

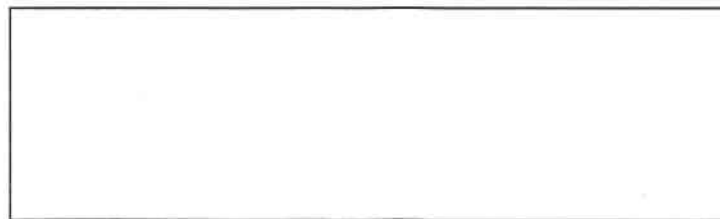
T.W.I.T.T. NEWSLETTER



The Tara Kiceniuk designed ICARUS rigid wing hang glider in flight. Photo by Floyd Fronius.

T.W.I.T.T.

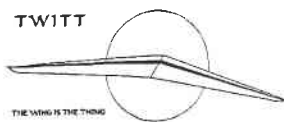
The Wing Is The Thing
P.O. Box 20430
El Cajon, CA 92021



The number to the right of your name indicates the last issue of your current subscription, e.g., **9601** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, **January 20, 1996**, beginning at 1330 hrs at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row on Joe Crosson Drive - East side of Gillespie).

TWITT



**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



I hope that all of you have a nice holiday season. I imagine everyone is now working on their New Year's resolution to loose all the weight that attached itself to your bodies from the baked goodies (be careful with those CG measurements right now).

I thought I would try to clarify something again, since it appears there may still be some confusion on the Australian Horten flying wing. The August 1991 issue of Australian Gliding published an article by Ray Ash relating the development and flying of a Horten wing being undertaken by Bill Moyes in Australia. The publication was given to TWITT by Alex Kozloff who in no way was or is involved in the project.

I have added an important note to the program announcement about being on time for the meeting this month. Doug has to leave early to make a prior commitment so he will lead off the meeting right at 1:30. Please make an extra effort to be there a little early.

With the coming of the new year, it is time I for my periodic plea for newsletter material. This month was almost a stretch, but thanks to Alain Mirouze's material on Fauvel and Kenin Renshaw's on Lippisch's delta wings I was able to fill the pages. However, the coffers are running somewhat dry other than discontinuous material from the library. Please send us your letters and pictures of what's going on with your pet project, or that of someone you know, whether it is full sized or model.

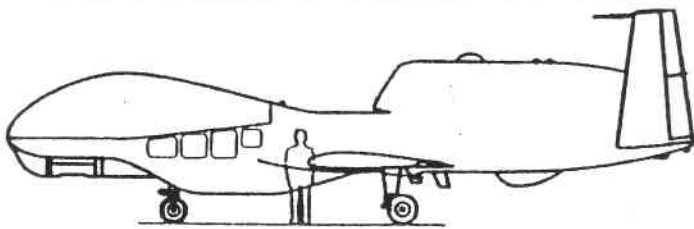
If you run across some unusual material on flying wings or tailless aircraft, get copies if possible and send along so we can share it with other members. If you have questions about construction techniques, design problems, etc., send those in so we can get you some answers from the membership. The motto of "People Helping People" doesn't have to apply only to the credit union industry, but can also work in TWITT to further the development of flying wing technology.

Andy

JANUARY 20, 1996 PROGRAM

Our speaker this month will be **Doug Fronius** (yes nepotism is still alive) talking to us about Teledyne Ryan Aeronautical's TIER II Plus High Altitude Endurance Unmanned Aerial Vehicle. He will be updating us on the unclassified portions of the program, some of which has been published in various aviation magazines.

The aircraft will have a 116' span with a gross takeoff weight of 25,000 lbs. It will be capable of staying on station 3,000 nm from its base for 24 hours at an altitude of 65,000'. Power will come from an Allison AE 3007 turbofan engine which produces 7,200 lbs of thrust. The design employs both composite (wing) and aluminum structures (fuselage).



It is to have synthetic aperture radar, electro-optical and infrared sensors and will transmit imagery via satellite communications. Tier II Plus is to demonstrate an affordable reconnaissance capability for the joint force commander that provides high-quality imagery direct to the field user.

IT IS VERY IMPORTANT THAT YOU ARRIVE AT OR BEFORE 1:30pm FOR THIS MEETING SINCE WE WILL BE STARTING RIGHT ON TIME DUE TO A TIME CONSTRAINT ON THE SPEAKER'S AVAILABILITY.

If you will be a little late or arrive late please come on in and pick up on the program. If you have something to present it can be accommodated at the end of Doug's presentation.

LETTERS TO THE EDITOR

12/22/95

TWITT:



Enclosed are some drawings of early tailless designs by Alexander Lippisch. The drawings show how Herr

Lippisch's early designs evolved. These are from his autobiography The Delta Wing published by Iowa State University Press. Unfortunately, I think this excellent book is out of print,

so if any TWITT's have a copy, hang on to it. Hope everyone has Happy Holidays and a prosperous New Year.

Kevin Renshaw
Fort Worth, Texas

(ed. - Thanks for the material. We will add the original copies you sent to the library.)

I have attempted to put together a collage of the top views from the various drawings you have sent.

The flying wing video we offer has some old German footage on it that includes a brief section of what looks like a Storch II type wing being launched behind a power plane with a lot of effort by the ground crew.)

12/2/95

TWITT:

I have found some documents really genuine from Charles FAUVEL and some others. I think that you are the most qualified to use and spread them.

Sorry for them being in French, but it was impossible to translate some many documents. If some of them are of absolute interest, send me a copy (I kept nothing here) and I hope to translate it for you.

Best wishes,

Alain MIROUZE
Le Sylvacane, France

(ed. - We would like to thank Alain for this unique FAUVEL material. We will treat it with care and add it to the library.)

I have tried to make a listing below of what was included, but it is in French and I may have lost something trying for a basic translation of titles.

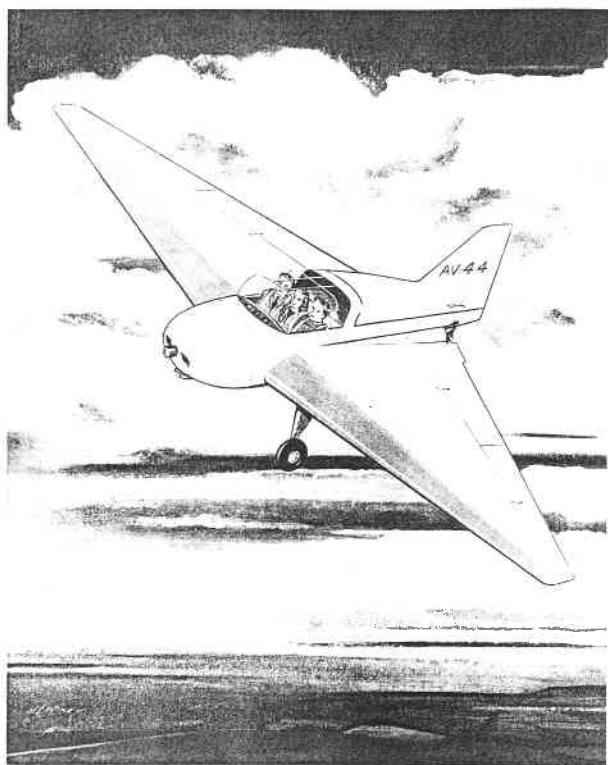
If anyone sees something that would really interest them, please give us a call and we will give you the cost of reproducing the article and shipping it to Alain for translation.

For those of you who are familiar with Fauvel's work, if you know of an English language book or article that includes information on the same aircraft, give us a call or drop us a line with the names and publishers. This might alleviate the need for Alain doing the translations.)

LISTING OF FAUVEL MATERIAL ADDED TO TWITT LIBRARY

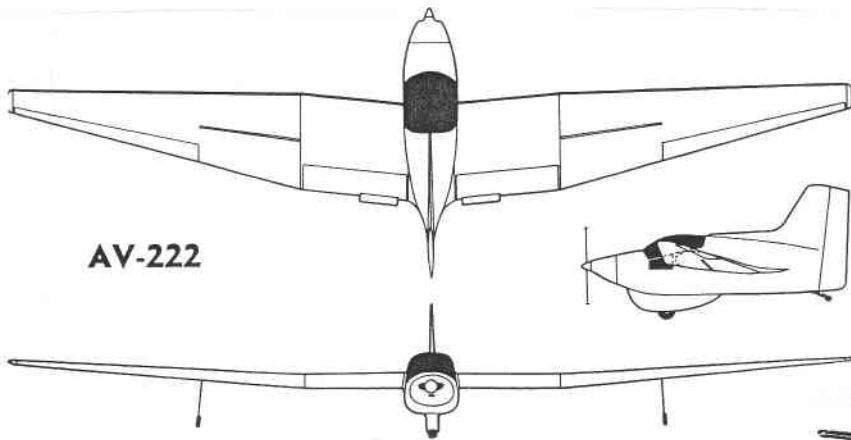
► UTILISATION DES PLANEURS A ENVOL AUTONOME EN VOL A VOILE, par Charles FAUVEL, Communication au Congress de L'OSTIV, South Cerney, 1965. 36 pages of text, 3-views, graphs and photos of Fauvel aircraft.

► 3-View & statistics for FAUVEL AVION AV.44, dated 10/14/58. Also an October 1973 paper signed by Fauvel titled "POUR CONSTRUCTEURS AMATEURS", AVION Bi-Triplace Cote A Cote AV 44, à Décollage et Atterrissage courts (ADAC-STOL), Puissance motrice; 90 à 140 CV.



A-V 44

► 3-View and text on the AV-222 BUSE (below), motoplaneur biplace. Also text material on AV-45 FAUCON, motoplaneur monoplace.



AV-222

► Undated text covering the AV-361 MOUETTE planeur monoplace, and a photo of the AV-45 planeur autonome monoplace.

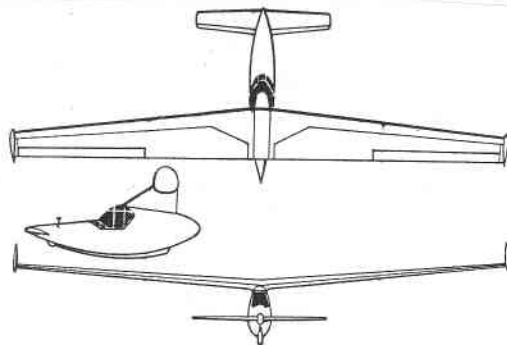
► Undated paper titled "REFERENCES TECHNIQUES de L'AILE VOLANTE Ch. FAUVEL", AV 10 #1 F-AONR PRISE PAR LES ALLEMANDS EN 1940, I-ESSAIS DE QUALITE DE VOL AU CENTRE D'ESSAIS EN VOL DE VILLACOUBLAY. Also two charts Centrage AR and Centrage AV (which appears to have hand written notes by FAUVEL).

► Several black and white photos of the AV 10 on the ground and inflight.

OTHER FRENCH LANGUAGE MATERIAL

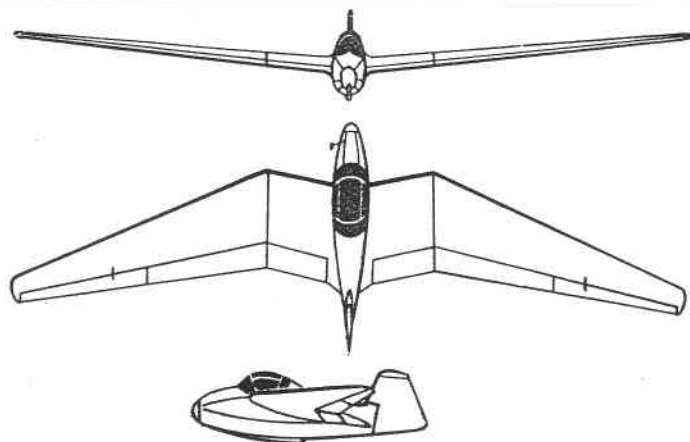
Alain MIROUZE also included some other material on various historical flying wing and tailless aircraft. All of it is in French, so I will try to give you the best guess as to what is being covered.

► Three pages titled "L'OEUVRE DE GEORGES BRIFFAUD" containing descriptions of George BRIFFAUD's aircraft some of which are tailless, with others that are stagger wing, and high quality black & white pictures of several designs (H.M. 14, G.B. 4, G.B.6, G.B. 9, G.B. 10 and G.B. 11). This series of aircraft appeared to begin in 1935 and continued until about 1980. The last one, G.B.81 seems to have three variants, two powered and one glider as seen in the 3-view on page 9.



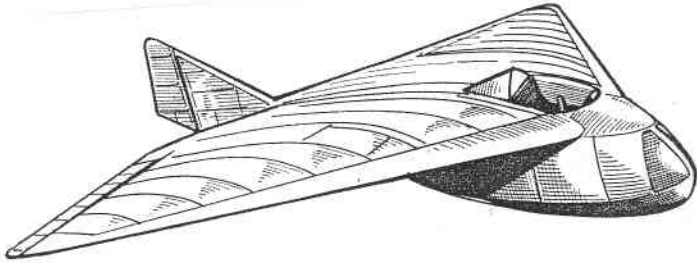
KACZKA

► Two sheets titled "LE VOL A VOILE POLONAIS" and "L'HISTOIRE DU VOL A VOILE POLONAIS", par Jean GRAMPAIX. The two tailless examples are the KACZKA canard sailplane shown above (there is also a photo of the actual aircraft), and the NIETOPERZ a 3-view sketch of which is shown below.

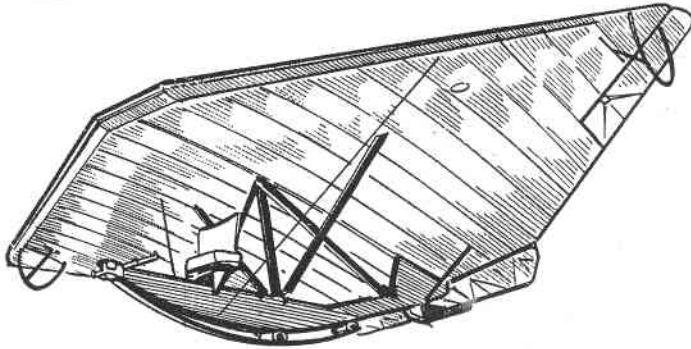


NIETOPERZ

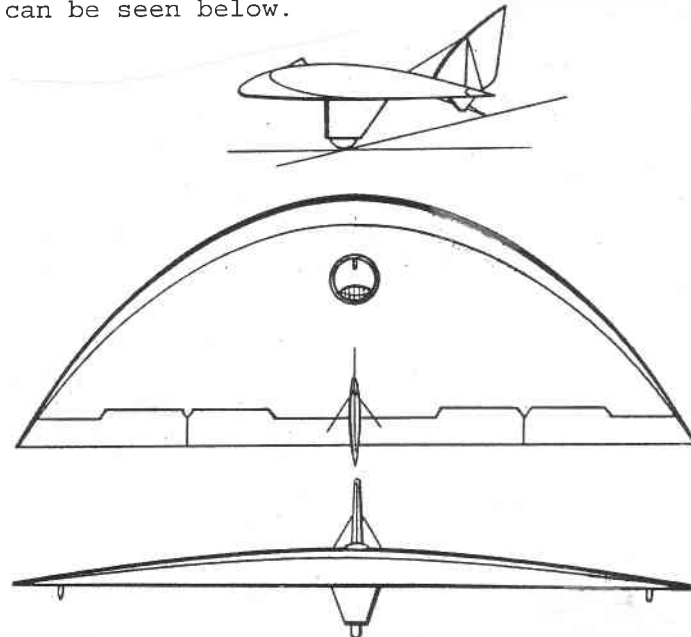
▶ One sheet titled "A L'AÉRO-CLUB DE LA COTE-D'OR" with an article titled "L'AILE VOLANTE AV-361" with text talking about the AV-22, AV-361, AV-36 and AV-45 of FAUVEL. It also includes a sketch of an Italian design called PIANA-CANOVA-500, a 1936 tailless delta wing seen below.



▶ Another sheet from the same magazine as above with a sketch of the PIANA-CANOVA-100, a circa 1934 delta wing primary glider style aircraft shown below.

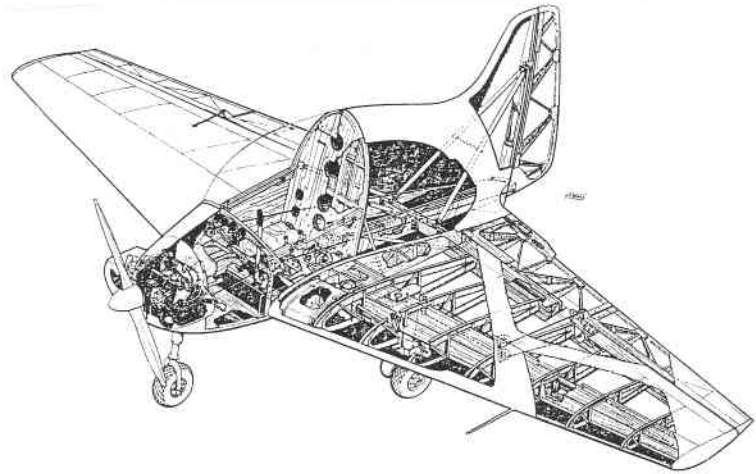


▶ Article titled "BORIS IVANOVITCH TCHERANOVSKII" from Aviation Magazine (date unknown) covering parabolas, one of which was the BITch-1 circa 1924. It appears to have had an initial flight of 1 minute 27 seconds traveling 570 meters. A sketch of the design can be seen below.



▶ Small sheet with an article on the FAUVEL AV-36 and a picture of a Witold Kasper design in flight.

▶ Small sheet with an article on the P-40 powered tailless aircraft apparently designed by J. Pottier with a trapezoidal shaped wing.



ABOVE: AV-60 LEPRECHAUN

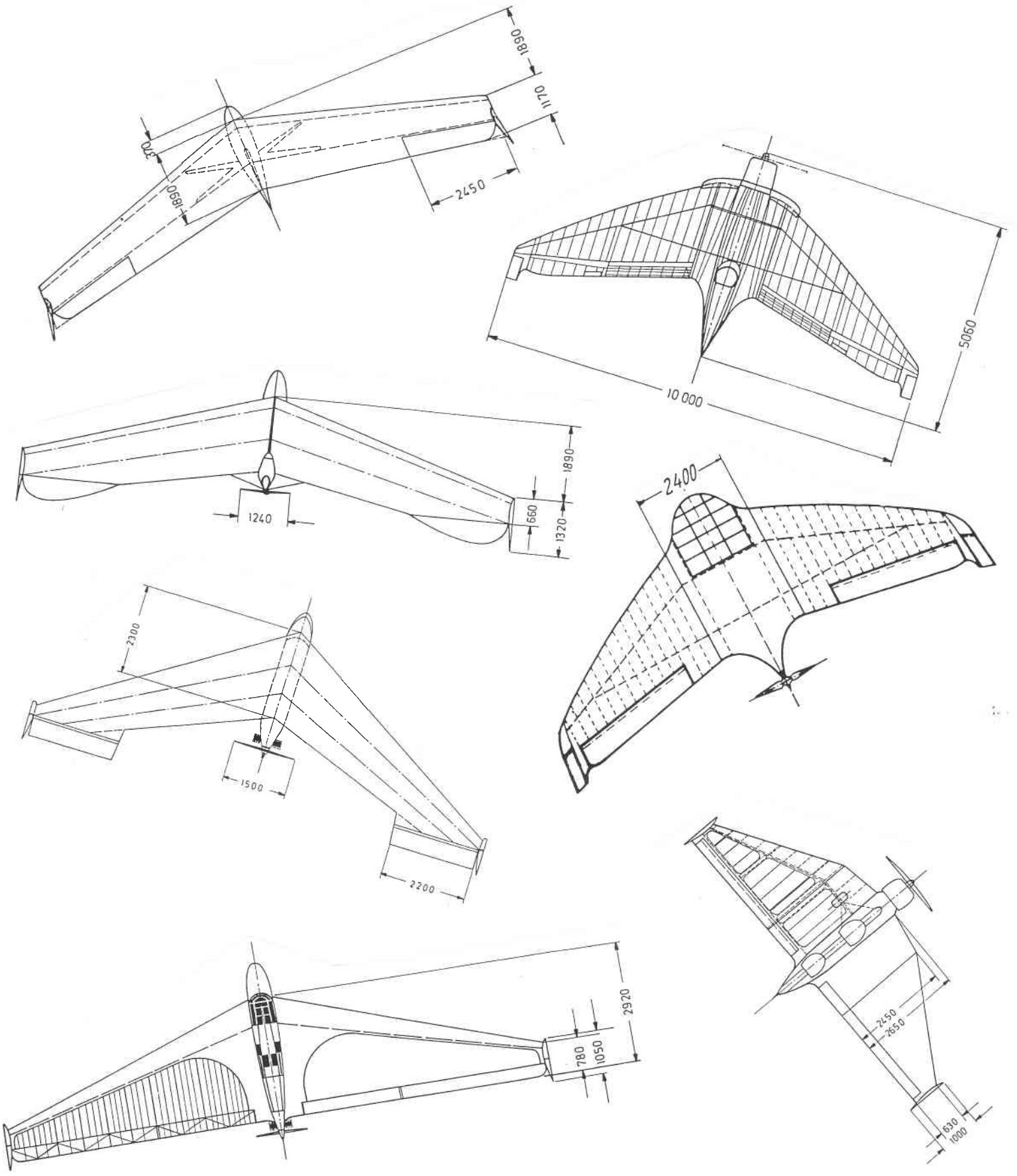
BARNES UPDATE MATERIAL

As promised in last month's issue, we have included on pages 6 to 8 the new material provided by Phil Barnes to supplement his September 1995 presentation.

If you ordered the video and booklet, you might want to photocopy these pages and stick them in your book for future reference. If you didn't order the tape and booklet, maybe this will whet your appetite to do so in the near future.

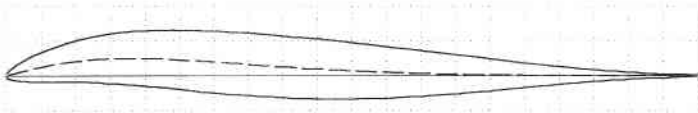
It sounds as if Phil is moving right along with his plans to publish a software package sometime in the future using math characterization for the design of airfoils and other aircraft components. We look forward to the day we can place an advertisement in the newsletter letting you know it is available.

FOLLOWING PAGE: A collage of Alexander Lippisch's designs from his book The Delta Wing. From top left, counterclockwise: **Storch I** experimental glider (1927) with outboard rudders on the wing bottom (followed by the **Storch II** (1927/28) of similar planform but with rudder on the top); **Storch V** (1929) powered aircraft with top-side rudders; **Storch VII** (1930/31) built for competition flight; **Delta I** (1931); **Delta IVa** (1935) modified single engine version; **Delta V-DFS 40** (1937/38) with wing-tips that drooped similar to some of the early Northrop designs, and; **Delta IVb** (1935) also with the drooped tips.



PMC-Z9 Airfoil Model Test

A narrow time window appeared in Dr. Michael Selig's wind tunnel at the University of Illinois, whereby Phil Barnes' PMC-Z9 (formerly - I9A) airfoil was "snuck in" and its lift measured versus angle of attack. The airfoil, designed for tailless or canard-configured model aircraft, uses an "inchworm" forward camber distribution to increase lift while maintaining near-zero pitching moment. The test demonstrated a 1.0 maximum lift coefficient. For comparison, the NACA 0009, which also has zero pitching moment, develops a maximum lift coefficient of 0.75 at low Reynolds Number. Drag and pitching moment measurements will have to wait until next year due to the current test backlog.



Thank You Note

Phil extends many thanks to those TWITT members who attended his September 16 presentation and to those who have corresponded by phone and by letter. Letters were received from Larry Nicholson (Calcutta, Oh), Robert Marriott (Sydney, Australia), and David Fitchette (les Andelys, France). Both Larry Nicholson and Bill Otto sent videotapes which have proven very helpful toward a future presentation. Feedback, good or bad, would be highly appreciated from TWITT members regarding the September 16 charts.

Regarding airfoil math characterization, Robert Marriott's letter expressed interest in *independent* control of the various airfoil geometric parameters. This prompted an improvement upon the method which was shown on September 16. The airfoil thickness math model shown at right illustrates the updated method, whereby the user simply changes any coefficient separately to attain reasonably independent control of max thickness location, cusp geometry, etc.

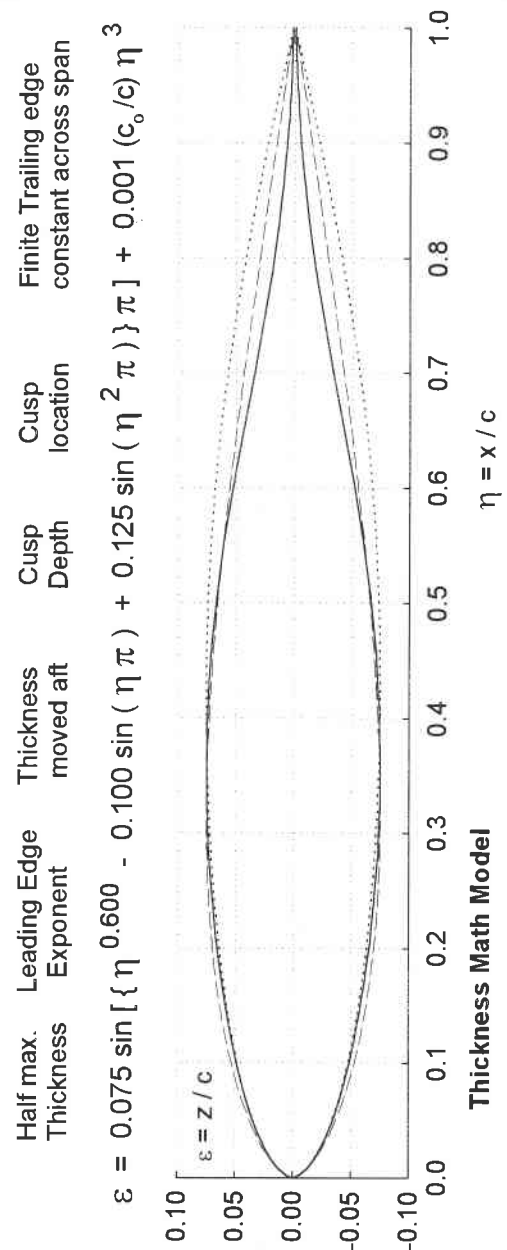
With the new method, leading edge radius and max thickness remain *absolutely* constant as other equation coefficients are varied. This will be thoroughly documented in the upcoming SAE paper AAL 96-1 which has been approved by Dr. Kamran Rokhsaz of Wichita State University for presentation in Dayton, Ohio at the 1996 SAE Aerospace Atlantic Conference.

Vortex Node Surface Velocity Method

To really take advantage of math-characterization of airfoil geometry, we need to compute and show the smooth velocity distribution over the airfoil, thus demonstrating the potential for enhanced laminar flow, etc. The current industry methods take a "vortex panel" approach which drives the normal velocity component on the airfoil surface to zero.

However, such panel methods are not always reliable and they require cumbersome calculations in the form of separate sub-integrations required for each vortex panel. A different approach, designated "vortex node," will be taken whereby the *tangential* velocity (local vorticity) distribution will be *estimated* as a function of clockwise distance (s) around the airfoil perimeter and then *updated* by numerically integrating the induced tangential velocities from all vortex nodes and superimposing this with the tangential velocity component due to the free stream.

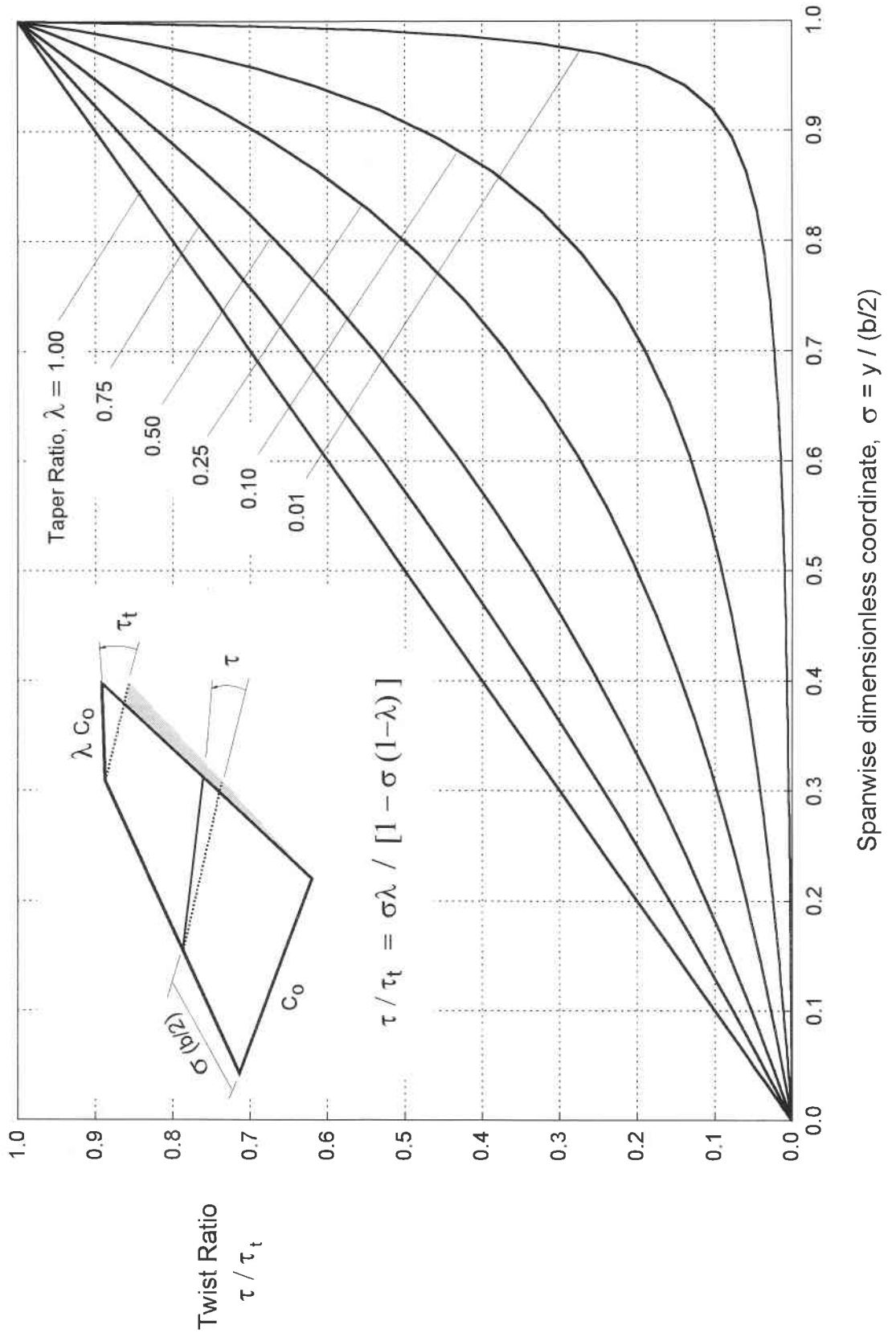
The concept is currently unproven. Nevertheless, the equations have been written, and BASIC programming will be initiated after the Nov 18 TWITT meeting. We'll let you know if this pans out. If successful, it will be integrated, with viscous effects, into Phil's planned airfoil math-characterization software package.



Spanwise Twist Distribution

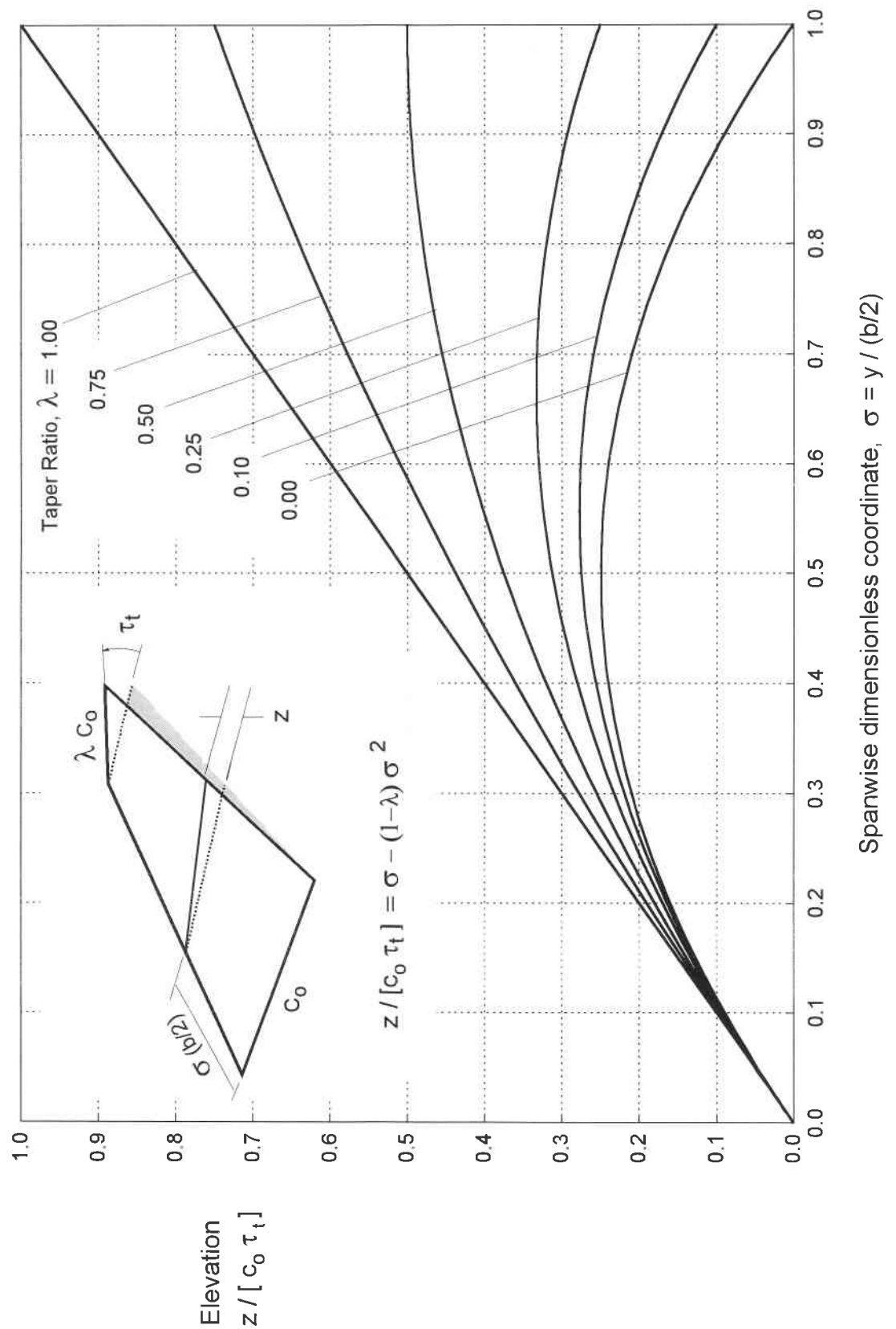
Tapered Wings With Straight Edges

Derived from Karl Sanders' Engineering Note,
Journal of Aircraft, Vol. 2, No. 4, July-Aug '65



Spanwise Trailing Edge Elevation

Tapered Wings With Linear Twist
Horizontal Leading Edge



AVAILABLE PLANS & REFERENCE MATERIAL



Tailless Aircraft Bibliography

by Serge Krauss

4th Edition: An extensive collection of about 2600 tailless and over 750 related-interest

listings. Over 15 pages of tailless design dates, listing works of over 250 creators of tailless aircraft, and the location of thousands of works and technical drawings for the Ho 229 (IX), Me 163, & Me 262.

Cost: \$23 (Domestic)
 \$32 (European destinations)
 \$35 (Asia/Australia destinations)

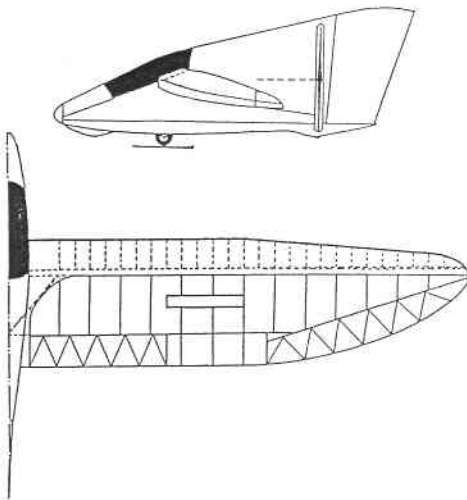
Order from: Serge Krauss
 3114 Edgehill Road
 Cleveland Hts., OH 44118

On The Wing...the book, by Bill and Bunny Kuhlman (B²) is a compilation of their monthly column that appears in RCSD. Many of the areas have been expanded and it includes coding for several computer programs to determine twist and stability. Priced at US\$28.00.

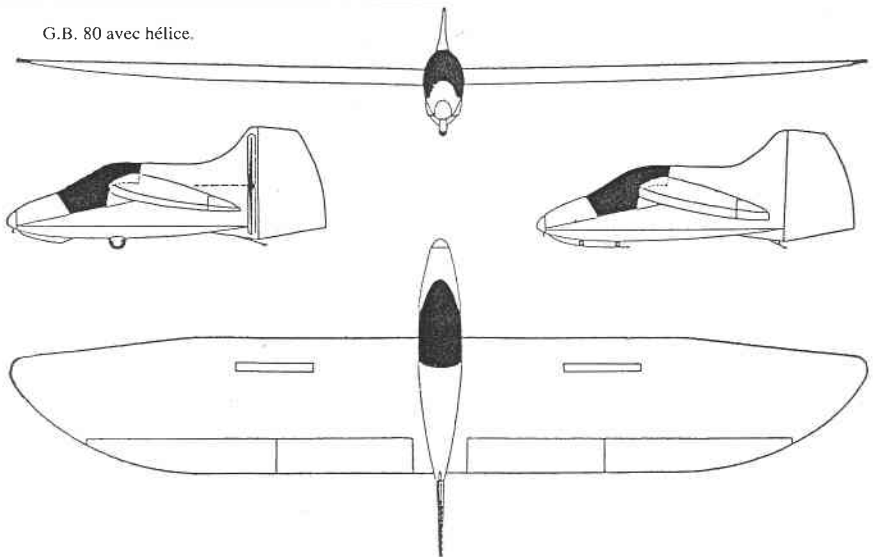
All these are available from B² Streamlines, P.O. Box 976, Olalla, WA 98359-0976, or (206) 857-7249 after 4pm Pacific Time. Orders shipped elsewhere will be sent surface mail unless an additional \$10 is included to cover air mail postage. Washington residents must add 7.5% sales tax.

Personal Aircraft Drag Reduction, by Bruce Carmichael. This 207 page, soft cover, 8½ x 11" book starts with a chronological history of experimental verification of large theoretically predicted drag reductions on aircraft components having extensive laminar boundary layers. Practical problems which could limit attainment of these large drag reductions are discussed and methods to minimize the problems are suggested. The book is limited to aerodynamic considerations,

Projet du G.B. 81.



G.B. 80 avec hélice.



ABOVE: Georges BRIFFAUD's G.B. 80 & 81.

Tailless Tale, by Dr. Ing. Ferdinando Gale'

Consists of 268 pages filled with line drawings, tables and a corresponding English text. It is directed towards modelers, but contains information suitable for amateur full size builders. Price is \$38, postage and handling included (also applies to Canada and Mexico).

You might also want to purchase his new book Structural Dimensioning of Radioguided Aeromodels, priced at \$18.00.

principally on drag reduction. 195 illus., 239 ref. Priced at \$25.00 postage paid from:

Bruce Carmichael
 34795 Camino Capistrano
 Capistrano Beach, CA 92624

VHS VIDEOS AND AUDIO TAPES

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

Cost: \$8.00 (postage paid)

VHS tape of Phil Barnes September 16, 1995 presentation on the "Math Characterization and Visualization of Aircraft Geometry. This can be packaged with a 35 page booklet of all the charts and graphs covered by Phil. There is also a set (2) of audio cassettes of the talk if you don't want or need the video.

Cost: VHS Tape \$5.00 postage paid
 Booklet \$5.00 postage paid
 Audio Tapes \$4.00 postage paid



ABOVE: APEX rigid wing hang glider on display at the November 1995 TWITT meeting. It has a composite D-tube leading edge with wing-tip rudders (not installed here) that are controlled by twist grips on the cross bar. Aircraft was brought by Floyd Fronius who is involved in the APEX's development.

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 tape of Alex's presentation explaining the material.

Cost: \$5.00 (postage paid)
 \$6.50 foreign (postage paid)

Audio tapes of presentations by Don Mitchell at the September 1991 SHA Western Workshop, Tehachapi, CA (1 cassette), and his March 1992 presentation at a regular TWITT meeting (2 cassettes).

Cost: \$3.50 (1 cass.)
 \$4.00 (2 cass.)
 Add: \$1.00 for foreign postage

Audio tapes of the presentation by Barnaby Wainfan at the September 1994 TWITT meeting where he discussed his prototype FMX-4 Facetmobile, low aspect ratio ultralight airplane.

Cost: \$4.00 postage paid
 Add: \$1.00 for foreign postage

Audio tape of the presentation by Bruce Carmichael at the May 1995 TWITT meeting where he discussed the past, present and future of aircraft using laminar flow boundary layers. This is the same talk he will be presenting at the 1995 EAA Convention at Oshkosh.

Cost: \$4.00 postage paid
 Add: \$1.00 foreign postage

Paper on Performance Analysis of the Horten IV Flying Wing, by Dezso Gyorgyfalvy, as presented at the VIII Congress of O.S.T.I.V., Köln, Germany, June 1960, published by The Aerophysics Department, Mississippi State University. Contains 13 page narrative discussing results of performance measurements, analysis of drag components, profile drag, parasite drag, the drag polar, the maximum lift coefficient, and possible performance improvements.

Cost: \$5.00 postage paid
 Add: \$2.00 foreign postage

Copy of article "Software Helps Launch a World-Class Glider", by John G. Roncz, Design News, September 12, 1994, A Cahners Publication, pp. 58-62. How Roncz and assistant Mark Mangelsdorf went about modeling the development of the Genesis 1 competition sailplane, discussing some of the CAD tools and how they were used.

Cost: \$1.00 postage paid

Paper "A Synopsis of Flying Wing Development, 1908-1953", by Richard P. Hallion, History Office, Air Force Flight Test Center, Edwards AFB, CA 93523, January 9, 1986. This paper has been prepared to furnish readers with a quick overview of flying wing development from the Dunne aircraft of pre-WWI vintage through