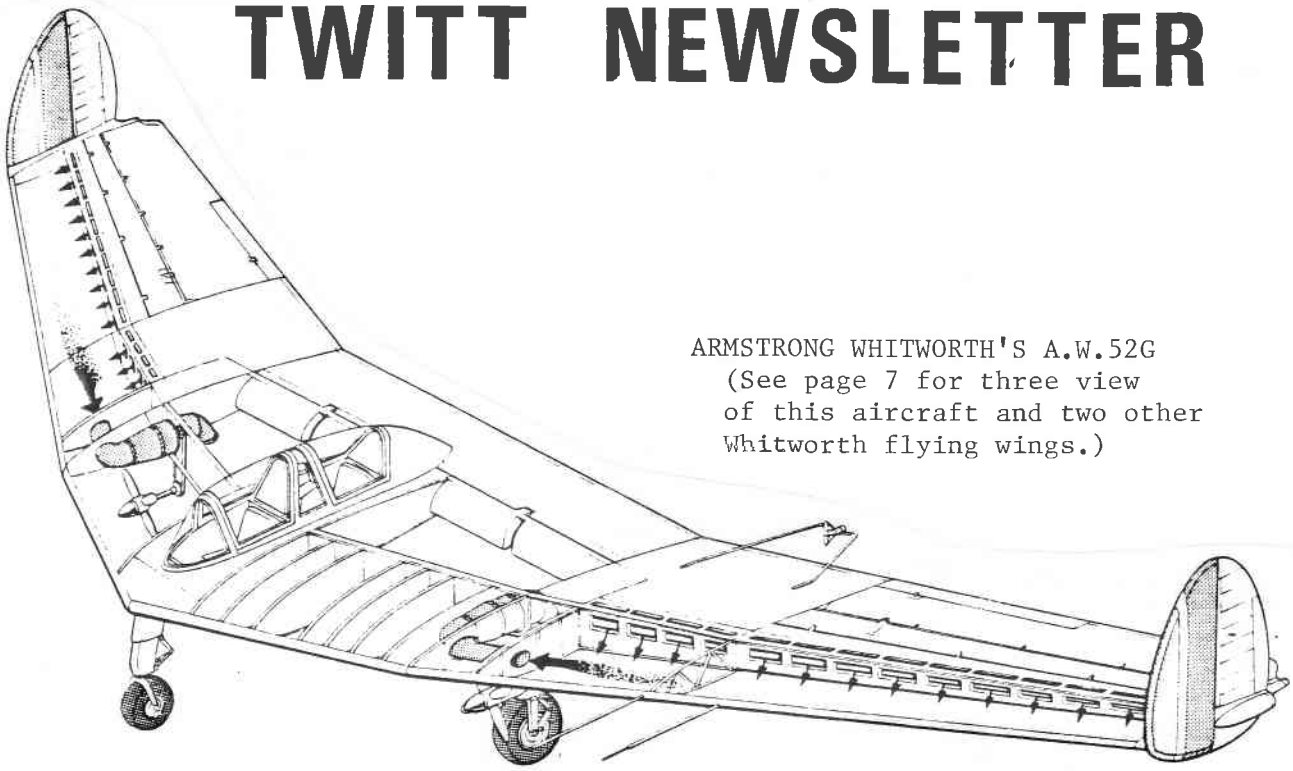
No. 46 APRIL 1990

TWITT NEWSLETTER



ARMSTRONG WHITWORTH'S A.W.52G
(See page 7 for three view of this aircraft and two other Whitworth flying wings.)

TWITT
(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., 9004 means this is your last issue unless renewed.

Subscription rates are $15 per year for U.S. mailings and $19 per year for foreign mailings due to higher postage rates.

Next TWITT meeting: Saturday, April 21, 1990, beginning at 1330 hrs at hanger A-4, Gillespie Field, El Cajon, Calif. (First hanger row on Joe Crosson Dr.)

PRESIDENT'S CORNER

First off this month I would like to thank all those members who have been sending in a little extra with the yearly subscriptions. For those of you who have designated them as a donation for use as needed, we have set them up as such. For those who did not state the extra was a donation, we have continued our policy of simply extending your subscription by the amount of overpayment. We appreciate all donations, but you must tell us how much is for a donation if you include it with your subscription renewal. Don't forget that the entire amount is tax deductible.

What your extra money does do is help us maintain an adequate cash flow to cover those unexpected expenses, such as, audio tapes, hot water pot, miscellaneous stationary supplies, etc., without drawing the checking account almost to zero. So thank you one and all for your contributions

I would also like to thank Bob for his efforts in acquiring some more chairs for the monthly meeting. He bought them at a very good price from the local EAA chapter and then proceeded to put a bolt here and a spot weld there to make them fully usuable.

Thanks also go to Kevin Renshaw for his excellent article on the Komet in this month's issue and for the contributions to the TWITT library. Hopefully there will be a comprehensive bibliography made of the library in the near future (are there any volunteers?).

Elections for new officers is just around the corner. Start thinking about who you might like to nominate and ask them if they would run for that office. We need at least three people since the Presid- ent & Vice President cannot double as the Treasurer. Send in your nominations now or at least prior to the June meeting so they can be announced and published. More on how everyone can vote will be provided in a future issue.

I would like to make an appeal to all our electronics genius' out there to start thinking and designing what they feel would be a workable solution to a low power drain active flight control management system. Hernan's original idea for achieving high performance was to have this type of system so the aircraft could be flown at its optimum yet still be manageable if the system failed and the pilot had to take over manually. Some early issues of the newsletter have more information on this concept, and we will republish some of it in upcoming issues along with any other ideas that surface in the mean time.

As you can see the minutes were quite lengthy this month due to the fantastic amount of information Jack Lambie presented. Because of the volume, only the highlights were hit by the minutes and they could not really capture the humorous stories which accompanied the technical material. I feel a copy of the tape is the only way you will come to appreciate what we all experienced on that Saturday. If you would like one send us a blank tape and sufficient return postage, or a check for $3 to cover the cost of a tape and postage.

Well that's plenty for this month. Please keep us informed of your latest activities, especially all you new modelling members. Your ideas may just lead to a solution for a full scale problem.

Andy

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APRIL PROGRAM

This month's speaker is Paul Nannie, who along with Bob Ambler, attempted an around the world flight using a pair of Piper Super Cruisers. The flight began in May 1976 from Gillespie, however, Bob had mechanical problems on the way to Europe so fell behind Paul. Bob eventually finished his repairs and continued on to Europe, where he spent some time before returning to Gillespie. Paul was able to continue on through Europe and Asia, but had some extreme difficulties on what turned out to be his last leg of the journey.

I don't want to give the story line away, so you will have to come to the meeting to hear his account of how this fabulous trip reached its conclusion.

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My favorite airline story is of the pilot who accidentally leaves his microphone on and passengers can hear him saying to his copilot: "I'm just too pooped to fly this baby this morning. What I need is a warm woman & a cold martini."
As a young flight attendant rushes to the cockpit to tell the pilot he's being overheard, a little old lady in the front row taps her on the fanny and says, "Miss, don't forget the martini!"

MINUTES OF THE MARCH 17, 1990 MEETING

Andy called the meeting to order at 1335 by announcing the main program of Jack Lambie's presentation and showing the raffle prize of Waldo Waterman's book Waldo, Pioneer Aviator. He mentioned that Craig Roberts had obtained a copy of Australia's Kookaburo catalog which has some very interesting books. He will be ordering at least one of the books and the the listing is available for others to review and copy if they want to place an order. Another item obtained by Craig was a French Gliding Books Catalog which is a bibiliography and price list, mostly in French, of articles and books on various aviation subjects. If anyone is proficient in French we sure could use your services to translate it.

Andy mentioned that many of the recent renewals had come in with extra money and instructions to use it for whatever TWITT felt necessary. These funds are very helpful in maintaining an adequate cash flow a go a long ways toward purchases, such as, a new hot water pot for the instant coffee, hot chocolate and tea. (See the President's Corner for more on this subject.)

Andy called on Randy Bergum to tell us about his current scale model project which is nearing completion. Randy went on to tell us about his concept of a foot-launchable glider which would weigh less than 100 lbs. His one third scale model has about a 14' span and weighs about 11 lbs. It is built out of foam and glass and uses conventional radio control equipment. It has been designed to use Irv Culver's wing twist theory where you put most of the twist within the first 30% of the span and then have a gradual twist out to the wing tip. This model is a proof of concept effort. He indicated there would be an article coming if and when the flight is successful.

The model is a flying wing (of course), with elevons out at the tips and vertical drag rudders that cant outward for total endplate drag. The tip rudders operate separately for yaw control and together for glide path and flare control while creating a positive pitching moment.

Randy briefly explained Irv Culver's twisting concept for a tapered, swept wing which prevents mid-section and tip stalling before the root section. To do this the root section should have a large angle of attack and then very quickly bring it down linearly to the 30% span point, with a gradual linear reduction out to the tip. The amount of twist used is dependent on the designed coefficient of lift. Irv's elevons have a more triangular shape, rather than constant chord, which helps reduce lift at the tip to prevent negative forces at the tip when you speed up. Randy used the standard constant chord elevons since this was to be a basis for proof of concept. The airfoil being used is an M6, which was recommended by a "friend". It is 12% thick and reflexed.

Bruce Carmichael gave us a brief recount of a letter he had received from Paul Leibenburg (sp.) who is test flying a powered version of the Wookstock. He now has flown the plane with the motor fully retracted and likes its handling characteristics. He thinks the L/D is somewhere in the high twenties or low thirties. The problems he has encountered finding and/or machining parts for the power conversion reduces the feasibility of offering it to other homebulders. His next project is going to be a self-launching ultra-light that will meet all the Fed rules and use some unique ideas he that he told Bruce were still to wild to talk about.

Bob wanted to make sure we acknowledged that several of our TWITT members were helpful in providing information to Brian Myers through a request in **Soaring** magazine. Don Mitchell and Kevin Renshaw both sent him data on the CG-4A and XCG-16 military gliders. Also noted in **Soaring** was Bill Hinote's Diamond Distance flight of 322 miles out of Tehachapi on July 23, covering the distance in his AS-W 20 in 4:56 hours. Congratulations to all for jobs well done.

Bob took over the program with a slide show of activity at Tehachapi, TWITT meetings, Irv Prue's shop in Pearblossom and a flight in John Chalmers Grob motor glider. Irv Prue is in the process of building a cruising motor glider using the power plant and cowling from a twin Commanche and then designing the airframe around it. He makes all his own parts and builds in aluminum. Bob had some pictures of a foot-launched carbon-fiber flying wing hang glider which has now been test flown once. The flight ended in a crash landing since the it came out very overweight. The designer will be providing us with more details as the project progresses.

After Bob's show the group took a break to get some coffee and begin the raffle

ticket sales. Dave Pio handled the sales in his usual excellent manner, getting us a little beyond the breakeven point on the cost of the book.

After the break, Bruce Carmichael introduced our main speaker for the day, Jack Lambie. Jack gave us a great talk on a number of subjects from throughout his colorful career in aviation. Presented here are his general comments about each of the areas he presented, since putting in all the juicy details would take up the entire newsletter. If your appetite is sufficiently wetted, you can always request a copy of the tape by sending us a blank cassette and the return postage.

Jack began with his exploits in the Fauvel AV36 he bought from Fred Jukich that had been flown in the 1954 Nationals. Fred wanted $2000 for the aircraft, but by the time Jack got through telling him all the things he was going to do with this glider, and how wonderful the plane was, Fred ended up letting Jack have it for $350.

His first flight in it was during a contest at Elsinore in 1954. He equated this initial flight to riding a row boat until he got used to its feel and handling character- istics. He found it flew at a lower lift coefficient than it was supposed to which meant it couldn't slow down enough to stay with the 1-26s in a thermal. After getting settled down he found it was very stable and handled quite nicely. He flew the cross- country course and came in third for the day.

The next day brought his first real adventure when the takeoff dolly was placed too far forward and as it came off it bounced up into the elevon and tore it off. He didn't know what had happened, but only that there was a lot of noise and a different feel to the controls than the first flight. After tow release he looked back and saw the damage, but since he had elected to leave the parachute on the ground for greater comfort in the glider he had no choice but to return to the field. Obviously he made it since he was there telling us about it.

Once it was repaired and back in the air he found it to be quite a stable aircraft. At 70 mph the stick was very smooth, unlike the churning he had experienced with 1-26s at that speed. Slope soaring could be done at low speeds, but when you reached the limit it would just unhook and drop off instead of mushing along like conventional gliders. When pulled straight up it would stall and then just fall into a recovery. When he tried to spin it, it just fell off and recovered.

One of the biggest problems was its tendency to ground loop on landing. It apparently didn't take much to set it off. He got tired of repairing the bottom of the vertical surfaces so put small wheels on them to help alleviate the damage.

On one attempt at his diamond distance he was forced to land on El Mirage dry lake with his ground crew already on their way to Nevada. While he was sitting in the hot sun thinking about walking the 5-6 miles back to the airport, Joe Moore happened by in his T-6 and landed to see what Jack was up to. Joe had a tow rope on board, so once Jack was taped back in the glider he hooked everything up and towed Jack right into a booming thermal. After reaching 14,000', Jack headed out on course several hours behind schedule.

He made it the Mesquite, Nevada, landing at sunset. Of course, the cows in the field started chewing at the fabric so Jack got some farm hands to help him put it on the other side of a nearby fence. Naturally he told the crew he had very skillfully landed in the extremely small field by coming in over the trees and using full spoilers, flaps, etc.

Now here comes the diversity of Jack's interest in everything around him. After finally getting through to his crew and finding he would be in Mesquite for the night, he went outside the cafe to wait it out. This was when he noticed the bats flying around a light eating the bugs. Some of the bugs knew they are being chased and zigged as the bat came in for the kill. Other bugs seemed to imitate the bats flying style which seemed to provide some protection. The bats only had about a one in three kill ratio due to the bugs tactics. He then found that the next light down didn't have any bats, but had a flock of nighthawks. Apparently they had divided up the territory using some unknown criteria, such as, different sonar frequencies.

Jack went on to explain a little on how a flying wing creates its lift. Since the action/reaction of the airmasses passing over the wing cause a flying wing to pitch forward, a reflex airfoil is used. This causes some loss in lift because you are not forcing as much air downward. To slow down you have to pull back on the stick which

makes the elevon go further up, giving even less downforce. This had its immediate consequence on one of Jack's out-landings where he was trying to put the Fauvel in-between a set of irrigation pipes. When he pulled back to clear one set the glider simply sank into the ground, catching one of the sprinkler heads and breaking it off. After calling his crew he found the farmer had taken his parachute and would not give it back until the sprinkler was paid for. Well Jack went into his song and dance routine and managed to get out without paying a cent. It just goes to show if you are always nice to the farmers you can get away with almost anything.

After flying the Fauvel for over a year he finally found that the only way to get a really quick, sharp turn was to stomp in full rudder, not ease it in slowly like conventional gliders. Of course this can have its drawbacks also. On one occasion he found that stomping caused everything to break loose so he no longer had any rudder control.

The Fauvel weighed about 450 lbs, had a 40' wingspan and flew with about a 24:1 L/D. The aircraft was carried in the cradle as a single piece. The wing was rolled into the holder and rotated up onto the trailer nose down. The verticals were then folded over to reduce wind drag and off you go.

Jack finally sold the Fauvel to Al Backstrom in Texas, but not until he had made several minor modifications in an attempt to get a little better performance.

His next aircraft was a BG-12, which he also modified by adding extra fin area. He said that it advanced the rate of roll more than anything else he had ever done to an airplane. It provided the necessary directional control to offset the adverse yaw factor. If you look at the modern glass ships you can see the large amount of fin area that has evolved over the years to help move those big wings around.

At this time Bruce mentioned that most pilots can't get enough tail, and Jack commented that Bruce was trying to compare gliding to sex and that there is no comparison: gliding lasts so much longer and you can usually keep it up longer.

Jack went on to tell us his story of an out-landing in a nudist camp after falling off the shear line on one cross-country flight. To make a long story short, he managed to thoroughly embarass himself by entering the dining room in the buff only to find that his hosts had dressed in his honor.

He now has a 70' span Jantar high performance glass ship. Again he has made some minor modifications like small winglets at the tips. When asked what they are for he explains they up his performance from 45:1 to 80:1. Not everyone believes this but it does keep them wondering. In the air it handles very nicely, but on the ground its big wing makes it want to groundloop if a tip gets down.

Jack showed some slides on the vehicles he had modified to reduce air resistance, achieving 50 mpg out of an early Honda.

He then told us about the rocks that move in the wind at places like Race Track Dry Lake, one of those wild out-landing experiences. He gave us all the various theories scientists have put forth on how or why these rocks move even though no one had actually seen it happen. Of course these guys hadn't anticipated Jack would see the real thing.

According the Jack, it turns out to be caused by an aero-hydra-dynamic combination of wind, water, mud and the rock. It seems that the rain causes water to collect around the base of the rock. As the wind begins to blow (about 18 mph) it causes a stagnation area at the front of the rock and vortices at the aft side. The vortices churn up the mud which then flows toward the stagnation point where it piles up. This combination of mud movement makes the rock roll towards the vortices. The rocks shape causes slight variations in these vortices which makes the rock change directions.

Since the scientific community didn't quite buy this "theory" Jack decided to try and prove it by bringing some of the rocks back to El Mirage Dry Lake and simulating the rainy conditions. What he did find was you can't duplicate nature's ability to rain and create puddles at the rock's base. He learned that it will take some dedicated person to go sit on the dry lake with a camera and wait for it to rain and blow in just the right way to photograph the rock's movement. By the way these rocks that are moving weigh in at over 600 lbs. Jack knows because he lifted one!!

After Jack concluded his excellent presentation we had the raffle, which was won by Harold Pio. And with that the meeting was adjourned.

LETTERS TO THE EDITOR

Feb 27, 1990

Dear Andy:

I received the back issues of the newsletter, and have been slowly working my way through them. There is some very interesting stuff buried in that stack on my coffee table!

Enclosed are a couple of items to be added to the TWITT library. The Horten report is a post war analysis of captured documents and photos of the entire Horten stable of flying wings. It includes some good drawings of all the designs, and they should reproduce well enough to print in the newsletter. It also shows some details of control systems, such as the all moving tips they tried on one of the ships. A flight evaluation of the HII by Hanna Reitsch is included. The black marks on some of the pages is where the security restrictions were marked out when the document was declassified.

The other item is an article on the Armstrong AW 52 flying wing project (glider and powered). It also had some interesting figures in it, including the system they tested for sucking off the boundry layer on one version. I keep seeing this idea resurface, and some of their comments might be instructional.

If we ever get a listing of the TWITT library, I'll cross reference it with my collection of flying wing data, and try to add to the main collection. I have access to a wide variety of sources. It would also be interesting to compile a listing of the status of all the flying wing projects that have surfaced in TWITT (for example, whatever happened to the Davis Alpha, Schapel SA882, etc.?).

I am preparing a report on the history and progress of the Komet project (including some photos of the construction). As soon as I get a little more time to make it all presentable, I'll submit it for publication. Work is still proceeding, but sometimes it seems like one step forward, then two steps back. More later...

Regards,
Kevin Renshaw

(Ed. Note: We will print some of the pictures included in the Armstrong article in this issue to give everyone an idea of his work. A complete listing of the TWITT library is a project that has yet to get done, but will be receiving more priority in the near future.)

Dear TWITT:

I am sorry this has taken so long, but I could not find how much the renewal was in the newsletter. Could you put a small information box inside the newsletter each month that states the renewal cost, where to send the money and who to make the check payable to.

Thank you,
Todd Hodges

(Ed. Note: This is a good thought and as you can see we began it this month on the cover in the lower left corner so we don't lose space inside the newsletter.)

March 13, 1990

TWITT:

I'm an armchair aviator and am currently looking into the history and working principles of tailless and/or flying wing aircraft.

I was referred to you by the Sailplane Homebuilder's Association. I'd be grateful for any leads on books, reports, people to talk to, etc., concerning tailless and/or flying wing aircraft.

A recent issue of Soaring magazine offered a book by Dr. Horten on flying wings. Are you aware of this book, and if so, is it worth the $45 cost?

Yours very truly,
David Bogart
305 Walnut St.
El Campo, TX 77437
(409) 543-3808

(Ed. Note: According to Bob the Horten book is well worth the expense. Another item of interest would be Serge Krauss' extensive bibliography of tailless material which is included in the advertisement section. As David has learned by now, we have included this newsletter in his information package so he can see first hand

what is available through TWITT. We would like to thank SHA for the referral and know David sees the ad- vantages of joining our fellow TWITTers.)

TWITT:

Please find enclosed my check for $20 to cover renewal of my newsletter subscription and any back issues I might need due to my tardiness in getting this to you. My lable number is 9001.

Please put the balance of the money to other TWITT purposes as required. It's not much, but I guess it buys a few stamps!

Good luck with your continuing efforts.

George Atkinson

(Ed. Note: Please read the President's Corner for more information concerning donations such as the one made by George.)

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ADDITIONS TO TWITT LIBRARY

"On The Wings of the Wind"
National Geographic, 1929

Horten Newsletter No. 1
Flight Engineering and Developments, Jan '90

French Gliding Books Catalog
Le Carreres
BP 11 - F-77440 Congis (France)

"Armstrong Whitworth's Flying Wings: A Tale of No Tails"
Air Enthusiast/Seventeen, 1982

"German Flying Wings Designed by Horten Brothers"
by N. LeBlanc, Captain, Air Corps
Summary Report No. F-SU-1110-ND, 1/10/46
Headquarters Air Material Command
Wright Field, Dayton Ohio

Aircraft of the Soviet Union
by Bill Gunston (date unknown)
(Russian flying wing designs)

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AVAILABLE PLANS/REFERENCE MATERIAL

Tailless Aircraft Bibliography
by Serge Krauss
Cost: $20
Order from: Serge Krauss
3114 Edgehill Road
Cleveland Hts., OH 44118

Horten H1c construction drawings with full size airfoil layout. 30 sheets 24" x 36" with specification manual. Price: $115.

Horten Newsletter
Cost: $5 per year for US/$7.50 foreign

Order from:

Flight Engineering and Developments
2453 Liberty Church Road
Temple, GA 30179
(404) 562-3512

WANTED

MITCHELL WING or other powered glider or truely soarable ultra-light, perferable with trailer.

Have cash or will trade for high performance (L/D 34:1) sailplane with enclosed trailer, oxygen, and instruments

Call Chuck at (619) 447-2519 (San Diego)

Quicksilver Hang Glider for research purposes. If you have one for sale or know of anyone who does please contact:

Randy Bergum
P.O. Box 6831
Fullerton, CA 92634
(714) 680-4963

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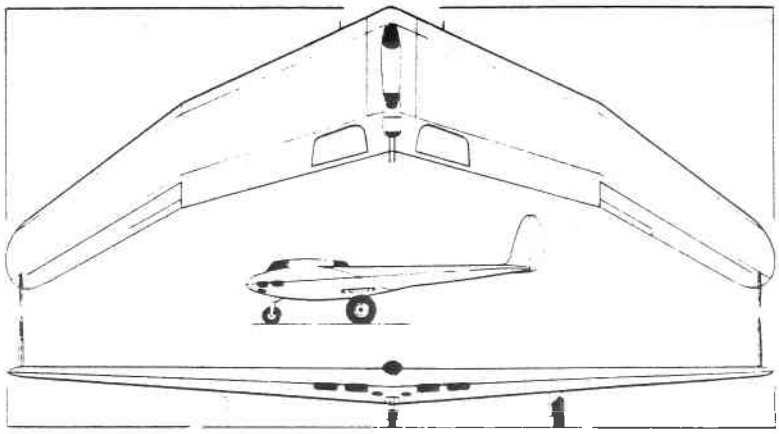
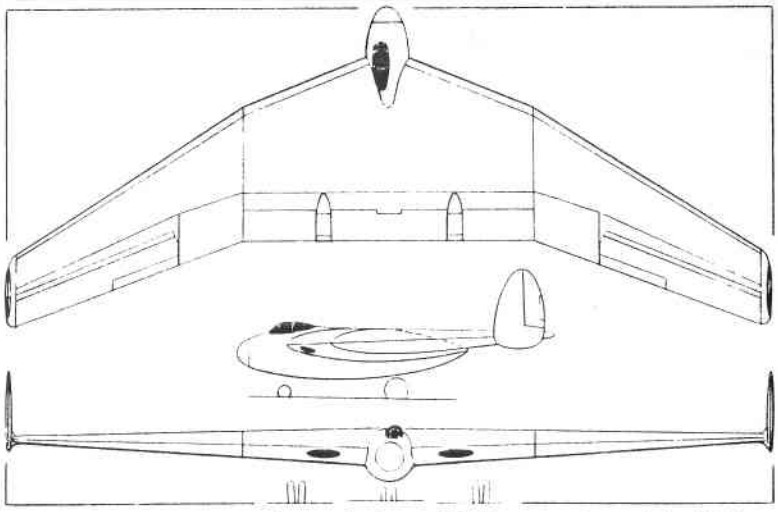
With 152 pages and 165 illustrations and diagrams, this book is a survey of flying wings and their development. A review, with examples of construction of flying wings from three countries, their development over the years, and new insights and remarkable improvements in recent years in these unusual aircraft, together with diagrams and illustrations, form the backbone of this book. You will see high-performance "wings" as well as simpler "Sunday Fliers" for all types of flying: cliff soaring, thermal soaring, electric flight, and distance-duration tasks as in F3B. Outstanding designers and builders give you their tricks and ideas for practical aircraft of guaranteed performance. You won't find another book for the R/C sailplane pilot quite as comprehensive and interesting on the subject of tailless aircraft as this one for the person who wants to take advantage of all previous experience to design and build his own flying wing. Jim Gray

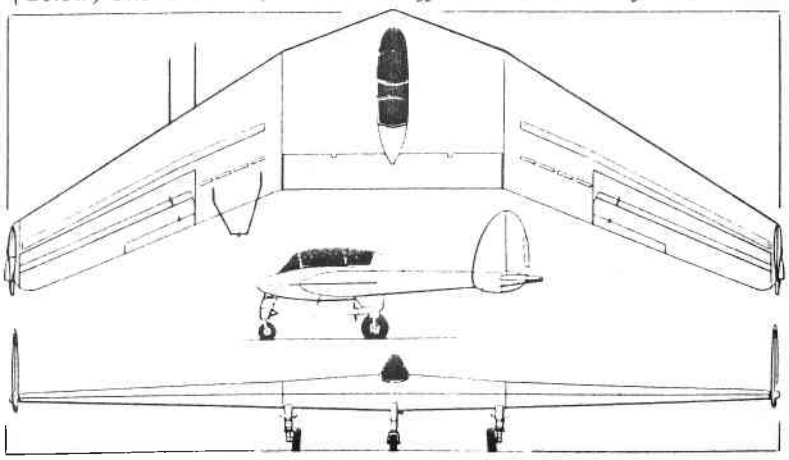
These are examples of the aircraft included in the Armstrong Whitworth article recently contributed to the TWITT library. This looks like a good item for everyone interested in creating their own library of reference material.



AWA's first flying-wing project was the A.W.50, a bomber proposal at the end of 1942 with a span of 120 ft (36.58 m) and four jet engines.



(Above) The original form of the A.W.52, as projected in 1944 to conform to Specification E.9/44 for a flying wing jet research aircraft. (Below) The A.W.52G, which was in effect a scale model of the A.W.52.



The following was extracted from a recent edition of the Tehachapi newspaper.

"Aviation Art Contest", by Fred O'Donnell

The Federal Aviation Administration and the National Aeronautical Association, in cooperation with the Federal Aeronautique International of Paris, France, are sponsoring the 1990 International Aviation Art Contest.

The contest, with the theme of "Silent Flight," is open to all children aged five to 16. Entries will be judged in three categories - Ages 5-8, 9-12, 13-16 - and the best three art works in each age group will be selected as national winners. The work of all nine U.S. winners will be forwarded to Paris for international judging.

Area art teachers are urged to contact Fred O'Donnell, Public Affairs Specialist at FAA Western-Pacific Region Headquarters, (213) 297-1431, for complete details and entry forms.

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Bruce Carmichael & Jack Lambie
see page 4

Komet
Kevin Renshaw

Upon Joining TWITT, I promised Andy that I would submit an article for publication on the design and development of the Komet, my tailless self-launching sailplane. I have been putting off writing about the design for a long time, preferring to have something flying before I publish, but I think that the memebers of TWITT deserve an advance peek. (As a side note, my wife has long maintained that I was a TWITT, and now she has documentation)

The Komet has its roots in the original SSA homebuilt sailplane design competition of 1981. At that time I had been working in the aircraft industry as a configuration designer for a few years, and decided that I was as capable of designing a sailplane as any of the other people I had been reading about. I had been flying gliders since high school and had just added my power ticket. Of course, in my naive youth, I thought that I could design and fly my ship in less than one year (in time for the fly-off). Little did I know what a long road lay ahead.

I chose a tailless design mainly due to the asthetic appeal of watching all-wing aircraft fly. I have always been fascinated by the designs of the Hortens, Lippisch and Northrup, and have amassed quite a collection of technical data on tailless aircraft (which I'm copying and sending piecemeal to TWITT). I have shamelessly stolen what I consider the best features of each, along with construction techniques from Rutan, and other modern homebuilders. I also borrowed the name from Herr Lippisch's best known tailless design, the Me 163.

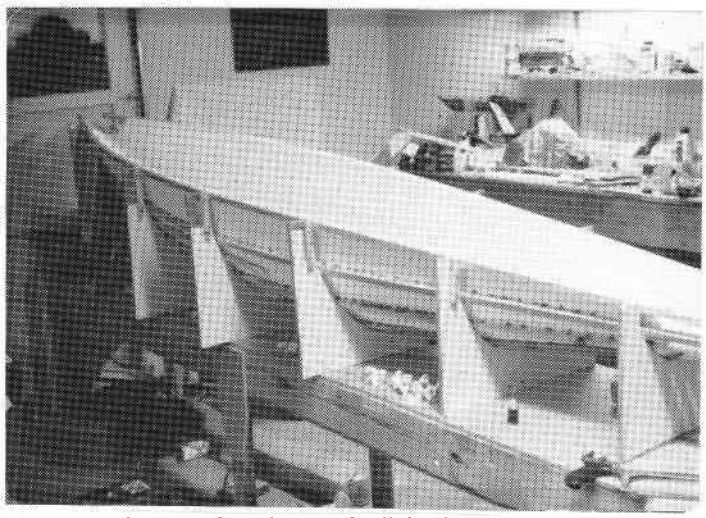
The design had to fufill several criteria. It had to have a cockpit large enough for me (6'4" 210 lb), had to have better performance and penetration than a 1-26, and had to be built in pieces that would fit in my 20' x 20' garage. The garage wound up being the limiting case on aspect ratio. Some rough numbers indicated that a gross weight of under 500 lbs was reasonable, and I wanted a wing loading of around 5 lb/sq ft, so I used a 100 sq ft wing planform. An aspect ratio of 15, with a 40 inch center section, gives wing panels that are about 19 feet along their longest dimension. The airfoil at the root is a 747A315 wich transistions to a 23012 in the elevon region and out to the tip. I used the 23012 outboard since the large leading edge radius and leading edge "droop" effect of the camber should help delay tip stall on the elevons.

Front View of the Komet

As you can see from the photos, the cockpit is "roomy" by conventional standards. I wasn't out to build the ultimate competition ship, so I gave myself a little elbow room. The fuselage is 28 inches wide at the pilots shoulders. The fuselage was built using a construction technique I borrowed from the Dragonfly homebuilt. A wooden stringer form was built on a bench (see photos), and then rigid urethane foam (Clark Foam) is bent into the form. The foam comes with a grid pattern scored into the surface to allow it to bend into compound curves. Once the foam is secured in the stringers with small dabs of Bondo, the inside is fiberglassed. This layer of glass keeps the shape after the shell is removed from the form, and the outside is then glassed. The result is a light, strong sandwich fuselage shell. The internal bulkheads are flat sheets of Clark Foam with 2 plys of bidirectional glass on each side. The wing carry through spar runs under the seat beneath the pilots thighs. An engine compartment is included aft of the seat bulkhead to allow addition of a

self-launch motor with a pusher prop. The Komet will initially be flown as a glider, to avoid spending more time messing with the engine and reduction system.

Stringer form for fuselage

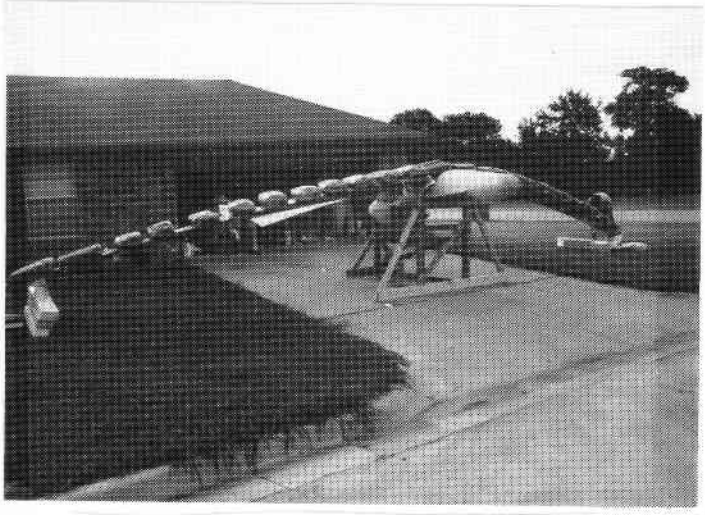


Lower fuselage shell in form

Construction of the canopy was an education in itself. I got the chance to learn about making plaster patterns, molds, and vacuum boxes. The forward part was easy; it is a flat wrapped cone shape. The aft part is 1/8 plexiglass formed in a vacum box. I think next time I will start with an existing canopy and design a fuselage around it!

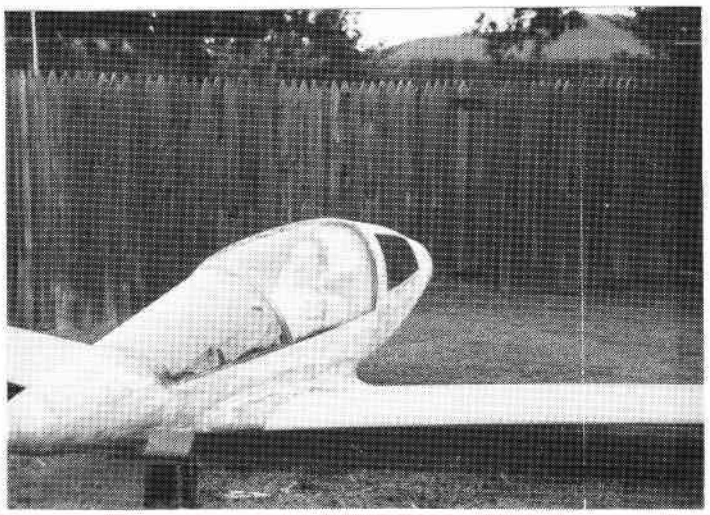
The wings were cut from blue styrene foam with a hot wire. Each wing panel was made in four sections, each about 5 feet long. This is about as long a piece of foam that can be cut without getting significant lag on the wire between templates. The foam was cut out in the spar area and used as a core for the spar. The first wing was built using a technique very similair to the VariEze, with the shear web being laid up first, and then the spar cap bonded on later with the skins. This wing failed during proof testing when this secondary bond let go and the spar cap buckled. The moral here is DO NOT use secondary bonds (gluing previously cured fiberglass parts together) in highly loaded areas. It also makes me a little nervous about early model VariEzes.

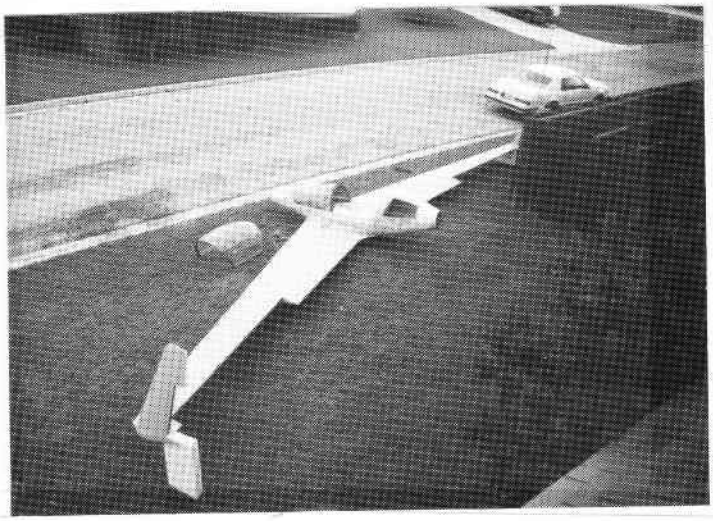
The new spars have the webs and spar caps co-cured (bonded in one step). The secondary bonds in this design are on the shear webs, where I have a larger bonding surface and lower loads relative to the caps. The shear webs also are wrapped around the spar box to mechanically restrain the caps from buckling. The upper skins are two plys of unidirectional glass run at ± 45 degrees plus an aditional ply run spanwise to help increase the buckling strength of the skin. The lower surface is just the two ± 45 degree plys. This set of wing passed a 6 g proof load (those are 80 pound concrete bags in the photo). This is the design limit load, with a 50% margin of safety beyond that. I am a firm believer in proof testing new designs before flying. Its a real gut check putting that last bag of concrete all the way out at the tip and watching it deflect, but it sure gives you peace of mind in the air knowing the structure is sound.



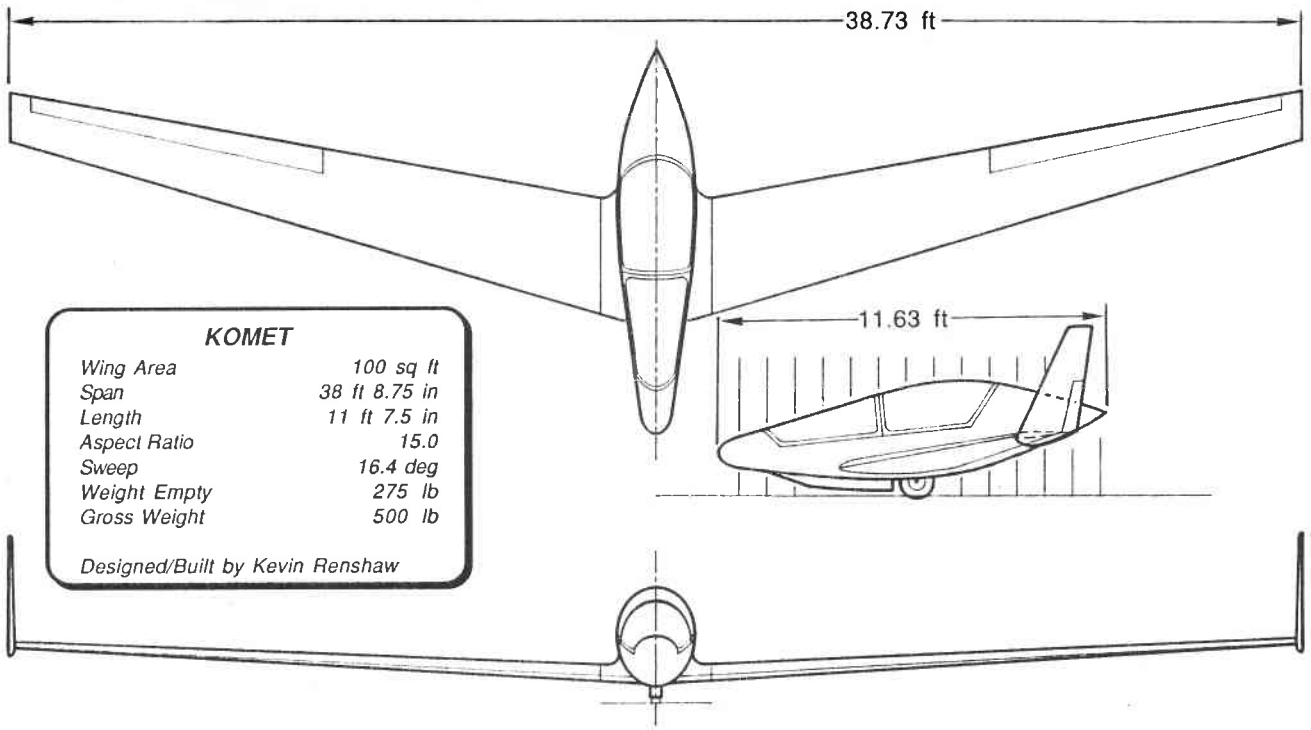
6-g proof load. Wingtips deflected 34"

The aircraft is currently in that dreaded 90% complete stage. As you can see from the photos, the wings have been filled, contoured and primed, and I'm working on the fuselage. The controls have been installed and the instrument panel is built up as a removable assembly. I am currently reworking the attach fittings to make assembly easier. I am continuing to work on finishing the ship as my regular job allows (along with taking my wife out occasionally,cutting the grass, visiting friends, etc), and hope to have it ready to fly this year (where have I heard that before???).





As for plans and kits, I am very discouraged by the current state of product liability litigation. I want to get the airplane flying first and then think about if I want to put anything out on the market. At the present time the drawings are not well enough organized for anyone else but me to build anything from them. Making up a usable set of plans would be a major effort in itself.



S.H.A.P. Talk, March 1990, Sailplane Homebuilders Association

ESTIMATING SAILPLANE PERFORMANCE VELOCITIES

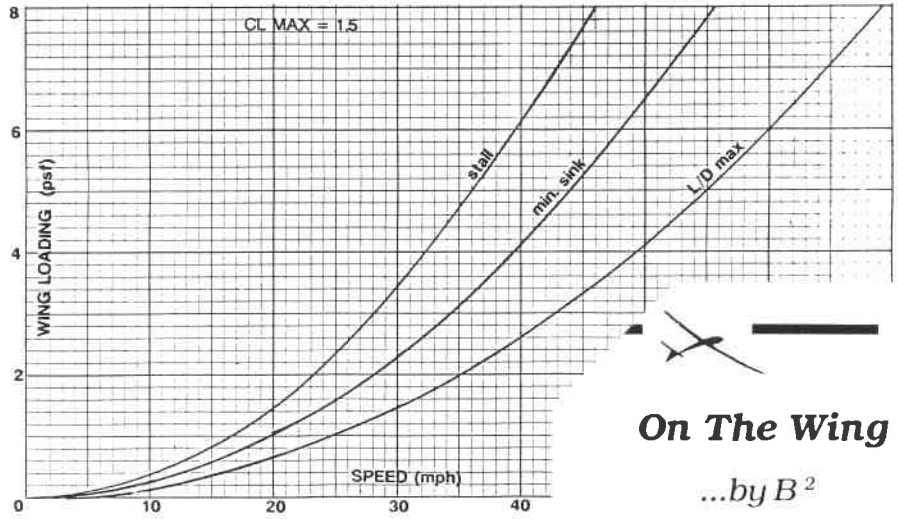
jim marske

When you design a sailplane one of the first items you must determine is what speed you are willing to accept in stall, thermalling and cruise speed. Sailplanes operate at fairly low reynolds numbers so the lift coefficients are not as high as you would see in NASA reports. We usually fly at 1 mil not at 3 mil. Our max C_L is in the 1.3 to 1.5 range assuming no flaps. There is a simple formula to compute stall speed such as:

$$V_s = \sqrt{\frac{\text{wing loading} \times 390}{C_L}}$$

If you are designing a conventional tailed sailplane use a C_L of 1.5. If you are designing a flying wing use a C_L of 1.3. Flying wings use reflex airfoils which have a lower lift coefficient.

You probably don't want to be bothered with math so lets use a chart which tells us fairly close not only the stall speed at a given wing loading but minimum sink and L/D max speed as well.



On The Wing

...by B²

"Faszination Nurflugel" is a new book on flying wings published by the German firm VTH (Verlag fur Technik und Handwerk GmbH). Hans-Jurgen Unverferth is the editor. Consisting of over 150 pages, it includes many photographs, drawings, 3-views and graphs. Divided into several sections, the book covers planks and swept wings, airfoils, control methods, and various solutions to problems pertinent to tailless aircraft.

ESTIMATING SAILPLANE PERFORMANCE

Jim Marske

A simple method to evaluate your proposed sailplane glide ratio can be readily accomplished without getting into heavy math or knowing the drag coefficients of the various components. While this formula cannot replace the standard method of calculating performance it is a good ball-park estimate for the amateur designer. If you are planning to enter a design in the SHA design contest you will find this abbreviated formula very useful.

$$L/D = \sqrt{\frac{\text{wing span}^2 \times \text{aspect ratio} \times k}{\text{fuselage length} \times (\text{airfoil thichness} + \text{mean camber})}}$$

Wingspan and fuselage length are measured in feet.

Airfoil thickness and mean camber are in % of chord.

k = fuselage factor, single place or two place tandem:
12 for clean, 10 average, 8 open cockpit, 5 dirty.

If struted wing, multiply results by .9. If double struted, multiply results by .8.

Do not use airfoil thickness less than 10% nor greater than 18%.

Do not use airfoil mean camber less than 2.5% nor greater than 6%

Do not use fuselage lengths less than 10 ft.

Example, Schweizer 1-26:

$$L/D = \sqrt{\frac{40^2 \times 10 \times 10}{21.5 \times (12 + 4)}} = \sqrt{\frac{1600 \times 100}{21.5 \times 16}} = 21.6$$

"Faszination Nurflugel" lacks some important items, like a method for calculating wing twist for various stability factors, but all of these missing things are readily available elsewhere. Hans-Jurgen's intent was to outline the progress of flying wing technology during the past several years, and to include "state-of-the-art" items along the way, while not duplicating the work of others. He has managed to do this in most outstanding fashion. "Faszination Nurflugel" is an excellent value for its $20.00 total cost (see below), and we recommend it highly.

"Faszination Nurflugel" is available directly from Verlag fur Technik und Handwerk GmbH, Postfach 1128, 7570 Baden-Baden J, Federal Republic of Germany, for DM29,50 plus DM3,00 for shipping. As this is being written the exchange rate is just under DM1, 00 = US$0.60, so DM32,50 equals US$19.50. VTH will accept your personal check made out in US dollars at the current exchange rate. The publication to request is Best.-Nr. FB 2026.

Those of you who are looking for a reasonably priced German-English technical dictionary and finding only "big honkers" costing $60.00 and ...continued on page 10