

T.W.I.T.T. NEWSLETTER



The Boeing X-48B Blended Wing Body sub-scale research aircraft banks smartly in this block 2 flight phase image, April 4, 2008. NASA Dryden Flight Research Center Photo Collection:
<http://www.dfrc.nasa.gov/Gallery/Photo/X-48B/Small/ED08-0092-02.jpg>

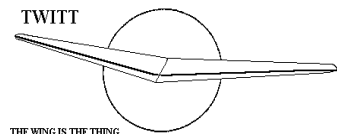
T.W.I.T.T.

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., 0809 means this is your last issue unless renewed.

Next TWITT meeting: Saturday, September 20, 2008, 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

Haste makes waste. In case you didn't notice your last newsletter had the right issue number but the wrong month. I got in a hurry to get it out when I got back from my conference and was thinking too hard about the September program, so entered September in the header instead of August. You can either cross out the month and write in August just to make sure there is no confusion later, or you can print a copy of the new cover page from the web site issue that is now up-to-date.

I hope some of you who live in southern California or on the west coast were able to make it to the ESA Western Workshop at Tehachapi over the Labor Day weekend. It was a great two days of outstanding programs covering a wide variety of very interesting topics. I will try and use some of the material in future newsletters since I think it is of general interest to all types of aircraft, be it conventional or flying wings. The use of regenerative power and electric flight even brought out Burt Rutan on Saturday to listen in on some of the presentations. He was traveling incognito since his nametag read "Chuck Yeager". We did miss not having Dr. Paul MacCready there since the subject was one dear to his heart and he had done a lot of work in finding more efficient methods for using regenerative systems in aircraft as reflected in his Pathfinder and Helios craft.

I will be getting busy in the next week or so scanning in more of the older newsletters. I hope to eventually have all the back issues to June 1986 on the web site by the time I am through. Unfortunately these older issues are all in black and white since the pictures were all gray scaled due to the printing techniques being used at the time. However, the material is all very good and for those of you who joined us later and didn't order any back issues this will be your opportunity to catch up on the historical side of TWITT.

Andy



**SEPTEMBER 20, 2008
PROGRAM**

DAN DOUGHERTY will be our speaker for the September meeting. He will be bringing his 2nd place winning entry in the 2008 SAE International Aero Design East competition and of course it is a flying wing. It uses a blended wing body model with a 5' wingspan. It has a 'belly flap' installed under the wing which was integral to the design, allowing the aircraft to rotate at takeoff. He will be bringing the fully functioning competition model for display since it survived the competition.

Here's a link to an article on their team's achievement:

<http://karl.papubs.csulb.edu/news-events/story.cfm?hackid=955>

"This is the first year the team has competed in both SAE Aero Design East and SAE Aero Design West competitions. At the West contest in early April, the CSULB team captured first-place honors for its micro class oral presentation, continuing a successful run that began with a first-place overall award for the debut of a tailless flying wing design in the open class contest during 2007."



**LETTERS TO THE
EDITOR**

July 28, 2008

Here it is, time to renew my subscription already. I truly look forward each month to seeing what the rest of the flying wing experimenters around the world are doing. Who would have guessed that someone built an under water research wing?

My latest projects are a couple of electric powered wings. Both are pushers. One is a fairly standard swept wing with a fin on each side just outboard of the prop. The other is a cranked delta. It also has the first tricycle landing gear I have tried to design, so it's definitely in the *de-bug* stage. There was also a semi-scale Bell X-1, which is dropped from another plane, however that one doesn't count because it has a tail.

Thank you for all the effort that goes into the TWITT Newsletter.

Sincerely,

Allan Morse
San Bruno, CA

(ed. – Thanks for the renewal. It is always great to see that the model builders out there are continuing to experiment with new configurations. Once you have some data on them and how they perform could you please send a short article and a couple of pictures?)

July 30, 2008

Time to renew my annual membership. Enclosed please find my payment to extend my membership one more year.

It has been great to read the newsletter every month. I look forward a lot to reading up on great flying wing information, discussion and new projects.

Regards,

Artur Goncalves
Portugal

(ed. – It is always great to get renewals from our foreign members. There is so much going on all over the world relative to flying wing development and historical accounts.)

August 1, 2008

Enclosed are three out of four in a series of articles about the "Wings Of Northrop" as published in Air Classics. I could not obtain a copy of the second part in the February 2008 issue since my local library didn't have it and couldn't get it. I have tried since January so maybe you can have better luck.

I am sending all that I can find. The originals are in color, very clear and large. Perhaps some other members can obtain originals in color.

Eugene Turner
San Jacinto, CA

(ed. – Eugene included copies of the first, third and fourth parts of the articles as published in the January, March and April of 2008. The copies weren't good enough to scan a couple of the images to give you an idea of the material, plus these are such new

publications there are copyright laws I couldn't overcome.

They are quite thorough articles on the various Northrop designs over the years, so offers a condensed history for those who don't have some of the other Northrop historical books.

We will add these copies to our archives and want to thank Eugene for sending them to us.)

August 30, 2008

I recently found an article titled "Horten Ho229 Introduction" in Radio Control Jet International magazine, June/July 2008 issue.

The lead-in for the article states the editor introduces the famous Horten Ho229 with two building articles to follow, which will feature the construction of two different size model aircraft. One will be a 1:8 scale and the other 1:5 scale and both use ducted fan engines.

You can probably find this issue in your local hobby store, but if not you can try to order one from: <http://www.rcjetinternational.com/issue/issue.aspx?cid=4142&iid=3877>

Steve Torpey
Bakersfield, CA

NURFLUGEL THREADS

August 9, 2008

How Do You Find The Stagnation Point And Upwash Angle

I am trying to help someone design vortilons for his Mitchell U-2. As I understand it the idea of a vortilon is to block the spanwise flow of the leading edge stagnation point at or just before the stall AoA. So if I have the pressure distribution at the critical AoA my guess is that the stagnation point is at the point of highest pressure and the upwash angle is perpendicular to the surface at that spot. Am I right about that? If not could somebody give me a clue? Would you guys look at this and tell me what you think.

<<http://www.homebuiltpairplanes.com/forums/showthread.php?t=4327>>

Thanks

Norm Masters

<mailto:nmasters@acsol.net>

The stagnation point is where the flow (velocity) is zero. So the pressure would be lowest, not the highest pressure. In your diagram it would be a little higher up the leading edge.

However, the U-2 is a very low drag design so I'm not sure why drag devices would be recommended without adverse yaw or some known bad behavior at stall like with the Vari-Eze and ERJ145.

http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1678-58782004000400004

There are vortex generators all over Boeing wings. "Things like vortex generators, stall fences and even winglets are all crutches for poor designs. Look at any Lockheed designed wing and you don't find these add on features." - anonymous. That might generate some discussion.

Rick (not an aerodynamicist).
rick-page@shaw.ca

August 23, 2008

Why On Earth Would A Swept Wing Have Polyhedral

The Mitchell U-2 has polyhedral and winglets. Since swept wings typically have dutch roll caused by excessive dihedral effect at low speed why would you design in actual dihedral? The only thing I can think of is that the U-2 is notorious for leaving part of one stabilator at the touchdown spot so Don put in the dihedral to get them farther up. If that's the case it seems to me that a small wheel would be a better solution. Other opinions?

Norm

I think Don knew it too. Here is the last b 10 he built.. Looks flat to me. You can see the stations for leading edge slats.

I have always wanted to get rid of the dihedral in the wing. Now that you say that, I will probably be doing it.

Mike
<MikeT52@roadrunner.com>

Excessive dutch-roll may also be due to low damping, and not just high dihedral effect. Either will get you there.

Al Bowers

<Albion.H.Bowers@nasa.gov>

The sweep, and dihedral combination has also struck me as a strange setup on the old 'fledge' rigid wing hang gliders, from what I have seen the tip fins skewed to aid control. Wondered if anyone out there ever flew one, and could comment on their handling?

Paul Westrup

<p_westrup@hotmail.com>

The Fledge, Quicksilver, Seagull V, icarus series and several others all only controlled yaw. They depended on STRONG dihedral effect and solid spiral stability to couple the yaw control into roll as well. They would start with a skid into a turn, but would quickly couple into roll as well. Once the bank was established, they would stay in a coordinated turn fairly well.

Notably, the Swift foot-launch sailplane was the opposite. It controlled roll only, and depended on dihedral effect and spiral stability to slip into a turn and then yaw. Again, once the turn was established, the spiral stability would coordinate nicely.

Dihedral and sweep allowed all these designs to fly quite well without full three-axis control.

Al Bowers

Yes, my 1/3rd model of the SWIFT wing turns fine on elevons (i.e. no rudder/yaw control) and locks into thermal turn well, though does demonstrate a bit of adverse yaw at low speed.

<http://uk.youtube.com/watch?v=v95ltWHrjm8>

I find it amazing that a wing with sweep and dihedral (like the fledge) could turn at all, must have been super stable and can only imagine the turn being less than precise like a rudder/elevator model.

Paul Westrup

That's consistent with what I've heard and my limited experience with the U-2 X Plane simulator. It flies nicely if you steer with your feet and just use the stabilators for pitch. The stabilators produce pretty strong adverse yaw making it hard to coordinate.

Norm

I'm just reciting the book like a pirate's parrot, he he... but it's interesting to know you have tried and it really works.

Ground loops because of lack of wingtip clearance? I imagine it should be a problem... However I've seen some pictures where the inboard positive dihedral seems to be large enough for the wingtip to be at the same point it would be if the wing had no dihedral at all.

Andre Martins

<kriptone@gmail.com>

The final configuration of any aircraft is a collection of compromises often driven by mundane things that drive the aerodynamics guys nuts. Many high performance sailplanes have turned out to be very demanding on takeoff and landing due to limited wing tip clearance.

A swept flying wing is a special case in that as the aircraft flares for landing, the wingtips get much closer to the ground. If a wingtip does touch, a ground loop becomes a possibility.

The mundane solution is dihedral or polyhedral - not for aerodynamic reasons but just to get the wing tips off the ground. Obviously, this leads to way too much yaw to roll coupling and dutch roll susceptibility. Adding a small wheel can help if you always operate from smooth surfaces but tiny wheels can catch in grass or weeds insuring a ground loop.

I've always liked Jim Marske's swept forward approach, which actually increases wing tip clearances in the flare. This allows a very nose high attitude and a very low energy at touchdown. You've no doubt noticed that birds sweep their wings forward as they land.

Bill Daniels

BILDAN@COMCAST.NET

August 25, 2008

Horten Docs In Germany

I have a person who is going to fly to Munich soon, so I want to know if there is a documentation center were to buy copies of any Horten craft documentation to be delivered to the hotel in Munich.

Greetings from Argentina.

Fernando Walter Siarez

<fws669@yahoo.com>

The Archive of the Deutsches Museum in Munich keeps some Horten documents, including a complete set of blueprints for the Ho 229 (original and on microfilm). But they do not deliver these documents to

the hotel, you have to go there and then you can order copies and then wait for some time (often weeks) until you receive these copies. But if you use the microfilm reader-printer you can directly print from it and take the drawings. They ask for a written application before you go there. They then can prepare the documents you want to see. You can contact them via their website.

<http://www.deutsches-museum.de/>

Sometimes it is a bit difficult. A friend from abroad was there several times asking for the Ho 229 plans, and he was always given the original drawings. They never told him about the microfilms. So he had to order the much more expensive copies of the original drawings instead of making copies from the microfilms (you can only print paper copies, they do not copy complete microfilm reels).

If the person is interested in Ho 229 drawings, it would be nice if he (or you) would contact me in advance.

Maik Swoboda

<ErzwoD2@hotmail.com>

Hello there, I don't contribute too often, but I have been to the Munchen museum, and their collection of documents is excellent. The viewer-printer takes a few tries, but it does good when its going. The cost of prints is about 70 cents each, and its on A3 paper, sort of a double-wide 'letter' size page, the resolution is very good, and blueprints are white-copied. There are several hundred drawing on the GO-229 fighter, and just to view them all is a 2-day job on its own. They are all on 3 spools of microfilm. There are technical papers from Jumo for their engines, and even some for the radios and the proposed radar sets. The problem is you must stay focused, because if you start to look at the titles just sitting in the foyer, you will be there forever. The staff are helpful and most speak English. There is space to park all around the immediate area within 2-3 blocks and closer, and walking to the museum is fun anyway. There are restaurants close by, a super gift shop on-premises that sells nice gifts at reasonable prices, and the Museum is on the river and you will cross a bridge to go into the grounds. Munich is a beautiful modern city itself and shops everywhere. If you can stay there a couple of days, do so. Well, enough of this PR stuff, the entrance to your hall is marked by a Pelton water wheel (US design, about 2.5 meters high), that is visible after you pay the admittance fee and walk through the entrance hall. Go in and go right up the stairs, and the technical department is up there. The staff are at several desks positioned around the large room, and you will speak to one of these people who will get your particulars (name, address) and get your microfilm cans (hockey-

puck size) and demonstrate the viewer-printer. The two photos I attached show the hall and the water wheel.

<http://www.windowslive.com/explore/messenger?ocid=TXE TAGLM WL messenger yahoo 082008>

Kenneth Taber

<kwtaber@hotmail.com>

I have never paid an admittance fee to enter the archive, you only need to pay a fee if you enter the Museum (which shows a beautiful and impressive collection). The archive entrance is at the opposite site of the Museums entrance (you can see the museums entrance on the first image on this site:

<http://www.deutsches-museum.de/information/>)

Maik Swoboda

August 27, 2008

Rare Aircraft

Some unique aircraft, some you've seen, most not I'm guessing:

Rare Aircraft - United States

<<http://rareaircraf1.greyfalcon.us/UNITED%20STATES.htm>>

AI

Thanks for sharing AI!! Like you said, a few I've seen before.... But some looked like mongrels... meaning some looked like two different types/manufacturers designs brought together.

Derek

I'll chime in. Being an addict for aviation history, there were no surprises but a magnificent collection of oddities and little known aircraft. Yet a lot of these were produced in quantity, but not well publicized. Some thoughts:

1. How many books and Hysterical Drekumentaries have we seen about "Lost Miracle Weapons of the Third Reich!" I contend that there is significant fodder for a dozen such if someone used these as starters!
2. Note the glide bombs and fuel experiments. Northrop had flying wing versions of such bomb and

towed/then released fuel gliders to extend a bomber's range without drag penalty.

3. Good to see a RARE picture of the Hughes D-2, a company funded project that so little is well recorded, including it's real purpose. For the congressmen to go after him as a "war profiteer" flies in the face of facts.

4. The B-17 engine test beds were quite common with airframes either given to defense manufacturers or sold for a few hundred \$ with only ferry hours. Rudy Opitz of Me163 test pilot and Horten fame worked for P&W flying one of these as an engineering test pilot.

5. Note the many EXTREME mods to P-47s and 51s. One -47 with a Chrysler engine had the unofficial speed record over 500mph.

6. In the post war battle for survival, note the aircraft company projects for civil airliners and especially light planes. We recall personal craft such as the North American Navion, but Convair, Grumman, Douglas, Fairchild, Bell, and even Boeing had projects that they cut metal on.

7. The Besler project actually used a steam engine from a switching locomotive, and could reverse rotation in the air to shorten touchdown ... apropos of the C-130 pitch of reversing prop pitch.

8. The Bell L-39 undermines the frequent statement that we were ignorant about swept wings until we examined German war booty. Most of the initial work was NAA sponsored dating from the 20s.

9. The Budd Conestoga was built from Stan less Steel!

10. The original Fisher XP-75 involved Preston Tucker, and I like to think it was an effort of a perpetual subcontractor to get into the prime market. It was designed around many existing parts from aircraft like the SBD, P-40, P-51 and F4U.
<http://home.att.net/~jbaugher1/p75.html>

11. Before the Sea Bees proved so adept at building runways on captured Pacific islands, we had prepared and flown a whole variety of military seaplanes, including six types of invasion gliders, and C-47s and P-38s on floats. The latter craft was modified with an S bend in the booms to raise the empennage if necessary.

12. The Lockheed L-133 was a proposal for what became the P-80

13. The McDonnell XP-67 deserves a better picture. An amazingly shaped and faired exercise.

http://www.anigrand.com/images/items/AA2056_XP-67/AA2056_XP-67_real_1.jpg

<http://www.geocities.com/raravia/img/bat01.jpg>

14. Bill Odom was killed air racing a P-51 with radiators in the tips similar to the ram jets. This eliminated the bottom scoop and also produced ram air thrust plus tip end plate gains.

Bob Storck

<<mailto:bstorck@sprynet.com>>

MITCHELL U-2 THREADS

August 13, 2008

New Mitchell Wing Video Clip

Here is a short clip shot from my B10 at 2400 ft when Tibor and I were flying to a fly-in 230 km NW Stockholm this weekend.

<http://www.youtube.com/watch?v=4eBx3gcELG8>

Carl Hyllander

<carl.hyllander@bredband.net>

(ed. There are several short videos of the U-2 and B-10 at this link, along with a number of over videos that might be of interest to some of you. Here is another link that takes a little time to load so be patient.

<http://hem.bredband.net/callegflygare/Mitchell%20wing%20U2.WMV>)

(ed. – The following article was provided by Richard Avalon, who gave it to me at the 2008 ESA Western Workshop over Labor Day weekend, just in time to put it together for the newsletter. Thanks Richard. There may be some misspellings included in this article but that is the way it was originally prepared and I didn't want to try and find what the true spelling might be. Kind of gives it some of the post-war research feel. You can also find a copy of it at the following link:
<http://www.roswellfiles.com/FOIA/FlyingWing.htm>)

SECRET

HEADQUARTERS BERLIN COMMAND
OFFICE OF MILITARY GOVERNMENT FOR
GERMANY (US) BERLIN, GERMANY

S-2 Branch

APO 742, US ARMY

16 December 47

Subject: Horton Brothers (Flying Saucers)

To: Deputy Director of Intelligence
European Command, Frankfurt
APO 757, US Army

(SOURCE: A-2)

1. The Horten brothers, Reimer and Walter, are residing in Goettingen at present. However, both of them are traveling a great deal throughout the Bi-Zone. Walter at present is traveling in Bavaria in search of a suitable place of employment. It is believed that he may have contacted USAFE Head- quarters in Wiesbaden for possible evacuation to the United States under "Paper Clip". Reimer is presently studying advanced mathematics at the university of Bonn, and is about to obtain his doctor's degree. It is believed that when his studies are completed he intends to accept a teaching position at the Institute for Technology (Technische Hochschule) in Braunschweig sometime in February or March 1948.

2. Both brothers are exceedingly peculiar and can be easily classified as eccentric and individualistic. Especially is this so of Reimer. He is the one who developed the theory of the flying wing and subsequently of all the models and aircrafts built by the brothers. Walter, on the other hand is the engineer who tried to put into practice the several somewhat fantastic ideas of his brother. The clash of personalities resulted in a continuous quarrel and friction between the two brothers. Reimer was always developing new ideas, which would increase the speed of the aircraft or improve its maneuverability; Walter on the other hand was tearing down the fantastic ideas of his brother by practical calculations and considerations.

3. The two men worked together up to and including the "Horten VIII" a flying wing intended to be a fighter plane powered with two Hirt engines (HM-60-R) with a performance of approximately 650 horsepower each. After the "Horten VIII" was finished, one of the usual and frequent quarrels separated the two brothers

temporarily. Walter went to work alone on the "Horten IX", which is a fighter plane of the flying wing design, with practically no changes from the model VIII except for the engines. Walter substituted the Hirt engines with BMW Jets of the type TL-004. The plane was made completely of plywood and was furnished with a Messerschmidt ME-109 Landing gear.

The model of this aircraft (Horten IX) was tested extensively in the supersonic wind tunnel (Mach No. 1.0) of the aerodynamic testing institute (Aerodynamische Versuchsanstalt), located in Goettingen. The tests were conducted in the late summer of 1944 under the personal supervision of Professor Betz, chief of the institute. Betz at that time was approximately sixty years old and next to Prandtl (then seventy-eight years old), was considered to be the best man on aerodynamics in Germany. Betz's attitude toward the flying wing is very conservative to say the least. Basically he is against the design of any flying wing. According to the official reports about the tests, air disturbances were created on the wing tips, resulting in air vacuums, which in turn would prevent the steering mechanism from functioning properly. This seems logical as, of course, neither the ailerons nor the rudders could properly accomplish their function in a partial vacuum created by air disturbances and whirls.

In spite of that, two Horten IX's were built and tried out by a test pilot, Eugen (now living in Goettingen) at Rechlin in the fall of 1944. One of the two planes, piloted by another test pilot, developed trouble with one of the jet engines while the pilot was trying to ascertain the maximum rate of climb. The right jet stopped suddenly, causing the aircraft to go into an immediate spin and subsequent crash in which the pilot was killed. Eugen, however, was more fortunate in putting the other ship through all the necessary paces without the least trouble. He maintains that the maximum speed attained was around 950 km per hour, and that there were no steering difficulties whatsoever, and that the danger of both head and tail spins was no greater than any other conventional aircraft.

After extensive tests, the Horten IX was accepted by the German Air Force as represented by Goering, who ordered immediate mass production. The first order went to Gothaer Waggon Fabrik, located in Gotha (Thuringia) in January 1945. Goering requested that ten planes be built immediately and that the entire factory was to concentrate and be converted to the production of the Horten IX. The firm in question received all the plans and designs of the ship. In spite of this explicit order, production of the Horten IX was

never started. The technical manager of the firm, Berthold, immediately upon receipt of the plans, submitted a number of suggestions to improve the aircraft. It is believed that his intention was to eliminate the Horten brothers as inventors and to modify the ship to such an extent that it would be more his brainchild than anybody else's. Numerous letters were exchanged from High Command of the German Air Force and Dr. Berthold, which finally were interrupted by the armistice in May 1945. When US troops occupied the town of Gotha, the designs of the Horten IX were kept in hiding and not handed over to American Military authorities. The original designs in possession of the Horten brothers were hidden in a salt mine in Salzdettfurt, but the model tested by Eugen was destroyed in April 1945. The original designs were recovered from Salzdettfurt by British authorities in the summer of 1945.

The Horten brothers, together with Dr. Betz, Eugen and Dr. Stueper (the test pilot of the aerodynamic institute in Goettingen), were invited to go to England in the late summer of 1945 where they remained for approximately ninety days. They were interrogated and questioned about their ideas and were given several problems to work on. However Reimer was very unwilling to cooperate to any extent whatsoever, unless an immediate contract was offered to him and his brother. Walter, on the other hand, not being a theoritician, was unable to comply and Reimer was sufficiently stubborn not to move a finger. Upon their return to Goettingen Walter remained in contact with British authorities and was actually paid a salary by the British between October 1945 and April 1946, as the British contemplated but never did offer him employment. Walter subsequently had a final argument with his brother and the two decided to part. Reimer then went to the university of Bonn to obtain his degree, and Walter organized an engineering office in Goettingen which served as a cover firm to keep him out of trouble with the labor authorities. Walter married Fraulien von der Groeben, an extremely intelligent woman, former chief secretary to Air Force General Udet.

In the spring of 1947 Walter Horten heard about the flying wing design in the United states by Northrop and decided to write Northrop for employment. He was answered in the summer of 1947 by a letter in which Northrop pointed out that he, himself, could not do anything to get him over to the States, but that he would welcome it very much if he could come to the United States and take up employment with the firm. He recommended that Walter should get in touch with

USAFE Headquarters in Wiesbaden in order to obtain necessary clearance.

4. As can be seen from the above, most of the Hortens' work took place in Western Germany. According to our source, neither of the brothers ever had any contact with any representative of the Soviet Air Force or any other foreign power. In spite of the fact that Reimer is rather disgusted with the British for not offering him a contract, it is believed very unlikely that he has approached the Soviet authorities in order to sell out to them. The only possible link between the Horten brothers and the Soviet authorities is the fact that a complete set of plans and designs were hidden at the Gothaer Waggon Fabrik and the knowledge of this is known by Dr. Berthold and a number of other engineers. It is possible and likely that either Berthold or any of the others having knowledge of the Horten IX would have sold out to the Soviet authorities for one of a number of reasons. However, this will be checked upon in the future, and it is hoped that contact with the the Gothaer Waggon Fabrik can be established.

5. As far as the "flying saucer" is concerned, a number of people were contacted in order to verify whether or not any such design at any time was contemplated or existed in the files of any German air research institute. The people contacted included the following:

Walter Horten
 Fraulien von der Groeben, former Secretary to Air Force General Udet
 Guenter Heinrich, former office for research of the High Command of the Air Force in Berlin
 Professor Betz, former chief of Aerodynamic Institute in Goettingen
 Eugen, former test pilot

All the above mentioned people contacted independently and at different times are very insistent on the fact that to their knowledge and belief no such design ever existed nor was projected by any of the German air research institutions. While they agree that such a design would be highly practical and desirable, they do not know anything about its possible realization now or in the past.

[signed]

HARRY H. PRETTY
 Lt Col GSC S2
 Telephone BERLIN 44715
 Copy furnished: Director of Intelligence, OMGUS

SECRET

A Model Approach

Sustaining Flight with Minimum Power
By Dean Sigler

(ed. – This is a condensed version of Dean's presentation at the ESA Western Workshop, Tehachapi, CA, August 30, 2008.)

My interest in developing a geodetic-based ultralight sailplane that emulates the great wooden ships of the 1930s goes back many years. The aesthetics of those machines is as important to me as the possibility of achieving greater performance with a more modern design.

The purity of flight is unbroken, regardless of what one flies.

Part of my interest in this type of airplane is based on a few light sailplanes that could be redesigned to fly on small, model airplane electric motors currently available. Such a setup would act as a sustainer motor, enabling the already launched sailplane to maintain altitude while the pilot finds more lift.

This presentation covers the origins of my interest, what comprises a basic electric motor system for a light sailplane, a breakdown of the components required, and cautions based on anecdotal and statistical evidence. I will end by showing the potential of these small, lightweight setups, and leave behind a listing of useful websites and resources that will enable others to pursue this study.

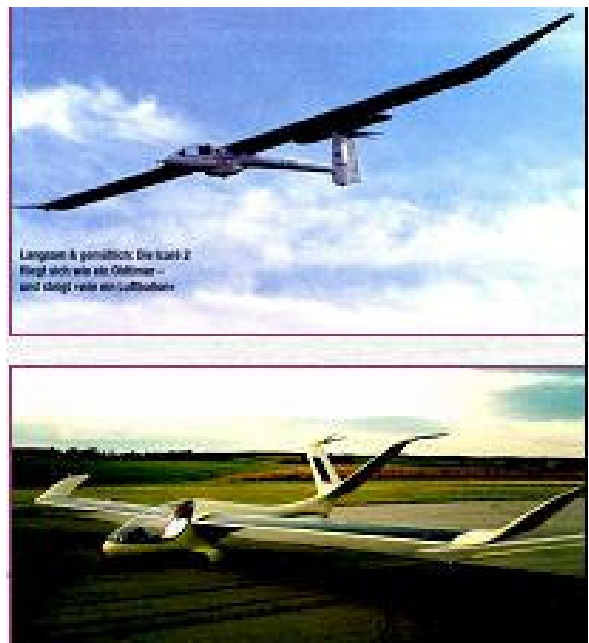
Following a heart attack in April, 2004, I had time to recuperate and engage in leisure reading. I had my daughter drive me to a favorite magazine shop in Portland, OR, where I purchased the current edition of Quiet Flyer, which featured Rob Honeycutt's amazing Extra 330L.



I was able to deduce that a 28-pound airplane that could hover had to be putting out at least 28-pounds of thrust. It turned out to be better than that, and I was able to conceive that these little model electric motors could power a sustainer power pack for sailplanes.

Assuming a 524-pound AUW sailplane with even a modest 25:1 lift to drag ratio, it would require only 20.96 pounds of thrust to maintain altitude at its best l/d speed.

Looking at solar-powered craft, I became further convinced that model airplane motors could be relied on for the necessary performance. After all, Solar Challenger had crossed the English Channel using an Astro-Flight motor, and Sunseeker had crossed the United States!



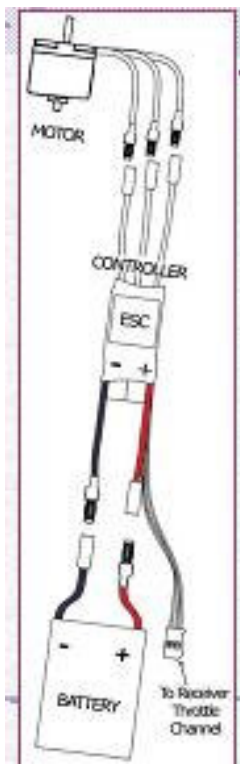
Icaré II (top image), with its 200 kg structural weight, is powered by a 12 kW electric motor, and requires 1.8 kW to maintain level flight. Jochen Ewald, Its pilot, describes the 25-meter plane's characteristics.

"The best glide angle is about 40:1 at 61 km/h, which gives nice, but slow progress if the wind is not too strong. Stalling speed is 45 km/hr, with the big glider going into a stable, shaking stall. During the flight tests, the big flying tail plane got a curved end to improve longitudinal stability. Without this, flying her must have been quite exhausting. During my flight, I am "thinking back" nearly 70 years, remembering Robert Kronfeld's huge Ku-4 "Austria" which most of us only know from photos and drawings: How might this (still, until the "ETA" flies) biggest ever built high performance glider with 30 meter span, an even lower wing loading and also a short tail have flown? Probably with comparable, but even more extreme characteristics! To compare the Icaré 2 with today still

flyable gliders, the Slingsby T-21 may be used: At about 60 km/hr the Icaré 2 behaves like a T-21 flown close to minimum speed, but not so handy!”

Gunter Rochelt’s Solaire II (bottom image) weighed 230 kg at takeoff, with 39 percent in its structure, 39 in its pilot, and 19 percent in its solar and battery power system. The remaining three percent were accounted for by a parachute.

Components vary in quality and price. For purposes of this paper and presentation, I’ve decided to stay with equipment that has demonstrated reliability, is made in America or Europe (there are a myriad of inexpensive Chinese components, but anecdotal evidence suggests lack of reliability and product support).



One has the option to select a single large motor or two or more smaller motor to get the desired thrust. Rob Honeycutt used twin Hacker motors in his successful Extra 330L, using a speed reduction drive to the prop.



Hacker followed up with multiple motors in geared drive arrangements – a twin-motor item and a four-motor design that produced 87 pounds of thrust through a 30-inch propeller. Costing \$2,995 for the motor/gearbox setup shown above, it and the twin-motor system were soon replaced by larger, single motor designs.

Most model motors in the size ranges of interest in this presentation are brushless, and are either inrunners or outrunners.

Inrunners (below) are built like traditional brushed motors, but take their speed control from an electronic speed controller.



Taking signals from the speed controller, the motors outer magnets are turned on an off at 120-degree phased intervals. Each time a pole is activated, it draws the rotor toward it.

The speed controller acts as the interface between the battery and the motor. Since the battery is always at the same voltage, the controller has to modulate that power to allow the motor to turn at different speeds. A series of MOSFET transistors act as switches in the speed controller and vary the width of the pulses sent to motor.

Inrunners tend to be more efficient than outrunners, but turn at incredibly high rpms, requiring the use of a gearbox to reduce propeller speed to required levels. Even with the 6.7 gearbox on this Neumotor, further reduction would be required. At 70,000 rpm, the output shaft would still turn over at 10,447 rpm!



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VIDEOS AND AUDIO TAPES



(ed. - These videos are also now available on DVD, at the buyer's choice.)

VHS tape containing First Flights "Flying Wings," Discovery Channel's The Wing Will Fly, and ME-163, SWIFT flight footage, Paragliding, and other miscellaneous items (approximately 3½+ hours of material).

Cost: \$8.00 postage paid
 Add: \$2.00 for foreign postage

VHS tape of Al Bowers' September 19, 1998 presentation on "The Horten H X Series: Ultra Light Flying Wing Sailplanes." The package includes Al's 20 pages of slides so you won't have to squint at the TV screen trying to read what he is explaining. This was an excellent presentation covering Horten history and an analysis of bell and elliptical lift distributions.

Cost: \$10.00 postage paid
 Add: \$ 2.00 for foreign postage

VHS tape of July 15, 2000 presentation by Stefanie Brochocki on the design history of the BKB-1 (Brochocki, Kasper, Bodek) as related by her father Stefan. The second part of this program was conducted by Henry Jex on the design and flights of the radio controlled Quetzalcoatlus

northropi (pterodactyl) used in the Smithsonian IMAX film. This was an Aerovironment project led by Dr. Paul MacCready.

Cost: \$8.00 postage paid
 Add: \$2.00 for foreign postage

An Overview of Composite Design Properties, by Alex Kozloff, as presented at the TWITT Meeting 3/19/94. Includes pamphlet of charts and graphs on composite characteristics, and audio cassette tape of Alex's presentation explaining the material.

Cost: \$5.00 postage paid
 Add: \$1.50 for foreign postage

VHS of Paul MacCready's presentation on March 21, 1998, covering his experiences with flying wings and how flying wings occur in nature. Tape includes Aerovironment's "Doing More With Much Less", and the presentations by Rudy Opitz, Dez George-Falvy and Jim Marske at the 1997 Flying Wing Symposiums at Harris Hill, plus some other miscellaneous "stuff".

Cost: \$8.00 postage paid in US
 Add: \$2.00 for foreign postage

VHS of Robert Hoey's presentation on November 20, 1999, covering his group's experimentation with radio controlled bird models being used to explore the control and performance parameters of birds. Tape comes with a complete set of the overhead slides used in the presentation.

Cost : \$10.00 postage paid in US
 \$15.00 foreign orders

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BLUEPRINTS - Available for the Mitchell Wing Model U-2 Superwing Experimental motor glider and the B-10 Ultralight motor glider. These two aircraft were designed by Don Mitchell and are considered by many to be the finest flying wing airplanes available. The complete drawings, which include instructions, constructions photos and a flight manual cost \$140, postage paid. Add \$15 for foreign shipping.

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