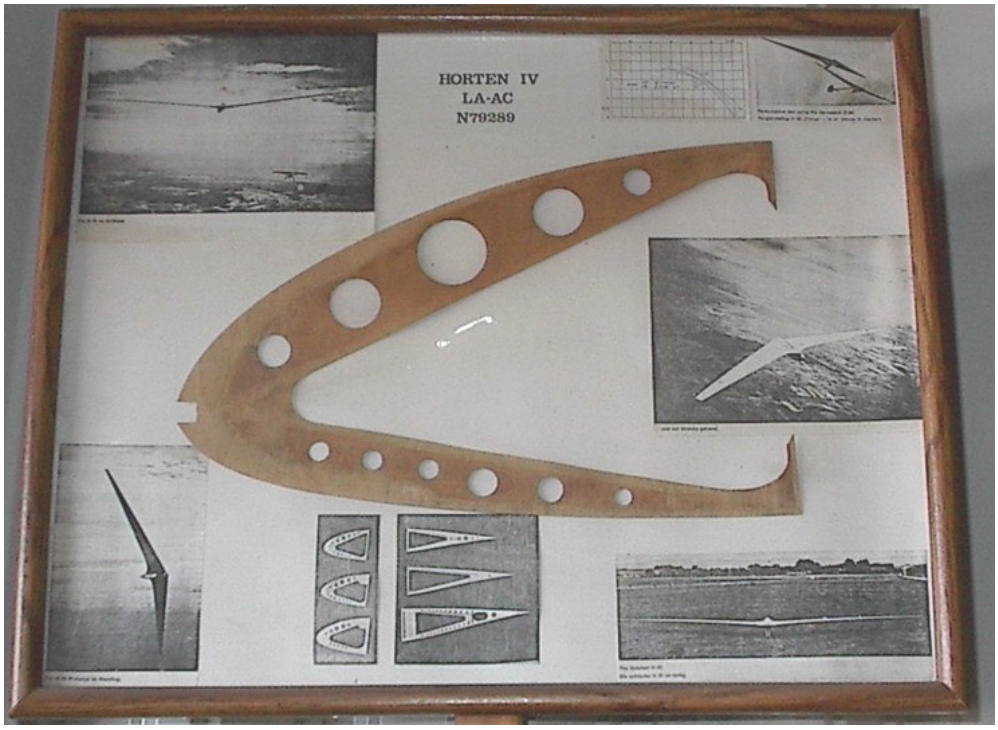
No. 227 MAY 2005

T.W.I.T.T. NEWSLETTER

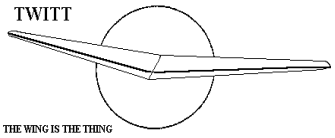
I don't recall including this picture in a newsletter in the past. It is a Horten IV nose rib that is part of Bob Fronius' collection of memorabilia on flying wings that he has acquired over the years.



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., **0505** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, May 21, 2005, 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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Editor: Andy Kecskes
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Wt/#Issues	FRG	AUSTRALIA	AFRICA
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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

First of all I need to thank Walt Scott for suggesting the speaker for this month's meeting. He provided the information I needed to make contact with Darrell Schmidt, who then agreed to come down and tell about the B-58 Hustler we featured on last month's cover. It is surprising what a picture can do when put in the right place. Thanks Walt.

Secondly, I would like to thank Paul Spatrisano for his work in obtaining permission to reprint an AIAA article on scissor tailed flying wings. This came along at just the right time and will provide material for the next couple of issues as we present it in serial form. I hope everyone enjoys the article and have some comments they are willing to share with the rest of the group as they get through the parts each month.

I hope everyone is getting ready for their summer flying vacations even if it might not be in a flying wing. I commented to one of the letters about there being more interest in actually building flying wings (usually a Mitchell design) in Europe than here in the US. Our group of enthusiasts has indeed shrunk over the past several years, but I know you all will continue to push efforts for producing at least homebuilt flying wings.

On that note I will make my continuing plea for letters, article and pictures of any flying wing projects you might be working on. It's through your efforts and relating them to other members that we keep the ideas of how to improve on wing designs, both from the full size and modeling areas. So please take a few minutes while you are waiting for the thermals to kick lose and jot down some notes about what you are doing or would like to do with a flying wing project. Send it along and we will see what others have to offer to further the idea(s).

Andy

MAY 21, 2005 PROGRAM

We are pleased to announce that our program for May will feature **Darrell Schmidt** who was a B-58 Hustler pilot and is going to tell us about the aircraft and his experiences flying this extremely high speed tailless design. This was the result of last month's cover shot and Walt Scott referring us to one of his airline day's buddies. This should be an interesting program about an aircraft that was at the cutting edge of technology for its day.

Darrell sent us the following information about his background.

Born and raised in Walla Walla, WA.
Enlisted Air Force as a Basic Airman, then Radio Tech then Aviation Cadet then commissioned.

Flight Instructor in T-28/T-33.
Aircraft Commander B-47, B-52H, B-58, C-7A.
Retired Air Force and ran a TV cable company for the few years.

Flight Instructor, Lear Jet/Citation for National Jet Industries Santa Ana, CA.

First Officer/Captain, Air California, Electra, 737, MD-80.
Captain, American Airlines, 737, MD-80, 757, 767 until mandatory retirement.

Part Time:
Ground school and flight simulator instructor, 737/MD-80 for Flight Safety Int'l and Alteon (Boeing) in Long Beach CA.

Visit Darrell's website on B-58 Hustler History at:
http://members.cox.net/dschmidt1/

Make sure to mark you calendar and join us at the hanger for the May program. This will be the third one in a row and I would like to see us have a good turnout for Darrell.

LETTERS TO THE EDITOR

April 18, 2005

TWITT:

Great job on the newsletter, obviously a lot of work on your part.

Please consider making the attached file (updated with enhanced notes based on questions from the meeting) available to TWITT members, perhaps via CDROM. Can you advertise it at the back of the newsletter? Alternatively, perhaps you could print hardcopies for those preferring that format.

Phil Barnes

(ed. – Thank you Phil for providing your presentation for distribution to the membership. I haven't had a chance to determine a cost of both printed and CDROM versions so there is flexibility in how you receive it. As soon as I get the prices I will put an ad in the classified section.

I imagine the printed version will be a little more expensive than our usual items since it really needs to be done in color to appreciate what Phil has done with his research.)

Separately, my response to Bob Hoey:

Dear Bob:

Thank you for your kind words and for driving all the way down from the desert for the presentation. In responding to your note, I would first like to clarify the trends in airspeed and L/D on page 7 of the April '05 newsletter. First, at sea level (point A) the albatross flies at 25 m/s (~55 mi/hr) with 0.7 lift coefficient at 2-g normal load factor. The L/D at this point is near 27. Then, at the top of the zoom (point C), the airspeed slows to 16 m/s. However, with the 1-g normal load factor at this point, the lift coefficient is not much different (0.8), whereby L/D is still near its optimum of 27. Indeed, as seen in the middle plot, L/D wanders very little from its optimum throughout the maneuver. Thus, it appears nature has well matched the albatross to a dynamic soaring environment.

Now to your observation about the albatross working the waves with little or no wind. I agree that the albatross has more methods than may meet the eye to "fly for free." Even with no wind, as you stated, waves with a threshold combination of height and

speed can be sufficient to displace air in an updraft which matches the sinking speed of the albatross, thus allowing it to hold constant elevation. This sink rate would be, from the example above, no less than 16 / 27 = 0.6 m/s, or just under 2 ft/s. With or without wind, if the albatross were to hold constant elevation and constant airspeed on the "windward" side of a wave crest, this would represent the familiar constant-energy soaring in "wave lift." On the other hand, if the albatross were to skip across the waves from crest to crest, a detailed analysis would be needed to see if energy could be maintained overall.

On my recent trip to Antarctica I saw several episodes (in light wind) of what appeared to be "terrain following" by the albatross, sometimes perpendicular to the waves, with wings level in ground effect (see photo), perhaps only 15-cm above the water. I had not included ground effect in my simulations because I thought the albatross rarely flies wings level. Anyway, it apparently often does. In so doing, it senses when energy runs low and then pulls up to execute a dynamic soaring zoom, thus regaining a surplus of energy to be used for subsequent wings-level terrain following.

Thus it appears we have both seen new methods (relative to "flat-sea" dynamic soaring) whereby the albatross flies for free, and most likely, there are more methods to be discovered. Thus, let us encourage others to join in the study of this marvelous bird, while encouraging all to help prevent its slide toward extinction on our short watch.

April 18, 2005

TWITT:

I am planning on building a Mitchell U-2. Do you know of anyone in this area who has or is building one? Is there anyone who knows how to apply the Culver Twist to this wing? Hope you can help.

Milt Clark
PO Box 3
Buckland,Ma.01338
(413)625-1074
<mobyj1@localnet.com>

(ed. – We have not heard of any others in his area building U-2s so if you have an answer to his question please make contact. Also, let us know so we can provide that information to others.)

April 19, 2005

Hi TWITT:

I am sorry to have to inform you that our friend Prof Dr Wolfgang Hopff died April 9th after being very sick with incurable cancer.

He was a fond aviator and he helped on many projects as flight instructor - Delphin-flapped Elfe or jet-powered Prometheus.

To all our American friends the best of wishes for luck, sanity, and lift.

Thomas Bircher
President EFF
<bitanx@bluewin.ch>

(ed. – I am sure there are members who know of Dr. Hopff and are sad that he has passed away.)

April 19, 2005

Thanks,

In this month's newsletter you refer to some Klingberg wing questions. I also have a Klingberg wing and would be interested in any effort to build a foam version.

Warren Bean
Member Technical Staff, Platform Engineering
Advanced Micro Devices, Inc.
(512) 602-1298
(512) 633-8429 (Cell)
<warren.bean@amd.com>

(ed. – I haven't heard anything about foam wings being made available to the general public. I have a hunch they are out there, but just not advertised. See the message below for where to get plans.)

April 24, 2005

Hello:

I sent a letter a while ago regarding membership and am awaiting response. I'm a long time modeler; spent the winter learning how to vacuum bag composite wings, and just designed my first flying wing for that technique. Used Panknin twist formula etc.
Looking forward to learning about membership.

Thermals.

Ron Gauthier
Binghamton, NY
<rgauthier@stny.rr.com>

(ed. – I sent a reply to Ron and have since received his membership subscription. I also asked him if he could provide us with some pictures of his vacuum techniques and a short article to share with our members.)

May 1, 2005

TWITT:

I am trying to find out if someone is reproducing the Jack Bale plans. If so can you tell me how to get in touch with them? Any help would be greatly appreciated.
I know he passed away and I can't find anything of his.

Thanks very much

Chuck Pacini
<7bropac@ttc-cmc.net>

(ed. – I know this question has come up before, but I don't recall the answer. I think any existing plans were sold, but no further reproductions were being done by the family. If anyone knows something different, please let us know.)

May 5, 2005

Adolfo:

I have been interested in the Mitchell's for some time. Can you send some pictures of your progress with remarks. I haven't been able to locate any EAA Members in Southern California building the U-2

Walt Scott
El Toro, CA
<P38g@aol.com>

From: Adolfo G. Martin <agonzalez@recol.es>

Now I am beginning with the main spar. Not much progress because just working on weekends.

Please find attached some pictures.

Have you joined the U2 and B10 yahoo groups?

Adolfo

(ed. – It seems there is more interest in building the U-2 in Europe than here in the US, although there is some interest as noted in a previous message.
I have included a couple of the pictures below and on the following page that Adolfo sent along to Walt so you can see some of his construction techniques.)

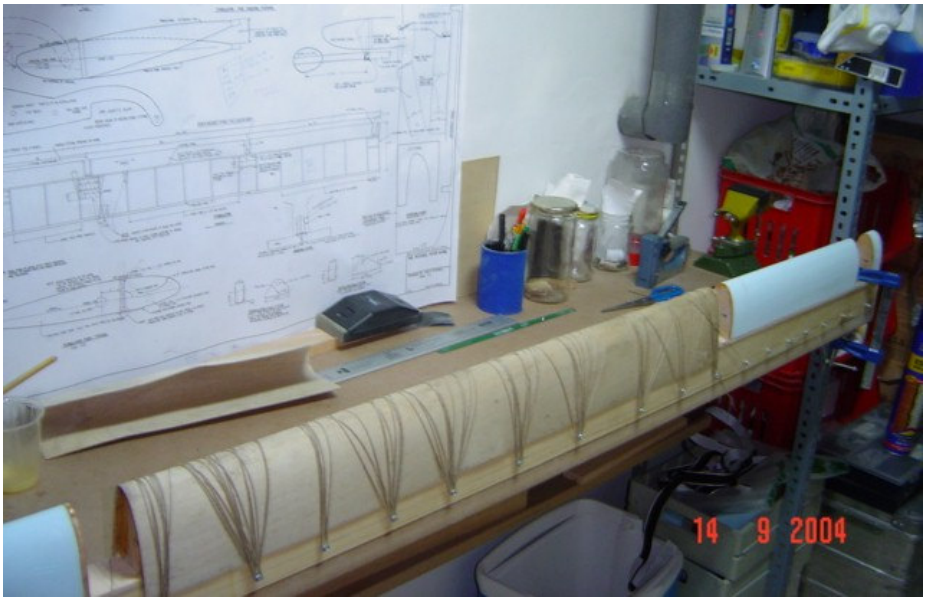
ABOVE: This is the outer wing spar on the jig table.

May 5, 2005

Hi Andy,

Glad I can contribute for a change. For a very long time I have been interested in the aerodynamic characteristics of "Scissor Wing" flying wings, as I'm sure everyone else has. I finally found this reasonably current research paper on the AIAA website (see attached) that I hope will interest everyone and maybe generate some spirited analysis/comparison with

ABOVE/BELOW: This is the stabilator in Adolfo's jig. This looks a lot easier than using a lot of sand bags to hold everything in place while it dries.



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other configurations (Horten) by Al Bowers et al. It ties neatly into the recent discussions amongst the faithful regarding Horten sin ^3 twist, bird flight wing tip aerodynamics etc.. It looks to me that this approach is used in Scaled Composites Spaceship One.

The email permission to print this paper in the newsletter from AIAA is below. I don't think they would like it posted on the website. The AIAA website is www.aiaa.org. There are more papers on this subject on the AIAA website, but they are more specific in nature and much longer. This one is an overview and gives credit to the originator, Dr Richard Vogt when he worked for Blohm & Voss during WW2.

On a related subject, Klingberg wing plans are still available from Rol Klingberg at: rolkling@yahoo.com.

If anyone is interested, I have re-plotted the ribs per a website by someone who worked with Al Bowers(?) (Help me out here Al) that gives the 2-meter Klingberg Wing a Horten sin ^3 twist (this results in proverse yaw in turns). The wing he built had an arced leading edge (looking at the wing head on) and dihedral to counteract this. I have re-plotted the ribs to result in a straight leading edge and no dihedral. If I'm correct this is very close to the original Horten designs.

Why all this? I want to compare the flight characteristics of the Horten layout and the Vogt layout via 2 meter R/C electric flying models. If anyone would like a copy of the new rib layout, send me proof that you purchased plans from Rol Klingberg and I will send you the rib layouts. I have no affiliation with him, but it is his intellectual property (the Klingberg Wing) and any plans should be purchased from him. I offer this for the experimenters of us out there to further the cause. If any of you have any thoughts or further information on this subject, please let me know before I go to the trouble of constructing these models!

Keep up the good work,

Paul Spatrisano
P.O. Box 8210
Bend, OR 97708
<pandb@bendcable.com>

May 05, 2005

Subject: Your reprinting request

Dear Mr. Spatrisano,

AIAA is pleased to grant permission for you to reprint the following paper in the TWITT newsletter:

Tipton, B.J., Smith, D.E., and Mullins, Jr., B.R., "The Aerodynamic and Performance Analysis of a Semi-Tailless Aircraft Configuration," AIAA paper 96-0408, Jan. 1996.

Appropriate credit must be given to AIAA (e.g., Originally published as Paper Title, Author, Paper number, etc. Copyright © 1996 by the American Institute of Aeronautics and Astronautics, Inc. Reprinted with permission.)

Thank you for your inquiry.

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(ed. – I would like to thank Paul for going to the effort of obtaining the required permission for re-printing this AIAA article in the newsletter. I will have to do it over a couple of issues since it is 10 pages and I don't have enough space to put it all in one. Since it is an Adobe file I can't just insert it into the newsletter like other text, so I have had to scan the pages and put them in like other images. This has degraded the clarity to some degree, so I hope you will be able to read it without a lot of difficulty. I apologize to those members with declining vision where you may have to use a magnifying glass. I know the feeling.

This is the title page and will serve as the acknowledgement of the authors and publisher of the paper.)

AIAA Meeting Papers on Disc, January 1996
A9618370, AIAA Paper 96-0408

The aerodynamic and performance analysis of a unique semi-tailless aircraft configuration

B. J. Tipton
Oklahoma Univ., Norman

D. E. Smith
Oklahoma Univ., Norman

B. R. Mullins, Jr.
Texas Univ., Arlington

AIAA 34th Aerospace Sciences Meeting and Exhibit, Reno, NV Jan 15-18, 1996

The feasibility of a unique semi-tailless aircraft configuration that utilizes a split empennage, mounted outboard and aft of the main wing trailing edge is examined. A description of the combined analytical/empirical model of the tip vortex flow field as a function of the geometry to evaluate the effectiveness of this type of empennage is included. An evaluation of the performance of the 'scissor-tail' is performed to determine the applicability of the configuration to a general-aviation aircraft. Results show good agreement between the analytic/empirical model and available performance data. Results also indicate that the configuration is a good novel candidate for a general aviation aircraft. (Author)

THE AERODYNAMIC AND PERFORMANCE ANALYSIS OF A UNIQUE SEMI-TAILLESS AIRCRAFT CONFIGURATION

by

Brian J. Tipton*
Duldley E. Smith†
The University of Oklahoma
Norman, Oklahoma

and

Baxter R. Mullins, Jr.‡
The University of Texas at Arlington
Arlington, Texas

ABSTRACT

The feasibility of a unique semi-tailless aircraft configuration that utilizes a split empennage, mounted outboard and aft of the main wing trailing edge ("scissor-tail") is examined. A description of the combined analytical/empirical model of the tip vortex flow field as a function of the geometry to evaluate the effectiveness of this type of empennage is included. An evaluation of the performance of the "scissor-tail" is performed to determine the applicability of the configuration to a general-aviation aircraft. Results show good agreement between the analytic/empirical model and available performance data. Results also indicate that the configuration is a good novel candidate for a general-aviation aircraft.

NOMENCLATURE

Regular Symbols:

C_D	Overall drag coefficient
C_{D_0}	Parasitic drag coefficient
C_L	Airplane lift coefficient
e	Oswald's efficiency factor
G	Non-dimensional circulation, Γ/bV_∞
J	Propeller advance ratio
$\hat{n}$	Normal vector
q	Dynamic pressure
r	Vortex radial coordinate
S	Surface area
V	Velocity

Greek Variables:

Γ	Dimensional Circulation
α	Angle of attack
δ	Control surface deflection angle
ε	Downwash angle
η	Spanwise station or dynamic pressure ratio

Subscripts:

E	Empennage
e	Rudder-vator
f	Flap
LC	Zero lift
T	Transverse
w	Wing
∞	Freestream condition

INTRODUCTION

During the later half of the Second World War, the deteriorating situation in Germany lead to an almost explosive acceleration in the development and application of new concepts and technologies in an effort to stem the eventual Allied Victory. Much of the effort was focused in the German aircraft industry as this had been the technology which propelled their original success and was the principal technology which was then devastating its industrial base. In an attempt to "leapfrog" the Allies increasing technological and numerical advantages, efforts were focused in the emerging technologies such as turbojet engine development, rocket development, high speed aerodynamic research (such as swept wing design and testing), and the examination of almost any configuration that might possess a possible performance advantage. These efforts led to many unusual and

*Graduate Student, Member AIAA
†Associate Professor, Member AIAA
‡Associate Professor, Senior Member AIAA

innovative aircraft configurations, some which have been extensively examined and integrated into actual production aircraft and many which have not been fully explored. Examples of these include; Rudiger Kosin and Walter Lehmann at Arado and their development of the crescent wing, Walter and Reimer Horten and their flying wing developments, Dr. Alexander Lippisch and the semi-tailless ME-163 rocket interceptor, and Hermann Pohlmann at Junkers and the swept forward wing.

One of the more creative designers during this period was Dr.-Ing Richard Vogt of Blohm and Voss. In addition to the well known large flying boats and float planes, Blohm and Voss was responsible for numerous unconventional designs and advanced concepts. These include the well known BV-141B asymmetric reconnaissance aircraft, the P188/03 (Fig. 1) cranked or "W" wing jet bomber and numerous semi-tailless configurations. Of the latter, the most interesting were the BV-200 series aircraft (Fig. 2). These configurations were characterized by a central-pod fuselage with swept main wings which had short "boom" like structures attached to the wing extending aft of the trailing edge. Attached to each of these booms were empennage surfaces with their leading edges near the trailing edge of the main wing. Some of the aerodynamic advantages claimed for these unusual configurations included

1. As in most tailless or semi-tailless aircraft, a minimum number of aerodynamic surfaces and junctions, and thus a reduced vehicle drag.
2. A reduction in the size of the empennage surface owing to increased empennage effectiveness because of the local upwash field of the main wing tip vortex. Boom mounted empennages provide significant contributions to control moment arms, thus minimizing the sweep required for trim, providing a greater control of static margin requirements.
3. Owing to the concentration of the span loading toward the wing tip and the "endplating" effect of the boom, aileron effectiveness is increased which allowed for reduction in aileron size, thus (contrary to all other semi-tailless configurations) one now has the freedom to use the majority of the wing trailing edge for high lift devices.

Fig. 1. P188/03 Cranked Wing Aircraft[1]

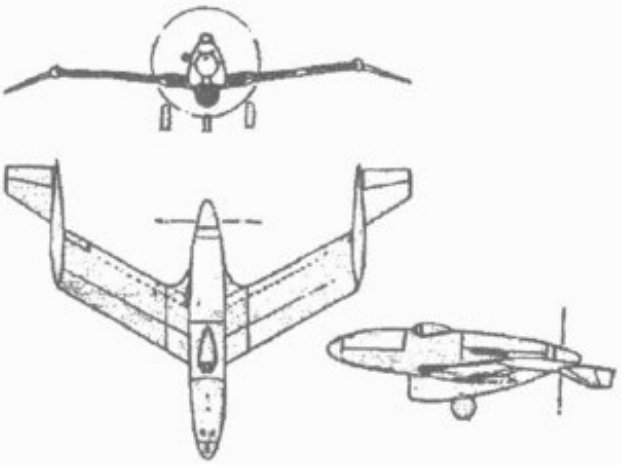

Fig. 2. BV-208.P3 Single seat day fighter with a reciprocating engine[1]

Of singular interest was the BV-208.P3 which had a single empennage surface mounted with a moderate amount of anhedral, which served the dual control purpose of both pitch and yaw as in a typical inverted Vee-tail, further reducing the number of surfaces.

The objectives of this research were twofold. First, to develop an analytical model capable of analyzing the "scissor-tail" configuration to generate a general method to enable the development of new aircraft utilizing this configuration. Secondly, to evaluate the benefits ascribed to it by its designers and its applicability as a general-aviation configuration. This paper describes the analytical/empirical model developed to analyze the specific flow field in the tip region to evaluate the empennage performance, and from a preliminary design level of analysis, evaluates the aerodynamic performance of the "scissor-tail" configuration.

Fig. 3 shows the transformation of a conventional empennage layout to that of the scissor-tail configuration. First, the empennage is split in half and each half moved spanwise to a position behind the trailing edge of the wing tip (Fig. 3b). This action removes the empennage from the velocity deficit region behind the wing and places the surface in the wing's upwash field rather than the wing's downwash field. Thus, surface effectiveness is increased, and, for the same control authority and stability, the surface areas can be decreased. Secondly, the wings are swept aft to provide an attachment for the empennage surfaces (Fig. 3b). This has the added benefit up increasing the

outboard loading of the wing, thus, for the same roll authority, reducing the required size of the aileron. This leaves more of the wing's trailing edge available for high lift devices. Both the horizontal and vertical portions of each empennage can be combined into a single, anhedral surface with projected surface areas matching the reduced sized empennage (Fig. 3c). Also, the fuselage can be shortened since the empennage carry through is no longer needed. Thus, the overall wetted area of the configuration is reduced. Lastly, the booms are added to the wing tip as a fairing for the junction. Thus, the "scissor-tail" configuration is closer to its conventional counterpart than first impressions may suggest. Although the actual BV-208 was still under development at the war's end, Blohm and Voss verified the concept's feasibility via limited flight testing of a modified aircraft. The Škoda-Kauba V-6, a small experimental aircraft with a pusher propeller and twin tailbooms, was converted to the BV-208 layout, renamed ŠK SL 6, and test flown successfully in 1944.[2] However, little is known about the plane's actual performance and flying qualities. Kentfield[3] reported what he believed to be "...an innovative aircraft configuration..." However, the configuration and developments described were identical to the concepts developed and tested by Blohm and Voss over fifty years ago.

ANALYTIC MODEL DEVELOPMENT

Tip Vortex/Empennage Interaction

To properly evaluate the performance of scissor-tail configuration, as well as the claims of increased empennage effectiveness, it is necessary to develop a method that from a preliminary design level of analysis, accurately describes the tip flow field in the region surrounding the empennage. The empennages of an aircraft provide both control power and dynamic stability and control. The increase in empennage effectiveness can be characterized by two contributions from the vortical flow field.

1. *Dynamic Pressure Ratio* (η_E): Fig. 4 depicts the flow field in the region surrounding the empennage. The rotational portion of the velocity field (V_T) combined with the freestream velocity causes the local velocity to be greater than the freestream, thus making $\eta_E > 1.0$. A conventional aircraft configuration has $\eta_E < 1.0$ due to its being in the wake region or velocity deficit region of the wing and is on the order of 0.95 to 0.96. This increase in dynamic pressure ratio increases both the control power and stability contribution of the empennage.

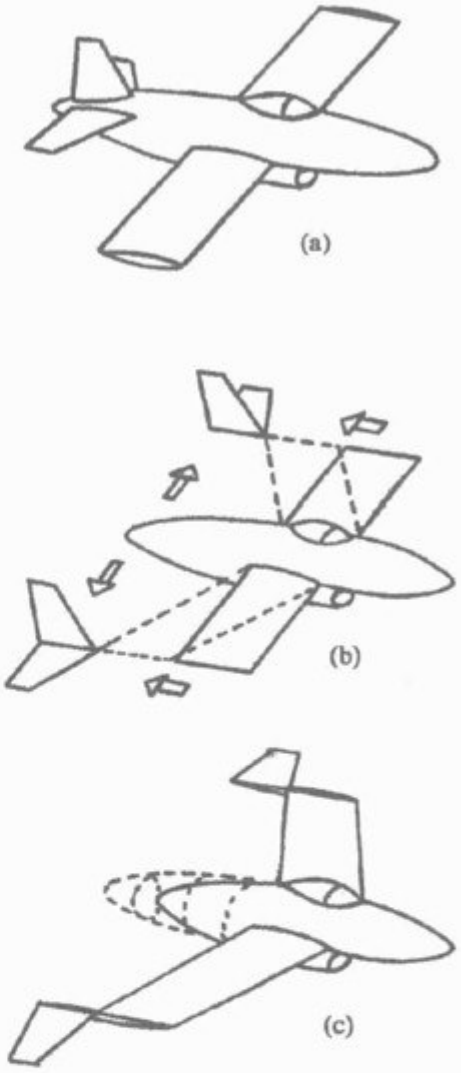

Fig. 3. Transformation to "scissor-tail" configuration

2. *Upwash* ($-\varepsilon$): Again from Fig. 4, one can see that the empennage is in the upwash field of the main wing's tip vortex. Since ε is usually defined as positive for a downwash field, it is now a negative quantity. The empennage angle of attack is expressed as

$$\alpha_E = \alpha_w - \varepsilon + i_E - i_w \qquad (1)$$

and is now increased rather than decreased as is the case for a conventional empennage, thus increasing the control power contribution of the empennage. Also, $\frac{\partial \varepsilon}{\partial \alpha}$ is now negative making the quantity

May 7, 2005

Hello:

I want to ask you for information on Horten Hx series "Pierniferos". The reason is that I am an aeronautical engineering student and at this moment am doing my thesis and the subject is to study the Horten Hxb. It consists in remaking the planes in CATIA and study the aerodynamics by a CFD analysis, after that the project continues by trying to optimize the configuration to get a lower landing speed and to make it in composite materials to get a lower weight.

I'm from Argentine and I study at the Nacional University of Còrdoba, where Reimar was living from 1950 to his death in 1994. We are trying to save all the data available of this kind of aircraft.

Thank you.

Leonardo Acevedo

Norman Masters <nmasters@acsol.net> provided the following to help Leonardo:

"Have you looked at the sample newsletter from TWITT? The October '98 letter has an article that might be helpful: http://www.twitt.org/

(ed. – What Norm forgot to tell Leonardo is that the October '98 newsletter only contains a part of Al Bowers presentation on the Hxc and that we have a video that includes a full set of Al's slides so you can really enjoy the material. Hopefully, we will hear from Leonardo about ordering it so he can get ALL the information he needs. I guess we also need to put him in touch with Al so perhaps they can establish a dialog that might produce some interesting results.)

May 1, 2005

Subject: Drawing help

I am learning to draw with my PC via AutoCAD 2000. I'd like to scan an existing sketch or plan on paper, import it to the AutoCAD and be able to modify the imported drawing. My teacher says it is not possible because the CAD 'sees' the imported graphic as a unit and therefore I couldn't pick single lines, etc. If this is true I'd like to know of some other cad program that fills my needs. Would anybody help, please?

Thanks,

Douglas Russell-White

<dear_w2002@yahoo.com>

Norman Masters offered the following:

Your teacher is right. You can trace over a picture to produce some very good line art but ACAD can't manipulate the picture itself. After tracing over the scanned image you can modify the tracing but I haven't seen a way to get around this intermediate step.

There is raster to vector conversion software but I don't know anybody who has used any lately. The last time I looked at any (about 13 years ago) I wasn't impressed with the low cost programs and the ones that worked were way out of range of the casual user.

The situation may be better now, try this search: <http://www.google.com/search?hl=en&lr=&q=raster+to+vector+conversion+autocad&btnG=Search>

(ed. – Perhaps others can benefit from this information if they are interested in electronic designing.)

AVAILABLE PLANS & REFERENCE MATERIAL

Coming Soon: <u>Tailless Aircraft Bibliography</u>
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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Cleveland Hts., OH 44118 (216) 321-5743

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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.

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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
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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.

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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
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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.

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Contents: Introduction; Aerodynamic Basic Principles; Stability; Control; Flight Characteristics; Design of Sweptback Flying Wings - Optimization, Fundamentals, and Special Problems; Hanggliders; Flying Models; Fables, Misjudgments and Prejudices, Fairy Tales and Myths, and; Discussion of Representative Tailless Aircraft.

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