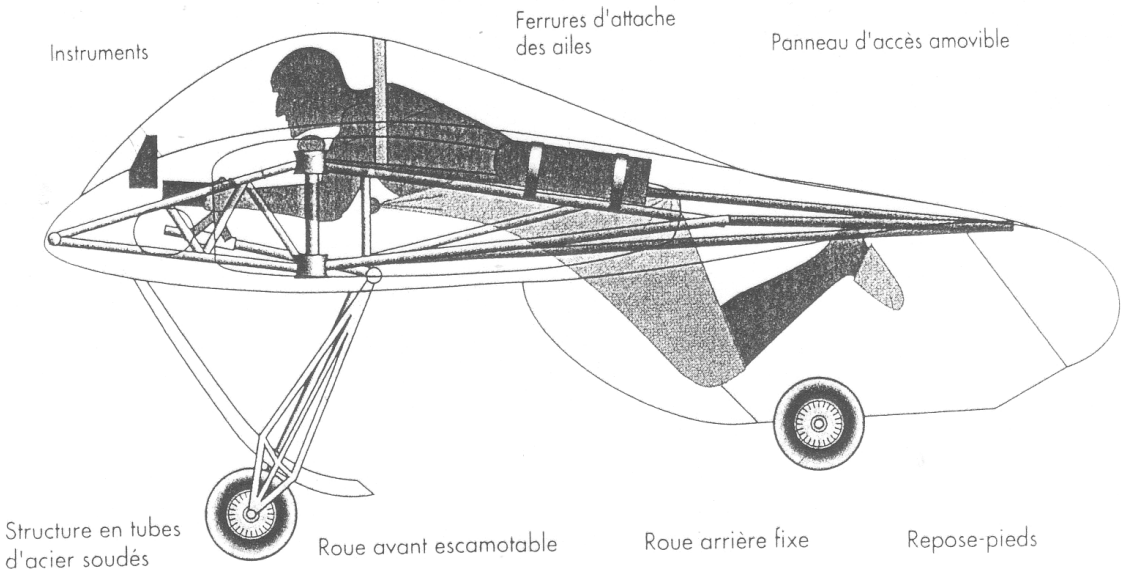
No. 376 DECEMBER 2017

T.W.I.T.T. NEWSLETTER



This is an illustration from the article starting on page 2.

T.W.I.T.T.
The Wing Is The Thing
P.O. Box 20430
El Cajon, CA 92021

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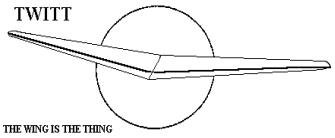

THE WING IS THE THING (T.W.I.T.T.)

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

This issue finishes the translation of the Horten IV article from what I think is a French aviation magazine. Again, there are no photos or illustrations since the copy version is so bad they wouldn't be viewable. I may try to find some versions on the web for next month since I don't have any other material for that issue.

So, if you have something you would like to share, please send it to me via e-mail or if you need to use the post office send it to the address below so I get it directly versus through the usual post office box.

Andy Kecskes
12305 Bar X Drive
Austin, TX 78727

I hope everyone has a great holiday season with family and friends close by. My move to Austin has made sure all our family is in one place and having two and a half year old twin grand kids makes it even more special this year since they understand what is going on.

Merry Christmas and Happy New Year.

LETTERS TO THE EDITOR

Dear Twitt,

I would like to build a Kasperwing 1-80, so I am searching for detailed plans, Unfortunately there is not any Kasperwing in Italy, so I need of plans.

Have you idea where are eventually available? It will be ok also the plans for the wings only.
Thank you in advance

Stefano Sartini

(ed. - Try the link below as a starter. You can also do a Google search on Kasperwing plans and get some other links that might be helpful. TWITT doesn't carry any plans for sale and this version of the Kasper design has not been a direct focus of the group.)

http://www.kasperwing.com/Kasperwing%20History.htm

Fellow Nurfluegelers:

I am about to republish the last edition of K. D. Wood's Technical Aerodynamics and the 10th edition of his Airplane Design.

Since not everybody has heard of him, I am looking for a tribute to him and his work for publication in the new editions, and to advertise them to the buying public. The idea is to contrast his approach - his pedagogy and his publication of his own textbooks - with the current approach, as well as to praise his personal qualities.

I never knew the man. I have collected his works and have hunted down obituaries and other material, but it is very rough, and in any case it isn't mine to reprint. Paraphrasing is...tacky.

If there is anybody there who actually knew him, or has contact with people who knew him, I would like to hear from you.

Marc de Piolenc
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(ed.- Below is the last page of the Horten article since it covers the IVb while the rest of the article was talking about the original version. I also put it here due to space construction limitations of the software I use for doing the newsletter.)

The Horten IVb

In 1944, Reimar Horten got a new Horten IV built in his shop near Bad Hersfeld. It was a variant with a wing using a laminar airfoil, copied from the P51-Mustang. After a first flight, the sailplane designated H.IVb was brought to Hornberg for tests. In fact, the real novelty with this H.IV was not so much the new airfoil, but the building techniques used. Since the use of the new airfoil had made the wing section lower, new materials had to be used. Horten went to using platic materials like those used on the twin-engine Horten H.Va. This time, he used these materials in form of D-tubes, glued in front of a spar which was reinforced with sheets of hard aluminum alloy. The D-tube skin and wing planking were of a sort of sandwich material, made of two layers of thin plywood with a layer of resin-impregnated corrugated cardboard inbetween. The pilot was placed in the cockpit the same way as before, only this time with the parachute under him, which would then also act as a protection in case of a hard landing. The landing gear was also improved and now consisted of to skids with wheels which allowed far better ground handling. Heinz Scheidhauer made two test flights near Göttingen before the sailplane was brought to Hornberg for further testing. The critical behaviour of the sailplane immediately became evident. The most important was a tendency of dissymetric stall and spin at 77km/h, recovery being possible only at about 100km/h. On january 18, 1945, Hermann Strebel flew the Horten IVb near Göppingen and went into a spin-stall. Witnesses said that the glider recovered from the spin, and that the wings then started to flutter violently until one wing broke off. Strebel bailed out, but his parachute did not open.

After this competition it was decided that the earodynamics department of the University of Missippi,(MSU) directed by Dr. August Raspet, would acquire the aircraft and that Rudi Opitz would be the test pilot.
Raspet said "We are currently studying data that the Germans elaborated, and we are convinced of the extraordinary potential of this concept. For exemple, we believe that the glide ratio of currently 32 can be brought up to 65 at least.(5)...

(5) footnote: A over-optimistic glide ratio. Today, the best gliders - all german made - the Schleicher ASH 25 and Schlempp-Hirth "Nimbus" attain a glide ration of 60 since the 80's

... The research objective was to explain why the calculated performance had not been attained during the comparative tests against the D-30, and to find out if this was due to the flying wing concept.
The first tests, made in may, 1953, showed that the performance was even lower than that found by Hans Zacher in the D30, but it was found to be mainly due to the bad overall state of the glider, so it was decided to rebuild it and give it a better surface finish, as well as a fairing for the front skid and a new canopy.
This work took several years and added some 39 kilos of weight.

Inset Page 17 top

Horten IV characteristics	
Wingspan	20.00m
Root chord	1.55m
Wingtip chord	.28m
Total elevon surface	3.16m²
Aspect ratio	21.8
Taper ratio	5.55
Dihedral	5°
Sweep at 25% of chord	17°
Sweep at leading edge	20°
Washout	7.1°

Weight data and performance data as given by:

	Horten	DFS	MSU	
Empty weight	249Kg	226Kg	265Kg	
Takeoff weight	329Kg	326Kg	367Kg	
Wing loading	17.4	17.2	19.4 Kg/m²	
max. glide	37	32	30	
at	73Km/h	68Km/h	82Km/h	
min. sink		.5	.55	.7 m/sex
at	60Km/h	56Km/h	72Km/h	
stall speed	55	49	58Km/h	

Typical airfoils on the Horten IV
Point A:
Max camber at 25% chord = 3%
Vrillage = twist, going from 0° at point A to - 6.7° at point D

Lower inset page 17:
The strange planform (and 3-view) of a Horten IV.

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...the airworthiness certificate was renewed on october 26, 1959. The test flights were conducted by Rudolf Opitz, then Dez-George Falvy made the evaluation flights that allowed to determine that the main performance degradation was due to the elevons being permanently deployed upwards, which results in high drag. Also, the flow separation behind the canopy caused additional drag.
In the report he presented at the 8th congress of the OSTIV in Cologne, Germany, in june, 1960, D. George Falvy pointed out that the Horten could be much improved by drag reduction measures, and that a modern flying wing of the size of the Horten IV could attain a maximum glide ratio of about 50.
Unfortunately, at that time the tests were discontinued due to the death of Dr. Raspet. In october, 1964, the Horten IV was sold to John Caller in Hollywood, Ca. the glider had at that time 708.5 hours logged.
Caller did not let the glider fly and sold it to Pr. John L. Groom in Redlands, Ca. in may 1967.
Groom planned to restore the glider and to found a club around it, but died on november 19, 1969, before getting to it.
From 1969 to 1975, the glider remained in a trailer at a farm in San Bernardino Valley. In Summer 1975 it was sold 500$ to Edward Maloney, owner of the Planes of Fame Museum at Buena Park, California, which is today at Chino Airfield.

Picture page 18:

Once laying down in the cockpit, George Falvy waits for an assistant to lay down the cockpit cover over his back. It does not look like as if it would be easy from this position to look at the sky around.

Lower inset page 18:

Top to bottom:
Pitch up
pitch down
roll (right)
yaw (left)
spoilers (outboard and inboard, outboard spoilers being used partially in the drag rudder function)

Another survivor

Kronfeld's Horten was not the only survivor. Another one made it into our time, number 26. Found in the british zone of occupied Germany, it seemed to have been used by the RAF aeroclub Scharfoldendorf and was damaged. the remains of the glider (mainly the wings) were taken to the Deusche Museum who, a few

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years ago, asked Peter Hanickel to do the restoration work. This restoration, which was ended on august 14, 1999 with a formal presentation of the glider, was not at all simple. "The only retrieved parts of our Horten IV were the wings" says Peter Hanickel. "The center section and the control surfaces were missing. the metal wingtips had been replaced by wooden wingtips by the british pilots. The plywood planking was damaged in many places. At one place there even was a repair that was made with the plywood grain in the wrong direction. In must be noticed that the carreer of this glider ended with a landing where the left wing was broken. The plywood skin was covered with a thick layer of grey paint and hight quantities of mastic had generously been applied to it to mask the imperfections. All glue bonds wre severely deteriorated, and in some places, parts would come apart when even hardly touched."
Since very few technical drawings have survived, the most complicated task was to rebuild the center section only from photos showing it without it's skin. "Without these photos, taken by the precendent owners 40 years ago, the restoration would have been impossible" told us Peter Hanickel. During this lengthy and patient restoration, Peter Hanickel discovered some interesting details, like the real identity of the H.IV No.26, which initially was registered D-10-1451, and not D-10-1452, as was believed. This means this was the Horten that was used for the comparative tests with the Darmstadt D-30.
On august 14, 1999, The Deutsche Museum presented the H.IV for the first time to a restricted audience. The photographs on these pages prove the success of the restoration. This is without any doubt the most beautiful Horten on display today.

Thanks to: Karl Nickel, engineer and test pilot for Horten, test pilots Heinz Schelhauer, Rudolf Opitz,D.-George Falvy, Peter Hanickel, restorer of the Horten IV, Edward Uden, head of the Horten archives, Peter

Selinger, Hans Peter Dabrowski, Eric Du Trieu de Terdonck, Helen Gristwood, head of the DERA Central Regional Archives.

Picture Page 19 top:
The beatiful Horten IV in flight in the skies of Mississippi in autumn, 1959.
Inset Page 19 left:
The control surfaces of the horten IV

- above the wing from left to right:
Rudder pedals
Pushtube to the inboard elevons
Position of main spar (dotted outline)
Hinges of the inboard elevons

- under the wing from left to right
Handlebar
Spoiler lever
Pushrod to outboard elevons
Pushrod to spoilers
Spoilers
Pushrod to outboard elevons
Pushrod to drag rudders.

Inset Page 19 right:
The glide ratio
The aerodynamic glide ratio is an expression for the ratio of lift to drag of a wing. It is expressed as a L to D ratio (sink over a given distance) in calm air.
The glide ratio is not the only characteristic of a glider. It's minimum sink figure is also very important, since the glider is always sinking and can only gain altitude by the climb rate of the ascending air - minus the glider's sink rate. This ascending current can be either dynamic lift on a hillside or thermal lift. (warm air ascending through colder air, for exemple).

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Flying the Horten IV - By Dez George Falvy

In the history of competition sailplanes, the admirable Horten IV has a special and incomparable place. In the post-war years it quickly became a legend, and today still, stirs a lot of interest.
When it was designed, the Horten IV was the most modern sailplane in the world. In terms of aerodynamics, it represented the "top notch" of what was built at that time and it had the best performance of the sailplanes of it's day.
Inevitably, a uncommon machine has some uncommon characteristics, and the H.IV was no exception to the rule. Generally speaking, it had very safe flight characteristics, however some situations needed a lot of attention. The first situation like this appeared right after takeoff: the standard procedure for aero-tow-takeoff is to use the rudders to keep the sailplane heading straight, while giving the stick some backpressure in order to let the sailplane fly slightly higher than the tow plane which is still accelerating and then too, takes off . The sailplane would take off first but would be prevented from flying too high, so not to prevent the tow-plane from taking off safely.
Only, the usual rudder corrections would result in the wing going down as soon as rudder was applied, and either the wing or the nose - or both - could touch the ground. This unusual behaviour could be cancelled out by appropriate pilot action on the elevons for corrective roll input, (1) but a simpler solution was to use elevon roll control only, and no rudder during that phase of take-off.
Once a bit higher up, the Horten would be flyable without any difficulty, behind the tow-plane as well as in free flight. In fact, the Horten IV had a very sophisticated elevon system that made it absolutely free of adverse yaw, which was one of the drawbacks of most classic sailplanes with tail.

Footnote (1) Elevons are the flaps that work both as elevators and ailerons. the name is a mixture of the english word "elevator" and the french word "aileron". these are commonly used on tailless aircraft.

picture page 20, top
Pilot getting into a Horten IV. the fairing around his legs also serves as rear skid and to some extent as lateral stabilizer.

picture page 20, bottom
The Horten IV. No. 26, registered D-10-145, built in 1943 by the "sonderkommando Göttingen" (special task force in Göttingen)
as restored by Peter Hanickel. Photo taken at the first presentation in Oberschleissheim north of Munich on august, 14, 1999 (Photo by E. Du Trieu de Terdonck)

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The three sets of elevons deflected in a very particular sequence. When pulling on the "handlebar-stick", the three inboard and outboard sections deflected together. When pushing out, the inboard section had the greatest downward deflection. When inclining the stick sideways (e.g. to the left) the left wing's outboard elevon section would deflect more upwards than the two others, while on the opposite wing, the inboard section would deflect more downward than the others. Also, the system was designed in a way that all upward deflections were about twice the angle than the downward travel on the opposite wing.
It was not an absolute necessity to have the drag rudders, except for radical directional changes.
The minimum flying speed in straight flight was 61km/h at 366Kg takeoff weight and a C.G at 1380mm aft from the nose, i.e. 17% chord from the pressure point. I has to be noted that this minimal speed depended very much on the actual C.G. location. The more the sailplane would be trimmed with an aft C.G. position, the higher this minimal speed became and vice versa. (this speed was 64km/h with the C.G. at 19.5% from the pressure point, while it would be 59km/h when the C.G was located at 13%.
It is very important to know that the Horten would never stall abruptly. With the stick fully aft, the sailplane would nose down slowly and then continue it's flight a bit lower. It would stabilize it's speed around 80km/h.
The flight characteristics in turns was extraordinary. Tight 360's could be made in 8 seconds with the stick full aft, or even hands off, without any risk of stalling. One really had the impression that the sailplane would pivot around it's wingtip. The Horten was very pitch sensitive as all tailless designs, because of the missing inertia around the pitch axis. This would lead to oscillations around that axis in windgusts, but at speeds below 130Km /h these would be dampened quickly, while at high speeds there was a great risk of flutter. I once experienced such a situation at 160km/h. The wingtips started to oscillate violently with increasing amplitude. A structural failure seemed imminent to me. But, before unlocking the canopy to bail out, I extended the spoilers, and the vibrations stopped immediately. I deducted that the maximum flying speed had to be around 150km/h.
The flight characteristics at landing were impressing. The size of the spoilers allowed steep descents at a speed of around 70 to 75 km/h. The forward and downward visibility was excellent due to the prone flying position and the size of the plexiglass nose area. Precision landings, far more precise than those made by classic gliders were common practice. It was preferrable though, to retract the spoilers at least partially just before touchdown, to reduce the sink rate somewhat. The ground roll was very short, about 30m, due to the friction created by the landing skid. The cockpit of the H.IV was narrow, but not uncomfortable. The pilot would rest on his knees and chest, with a cushion under his chin. With 1.80m and 88kg I was not really a small pilot, and I logged about 60 hours on the Horten without any difficulty.

Picture page 21, top
Pilot position in the Horten IV
above the illustration from left to right:
Instruments, Wing fittings, rear acces panel (cabin cover)
below the illustration from left to right:
welded steel tube structure, retractable front wheel, fixed rear wheel, footrests

Inset page 21 bottom

AVAILABLE PLANS & REFERENCE MATERIAL

Coming Soon: Tailless Aircraft Bibliography Edition 1-g

Edition 1-f, which is sold out, contained over 5600 annotated tailless aircraft and related listings: reports, papers, books, articles, patents, etc. of 1867 - present, listed chronologically and supported by introductory material, 3 Appendices, and other helpful information. Historical overview. Information on sources, location and acquisition of material. Alphabetical listing of 370 creators of tailless and related aircraft, including dates and configurations. More. Only a limited number printed. Not cross referenced: 342 pages. It was spiral bound in plain black vinyl. By far the largest ever of its kind - a unique source of hardcore information.

But don't despair, Edition 1-g is in the works and will be bigger and better than ever. It will also include a very extensive listing of the relevant U.S. patents, which may be the most comprehensive one ever put together. A publication date has not been set yet, so check back here once in a while.

Prices: To Be Announced

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3114 Edgehill Road
Cleveland Hts., OH 44118 (216) 321-5743

VIDEOS AND AUDIO TAPES

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

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 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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