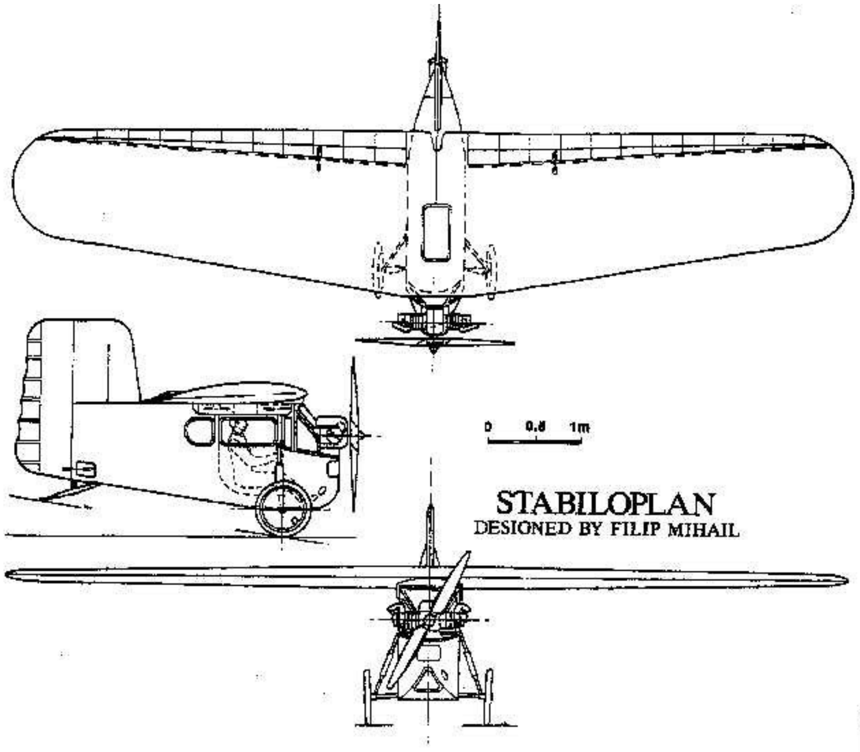
No. 160 OCTOBER 1999

T.W.I.T.T. NEWSLETTER



This is the airplane that Mike Minty was asking about in one of our previous newsletters. He can't recall exactly what publication it came from. He is in contact with Al Backstrom who has some additional information on it and hopefully we will be able to get copies as time goes by. From this 3-view we can see why Mike would like to do a model, not only because it would have an unusual look at the flying field, but from the simplicity of the construction.

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., **9910** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, November 20, 1999, beginning at 1:30 pm at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row on Joe Crosson Drive - Southeast side of Gillespie).

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

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

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Meetings are held on the third Saturday of every other month (beginning with January), at 1:30 PM, at Hanger A-4, Gillespie Field, El Cajon, California (first row of hangers on the south end of Joe Crosson Drive, east side of Gillespie).

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PRESIDENT'S CORNER

With more information coming in via e-mail and available through other internet websites, I have decided to split the September meetings minutes between two issues. This will allow for additional letters and a wider range of material to be presented in each issue. The feedback I receive always seems to indicate that you all like the pictures and a variety of subjects, whether old or new, so I will try to keep the newsletter moving in that direction.

There has been a decline in our overall membership in the past few months due to non-renewals of subscriptions. Since very few of these prior members have given any indication of why they were dropping membership, we have no way of knowing what is lacking within the organization. I do know that it is difficult for some of the foreign members to get dollars or US funds checks for payment, but unfortunately we are too small to make it economical to offer a credit card payment option. And a few have dropped to use the money for other subscriptions that were more important to them at the time.

With that thought in mind, I would like to hear from any of our members who feel the organization is not meeting their needs and why. Material included each month is based on what is available from all sources, and as I noted above, I am trying to keep it somewhat varied to meet the widest possible interests of the membership. However, if I don't know what is missing I obviously can't correct the problem, so please write or e-mail me with your concerns and suggestions. I can't say we can do something about all of them, but at least by knowing where to start, progress can be made to make this organization better.

Thank you all for your help and support.

Andy

NOVEMBER 1999 PROGRAM

We have a very special program in store for you in November. Robert Hoey will be joining us and relating how he and his partners have been trying to simulate bird flight utilizing radio controlled models. These are very unique gliders (see the tip photo below) and they have achieved very interesting results that could eventually be translated into something useable on manned aircraft (probably in the distant future).

So if you are a bird lover, like radio control models and

unique flying wings, then this is the program for you. We expect some lively discussion between Robert and Phil Burgers, our resident expert on bird flight. Make sure to mark you calendars now so you don't miss our final, and really fascinating, program for 1999.

MINUTES OF THE SEPTEMBER 18, 1999 MEETING

As usual, Andy opened the meeting by welcoming everyone and going over the housekeeping items. He then related that Serge Krauss and Chris Denny both noted that the September cover was the Management & Research, Inc., Model H-70-71, also known as the "Tuscar Metals Tailless" or "Bumblebee" designed by Thomas Hoff.

This aircraft flew from December '37 or '38 to August '45 and was stationed probably in Philadelphia, PA. E.T. Woolridge's Winged Wonders book indicates it was manufactured for the U.S. Commerce Department and tested at Floyd Bennet Field, NY, after being rebuilt by Tuscar Metals following a January 27, 1938 crash. The cover photo was apparently taken at Bennet Field (R. Arnold, S.I. negative 81-13688). Wooldridge also states that it was a "derivative of the Stearman-Hammond Y" which Serge thought was related to the original twin-boom Northrop "Flying Wing" of September '29. N20399 was said to be "difficult" to fly and was destroyed in a crash in August of 1949. Our thanks to Serge and Chris for the information, however, it still didn't answer the question about where the editor originally got the picture which apparently will remain a mystery.

Andy talked briefly about the November program telling the group about Robert Hoey's recent presentation at the SHA Workshop and some of the experimenting he and his friends have conducted recently. The bird models are carried to altitude under a mother ship and on one occasion the glider popped back up hitting the launch craft. The collision knocked off one of the glider's simulated tip feather ailerons, but they found it performed well using just the other wing's set accidentally proving some of the theories they had been working on.

Between Bob Chase and Bruce Carmichael there was a brief coverage of what they saw at this year's Oshkosh gathering, which unfortunately didn't include any new flying wing aircraft. Bob did find some material on Wright Flyer (circa 1909) propellers that might help Bob Recks with his research for the San Diego Aerospace Museum. Bruce mentioned that Rutan flew his Proteus and it was also on static display.

Andy mentioned that for those who might be interested, there was a video in the machine on Jim Marske's aircraft, including the current status of the Pioneer III. This could be viewed after the meeting and he noted the tape is available from Marske's company (our copy was donated by Lloyd Watson who was instrumental in producing it).

Even though it would be too late for the general membership through the newsletter, Andy announced that there would be two flying wing seminars in Germany in October. One would be in Kurhaus and cover things like the Northrop and Horten wings, and experiences with the SB-13. The other would be held in Berlin and include a view of the progress on the Horten aircraft on loan from the Smithsonian for restoration. This brought up a question about the location of the Horten IV shown in September's newsletter. Andy noted this project was completed in Munich from structures left after a crash in about 1945 and had nothing to do with the Smithsonian project.

With all of this out of the way, Andy introduced **Phil Barnes**, our main program speaker for today. Phil would be telling us about his latest foray into the world of electronic design and analysis of propellers. He would have to stay on his toes with this one, since Gene Larrabee, Phil Burgers and Bruce Carmichael were in the audience along with Jack Norris and Andy Bauer who help Phil through some of the rough spots. So the floor was turned over the Phil.

Phil's presentation has been built around his SAE Technical paper on Math Modeling of Propeller Geometry and Aerodynamics. He feels that even with our movement into the new millennium, propellers were here to stay for the average sport aviation aircraft. Jet engines have been around for over 60 years yet they have not been able to replace the propeller in all types of applications. One of the reasons for this is that a jet engine is not fuel efficient in that it takes a small quantity of air and shoots it very high velocity which is somewhat wasted in the atmosphere as it leaves the aircraft. On the other hand a propeller takes a large quantity of air and accelerates a small amount using highly efficient blades.

This analysis project originated about a year ago and was supposed to take a year, but he tried to do it in 8-months. Consequently, he had to make a number of changes after his April '99 presentation at SAE and the discovery of some technical errors. The study of propellers involves very intense vortex lattice calculations that track a lot of variables, but Phil promised he would try to keep all this math stuff to the minimum necessary for understanding the concepts.

Getting into the presentation, Phil showed a series of slides demonstrating the various types of propellers being used on commercial aircraft around the world. One of the more unusual ones was the Anatov AN-70 counter-rotating prop-fan cargo plane. This engine and propeller combination is currently the most fuel efficient system in the world and is still going through the de-bugging phases so may be even better in the future. The front row has eight blades and the rear row six and the Russians have found the secret to matching their performance as a single unit. It also uses a cowling that allows for an axis-symmetric, uniform flow field which maintains a uniform velocity around it thus reducing vibration. An elliptical forebody behind the prop-fan would produce a non-uniform flow field as each blade came around.

The realm that Phil is working in for his analysis is subsonic blades versus the transonic blade speeds associated with prop-fans. But he noted that a subsonic propeller can still reach airspeeds of .5 mach at good fuel efficiency.

At this point he mentioned that all this analysis method is also applicable to wind turbines. He thinks that there will be large banks of wind turbines off-shore producing electricity while not providing the visual pollution now associated with turbine farms on land. The newer styled blades would also turn at slower speeds to reduce the danger to sea birds.

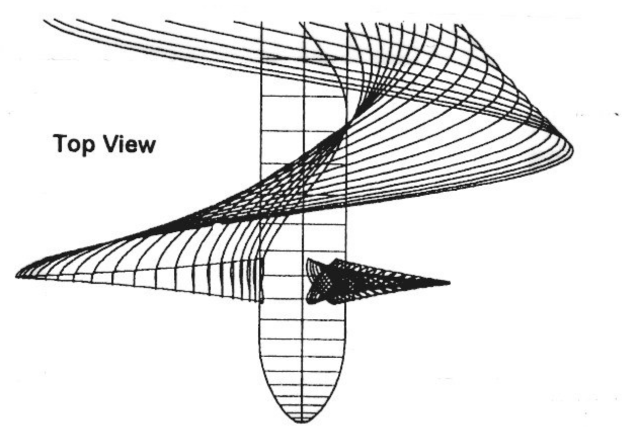
One of the pictures he showed was of the Boeing ATT concept aircraft using four engines and propellers interlinked so that any one engine can power any of the propellers. The concept drawing was of a tailless version which looked something like a cross between a C-130 turbo-prop wing with a C-17 forward fuselage section and duck-tailed afterbody ala on old C-119 flying boxcar. Apparently there was also a tailed version originally considered, but someone at Boeing must have talked to a TWITT member and realized the tailless concept would be better (sure!!!).

(ed. - At this point Phil moved into the more technical side of his presentation. So rather than try and transcribe what was said and miss some of the finer details, the following is excerpts from his SAE paper that relate to what he covered. This is only a small portion of what's in the paper and I have only included a few of the illustrations accompanying the text. And since he said he would include a pretty picture with each technical slide, I included bits and pieces to pique your interest.

I will put Phil's address and the paper's price at the end of the minutes for those of you who would be interested in having a full copy. TWITT will also offer a copy of the audio tape so you can hear exactly what he said and how he responded to some of the questions/comments from the audience.)

This analysis, taking strong advantage of the classical work by Rankine, Betz and Glauert, accounts for the effects of an axisymmetric nacelle in both the vector boundary condition and Glauert velocity diagram. The Betz and Glauert Conditions for the optimum loading of an inviscid propeller are shown to be equivalent. Math models for wake continuity and rollup are proposed and various wake geometries are studied. Thrust loading calculations compare favorably with NACA wake-pressure-derived test data. Rationale and equations for "math modeling" of propeller geometry are presented and illustrated. Finally, geometric and aerodynamic math models are integrated for the preliminary design of a propeller.

Over a century ago, Rankine developed two essential tools used herein. The first is his approach for using a series of sources and sinks to calculate the flow around a closed axisymmetric body. We can use this method to calculate the axial velocity in the plane of the propeller with the propeller removed. In 1865, Rankine introduced the actuator disk concept which was later developed by Froude. We will use the actuator disk to calculate the average slipstream velocity and corresponding wake area for our wake continuity model.



Geometry Study - NACA TN 1834, Prop. #2, β_{75}=12^c J=0.408, Math-Modeled Continuity.

Betz described in 1919 the condition representing the minimum induced loss due to the helical wake. This was the analog of constant downwash induced by the wake of an elliptically-loaded wing. A compact mathematical statement of the *Betz Condition* was later provided by Hartman and Feldman in their NACA report. We will subsequently define and apply the "*Betz Parameters*."

Just across the channel from Betz, a 4-blade, model propeller of constant pitch was tested in a British laboratory at 0.63 advance ratio. Its axial and circumferential wake velocities were recorded. The test data verifies the classical predictions: (1) the flow is irrotational upstream of the propeller; (2) the propeller imparts an "immediate" rotation to the flow with no sudden change in axial velocity; (3) the induced axial velocity in the ultimate wake is twice that at the propeller disk, and; (4) per Glauert's prediction, the induced axial velocity vanishes at both the root and tip. Also of interest, for the tested conditions, the "ultimate wake" is developed within 1/2 diameter downstream.

In 1926, Glauert published his pioneering work on airfoils, wings and propellers. He introduced the velocity diagram which is both fundamental to propeller analysis and still in use today. His diagram shows the effects of the wake-induced axial and circumferential velocities on the local blade angle of attack and relative airspeed which influences, by its square, the local propeller forces. With a slight variation, we will use the Glauert diagram herein.

Goldstein, in his 1929 doctoral dissertation, solved for the optimal distribution of bound vortex strength on a lightly-loaded propeller, assuming the "*Betz Condition*," and described the rigid helical wake model. Theodorsen later extended Goldstein's results for loaded operation. Herein, we refer to Theodorsen's more exact version of Goldstein's non-dimensional bound vortex strength. In 1934, Glauert authored the propeller chapter of Durand's book, where he showed the equivalence of his "*constant-section-efficiency condition*" with the "*Betz Condition*" when neglecting profile drag.

Next, Phil introduces his geometric and aerodynamic terminology. Although somewhat unconventional, the approach is consistent with his previous papers and modeling methods and allows compact notation.

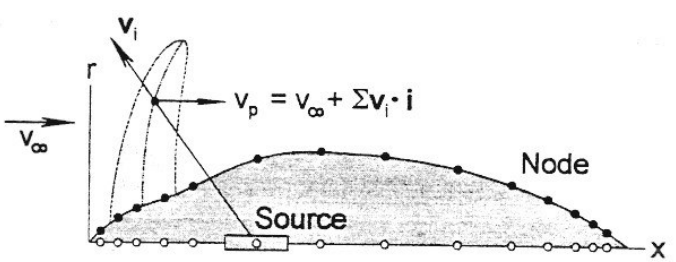
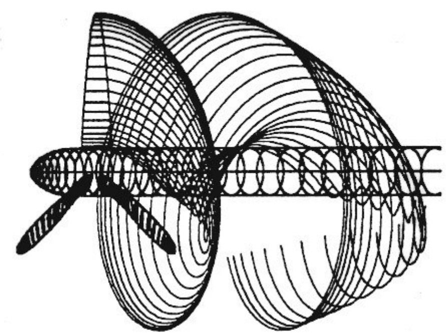


Figure 1.3-1 Profile Velocity Calculation

Body effects where now on the agenda. The flowfield in which the propeller operates affects its performance. We designate (V_p) as the non-dimensional axial "profile" velocity at the plane of the propeller, with the propeller removed. With a spinner and body, (V_p) differs from unity, particularly near the hub. Although most nacelles are not axisymmetric, the effects of an equivalent body of rotation offer a first approximation for preliminary design. If the body is not axisymmetric, the circumferential variations in profile velocity will likely degrade efficiency and increase vibration.

Chow applies Rankine's source-sink method of calculating the inviscid flowfield at any point for an axisymmetric body at zero angle of attack. Here we arrange (M) sources along the body axis (see figure below). Each source is accompanied by a surface node. The stream function is zero along the body surface, and that at each node is that due to the free stream plus that induced by all the surfaces. Thus, since each source affects all the others, the distribution of source strength is determined by the solution of (M) linear simultaneous equations. The body is closed, so the solution includes the constraint that the sum of all sources is zero.

Finally, given the source strengths, a vector analysis including the unit vector (**i**) allows calculation of the axial component of the source-induced velocity at each radial station for the propeller, as shown in the figure. This, added to the free-stream velocity obtains the "profile" velocity (V_p). The solution always obtains sources alternating with sinks.



Effect of Wake Model on Calculated Thrust Loading, NACA TN 1834, Prop. #2.

The exposed portion of the propeller blade is analogous to a complete wing. Although only the wing sees a fixed relative wind, the bound vortex strength falls nearly or exactly to zero at each "wingtip" for both "wings." At the propeller hub, the thrust contribution is quite small. Thus, whereas a wing with elliptical tips could well use a cambered airfoil throughout, a propeller blade should perhaps have low camber at the hub to reduce torque.

As with a wing, the bound vortex strength reaches a maximum roughly, or exactly, at mid span. Here, it is important to distinguish bound vortex strength from thrust loading. The latter peaks around 70-85% radius where the combination of bound vortex strength, blade angle, and relative wind is most useful. Whereas the bound vortex strength of a wing is proportional to the product of local chord and local lift coefficient, that for a propeller section is proportional as well to the relative wind velocity.

For the purpose of calculating profile drag, the calculated or empirical characteristics of the cambered section at its angle of attack are used. Depending on advance ratio and blade angle, significant portions of the blade may be stalled, whereby a section "polar" is of no use. Instead, profile drag coefficient should be characterized with angle of attack, whereby the drag steadily increases with angle of attack beyond stall. In this regime, profile drag can significantly affect torque.

The "vortex step method" is simply a vortex lattice method using only one chordwise horseshoe vortex. The accuracy of this method for predicting the lift of subsonic wings is demonstrated in one of Phil's earlier papers. We have the choice or arranging (N) horseshoe vortices of "vortex step" strength (Γ) side-by-side, or in nesting the same number of vortices of strength ($\Delta\Gamma$), each representing the difference in bound vortex strength between adjacent "vortex steps." Either approach obtains the same answer, but the nested horseshoe vortex has an "incoming" filament, and "bound" filament, and an "outgoing" filament which leaves at the propeller tip (Figure 1.7). Each vortex makes a right turn at its corresponding downwash node located on the chord line of the local equivalent thin section.

At this point Phil went through a lot formulas to demonstrate his approach to the analysis and it is more than what's needed in this forum. So I am going to take some bits and pieces that offer a few of his or other's insights into the analysis. I apologize to Phil if this becomes somewhat disjointed, but you should get a good idea of what was covered and if you have questions just order the paper.

Wake Rollup Math Model - We know from Prandtl's work that the trailing vortex filaments outboard of the radial position corresponding to the maximum bound vortex strength will rollup into a tip vortex. Chow has computed the rollup of the vortex sheet behind an elliptically-loaded wing. Although he characterized his results in terms of a dimensionless time, we can instead interpret his results in terms of a "rollup parameter" (S) which includes distance and bound vortex strength (Figure 1.11).

Wake-Induced Velocity - Here, we investigate the effects of wake extent and then calculate the wake-induced velocities with three methods. First, Figure 1.13-1 shows the effect of wake extent for three radial stations, using the circumferential averaging method to be described subsequently. For the state advance ratio (0.707), at least one revolution is required to obtain the full effect of the wake.

Glauert's wake model has two assumptions. The first, rejected by Theodorsen and later by Glauert himself, has each blade section independent of the rest. We will show later that this assumption obtains optimistic thrust. However, we accept and apply the second assumption that the flow is axisymmetric and that the momentum principal, applied to the annular flow through any radial strip (ΔR), allows us to relate (DdT/dR, dQ/dR, V_{ix}, $V_{i\theta}$).

With Glauert's axisymmetric flow model, which is also emulated by our "circumferential averaging" method, the propeller appears to be approaching air as a "bound vortex disk" with only radial variations in *bound* vortex density. Also, the wake appears as a solid streamtube with only radial variations in *trailing* vortex density. This largely reflects Glauert's "many blades" description. As pointed out by Glauert, and as seen on page 4 herein, the flow is irrotational at any point upstream, where the circumferential velocity induced by the wake is canceled by that induced by the "bound vortex disk." Modeling axisymmetric flow is consistent with these phenomena.

Blade Tip Shape - In contrast to a wing, where low Reynolds numbers works against the theoretical advantages of an elliptical wingtip, high Reynolds numbers can prevail near the tip of the propeller. If a propeller planform incorporates somewhat of an elliptical tip, swept or unswept, a working lift coefficient can be preserved at all radii, except perhaps near the hub. Then, the lift and drag (thrust and torque) vanish towards the tip only because the chord vanishes. However, with a constant-chord blade, the obligatory loss of lift and thrust toward the tip is accompanied by non-vanishing drag and torque.

Contemporary blade planforms frequently exhibit a constant-chord region and an "elliptical tip" region. Also, the backbone may incorporate curvature over some or all the blade, as illustrated by the outer portion of the blade for the low-speed propeller shown in Figure 2.2.

Conclusions and Recommendations - A new version of the vortex step method for calculating propeller blade loading was described and verified with NACA test data. Wake models for continuity and rollup were studied. A rationale for math modeling of propeller geometry was presented and illustrated. Then a consistent and compact nomenclature system was proposed and applied for both geometry and aerodynamics. The Betz and Glauert Conditions for optimum loading were shown to be equivalent.

The effect of an axisymmetric body were included in the velocity diagrams and boundary conditions. New wind-tunnel tests should include the measurement of the profile velocity, and this should be included in the calculation of propeller performance. Also, test reports should fully document the blade geometry. Originators of such geometry are of course advised to "math model."

For those interested in obtaining the entire text of Phil's presentation, it can be purchased for $15.00 (US currency) directly from him at:

Philip Barnes
982 W. 11th Street, #5
San Pedro, CA 90731

(A copy of this meetings audio tape is also available from TWITT at a cost of $5.00, postage paid.)

At the completion of Phil's talk, Jack Norris gave the group a quick overview of his current project. He is working on a book that will take all of the complicated math, often referred to by Phil, and convert its results into that understandable in English. This will be meant for pilots that are not mathematicians, but who want to know more about how their propellers work and what they can do to help improve performance through the better use of the correct propeller.

LETTERS TO THE EDITOR

9/14/99

TWITT:

Just received the September issue of TWITT with NX20399 on the cover.

I have two clippings of that aircraft; probably from old Air Trails or similar magazines. Neither duplicates the photo on the cover.

One clipping is a Rudy Arnold photo stating that the plane was tested by Jimmy Taylor, but neglects to name the machine. The other picture show a fence in the background that could conceivably be the same fence as shown in your photo, but it's "iffy". Both photos show the plane resting on brick or cobblestone paving. In pencil on the clipping I labeled it "in Philadelphia", but that was years ago.

I was just ahead of Horten in my Flying Wing scrapbook.

It's time to renew my subscription, so here's my check.

Yours,

Keith Hauke
Marine City, MI

(ed. - As we have seen from the minutes Keith is right on track with his information. Thanks for letting us know about your scrapbook and for your renewal.)

9/14/99

TWITT:

I just took a picture of a bunch of models with which I have been experimenting. All are sort of flying wings, so I thought TWITT would enjoy seeing the picture.

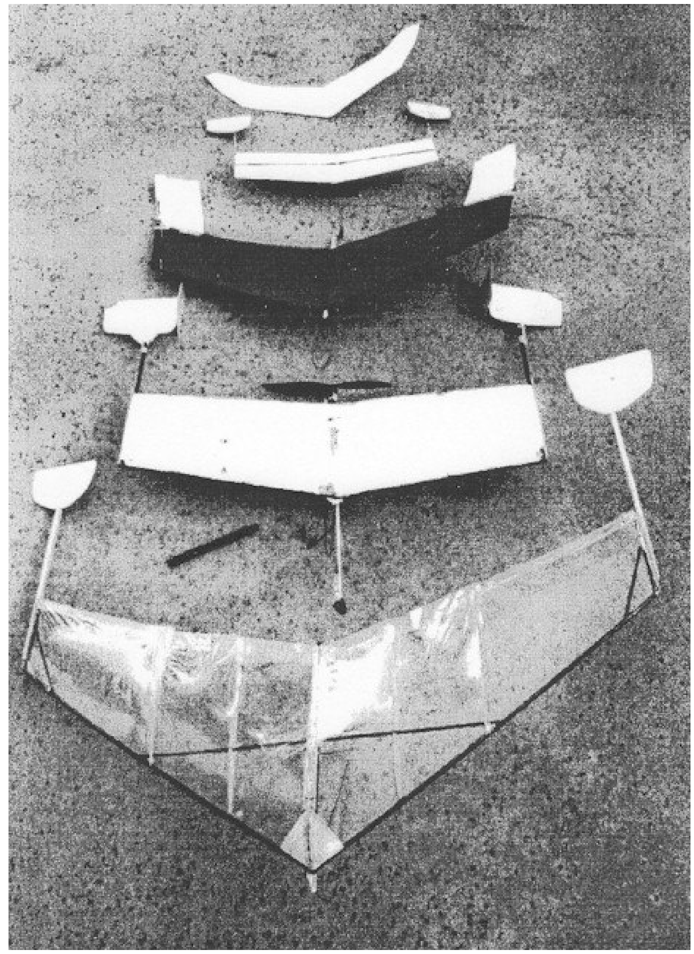
The stabilized set in the up-region of the tip vortex have more authority than the same area behind the wing center. This is sometimes called "wisor tail" first developed as the BV-208.P3 aircraft designed by Dr. Ing. Richard Vogt during the latter half of WW II. The reference was sent to me by Phil Burgers. It's from Aerospace Engineering, May 1996. All of this connects to what Hoey is doing on vulture controls, and Al Bowers on the Hortens and hat-shaped rather than elliptical lift distribution and, Karl Nickel on the same subject.

The rear-most glider is the "Walpalong" of my son Tyler.

The second from largest model is electric powered and flies fine with 2.4 oz gross weight. These studies are aimed at building a stable, controllable, slow flying model I'll call "Housefly" to fly in a living room with a video camera.

Sincerely yours,

Paul MacCready



(ed. - Thanks a lot for the picture which I have included above and, the explanation of what you are trying to do. I hope that some day in the near future we can get you to come down and tell us more about them and demonstrate their flying characteristics.)

9/30/99

TWITT:

Hello, I'm a Carleton University student in Ottawa, Canada. I'm currently working on my Bachelor of Aerospace Engineering and I'm in my second year. I am also involved in a contest that will be taking place at Daytona beach. The contest involves building and flying a model that can carry the most weight given a specific set of rules. We have a plane already designed and we are currently building two models for this years competition.

Next year we plan to change our design a little. We would like to build a flying wing to carry the weight. We placed sixth last year and we should do well this year too. However the thought of building the wing has inspired me to get started on the design. Unfortunately starting from scratch I know very little about flying wings. So if it wouldn't be too much trouble I would like to ask you if you know of any good text on the subject, web sites or anything else pertaining to flying wings. Even a proven airfoil would help.

Thank you.

Winston D.G. Ernst
2nd year Aerospace Engineering A
Carleton University
e-mail: wernst@chat.carleton.ca
w_ernst@engsoc.carleton.ca
wernst@canada.com
wernst@home.com

(ed. - This sounds like a good opportunity for our members to shine by giving Winston some help. I know there are a lot of good references out there, but I am not the one to make the recommendations based on what you see above.

I would hope some of you more ambitious ones out there would also pass along some hints on how they can best achieve their goal staying within the rules as shown above. I think it would super if they could come out on top with a flying wing design and that we could take some of the backstage credit for helping them get there.

So breakout your thinking caps and tune up your calculating pencils, but don't just give them the answers, just helpful hints that might point them in the right directions.)

9/13/99

TWITT:

Been looking for this site for a long time, had a few erroneous tips but finally found you through David Dodges home page and a link. I'm too far away to attend meetings and such.

I've been flying model wing only aircraft since the early Eighties with Barney Wainfan and the Blacksheep Exhibition squadron for whom I wrote the rules for what is called the Hawthorne event. Been a participant at Carl Hatrack's flying wing meet numerous times, and just love wings.

Below a photo by Bill Hannan of my Etrich #1 which appeared in Model Builder a few years back. You may remember it?

Good to have found you and will send $ to join at end of month (payday for retirees)

Thanks

Carlo Godel
2873 Unaweep Avenue
Grand Junction, CO 81503
regiaero@gj.net

9/13/99

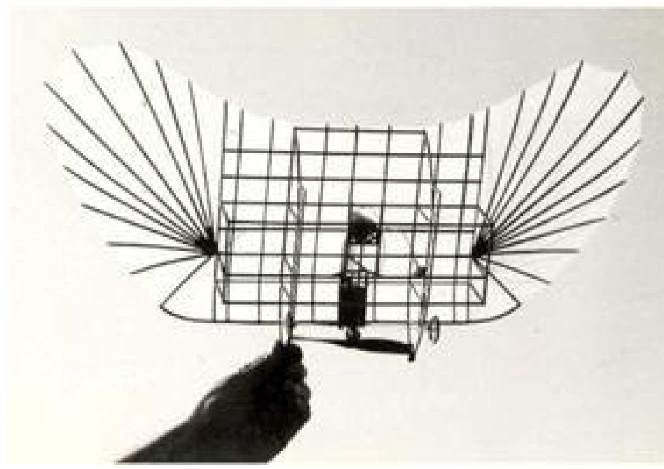
I might have some more pictures, but I can't find them. I just moved to Colorado and have not had the time to rearrange all my suff. The Etrich had a wing span of 20" and was powered by a Telco CO2 motor with a 6cc tank . The best time achieved by the model was 11 sec. Not good enough for AMA Gas Scale at the time. Problem with the Etrich and most early wings was the lack of vertical area and the resultant instability when upset by the slightest breeze. The Dunnes did much better.

This photo was recently published in a German model magazine, but I don't know which one. Carl Hatrack showed it to me last time I was out in Calif.

Hope this helps

Carlo

(ed. - Below is the picture Carlo sent, and then below that is what he sent back after I asked for additional information.)



9/23/99

Been perusing your site and must comment on a few of the items read. Regarding Miller's aerodynamics "lots of words, no meat". Actually most of it comes from the other end of the cow. It is a proven fact that lift is created when a body displaces the same weight of air as it weighs itself and it can be predicated to the volume that the wing and fuselage displace. Drag on the other hand is created by the surface area and the thickness (flat plate drag) of the body as a whole. Dirigibles are not lighter than air craft but are negatively bouyant (they sink if they are not moving). The movement of the body through the still air creates lift proportional to the amount (weight) of air the body displaces.

As for the article by Mr.Burger as to how birds came to fly, I think they are all wrong. Dinosaurs jumped from tree to tree and in the process losing altitude. Feathers were already present as insulation and the lengthening of these feathers allowed them to go longer distances before hitting the ground hard. As for the thrust of a wing Juan de la Cierva came across that very thing when he built his Autogyro. The uplift he talks about is the rebound of normally displaced air around the birds body and wings.

This should add heat to the already heated arguments. Just love to throw in a wrench.... consider why does the weight of a model differ so much from a prototype in weight per square ? Will send answer next time....

Carlo

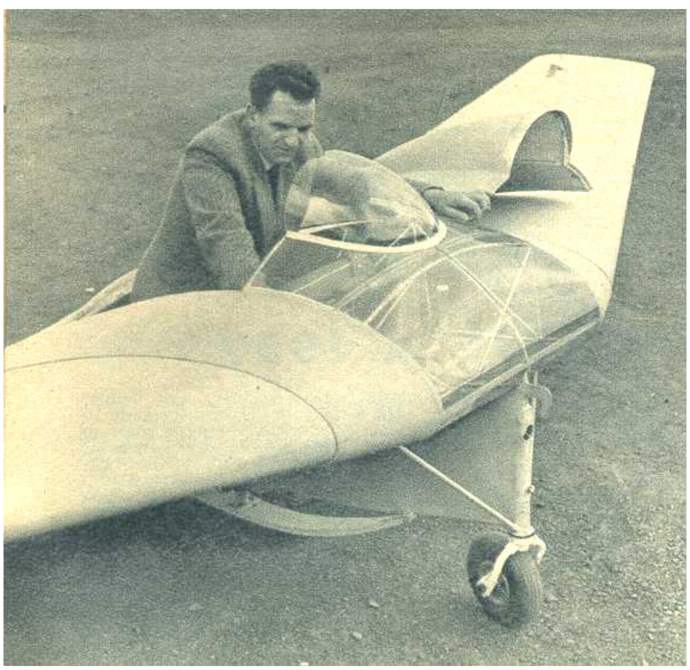
(ed. - Thanks for the picture and we eagerly await more information once you have dug it out of the moving box.
In response to his brief note accompanying the subscription, I referred Carlo to the Nurflugel mailing list since he was looking for a flying wing chat group. It is the only active one I am aware of, but if anyone knows of another chat room that includes flying wings as part of the subject line, please let us know.)

9/15/99

TWITT:

I have still in my archives 2 references concerning unknown flying wings. I do not remember if I already sent you these pieces of information. Maybe, some of our friends have more information on these aircrafts.

1) German flying wing : (Photo : Source: Aviation-Magazine Nr. 236 - 01-Oct-57 - Page 41.) There are not so much details on the BAHR flying wing. The small article in the periodical says what follows : "This summer (in 1957) there was a glider contest, the Gunther cup, organized for the purpose of demonstrating that the RHÖN, despite his area border proximity, was still interesting for soaring. Among the 12 gliders presented by Germany, there was the one presented. This tailless aircraft was built in 3 years by Mr. Johannes Bahr. Mr. Bahr is not pilot but he was wishing to present his aircraft to the other pilots before the certification. It is piloted in prone position." (Picture below.)

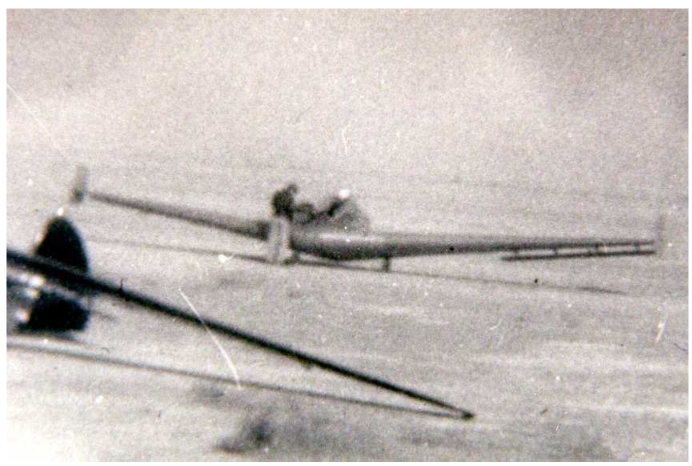


2) American flying wing, name unknown: I received this document (original photo) through Mr. Mark Granich who is the son-in-law of Mr. Robert Heidemann. Mr. Robert Heidemann is the brother of Mr. Walter Heidemann who worked during W.W.II. and, after, with the Northrop Aeronautical Institute at Hawthorne. Mr. Walter Heideman was in charge of the project Horten HoVI at that time. The brothers Heidemann never spoke about the work in Northrop because it was confidential (war period and military secret). Mr. Walter Heidemann is dead since several years and, unfortunately, all this knowledge of the flying wing history is lost.

According to the letter I have received from Mr. Granich, Mr. Walter Heidemann was a glider pilot for the US Air Force and was transferred to power plane flying for the last 6 months of the war. Both brothers went back to glider flying after the war and never spoke about their activities during the war.

Concerning the photo Mr. Granich sent me, the comments are as follow : "Bob asked me to mail you the enclosed information and, in particular, the small black and white photograph taken approximately in 1933-1934 at Rosemond Dry Lake. The photo shows the flying wing glider in the far background. Bob recalled that Hawley Bowlus designed, built and flew the flying wing gliders both before and during world war II. Hawley Bowlus could have been in charge of the project. Bob remembers that the gliders were occassionally flewn out at Rosemound Dry Lake, now called Edward's Air Force Base. Walt, meanwhile, had been a glider pilot commander before the war."

I received the information regarding the Heidemann brothers from Mr. Stanley A. Hall (who was asked by Northrop to fly the Ho VI but refused because of the high flexibility of the wings).



With best regards.

Eric_du_Trieu_de_Terdonck@vesuvius.com

(ed. - Thanks of the photos an accompanying information. I have only included the closeup of the Bowlus, even through it was quite fuzzy. It looks like something I have seen in other books and historical photos that Don Mitchel showed one time during his talks. There is probably someone out there with more information on it.
I haven't seen anything on the Bahr before, so it will be interesting to see what comes out from our members on this one.)

JIM MARSKE WORKSHOP

(Note: By the time the newsletter hits the streets, this workshop will be history, but you should be aware that they exist and are being held periodically.)

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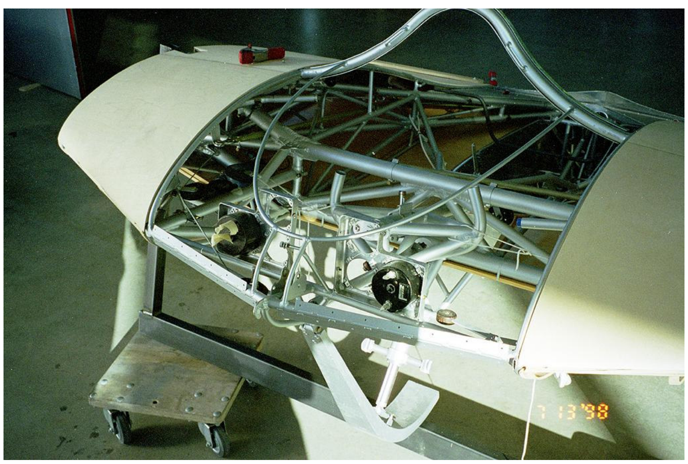
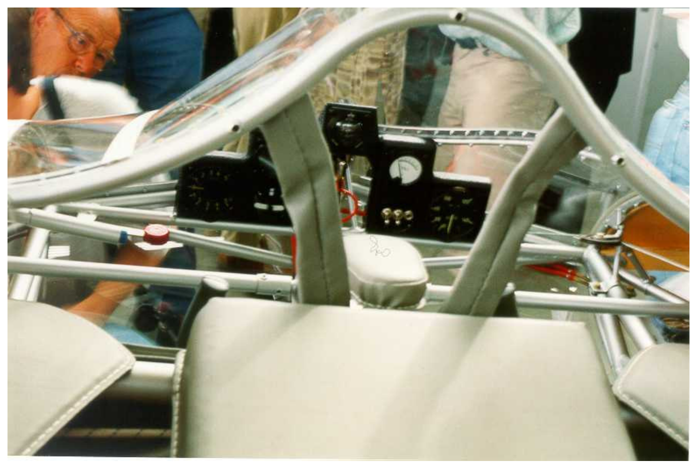


ABOVE: Horten IV cockpit structure, front view, during construction in Munich. (Photo by: Russ Lee, NASM; Source: Nurflugel.com)

ABOVE: Horten IV nose skid that is retractable. (Photo by Russ Lee; Source: Nurflugel.com)



ABOVE: Another view of the inside of the Horten IV cockpit area.