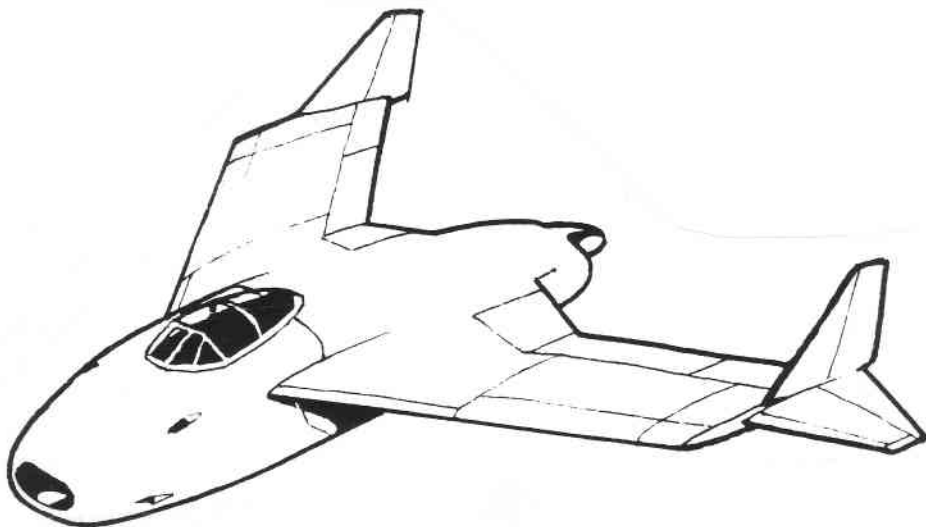


**T.W.I.T.T. NEWSLETTER****Blohn und Voss P.215**

The P.215 was designed in response to a requirement for a night and all-weather fighter. The unorthodox tailless layout incorporated 30° swept wings and anhedral wingtip control surfaces. Inboard of these surfaces, at the junction of the wings and wingtips, were small vertical fins. It was a large aircraft for its type, with a crew of 3 in a pressurized cabin, and powered by 2 side-by-side HeS 011 turbojets housed in the rear fuselage and fed by an air intake in the extreme nose. Also in the nose was a very formidable armament of 5 30mm cannon, plus radar equipment. Two oblique-mounted upward firing 30mm cannon and 1 rear firing 15mm machine gun were also to be fitted.

**T.W.I.T.T.**

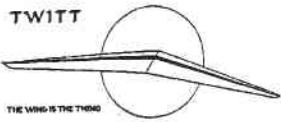
The Wing Is The Thing  
P.O. Box 20430  
El Cajon, CA 92021



The number to the right of your name indicates the last issue of your current subscription, e.g., **9511** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, **November 18, 1995**, 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**



**There** isn't much to tell you

about this month. Everything seems to keep just rolling along. However, the mail has been getting a little thin for the last couple of months. I thought that some of the articles in recent issues would have caused some spirited debate about the issues at hand. Perhaps you are all so busy putting the finishing touches on your summer projects you don't have time to write.

For those of you who haven't ordered your copy of Phil Barnes presentation graphs and an accompanying audio or video tape, they are always available. We have sold a number of them, including two to our overseas members who obviously can't make very many meetings.

I am looking forward to the November meeting with the various examples of rigid wings that will be on display. If you are a flier or have been thinking about beginning with a hang glider or other type of ultra light, this should be a must meeting to talk with some experts in the areas. Some times these types of meetings are the most enjoyable for everyone since they get away from the very technical terms and engineering diagrams and get down to the actual hardware and what actually works in the air.

I hope the letter from Robert Marriott on getting started with computers and airfoil design type software doesn't discourage anyone from joining the world of cyberspace. It would be nice to see more of you communicating with me and each other via the Internet and E-mail. There are a number of very good and reasonably priced connection services available if you have a home computer, and many local libraries now have a terminal available from browsing the Internet. This later options means you don't even have to invest in the computer and other stuff necessary for the connection.

I hope all of you are looking forward to the upcoming holiday season with an eye toward taking some time off from that project and enjoying time with your family and friends.

*Andy*

## NOVEMBER 18, 1995 PROGRAM

**Chuck Rhodes** will be our featured speaker this month. He will be talking about the history of rigid wings and how they have developed into today's higher performance flying wing type aircraft. The future of rigid wing gliders and the development of ultralight sailplanes will also be covered. Chuck will bring along an **Apex**, **Icarus**, and his **Mitchell Wing** and put them on display, which will probably become part of the program. Also, Maurice Butler will have his flying wing on display.

Chuck is the owner of George Worthington's Mitchell Wing and has been involved with hang gliders since 1973 and rigid wings since 1975. He is currently the editor for the Ultra Light Soaring News, and was the editor of the Rigid Wing Reader before that.

This should be a very interesting program for those of you who like the hands on approach since we will have hardware available for inspection. It will also be good for those of you who are trying to decide if an ultralight type wing is the way for you to go verse building that "high performance" dream machine. Either way, make sure to be there for this program.



ABOVE: Chuck Rhodes in his Mitchell Wing preparing for a truck/winch tow at Tehachapi during the recent SHA Western Workshop over the Labor Day holiday. Many of these flights were simply sleigh rides. Photo courtesy of Floyd Fronius.

## LETTERS TO THE EDITOR

10/10/95



TWITT:

**Enclosed** are two magazine articles that should be of interest to our members.

The August 1993 issue of the EAA's Vintage Airplane magazine had a nice article on the history of the Waterman Aerobile and Arrowplane.

The Fall 1994 issue of Air Power History Magazine includes an article on the history of the flying wing leading up to the B-2. The cover of the magazine is interesting, with the front cover being a photo of the YB-49 flying over Edwards AFB, and the back cover being a photo of the B-2 positioned over the exact same part of the base (I imagine the Northrop photographers had to make several attempts to get the perfect angle).

I have also included a handout describing the A-12 that the Fort Worth Aviation Heritage Association has at a recent airshow. This museum group rescued the full scale mockup of the A-12 from being destroyed and has restored it to display status. They also have several of the A-12 wind tunnel models, and use these as display items at airshows.

Regards,

Kevin Renshaw

*(ed. - Thanks for the articles and info on the A-12. I will extract some of it for this issue and perhaps use it for filler in future months. It is a shame that the aircraft manufacturers feel it is necessary to destroy mockups and prototypes versus trying to find museums or other organizations that would properly care for them and allow aviation enthusiasts the joy of seeing them.)*

9/24/95

TWITT:

*(ed. - The following is a condensed version of a letter sent to us soon after Robert sent his other letters expressing frustration over not being able to get his airfoil software to work. Hopefully it will help others who might be thinking of entering the world of computers and designing software*

*make better decisions, which in turn will make the whole project much more fun.)*

I've just solved most of an enormous problem. It involves computer software/hardware which I purchased from vendors in the USA. I thought the members might be interested in my findings. Here it goes.

**(\*!!!#~@#??&+\*) COMPUTERS AND THE BLACK HOLE**

Ten years ago I decided that I needed to become computer literate, simply to keep up with contemporary technology and times, not to mention survive commercially.

Since I have the "bug" and intend to design and build a sailplane I decided to combine the two endeavors. And so two years ago began researching applicable software. I did not own a computer at the time. My brother advised me to find out exactly what hardware, ie. computer processor, hard drive size, RAM (memory), etc., each software required before I purchased a computer. This would prove to be crucial advice. I sent away 10 inquiries and receive about 7 replies back. (Black Hole)

Some vendors offer DEMO disks and some a 30 day trial period with no questions asked about return facilities, and some both. There is a plethora of software available for almost anything you wish to calculate, postulate or manipulate. It just depends upon how much money you are prepared to spend.

I sent my cash and order for the demo disk of Airfoil-ii which I receive in due course. Then I ran it on my brother's 286, black & white screen computer which did not have a math co-processor (crucial mistake #1). It seemed to work fine, so I purchased the software.

I also purchased software called Vortex, which offers a 30 day, no questions asked, money back guarantee.

Now I live in Australia which is on the end of the Indonesian peninsula, a bloody long way from anywhere and on the opposite side of the Pacific Ocean to the USA. Surface mail takes 6-8 weeks to reach us from North America, if it arrives at all, and airmail 1-2 weeks if it avoids the ..... Black Hole.

Both pieces of software came with manuals (big thick, confusing ones) which will take you in excess of 30 days to read, let alone understand. It doesn't mean that an inexperience person shouldn't attempt to master the software, simply that it will take time and determination and as much help as you can muster.

Help is the most important ingredient. If you have it you will be better off. Out here in the middle of the nowhere, help seems far, far away, on the other side of the Pacific ..... Black Hole.

Not having any help at all I immediately had problems setting up the Airfoil-ii software onto/into my computer hard drive. Multiple trial and error attempts finally resolved this

problem.

Airfoil-ii gives the operator a choice to "Y" yes, use a math co-processor (a chip which makes math calculations in your computer go faster) OR "N" no do not use the math co-processor. With the "Y" choice the program would not run but should have. With the "N" choice the program would run but had numerous problems displaying and printing the graphs. This turned out to be the MAJOR problem confronting me.

It is well to remember here that I was not particularly computer literate at the time and so tended to blame my inexperience for any and all failures in operating the program and computer. (ed. - I can sure sympathize with this statement over the years.) In any computer system there are three major components which could be faulty:

- 1) The hardware (computer electronics)
- 2) The software (program code)
- 3) The idiot who is pushing the buttons

This tendency to blame myself camouflaged the possibility that either the software or hardware might be faulty. With time spent banging my head against the screen, I began to suspect the problem was other than myself. I looked accusatively at the hardware.

I ran a diagnostic test on my math co-processor. It passed the test at all points. This according to my novice judgement could only mean the problem was in the software.

I sent hulking reams of badly printed graphs and data and a huge letter of explanation off toward the .....Black Hole..... to the vendor who was appropriately dumbfounded. It was to take the vendor 7 months of head scratching to return my monolithic mail.

While waiting, I attacked the Vortex program. It is again confrontingly complex upon first impression, but it is not so if you persevere (or have someone to help you). It does itself a disservice by not having a "plain language" manual. It took a month of spare time to read the manual and fool around punching numbers into the program to arrive at a point where I understood the "principle" of how to operate it. But the manual and data books leave out the definition of one important input. I telephoned the vendor and he didn't know either. He had never needed its use. He promised to inquire at appropriate places and get back to me, but didn't..... oh, oh, .....Black Hole.....again.

Fourteen months after I receive Vortex I became impatient and started bunging in guesses for the undefined value. Finally I figured out the definition for myself. When I used this information I ran the program 8 times and receive 8 different ridiculous results. Vortex is a number crunching program and leans heavily on a math co-processor to work properly. If it does not, it could produce results such as I was achieving.

Now I had two programs that were not working properly. There seemed to be a common element, the math co-processor. I had to test it out

more thoroughly than I had already done.

I own a 386 DX2 40 computer with an add-on math co-processor chip. To test the co-processor I took the software to my friends home and ran it on his new 486 which has a built-in co-processor. Both the programs ran ABSOLUTELY PERFECTLY the first time, no questions asked. Boy was I annoyed. This led me to condemn my whole computer hardware. Now I know why they call the main component a motherboard.

*(ed. - Robert goes on to say he tried the software on a older model 486 which didn't have a co-processor and found Vortex ran perfectly, but Airfoil-ii only ran well in the "N" mode.)*

I was faced with the fact that I had different results on different machines, and different results on ostensibly the same or similar machines. Now I am really pissed off, so I decided to "cut the crap and go for the jugular."



ABOVE: Chuck Rhodes landing his Mitchell Wing after a short flight from a truck/winch tow at Tehachapi.

I went to my friend and asked what specific type of motherboard his computer ran and found it to be a 486 VESA Green mainboard. I then went to my local computer shop and had them upgrade my 386 to the same specifications. I then tried a run with these results:

Vortex ran PERFECTLY...REPEATEDLY and blindingly fast.

Airfoil-ii ran PERFECTLY...REPEATEDLY and blindingly fast in either the "Y" or "N" modes.

VICTORY....I had won the war and race around and waved the results in the blank and startled faces of all my friends.

## SO WHAT CAN WE MAKE OF ALL THIS?

The conclusion that all the above machinations led me to was that not all 386's and 486's are the same, and software run on different computers even with the same type number may produce different results due to the peculiarities of the configuration of the electronics on the chips and boards inside the box. This may sound moronically obvious to a computer aficionado, but it was by no means so to me when I started. It has grave importance to anyone thinking of buying similar non-mainstream software and has given me to offer the following warning/advice to those who would heed:

For those who do not own a computer,

- 1) Do not buy one before you buy the software. Do it the other way around. Research and be familiar with the hardware requirements of the software and buy the info package and the demo disk if available.

- 2) If you now have the info sheet and or demo disk, go find a friend who owns a computer and printer which satisfies the hardware requirements of the software AND IS WITHIN YOUR PRICE RANGE and decide to buy EXACTLY, and I mean EXACTLY that same computer and printer combination. Try the software on that EXACT SAME system. Use every option it offers you. Remember you are not looking to see if you like the pretty colors on the screen, you are looking to see whether the program does what it is supposed to do or crashes.

- 3) Buy the software and take delivery. Try it out on your friends hardware. Get him interested (copious amounts of beer and junk food usually does the trick) so that he helps you get it up and running without the operator idiotfactor which you are guaranteed to bring to the exercise.

- 4) If the program runs and prints satisfactorily, become entirely familiar with how to operate it before you -

- 5) Go out and buy EXACTLY that same type, brand and motherboard. For a pox upon you if you don't.

For those who own a computer already:

- 1) Buy the info package and demo disk if

available and ascertain whether your hardware meets the requirements. Try the demo disk. If all is well...buy the software. If not and you are considering purchasing bits to make it so, GOTO item 2 through 5 above, do not pass go, do not think you can avoid same.

Of course if you have lots of money and can afford to purchase new hardware, take your demo disk or delivered software to the computer retailer of your choice and run it on a selection of systems you promise to buy. Buy the one that works. REMEMBER you must test the printer in combinations with the computer. DO run the program twice and print any graphs or tables of numbers each time to confirm function and repeatability. DO analyze numerical data for sanity of results (a Cl = 36.876 should be suspected).

My case was made excruciatingly painful by the fact that the software I ran turned out to be incompatible with the motherboard in the computer I bought. This despite the fact that the hardware satisfied all the requirements of the software. I had no way of knowing this in advance and no one whose experience would have saved me a lot of time and angst.

It is important if you are new to computers to get some help.

One of the vendors mentioned that several of his customers took up his money back guarantee with the explanation that they did not want software that you need to be an engineer to use. It is not necessary to be an engineer to run these programs, but not being so, it is almost essential to have available someone knowledgeable to help. In my case I had to do it mostly myself which was hard.

This article is not in any way designed to debunk Airfoil-ii or Vortex, both of which, now that I have them going, will prove to be very useful. It is simply meant to encourage and advise anyone who is contemplating purchasing any software to do it right. I hope you take heed.

Yours faithfully,

Robert Marriott  
Sydney, Australia

*(ed. - It sounds like Robert had a really frustrating experience with something that should have been relatively easy. This is the not the first time I have heard of people having problems running software on machines that meet the manufacturers specifications. It must have something to do with whether or not you buy a true IBM computer or a clone that has some odd motherboard which emulates ALMOST ALL of the IBM functions.*

*So far I have been lucky with a clone type machine, in that all the software I have loaded has worked according to the directions. The only difficulties I have experienced had to do with not having the right printer driver software to get the material from the computer through the wire to the printer.*

*Although Robert's advice is sound, it may not always be possible to try software on a computer before deciding to buy either one. In this case, make sure you buy a computer that is TRULY IBM compatible if you are going to run MS-DOS based software and that you have a money back*

*guarantee to return the software if it doesn't work.*

*I am not a computer expert, but have found that with a little patience everything will usually work its way out. One piece of advice I give my friends who are just getting started with a new piece of software is not to begin by inputting data they really care about because invariably they will lose it at least several times while learning the ins and outs of the program. They have thanked me later and indicated the process had been less frustrating since they only lost garbage and fun trying to figure out what silly mistake "they" made (computers are only as smart as their operators).*

*I hope all of this will be of some help to at least one member who is on the verge of entering the information processing age. It can be fun if you approach it with the right attitude and don't ever get the feeling the machine knows more than you do (it only knows what you tell it).*



ABOVE: A typical days line-up of wings waiting for the right launch weather at a favorite flying site in the Laguna Mountains east of San Diego. Photo courtesy of Floyd Fronius.

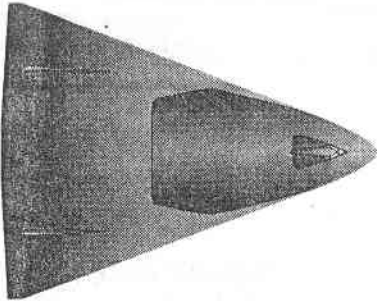
## NEW WAVERIDER JET

(This came from the San Diego Union-Tribune with a by-line of William H. McMichael, Newport News Daily Press, Hampton, VA.)

**NASA** engineers are designing an aircraft that goes five times the speed of sound by riding its own shock wave. The WAVERIDER is most likely going to initially be a combat jet, but could some day turn into a high altitude, high speed airliner.

The Waverider--potentially a triangular, needle-nosed aircraft powered by an air-breathing jet engine--would:

- ▶ Travel fast enough to catch up to its own shock wave.
- ▶ Be designed so that the sweep of its wings "fits" into that wave at a given speed.
- ▶ Use less fuel to fly more efficiently.



SOURCE: NASA Langley (Va.)

Riding the shock wave is the key, but it can't be done unless high air pressure can be kept on the bottom of the airplane. The Waverider design is an elongated triangle, its wings set in a dramatic rearward sweep. It is the leading edges of these wings, which run all the way to forward to the tip of the aircraft's nose, that would touch the edge of the Mach 5 shock wave. At this point, the shock on the upper surface disappears, and the plane "rides" the wave on its lower surface.

*(ed. - We bring this to you because the shape of the Waverider is, of course, a delta shaped flying wing. I am sure we will see more about this in the technical publications in the near future.)*

## A-12A AVENGER STEALTH FIGHTER

### Type

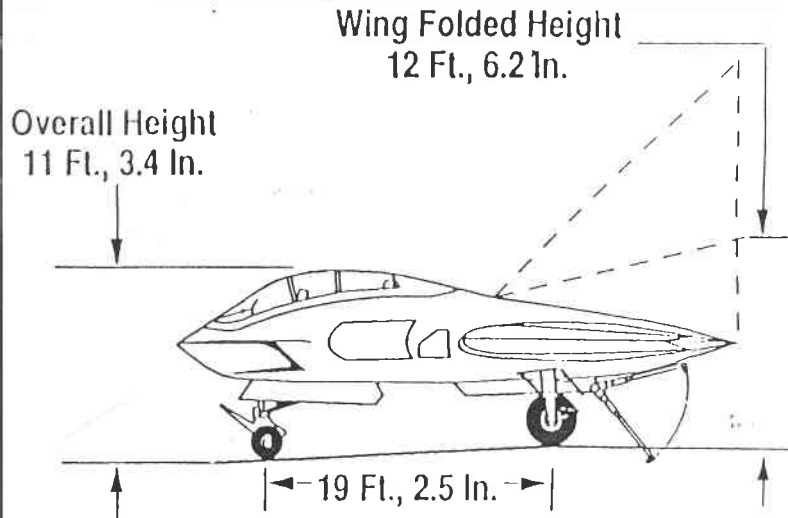
Two seat, two engine, carrier based medium fighter for air-to-air or air-to-ground all weather day or night attack

### Specifications:

Wing Span	
Overall	70'3"
Folded	36'3.25"
Length	37'3"
Aspect Ratio	3.75
Wheel Base	19'2.25"
Wheel Track	22'
Height	
Overall	11'3.375"
Folded	12'6.25"
Wing Area	1,308 sq. ft.
Design Load Factor	9 Gs
Gross Weight	80,000 lbs
Combat Radius	920 miles
Speed	580 mph @ S.L.

### Powerplants

2 GE F412-400 non-afterburning turbo-fan engines developing about 13,000 lbs thrust each.



### Armament

Up to two AIM-120 AMRAAM missiles  
 Up to two HARM missiles  
 Planned to accommodate a full range of air-to-ground ordnance including the MK 82 and "smart" weapons.

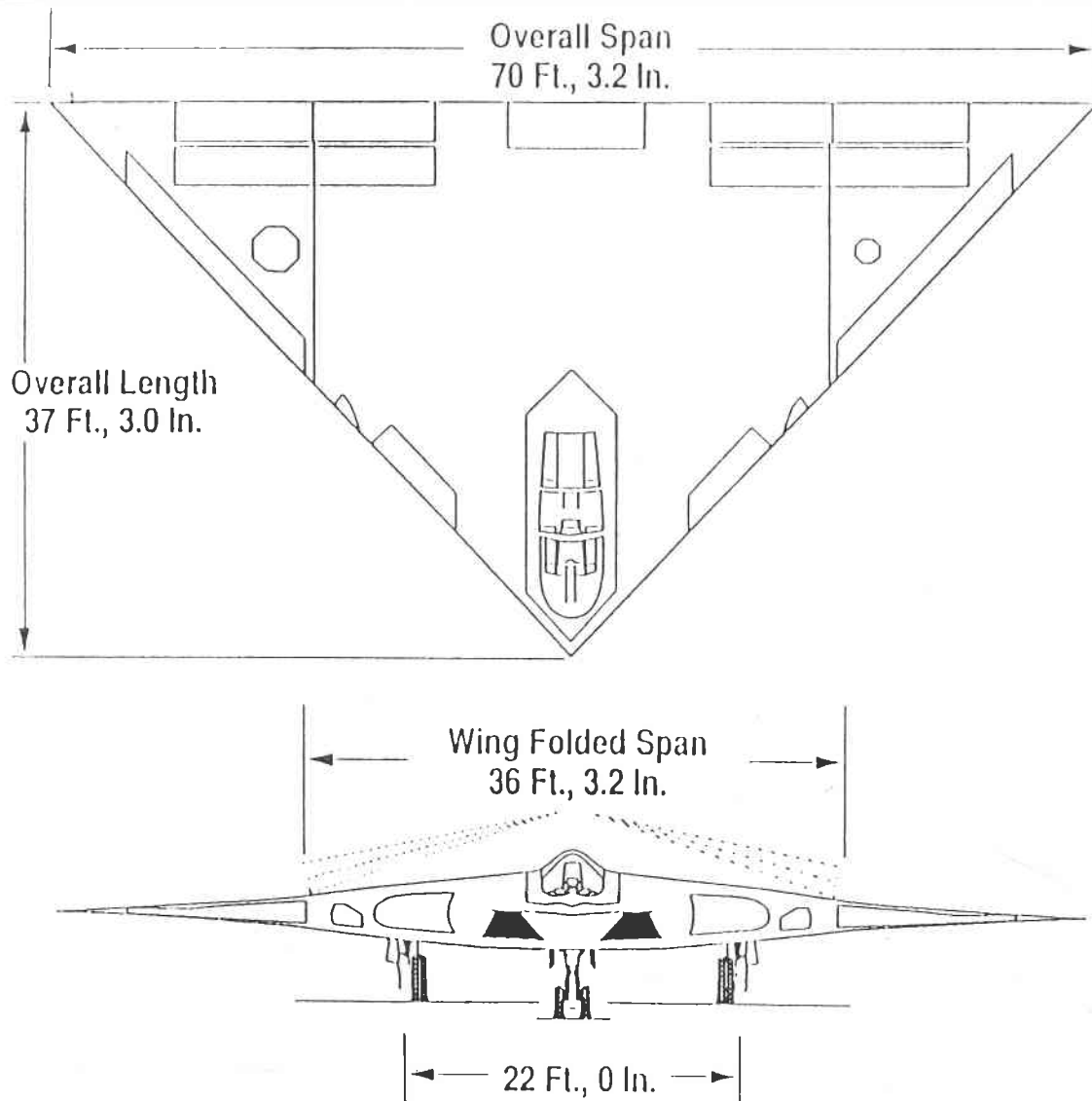
### Avionics

Westinghouse AN-APQ-183 Multi-mode Radar  
 IBM Mission Control Computer  
 Kaiser wide field of view holographic HUD  
 7 Kaiser Multi-function display screens  
 GE Infrared Search & Track System  
 Integrated Electronic Warfare System  
 AN/ALD-11 Electronic Surveillance Module

### Program Status

A-12 program was cancelled by the Department of Defense on January 5, 1991.

(Information courtesy of Kevin Renshaw.)



**FOR THOSE INTERESTED**

**Design News**, Cahners Publication, September 12, 1994, pp. 58-64, contains an article by John G. Roncz explaining how he went about using various types of design software to produce the Genesis 1 competition sailplane. It appears there is also available a CD-ROM with much more information, including pictures, charts and graphs that could not be included in a printed article.

The shorter, published article covers the software tools that were used and some of the problems encountered in reaching the optimum wing design that would beat a Discus in the international soaring arena.

One of the things noted was the lack of the ability to use electronics to augment flight stability, hence the inclusion of a vertical tail and small horizontal surface. This was

one of the original concepts TWITT was founded on, that of designing an efficient electro-mechanical-hydraulic system to control the glider's stability at very aft CGs.

If you want a copy of this article or the CD-ROM package, you might want to correspond with Unique Airplanes, Design News, 275 Washington Street, Newton, MA 02158.

**MORE.....**

The February issue of R/C Soaring Digest (Vol. 12, No. 2, pp14-15) contained an interesting model in Bill & Bunny Kuhlman's (B<sup>2</sup>) "on the Wing" feature.

The "Essence" was designed by Dr. Alan Schwerin of Lake Charles, LA, and has several characteristics that should intrigue our modellers.

The first is that it uses an SD 7037 section



at the root and a SD 8020 section for the tip with a linear transtion from one airfoil to the other. Although these airfoils are not normally used in tailless applications, the combination here seems to work well.

Dr. Schwerin achieved lateral stability through the use of enlarge fences which are 3" high and located at about 80% of the semi-span. He has 5° of dihedral in the center section and 10° in the outer panels. The latter has improved the model's winch launch performance. Elevons are the only means of control and extend from the root to the fences, which has given it an excellent roll rate.

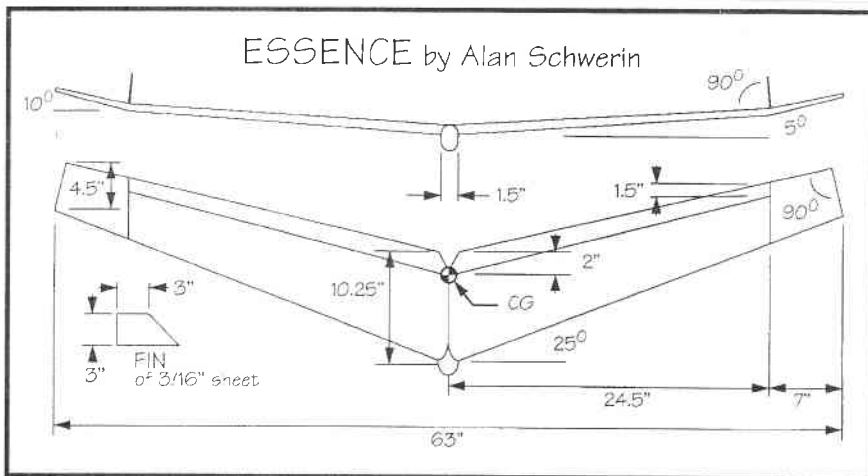
Below is a diagram and picture of the model as shown in the article.

Rieger.

The article goes on to explain the characteristics of Rieger's airfoils and their applications to tailless aircraft, specially models.

The diagram shown at the top of the next page accompanied the article, along with the plots and profiles of several airfoils to show the degree of reflex being used.

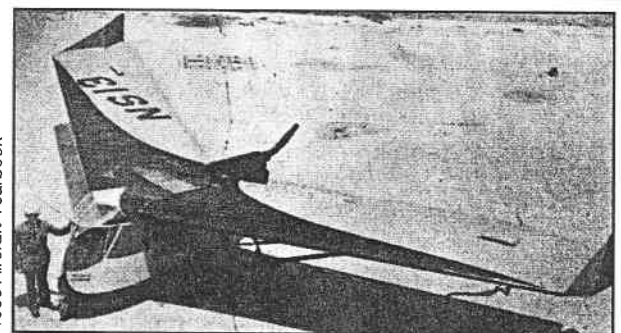
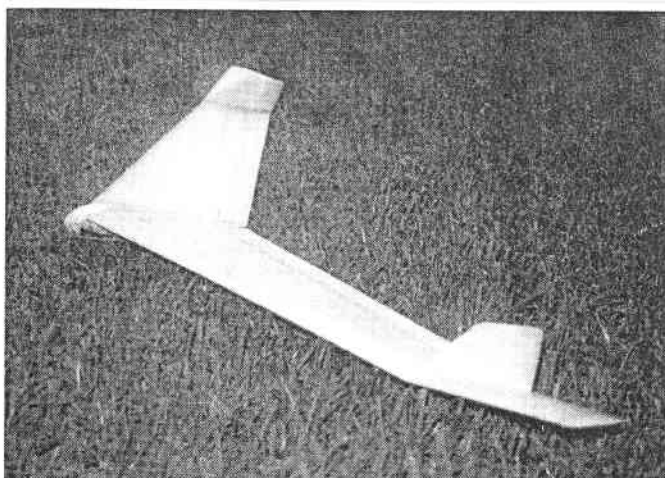
ed. - These articles in the R/C Soaring Digest are written specifically for people who are interested in flying wings and tailless technology as it prevails in today's modelling world. I hope that this small sample of the types of things available to you, the modeller, by subscribing to RCSD might wet your appetite. If you are interested, see the advertisement in our classified section.)



**AND LAST, BUT NOT LEAST....**

I thought I would show some of our newcomers a little of Waldo Waterman's aerocars that were based on flying wings. This was done to make it easier to convert the craft from an plane into a car by folding the wings in behind the fuselage, and either leaving them at the airport or trailering them to another takeoff point.

The picture below is the ARROWPLANE which was the predecessor to the ARROWBILE which was a little sleeker. The "Plane" has a span of 40', length of 18'6", and a height of 8".



1936 Aircraft Yearbook

**A LITTLE MORE.....**

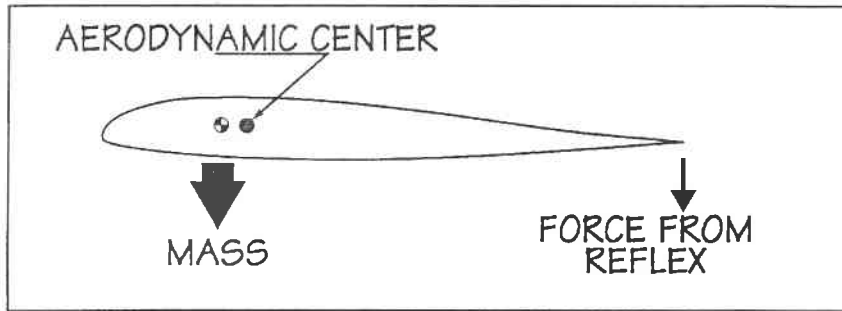
In the April 1995 issue of R/C Soaring Digest (Vol. 12, No. 4, pp. 31-35), B2's "on the Wing" featured the airfoils of Alfons

**REFERENCE MATERIAL**

Tailless Aircraft Bibliography

by Serge Krauss

**4th Edition:** An exten-sive collection of about 2600 tailless and over 750 related-interest listings. Over 15 pages of tailless design



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

Bruce Carmichael  
34795 Camino Capistrano  
Capistrano Beach, CA 92624



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)

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3114 Edgehill Road  
Cleveland Hts., OH 44118

## 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

### 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.

On The Wing...the book, by Bill and Bunny Kuhlman (B<sup>2</sup>) 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 B<sup>2</sup> 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

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 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

