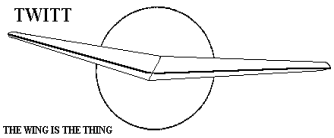
No. 168 JUNE 2000

T.W.I.T.T. NEWSLETTER

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., **0003** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, March 18, 2000, 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, east side of Gillespie).

TABLE OF CONTENTS

PRESIDENT'S CORNER

Well, I have heard from some of you that you like pictures in the newsletter, so this one should satisfy just about everyone. I agree, some of the pictures are not of flying wings, but they do reflect the subject matter of your speaker. I must apologize to all the various web site owners where I grabbed most of them, since Gene's photocopies were not suitable for reproduction. I was in a hurry and didn't keep track of the sources for each like a good editor should. I also apologize to you, the members, since the quality of some are not what I would like them to be.

Just to give everyone an advance heads-up, we have lined up Al Bowers for our September program. Al has agreed to tell us all he can about the current status of the joint NASA/Boeing Blended Wing Body (BWB) project. This will be a definite must for attendance, since it will be the most up-to-date information you will get short of working on the project yourself. So mark September 16th right now on your calendar so you don't plan anything else on that Saturday.

At this point in time we are planning on video taping both the July and September programs, since we think many of you would like to see them rather than just read about it in the minutes. Once everything is complete and we have packages ready for distribution, we will give you a price.

I would personally like to thank Reinhold Stadler for his excellent article on the Horten VIi and the fantastic graphic that goes with it. We had planned on publishing it last month, but Reinhold wasn't quite finished with the graphic and, I am glad we waited for the complete package. I hope everyone enjoys it.

Andy

JULY 15, 2000 PROGRAM

The July program will feature Henry Jex and his subject will be, "Creating An Autonomous Flying Replica of The Quetzalcoatlus Northropi Pterodactyl ". The program will include a one hour slide show to illustrate the talk about the pterodactyl's development (in which the speaker actively participated at AeroVironment Inc). The will then be a 14 minute videotape covering test-flights and "incidents" and, then Henry will open the floor for a discussion period.

Make sure to check next month's newsletter for a short bio on Henry. This will be a good program describing an ancient flying wing and how modern technology was able to duplicate it.

MINUTES OF THE MAY 20, 2000 MEETING

At the usual 1:30 starting time (okay, so we didn't really get started until 1:45), Andy gathered everyone into the hanger to begin the May meeting. After briefing the group on house keeping items, he asked everyone to introduce themselves since there were some new faces in the audience. Among these were: Dean and Kim Rosenlof from Phoenix, Arizona, whom we haven't seen in a long time and it was great to have them on hand again; Jay Sadowski and his wife Lorraine from Milwaukee, Wisconsin who is the creator of the foam model wings shown later; Bob Hoey and his wife Carol from Palmdale, and; Lyle Maxey, a well renown soaring personality who wrote the early papers on higher wing loadings for cross-country sailplanes and became national champion using his theories.

After the introductions, Jay Sadowski gave the group a short overview of his new blended wing design, hand launched, foam glider. You can see what these look like in the article below the minutes, which also explains how they came about, so I won't cover it here. Jay launched one of his samples and it flew quite well and there was a lot of activity around his briefcase after the meeting so apparently they were a hit.

Andy then introduced Gene Larrabee who would be telling us about "Early Airplane Stability and Control". Gene started out with a series of overheads on the early gliders and airplanes of the Wright Brothers *(everyone remembers them, right). (ed. – I will use Gene's outline to summarize what he covered since he went through the slides pretty quickly.)*

The first airplane was the 1902 glider that was developed from an earlier kite version that couldn't carry a man. The control system was still being worked out, but initially it involved using the left stick being pulled back to increase airframe lift. The airplane was unstable in pitch and required a steady pilot-foreplane oscillation to maintain flight. It had a body board for roll control, but this was found to be unsuitable so they came up with a coupling of their wing warp with the rudders. This help overcome the adverse yaw and they applied for a patent believing this was the secret to flight.

By 1903 they had a perfected their engine and propeller combination for the first powered flight. During the following years they removed the negative dihedral, ballast it for a more nose heavy condition and added larger foreplanes. The famous tower weight dropping launch procedure was developed and the pilot was moved to an erect position from the original prone method. A right stick was added to give independent roll and yaw control with the stick being moved in a figure eight manner to enter and leave turns. They also noted a stall during turns which was corrected for by lowering the nose. The engines and propellers were both improved and new gear sprocket ratios developed. By 1908 the Wright Brothers were making successful demonstrations of their airplanes in Europe and the United States. In 1911, they went to an aft horizontal tail arrangement, but still had right and left sticks for coordinating control, and had still not installed any safety belts.

ABOVE: Our speaker for the day, Gene Larrabee.

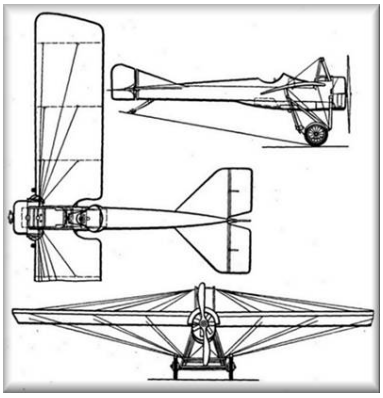
From the Wright Brothers we moved on to the early designs of Glen Curtiss, including the *White Wing* and *June Bug* biplanes that flew in Canada in 1908. Curtiss introduced the auto wheel for steering the rudder and used

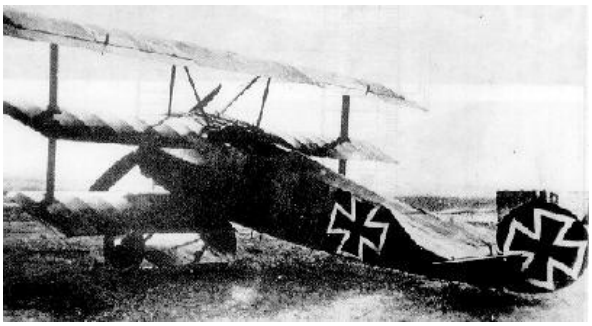
a fore/aft motion to control the foreplane elevator. Triangular tip panels were used for roll control through a shoulder harness arrangement. By 1909, Curtiss had installed strut mounted ailerons between the upper and lower wings at the tips. Beachey eliminated the foreplane in 1910, and the Curtiss flying boat (below) was flown in 1913. Then there was the J, N and JN tractor biplanes designed by B. Douglas Thomas, reflecting the Sopwith and Avro styles. Early JN's had strut ailerons, but later flap-type ailerons with Déperdussin type controls were added. The JN-4 also moved to having a control stick like the Blériot.

Speaking of Blériot, his design was a tractor, monoplane with wing warp and aft elevator which were both controlled by a "cloche" stick. He also included foot operated rudder pedals with uncrossed control wires where pushing with the right foot would yield a right turn.

Gene then moved along to the work of Armand Déperdussin. This included a "monocoque" fuselage designed by Béchereau and was holder of the airplane speed record in 1913 (3-view of right column). This design incorporated a wheel for wing warp and elevator control, while incorporating a Bleriot style rudder. An interesting fact not talked about much was Béchereau designing the SPAD for Déperdussin. When Societé Anonyme pour Avions Déperdussin (SPAD) went into bankruptcy, it was bought by Blériot and gave it a new name, Societé Anonyme pout Avions and ses Dérives (SPAD) so the type name was preserved. The SPAD was a rigid, fully triangulated biplane and was proof against terminal velocity dives.

Next in the lineage of early designs were those of Anthony Fokker. In 1916 he was making copies of Morane-Saulnier airplanes. When one landed in Germany with an unsynchronized machine gun firing through the propeller with steal wedge protected blades, Fokker developed a synchronized Maxim gun (made by the arsenal at Spandau) to fire through the propeller with great success.





Max Immelmann perfected the Immelmann Turn, which was a half loop followed by a snap roll made with the all-moving rudder, in the Fokker Eindecker. However, the Eindecker has Blériot type thin highly cambered wings that were not proof against terminal velocity dives. The wing warp arrangement made them soft in torsion and they would tuck under while tearing off. Fokker and Platz developed torsionally stiff thick wings (based on Göttingen research) with plywood and spruce box spars, which had low drag and superior stalling qualities for the Fokker Dr I triplane, D VII biplane and D VIII monoplane.

Leslie Friese invented the Bristol Balanced Aileron, first tried out on the Avro 504 training planes. It featured a sharp pointed nose which protruded from the lower wing surface when the aileron was deflected up, thereby reducing the adverse yaw from the down aileron on the other side. Best of all, it greatly reduce the force required to deflect the ailerons at high speed, which is why the P-40 could roll away from a Zero on its tail. Friese ailerons of the Focke-Wulf 190 permitted it to roll 180 degrees per second. This type of aileron was so touchy they had to be adjusted by flight testing.

Gene then moved along to Igor Sikorski (one of his designs above) who had developed biplanes in Russia following the French and American practices. He used Déperdussin controls, but with the rudder wires crossed and the opposite of Blériot (and all other practices of the time). Before the first World War he created a large four tractor engine biplane, the largest constructed until that

then, which flew between St. Petersburg and Kiev in 1914. It was called the *Ilya Muromets*. There is a picture of two Russian soldiers standing on the aft fuselage when in flight, holding onto a railing. Sikorski emigrated to the United States in the twenties where he constructed a big biplane, the S-29, which was eventually "shot down" as a German bomber in the Hollywood film, "Wings". Sikorsky continued to cross the rudder controls on his personal airplanes. He and his Russian friends were quite successful in developing helicopters in the '40's.

Gene briefly covered the work of T.O.M. Sopwith, whose aircraft factory developed many WW I aircraft, most notably the *Camel* fighter (below). This airplane was both famous in combat and dangerous to its pilot. It was easily stalled and fell instantly into a spin when stalled. A bigger vertical tail would have helped.

The last designer introduced by Gene was Sir Geoffrey de Havilland who worked for the Royal Aircraft Factory before and during the War. He was partly responsible for the S.E.-4 before he started his own company. His two-seated DH-4 was adopted by the United States during the war and became famous with its American developed Liberty engine.

In wrapping up his presentation on stability and control, Gene mentioned that it was impossible to fly blind with a compass because of Northerly Turning Error, unless you resolutely fly South. The turn and bank indicator invented by Elmer Sperry made it possible to stay right side up in turbulence. Sperry and his associates also invented the artificial horizon and the directional gyro, which made controlled blind flight routine. Finally, he perfected the autopilot, whose prototype made Wiley Post's *second* flight around the world possible without a navigator.

SPAD

After this first part of Gene's presentation, we broke up for few minutes to cool off from the heat in a closed hanger, get some refreshments and have a donut or two. Andy then gathered everyone back together again to view the remaining part of a video covering the life and times of the Wright Brothers. Gene had taped this from a the Biography series and it was very well done, including some footage of a replica Wright glider being flown from a sand dune.

ABOVE: The group watching the documentary video on the Wright Brothers achievements.

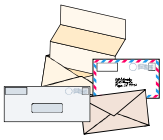
After the video, Andy adjourned the meeting and everyone gathered to finish off the donuts, hanger fly a little more and talk with Jay about his various types of small foam gliders.

CREATURE GLIDERS

Jay Sadowski offers the following explanation on how his series of foam, hand-launched creature gliders came about: This blended wing airplane shape was developed while teaching middle school art classes. Using foam plates and glue to build little gliders from templates, the students were totally absorbed with this popular project. Building tail sections for the gliders seemed troublesome for some of the kids, as well as, leaving a lot of material waste. Eventually, a canard design was introduced to the class. It proved to save some material in the constructions. The inevitable happened, the canard shape blended into the wing and became the "blended wing" glide made with just one foam plate. A steel stamping die was built to punch the shape on the plate allowing for snap-out-and-glue production, which in turn, provided more free time for test flying the new airplanes about the classroom.

ABOVE: Jay Sadowski, his wife Lorraine and our speaker Gene Larrabee posing for a photo opt after the meeting.

Asked, "Where can we get these?" the inspiration hit me to get it patented and start on the long road learning how to do plastic foam. Over time, almost fifty metal molds of various glider shapes were built. Out of that, six were good enough to become "Creature Gliders". The Bat and Bird were first into production with five thousand pieces each. Dactyl, Duck and Bunny will follow. Pig is just a drawing at this time. Living in the Tool and Die belt of America, this flying wing project of mine is really a product of my industrial environment. I owe it to the many resources that were opened during the journey, which continues to this day.



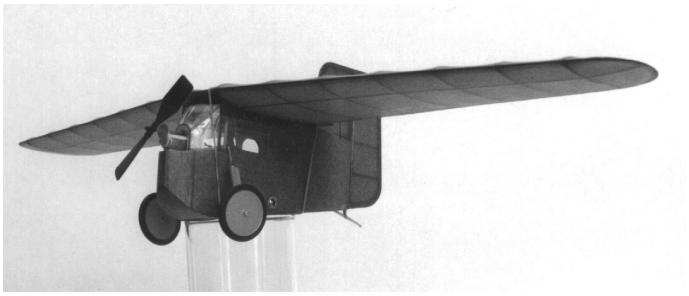
LETTERS TO THE EDITOR

April 4, 2000

TWITT:

Please find enclosed $25 for my renewed subscription. I have also enclosed a few photographs of tailless scale models that I have built and flown recently, which may be of some interest. All these models are between 18 and 26 inch wingspan. If you are familiar with indoor flying, they are all 9 inch length rule peanuts. They are all indoor free flight models – there is a very active indoor flying scene here in the UK.

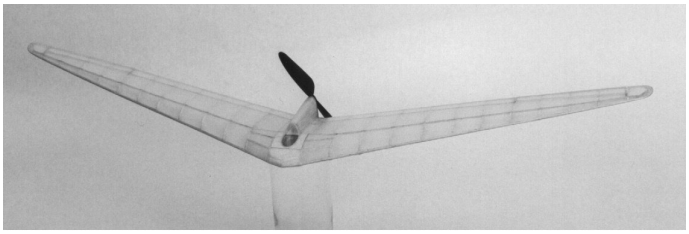
The Backstrom WPB1 (see last month's cover) was built to my own design based upon a scale drawing that Al sent me. It is rubber powered and is rather a fast and furious flyer – 2 high speed circuits of the hall whilst the other flyers cower against the walls! Very sensitive to elevon adjustments and CG position. It was interesting that it was quite easy to trim before I applied the color finish, but adding about 4 grams of paint made it much more sensitive. I do not know if it was the increased weight or the altered surface finish. Sometime I will build another and get it lighter and perhaps a bit larger and see if that is better – it will also be a chance to correct the cockpit area which is not quite right.



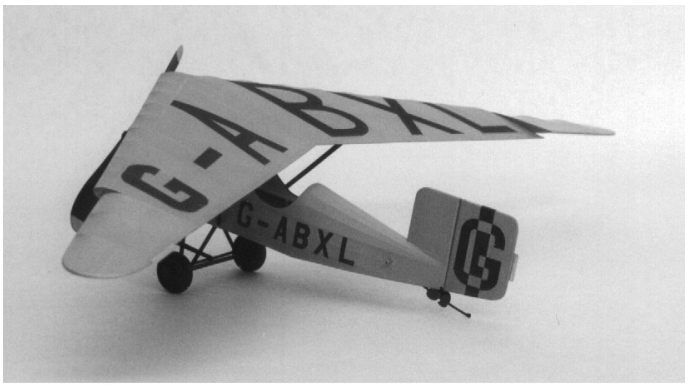
The Stabiloplan (above) is based upon a drawing that Al Backstrom published in Air Wars. In the photo it is fitted with a KP00 electric motor but I have found it under powered and have just replaced it with a Gasparin GM63 co2 set up. Trimming has yet to be completed but so far it look promising.

The Horten IIID was built from a plan by Bob Marchese from your side of the pond which was intended for electric power. I did not like the high weight of the electric motor and batteries and in the photo it is rubber powered for initial tests. These were successful and since then I have fitted a GM24 co2 motor with great success. It flies beautifully and from what I can gather from the literature, very like the full size. Turn is obtained using a drag flap under the left wing and a small amount of differential aileron against the turn. The pattern is a straight initial climb followed by a steeply banked left turn – but with no tendency to spiral in. As the power declines the turn opens a bit and the bank comes off to give a really elegant decent. A real pleasure to watch.

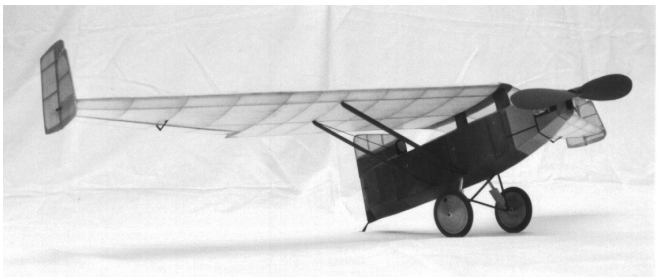
Wing has 7 degrees of washout, as on the full size and when turning at speed it show a very rapid, high speed stall – more like a flick of changed incidence with no loss of altitude. Very interesting model. I would like to build one two or three time the size for IC power - but still free flight. I will have nothing to do with radio control. A proper model aeroplane should be able to look after itself!



The Lippisch Storch is reduced in size and altered a bit from a plan that Al Backstrom (that man again!) published in Flying Models a few years ago. A pussy cat to trim and a delightful flyer. Sensitive to rudder offset and thrustline but predictable. It is rubber powered and quite light, which certainly helps.



The Granger Archaeopteryx (top of right column) is my own design from a selection of scale data. I also have the advantage that the full size is in the Shuttleworth Collection which is only 20 miles from my home. It is rubber powered and flies very well. Tricky to trim but it was a help that I know Richard Granger and he was able to tell me how his grandfather set up the full size! I have not yet managed to sort out how to get it to ROG. This is a problem with all of the taillesses I have built. They are inevitably short and



have a high ground angle. They ground loop very easily and also tend to tip stall as they start to leave the ground. The only consolation is that quite a lot of full size ones seem to have been difficult on the ground.

If any of this is of interest then I would be happy to enlarge on it. Also, if modelers in TWITT or outside would like to correspond or exchange plans and information my address is below.

Regards and thanks for all the interesting material in the newsletter and on the web site.

Chris Strachen
56 Way Lane
Waterbeach
Cambridge CB5 9NQ
United Kingdom
(44) 1223 860498

(ed. – Thanks very much for the pictures and the information that goes with them. I hope you get a lot of inquiries from the modeling members since these all look like fun to build and fly.)

May 26, 2000

TWITT:

Please note that I have already sent all the pieces of information I have in my hands concerning the modeler periodicals to Krzysztof (see his message in the May issue of the newsletter - Page 3). I give you here-under these pieces of information which, I hope, can also be of help to the other TWITT members.

RCM => R/C Modeler Magazine (I assume so !)
P.O. Box 487
144, West Sierra Madre Boulevard
Sierra Madre, California 91024
U.S.A.
Tel. : +1/800-523-1736 (for order only)
Tel. Office : +1/626-355-1476
Fax : +1/626-355-6415
E-mail : RCMCORP@aol.com
Website: http://www.mag-web.com/rc-modeler/index.html
Back issues are not listed but, announced at $6.00 per piece.

Model Builder. I get the following message from one of my correspondents :

"Look at Bill Northrop's catalog. He was the original publisher of Model Builder magazine and has obtained the plans collection after the magazine folded. I think there was a scale Northrop (no relation, I think) flying wing in there. No e-mail or web site in his ad, here's the advertised address/phone :

Bill Northrop's Plans Service
2019 Doral Court
Henderson, NV 89014
phone: 702-896-2162, fax 702-897-7775"

MAN => Model Airplane News (I assume so !)
http://www.modelairplanenews.com/

You remember the message from Mr. Terry Baxter (Darwin, Australia) in one of the last TWITT newsletters. I found an interesting site for the Shuttleworth collection and

it is confirmed that they have a Sopwith Pup 1916 as Terry is looking for. They have also a Sopwith Triplane Replica. All the aircraft in this place are in flying condition ! Website is : http://www.shuttleworth.org/

I hope these info's are already of help to you and the TWITT members.

Concerning the paper "Early BWB", page 7 of the last issue of the newsletter, and the story about the HoXVIII, I am a little bit surprised and I shall check in my books concerning the KAHLA (not Kahia) plant. I think this story has to be stored in the "Tales" cupboard. I shall send you a small summary of what I can find.

With my best regards.

Eric
(Eric_du_Trieu_de_Terdonck@vesuvius.com)

(ed. – Thanks for all the information about the various articles. I hope it helps other members who might be interested in the same things.

I look forward to your findings on the Horten "tale".)

NEW ARTICLE ON HORTEN

We were pleased to find out that Kim Rosenlof, one of our members from Phoenix, Arizona, had her story "Horten Flying Wing" published in the June 2000 issue of Flight Journal, Vol. 5, No. 3, pp. 58-64, published by Air Age, Inc., 100 East Ridge, Ridgefield, CT 06877-4606.

This is a well written summary of Horten's flying wings, in particular the H IV. It is just the right mix between historical recollections from those involved with the aircraft, technical facts and, the current status of restorations. There are many black and white photos not usually seen in other publications or stories on the Horten Brothers.

It is our understanding that Kim was able to interview Rudy Optiz who flew the H IV with great success in US competitions. The article includes some of Rudy's thoughts about the glider, as well as, those of Heinz Scheidhauer on CG winch tows of the H IV.

This magazine if available at most well stocked book stores and magazine stands. If they don't have, ask them to order it. It's priced at $3.95 US or $4.95 Canadian.

ASSESSMENT OF HORTEN VII

The H VII is one of the less famous Horten airplanes. Nevertheless, this flying wing should be of interest to enthusiasts, as it was one of the favorite airplanes for both the Horten brothers, as well as, their test-pilot Heinz Scheidhauer. This was a good reason for me to re-assess that airplane. That investigation is still ongoing. What I can give here are the preliminary results.

The H VII has a span of slightly less than 16 m, root chord is 5250 mm and tip chord (theoretical tapered wing) 800 mm. Root chord for the basic simple tapered wing is 4500 mm. The aerodynamic layout is typical for the early period. The center section has a straight trailing edge, similar to Reimar's last design, the PUL 10. The H VII does not feature the Horten tail that we can find on the H IV or H IX.

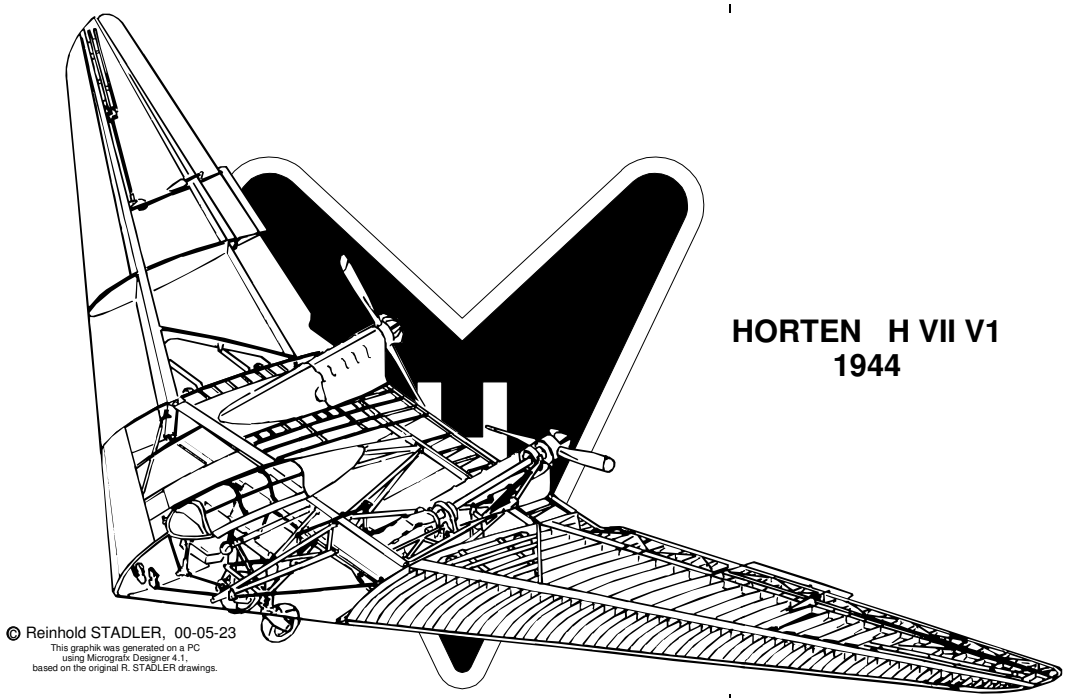
Wing sections are the reflexed Horten-section at the root and a symmetrical section at the tip. Intermediate wing sections were derived by linear geometrical interpolation of the basic trapezoidal wing, for the enlarged center section geometrical scaling was applied. Wing twist is of the typical power-formula, with maximum twist of 6 degrees. It may be interesting to note, that this is true for most of the Horten airplanes. Other than normally described in literature, the airplanes did not have the exact twist for the bell shaped lift distribution. The "bell shaped lift distribution" was first described by Ludwig Prandtl and propagated by Alexander Lippisch. This lift distribution was tailored to reduce structural loads in the wing. It was then adapted by the Horten brothers for their tailless airplanes and later became the famous "Horten-bell shaped lift distribution".

Reimar Horten obviously used this simple mathematical model (one formula to calculate twist for arbitrary wing shapes) to derive the conceptual design for his airplanes. As this model did not incorporate wing sweep, the real lift distribution on the swept wing does look different. For the airplane's twist was then simplified, possibly due to constructual reasons. The H VII is no exception here. CoG had to be adapted during the first test flights to fit as it could not be calculated exactly due to the missing sweep term.

First documents for the H VII were available from 1942, showing the general layout of this airplane. At this time the airplane had the RLM-number 8-254. The drawing shows a layout with brake rudders, similar to the H IX. The first prototype H VII V1 was built with this type of rudders. The V1 had split landing flaps in the center section.

The H VII V1 was built at Peschke in Minden. The center section was in full metal, therefore structurally the H VII was the most advanced Horten design of that time. The main spar is a conventional double T-beam, running behind the two-pilot cockpit. The engines are well faired into the wing-structure and cooled by air via inlets below the main spar. The airplane has a fully retractable 4-wheel landing gear, the rear wheels are turned 90 degrees for retraction. The lower forward center section shows window-openings for downward visibility. The canopy is sliding aft, as on the H IX. The outer wings were of wooden construction, typical for Horten. The wings had torsion stiff nose boxes. Two flaps per wing were attached at the trailing edge. The V1 had additional trim flaps on the outer aileron.

During 1943 the number of the H VII changed from 8-254 to 8-266. First flight of the H VII V1 is told to be early in 1944 (March?). That airplane was mostly



HORTEN H VII V1
1944

flown by Scheidhauer and Walter Horten. Both were very satisfied by the flight quality and performance. Single engine flight was no problem on this airplane. Interestingly, the load test to verify the structural integrity was done in August 1944. Photos of this load tests can be found in literature and show that the airplane was not finished at that time. Therefore the date of the first flight is questionable. At the time of the load test the airplane still had its brake-drag rudders. This was then replaced by a tongue-rudder, sliding out sideways from the wing tips. This rudder can be seen in at least on one picture showing the H VII V1 in flight. Obviously the tongue rudder was not a success, because on later prototypes it was replaced by the initial brake rudders.

The H VII was foreseen to be the trainer aircraft for Ho 229 pilots. The JG 400 was ordered to re-equip with Ho 226 and Ho 229. The landing flaps on the H VII V1 were fixed because the RLM wanted higher landing speeds on the trainer. The inner wing flaps still had the landing flap function. This is verified by flap deflection measurements taken in September 1944.

Construction for the H VII V2 and V3 was started at Peschke. These airplanes incorporated some different features. The engine bay structure was redesigned. The engine cooling was now performed by fans, the air-inlets moved into the wing-nose of the center section. An oil tank was sitting on the left side of the center section. Its layout does not allow longtime negative g-forces. Obviously these airplanes were not fully aerobatic.

A really interesting finding was the discovery of a H VII version with reduced span. This airplane did not have simply cut wings. The calculations show, that the aerodynamic layout was totally revised. This means, wing sections were different on the rib stations and total geometrical twist was reduced. Maybe that layout was another answer to the requirements given by the RLM. If any parts were cut for this version is not known.

In all, the Horten H VII appears to be a rather advanced design. While the aerodynamic layout of the Horten airplanes was well developed right from the beginning, the H VII made the step to high performance aircraft also from the structural point of view. Unfortunately no example survived and we now have to reconstruct that interesting flying wing from the few sources that were left.

Cutaway of the H VII. This small sketch exclusively shows the internal features of this interesting airplane.

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