (also for the STINGRAY) can be forwarded in case of interest.



ABOVE: This appears to be an artist's concept of a more advanced version of the STINGRAY taken from the web site referenced in this article. This looks like it could be jet a powered version with an air intake on the top surface. For the modelers in our group, this looks like it would be an interesting project for a ducted fan model since the fan unit would have plenty of room inside the very deep wing structure. Source: Geoskop, Journal GEO, Nr. 6, Jun '98, pp. 178-180.

(ed. - Here is a series of e-mails on the Northrop N-1M's drooped wing tips used during the early testing.)

Date: Tue, 20 Apr 1999 11:14:37 -0600
From: "N. Masters" <enormas@gj.net>
Subject: Re: Mike Allen wing

Northrop said that the diffuser tips, on the N-1M, didn't work out as well as he had hoped. The plane was just an under powered dog, and straitening the tips didn't make it much better. Other people have used that feature, using different names, with good results. I think the main reasons it's not seen more often are that the bend in the spar adds a little extra weight and complexity, and the low tip location vastly complicates ground handling.

-Norm

(Original message starting response above.)

> From: Mikey <allenm@pr.erau.edu>
>
> How did those N9M experiments
> with variable tips work out for Norhtrop?

Date: Tue, 20 Apr 1999 10:33:45 -0700 (PDT)
From: richard miller <richardmiller@rocketmail.com>
Subject: Re: Mike Allen wing

To "N Master"

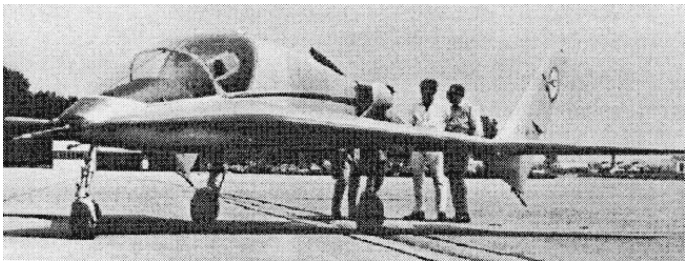
I had good cause at the time I was designing and building the *Model A*, a diffusor-tip untralight - that was in 1976 - to examine all the Northrup plans as carefully as I could for evidence that they employed the same planform. My conclusion then, and it has not changed since, is that the break in all cases was on a line parallel to the longitudinal axis [top view] of the aircraft.

A diffusor tip, as I understand it, has a lower design angle of attack resulting from the outer portion of the wing being bent downward on a line that converges with the longitudinal axis [top view] ahead of the aircraft.

Did you mean a diffusor tip as I define it, or simply a canted outboard element?

Sincerely,

Richard Miller



ABOVE: The Payen PA-61F "Arbalete II", which was damaged during its first flight in 1970.

Date: Tue, 20 Apr 1999 13:16:23 -0600
From: "N. Masters" <enormas@gj.net>
Subject: Re: Mike Allen wing

I believe you're right about the break line on the N-1M always being parallel to the center line. Although It was designed in such a way that the tip could have been adjusted to have a different sweep angle than the rest of the wing.

As for the definition of the word "diffuser", My dictionary says it means "to pour out in different directions or to scatter". It seems to me that that is a reasonable description of what the tips on the N-1M were intended to do i.e. when the ellevon is deflected the the down wash "pours out" in a direction different from that of the rest of the wing. Furthermore, the the earliest use of the word "diffuser" to describe the tips on the N-1M (that I'm aware of) is in "Stability of tail-less aeroplanes" by A. R. Weyl 1945.

As I see it, changing the angle of the break line in the plan view is a variation on a theme and not a completely different concept, as your tone implies. The technique of deflecting part of the wing about a line that is not parallel to the center line of the aircraft is common practice in modeling. Many polyhedral models gain a degree of washout this way. Doug Holverson uses this technique in some of his boost gliders.

If my comments have agitated a new thread I'm afraid I won't be able to participate as I am leaving in a few minutes and won't be back until next week.

-Norm

(ed. - Here is an interesting piece. When I saw this, I called Richard Snyder, whose father designed the ARUP series, to see what he knew about this. Richard was surprised, since the seller says he received all his material from the estate of a foot doctor, and Richard says that whatever was in the estate, he of course got.

This is at least the second piece of flying wing material showing up on this auction type web site. The Horton Wingless, which is the subject of the May meeting, also showed up on e-Bay with someone selling an early promotional print.)

Date: Sat, 17 Apr 1999 13:12:14 -0700 (PDT)
From: Albert Locker <alwings98@yahoo.com>
Subject: ARUP data on ebay.

Hi Nurflugel readers, For those who might be interested, there is some ARUP data for sale on ebay, Item #91751259. The seller indicates he has a folder of additional ARUP data. Good luck.

Albert

3/10/99

TWITT:

Saw the stuff on the Schapel ship on the net and it made me thing of this one. What ever happened to it?

Al Backstrom

(ed. - Al included a photocopy of an article from Sport Pilot, October 1990, on the "Davis Flying Wing". There are some similarities in the looks between the Davis and Schapel wings, but I would think the design philosophies were somewhat different. Davis was greatly influenced by the work of Jack Northrop and based much of his wing on Northrop's ideas. Hopefully, in the months ahead we will have a chance to hear from Rod Schapel on how he went about designing his flying wing.

As for the status of the Davis wing, it is my understanding that the prototype was damaged in a power-off landing accident in which Davis severely injured his back and was not able to continue with the design and development project. There has been occasional interest in the design and Dr. Barney Vincelette built a similar prototype a few years ago, but it did not work out as he had anticipated. I am also under the impression that if someone was really serious about doing work with this design, that it might be possible to get some type of plans through Barney. Barney

is also involved with trying to establish a market for the PUL-10 here in the US.

Part of the article was an introductory statement by Gilbert E. Davis that I have included below. It was the only piece of the article Al had, so if anyone has the complete piece from the magazine, we would appreciate a copy of it for the library.)

INTRODUCTION

by Gilbert E. Davis

The Northrop Flying Wing has been called by some, "the most advanced aircraft design of this century." The comment is certainly backed by facts. Facts that have intrigued many homebuilders for years. The XB-35 bomber could carry more weight farther, faster and do it more economically than any other aircraft of the same horsepower, flying the same mission.

I have been interested in the Northrop Flying Wing for many years, but not until I became friends with Joseph G. Rosales of Gardena, California, did I decide that designing and building a successful flying wing of the Northrop type, small enough and economical enough for pilots in the homebuilt kit market, was feasible.

Joe Rosales was one of the most interesting people I Have ever known, and over the years we became close friends. He was born in Guatemala City in 1901 and came to the United States in 1920, later attending Columbia University. After working in New York for several years, Joe went to work for Jack Northrop in 1938 and went on to become the original work manager of AirResearch Manufacturing Company from 1940-1949.

In 1951 he was involved in the layout and construction of the Anaheim Division of Northrop Aircraft, Inc., serving also as superintendent of production engineering. Joe was one of those rare people with a multitude of varied talents - designer, inventor, master machinist, pilot, and leader of men. He not only was a person with many skills, but also one with deep convictions and an abundance of business contacts and personal friends.

In conversations between Jack Northrop and Joe in the later years of their lives, Mr. Northrop told Joe that concerning the continued development of the flying wing - well, "he'd leave that to a younger man." Joe died first, August 27, 1979, and Jack Northrop passed away in 1981 at the age of eighty-five. Both were great men and giants in their fields.

My friendship over the years with Joe Rosales, the comments Jack Northrop had made to him, and my meeting with Bill Lear in 1977 in Reno, all convinced me that the flying wing offered a real opportunity and that the time was right to bring it into the realm of general aviation.

The Davis Alpha test aircraft has proved that Mr. Northrop was right. Many have said of Northrop that he was 30 years ahead of his time - maybe they were right. Many world records wait to be broken and thanks to Mr. John K. Northrop and my good friend Joe Rosales, we now have the aircraft to initiate the challenge.

(ed. - As I mentioned in my column, there was a group trying to put together a flying wing project. The following is part of that conversation. The lines started with a < are the statements/questions from one of the other list members being addressed by the author of the current message.)

Subject: Re: On-line-design-projects
From: Elliott Whitticar <whitticar1@home.com>
Date: Tue, 20 Apr 1999 00:46:47 -0400

Koen, J.P., Andre, and Gregg,

I neglected to respond because I was busy with taxes, etc. for a few days. Let's see if we can build a consensus on one powered aircraft and one glider.

"J.P. Morere" wrote:

> Of course, anything that I get involved in is subject to being built as a model.

Great! I wouldn't want to fly in anything that didn't fly first as an R/C model. I hope you'll be able to share your expertise with us.

> I would be interested in a US legal ultralight design (weight 254 lb, Vmax 55 MPH, stall 27 MPH)... Otherwise, I would have to get a pilots license. Yes, I could, but it does take much money.

Sounds good to me. One common tailless configuration is the tricycle under a hanglider, e.g. http://www.aerotrike.com/. We know that this layout is "do-able," and might make a good beginner's project. By the way, the aerotrike holds two people and 13 gallons of fuel, while FAR part 103 (http://www.faa.gov/avr/AFS/FARS/far-103.txt) calls for a single-seater and 5 gallons of fuel. Can you fly these in the U.S. without a pilot's license?

However, this layout fails to stir my imagination. I'm thinking more along the lines of a low wing, open-cockpit design more reminiscent of the Northrop N-9M or Horten H-VII. Does anyone agree? I'm not aware of any ultralights which follow this design pattern. What would be the main problems with this design? I can think of a few issues right away:

- The root chord would have to be at least 3 meters in order to fit a pilot and engine near the c.g. So we're talking about a lot of surface area and skin friction, especially if the wings are covered in a rough material.
- Aerodynamic stability would be tricker than in a high-wing model. The c.g. would have to be far enough forward so you wouldn't lose all stability when the pilot leans back in the seat.
- May need to build some kind of extension shaft for the propeller if we use a pusher-configuration. Adds weight and expense.

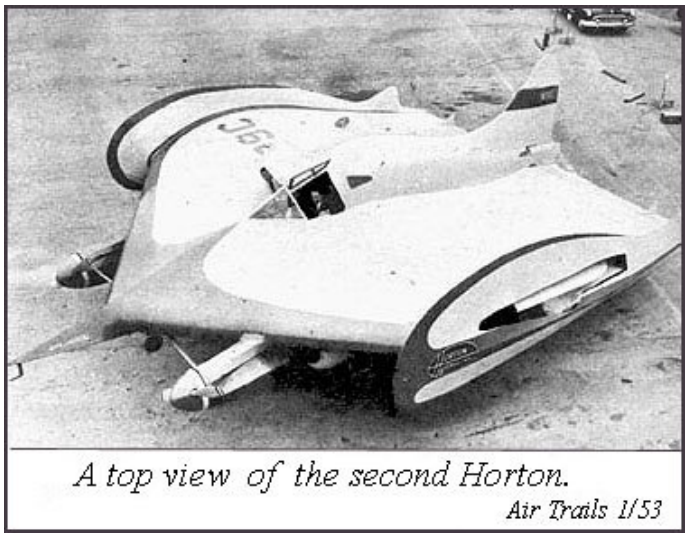
- On the positive side, a 20% wing thickness with a 3 meter root chord would let us "hide" the first .6 m (2 feet) of the pilot's body within the wing. This should give us lower parasite drag than other ultralights, which would help make up for the high skin friction and induced drag from using a non-elliptical (bell-shaped?) spanwise lift distribution.
- Transportation would be more difficult than models which use a folding hang-glider type wing.

> koen.van.de.kerckhove@altavista.net wrote:
> What is my goal? Well, I think everyone is intrested in how a flying wing gets from drawing board to prototype. I want to start such a project and share it with EVERYONE. I would like to make a P2 (read P square; means PP; stands for Peoples Plane).
How does one say "People's Nurflugel" in German? Volksflugel?

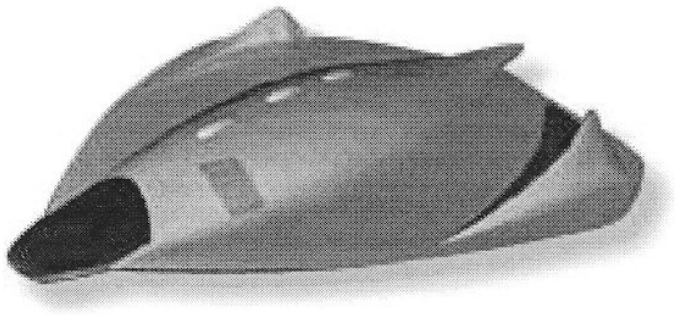
Gregg,

Thanks for the info on the desktop aero software. Do you have any experience with their product, "Applied Aerodynamics - a Digital Textbook?" It might be my next purchase, after I finish reading Nickel and Wohlfahrt's book.

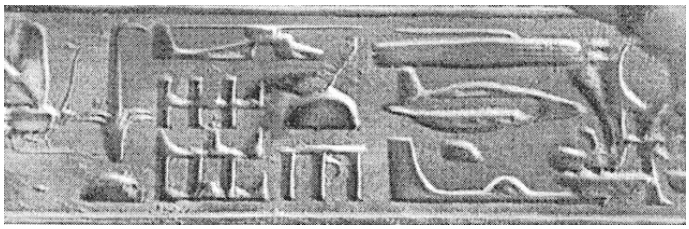
How about the students on the mailing list? What textbooks have you used for aircraft design which may have some applicability to tailless ultralights?



ABOVE: The Horton Wingless with “air brakes” retracted and it is presumed, William Horton sitting in the cockpit for his promotional shot.



ABOVE: From the historic (Horton & Payen) to the future. This is a Testors Models concept drawing of an UFO based on information from Bob Lazar, who supposedly had seen one. For more on what Testors is doing in this area, visit their web site at: www.testors.com.



ABOVE: This is an Egyptian wall plaque from one of the many temples. It depicts what appear to be various types of aircraft like a helicopter and at least two types of planes, one of which could be a flying wing. For more on this, check out the following web site: www.in.search-of.com/frames/hamiltion/ancientaircraft_nf.shtml.

(ed. – I am a little leery of the authenticity of such a plague since it never seems to appear in other media when covering ancient aircraft.)