No. 199 JANUARY 2003

T.W.I.T.T. NEWSLETTER

This was found in the Sailplane Homebuilders Association photo archives, but it was not labeled. It looks like the pictures were taken in a desert area where possible auto tows were being done. Does anyone know what this glider is and who designed it?

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

The number after your name indicates the ending year and month of your current subscription, i.e., **0301** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, January 18, 2003, beginning at 1:30 pm at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row on Joe Crosson Drive - Southeast side of Gillespie).

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

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

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Meetings are held on the third Saturday of every other month (beginning with January), at 1:30 PM, at Hanger A-4, Gillespie Field, El Cajon, California (first row of hangers on the south end of Joe Crosson Drive (#1720), east side of Gillespie or Skid Row for those flying in).

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PRESIDENT'S CORNER

I hope that everyone had joyous holiday and happy New Year celebrations with their family and friends. This year in San Diego we actually had weather that made it seem like winter with cold temperatures and rainy conditions greeting us on the 25th. Normally we are looking at the mid-sixties with blue skies so it's hard to think about snowmen and icicles.

We have some good news concerning Gerry Heflin's Sklyer project. He tells us that he has found a backer that will support bringing the project up to the production point. So he will be starting on an improved version that should be lighter now that he knows more about the materials and construction techniques. He will keep us informed of progress on the new version.

By now I guess it is official, I am also the editor for the Sailplane Homebuilders Association (SHA) quarterly publication. I see this as an opportunity to help both of our organizations since we share some common goals, building aircraft for personal transportation. For TWITT members this usually means some type of flying wing or tailless aircraft, while for SHA members it can be almost anything that could be classified as a glider. There is a lot of information that can be shared relative to these goals and I hope that we will be able to accomplish that.

This issue contains the last part of November's meeting, which was done by Bruce Carmichael. I want to thank him again for stepping in at the last minute and putting together an excellent overview of these flying wings from around the world. I hope everyone is enjoying the text and pictures that he provided.

With the new year will come new challenges for all of us. Hopefully everyone will get started on their favorite project or continue towards it's completion if already in progress. Good luck in your endeavors.

Andy

JANUARY 18, 2003 PROGRAM

As of publication time we were still trying to make contact with the students from the University of California San Diego's (UCSD) aeronautical engineering school to come out an tell us about their AIAA competition flying wing. They have been on Christmas break and out of e-mail contact, but we are hopeful to hear from them before the meeting date. Their flying wing aircraft came in fifth and, their conventional aircraft took first prize, so overall they did very well in the contest.

Whether or not they show up, we will have a meeting with some type of alternate program. So join us for the first meeting of the new year.

MARCH 15, 2003 PROGRAM

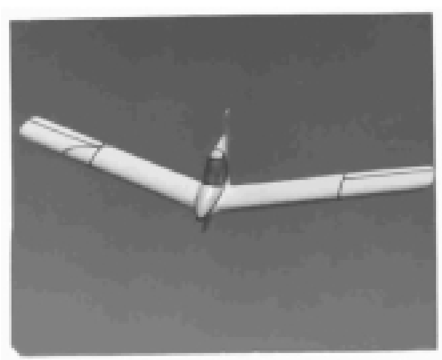
Just a reminder that the March program will feature Dr. Paul MacCready. He will be covering his latest experiments in flying wing models and efficiencies of flight. Make sure to mark your calendars now so you don't miss this one if you live in the southern California area or can travel in with this much advanced notice.

NOVEMBER 16, 2002 MEETING RECAP (cont.)

In 1950, while attending the National Soaring Meet in Grand Prairie Texas, I saw a tiny 26 foot span, 7.5 aspect ratio, swept back flying wing with all moving wing tip elevons (photo to right). This had apparently evolved from a comment that Dr. Alexander Lippisch had made to Dr. August Raspet pointing out that a very low aspect ratio very low zero lift drag craft obtained its maximum L/D at a low value of lift coefficient compared to normal sailplanes. Thus one could obtain better penetration than you might think. This idea intrigued Raspet. He encouraged Prof. Franklin Farrar of Vanderbilt University to build such a ship. With a 175# empty weight and a l75# payload, the wing loading came to 3.89 p.s.f. An L/D of 36 and a minimum sink of 2.4 ft./sec. was expected. The pod was entirely below the wing. Entry and exit was obtained by jettisoning the tail cone. One crawled in on ones belly until your head came to the transparent leading edge. You stuck an arm out inside each wing until you grasped a handle, which controlled the all-moving elevons at the wing tips. The photo shows Wally Wiberg and Franklin Farrar with the claustrophobic wing. The normally wild, risk-taking Wiberg made a ground tow but said, "Thanks but no thanks' for an offer for aero tow. *(ed. – It has been said this is one of the few times Wiberg ever refused to fly something.)*

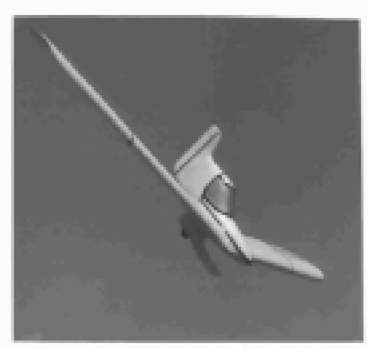
Back in the 70's this writer became fascinated with the concept of a minimum soarable sailplane and studied many of the previous attempts. Being 5 ft. 7 inches tall and

weighing 120 pounds the designs were form fitting and no threat to most other pilots. One version seen in the photos below had a 3 piece constant 3 ft. chord, 30 ft. span, aspect ratio 10 wing of 90 sq. ft. with 13 degrees of sweepback. The center 18 feet of the wing was built integral with the pod and



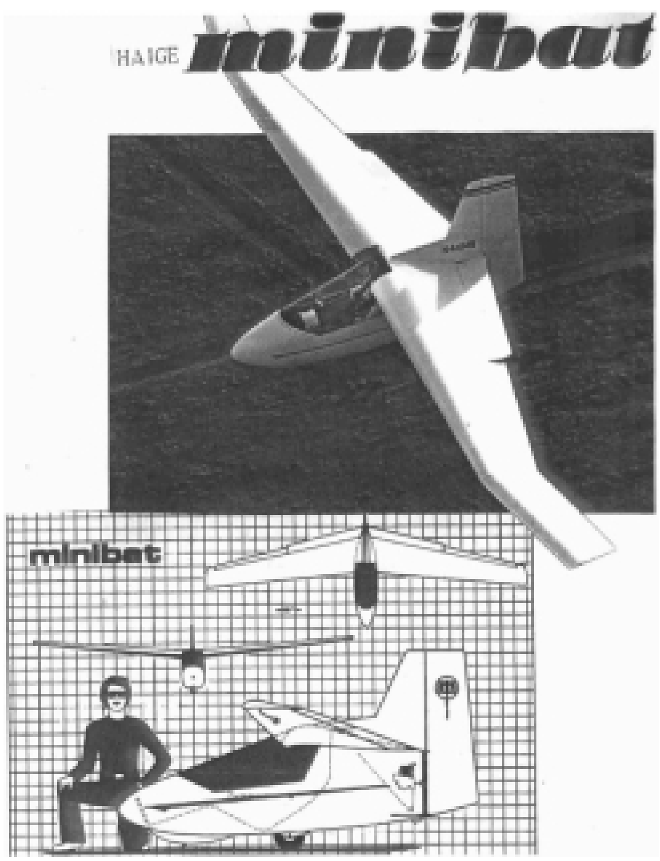
ORIGINAL VERSION
SPAN = 30 FT. LENGTH = 8.33 FT.
CHORD = 3 FT. AREA = 90 SQ.FT.
ASPECT RATIO = 10 SWEEP = 13°
DIHEDRAL = 0 UPSWEPT TIPS
WING JOINTS 9 FT. FROM C.L.
AIRFOIL = 63 515 REFLEXED
OUTBOARD DIFF. ELEVONS FOR
PITCH AND ROLL CONTROL
CENTERLINE FIN AND RUDDER
FUSE,CENTER WING, L.G. ONE UNIT
FAIRED SUB PYLON, WHEEL, & SKID

REVISED VERSION
SPAN=36 FT. LENGTH=8.33 FT. HT=5.4 FT
AREA=93 SQ. FT. WING JOINTS 8 FT OUT
TAPERED OUTER PANELS ZERO TWIST
INBD CHORD=3 FT. OUTBD AVE=2.25 FT
ASPECT RATIO = 14 SWEEPBACK = 13°
AIRFOIL - 63 515 REFLEXED 0 DIHEDRAL
OUTBOARD DIFFERENTIAL ELEVONS
FOR PITCH AND ROLL CONTROL
CENTERLINE FIN- DIRECTIONAL STAB.
ELEVON INSET SPOILERS-DIR CONTROL
154 # EMPTY WT.154 # P.L.308 # GROSS WT.
WING LOADING = 3.3 P.S.F.
GROSS WEIGHT / SPAN SQUARED = 0.24



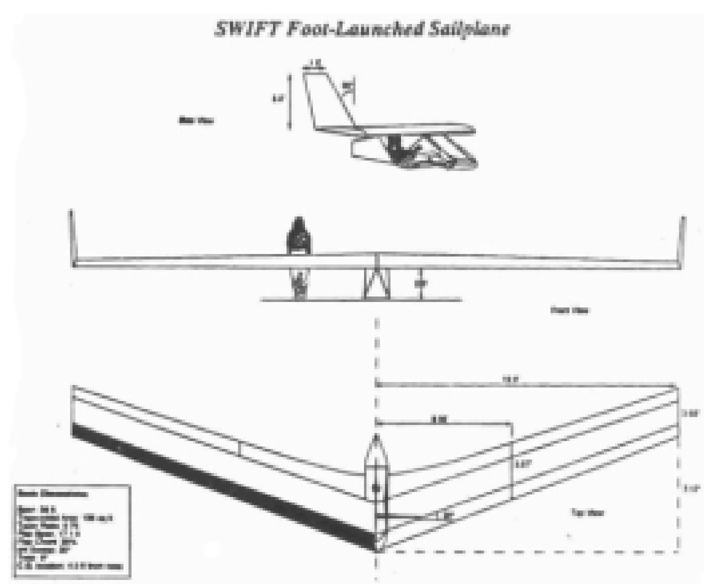
landing gear for lightness and reduced assembly time. The 6-foot outer panels were removable leading to a 20-foot trailer length. I combined the NACA 63 515 thickness form with 2 camber lines to produce a low drag reflexed zero pitching moment airfoil section. Outboard elevons provide pitch and roll control with a centerline fin and rudder for directional stability and control. The pod was so small that I had to put two rocker arm bumps near the nose to clear my shoe toes. Bob Noble told me that if I expected to fly that from a real airport I would have to put a brazier on it. The little craft was jacked up on a faired sub pylon with single wheel and skid, which should make it exciting on ground runs. Of course I never got it built.

On second thought, I could increase the span to 36 ft. and still keep a trailer length of 20 ft. I would reduce the center wing span to 16 feet making each outer panel 10 ft. in length allowing more control power for the elevons which have to do 2 jobs. I would taper the outer panels to improve the lift distribution. Aspect ratio would now be 14. Sweep and airfoil would remain the same. The centerline fin would be retained but the rudder replaced by upper surface spoilers inset in the elevons to get some arm for the directional control. I project an empty weight of 154# with a 154# payload yielding a wing loading of 3.3 p.s.f. and a gross wt./span squared value of 0.24. I would also make the pod a little bigger. Don't hold your breath waiting for me to build it. You know old "lots of charts no parts" Carmichael.



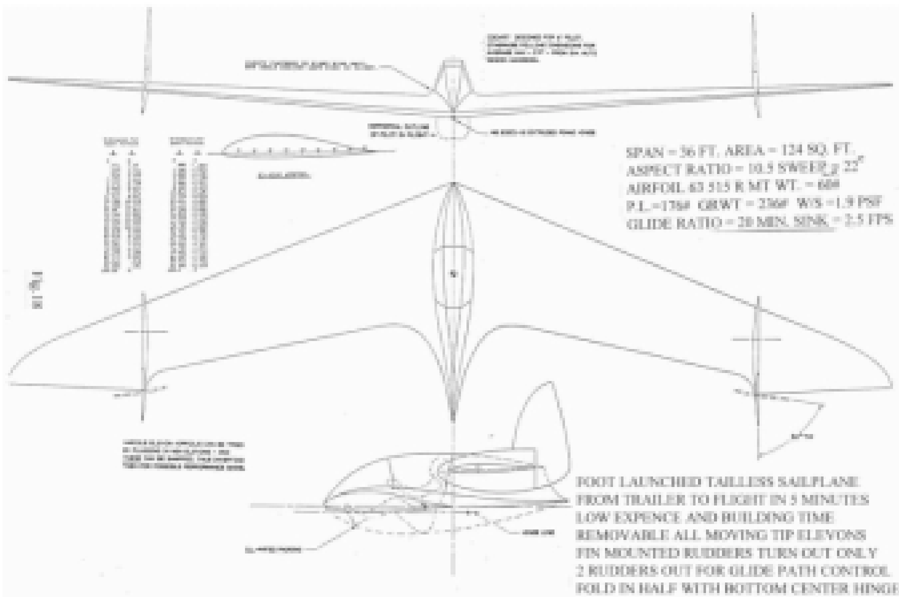
Larry Haig being of size similar to your writer/speaker sought smaller, less expensive soarable sailplanes and was additionally driven by the desire for self-launch capability. His EAGLET with inverted V tail was a noble effort but early composite problems and too small an engine for self-launch prevented it from becoming the American Volksplane.
The MINIBAT (above) was his second attempt. The swept forward wing was in a high position. The engine was in the rear pod with the propeller rotating in the gap in front of the centerline rudder. After initial flight trials he extended the wing with constant cord unswept outer panels. This serious attempt to put an inexpensive self-launch sailplane into easy to build kit form was just too radical to become popular. It incorporated many construction details that it would be well to apply to a less radical design.

The SWIFT (below), is a 100# empty weight foot launched, cantilever, rigid, 21 degree sweptback flying wing. The design was a cooperative effort between Prof. Ilan Kroo and Steve Morris of Stanford University, hang glider manufacturer Brian Robbins and test pilot Brian Porter. It incorporated side stick controlled aerodynamic control surfaces. The combination of sweep, taper and twist allowed down deflection of the inboard flap producing both an increase in lift and an increment in nose up trimming pitching moment. They discovered this independently in opposition to the common saying that you can't use lift-increasing flaps on a tailless craft. Actually Al Backstrom had explained this to me decades before. The SWIFT winglets are fixed and provide an increase in effective span, increased roll authority, and with aileron deflection produce favorable yaw. After studying Dick Johnson's thermal and downdraft measurements they set design goals of 200 f.p.m. sink at 100 ft. turn radius, L/D not less than 20 and L/D at least 15 at 60 knots flight speed. A stall speed as low as other foot launched gliders, an empty weight not more than 100# and exceptional control at low speed were demanded. They achieved a 100# empty weight and an L/D max. of almost 25. The Swift was not economical to continue producing in the United States. It is now produced in Belgium.



The most imaginative entry in an SHA design contest a decade ago was the late Ed Lockhart's WINGTHING (next page). This foot launched and landed tailless 22-degree sweptback flying wing with all moving tip elevons had vertical fins at the wing/elevon intersection. Rudders are deflected out singly for directional control and together for glide path control. Pilot controls are a stick for each elevon with twist grip for each rudder. Ed employed my NACA 63 515 R airfoil.

A hinge on the lower centerline permitted the wing to be folded in half for transport. The elevons are removable. The canopy is fixed to one side but is released from the other to permit folding. The span is 36 ft., aspect ratio 10.5, and Ed projected an empty weight of only 60 pounds using a combination of carbon, balsa and model aircraft builders tricks. At a wing loading of 1.9 p.s.f. he projected a glide ratio of 20 and a minimum sink of 2.5 ft./sec. He built a tenth scale model, which flew beautifully in both straight and turning flight. He did not get to build the full-scale ship but someone should proceed with this remarkable design.



Jim Marske has designed, built, kitted, and flown several tailless sailplanes. A recent light version is the 42.6 ft., 11.1 aspect ratio, 180 pound empty weight MONARCH (next page) having a wing loading of 1.8 to 2.6 p.s.f. It delivers a glide ratio of 22 at 36 m.p.h. and sink of 138 fpm. at 30 m.p.h.. The next version with the latest composites will meet the ultralight maximum empty weight of 154 pounds. Ultralight soaring may be a wave of the future but must be developed with care. The tailless configuration often introduces problems negating advantages but it may prove to be the practical solution to ultralight sailplanes that it has proven for foot launched types.

LETTERS TO THE EDITOR

December 4, 2002

TWITT:

I am sorry to communicate that I will not renew the subscription to the newsletter (life duties – family, career, study, house movings & health – take me apart from what I would prefer to do). Please believe that I have about 3+ years of the newsletter to read and organize.

I am convinced that TWITT represents and stays at the top of the aeronautical and space science with fair equilibrium between theory and practice. I know I will join again in the future. Until then, I say thank you to every person that organize, participate and are is involved in the wing. I friendly embrace everyone of you.

Sincerely yours,

Giorgio Cavallo
Via Vespucci 3
56125 Pisa, Italy

(ed. - First, I would like to say I am sorry we are losing Giorgio, but also glad to know that he will be back. He has made a number of contributions to TWITT during his membership and, for that we are grateful.

Next, I would like to thank him for the nice comments about TWITT. We try to stay up to date with what is going on in the world of flying wings, but sometimes it is hard to get current information.

Lastly, he addresses one of the reasons I am hearing more and more on why we have seen our membership decline. The demands of family and career have taken their toll on our membership over the past several years, as they should. We just hope that as these other activities find success we will see people return to find out what they have missed in the ensuing years.)

(ed. – Karl Nickel had asked a question about the Mitchell external control system earlier and, although there didn't appear to be an answer concerning detailed test data, we have seen some additional information appear on the Nurflugel mailing list. Here is some of it.)

November 15, 2002

TWITT:

Mr. Avalon is not up to speed on the research that has been done on a key component of his product. The NACA did a lot of testing with external flaps back in the late 1930s, both in the wind tunnel and on an airplane. I'm sure Junkers also had data before they used them on their planes, but I wouldn't know where to look for old German reports. The two links below will get you to lists of most of the relevant information on the net. The NACA LARK link has several of the original reports in PDF format and the Google link has examples of some recent applications. Since you included Dr. Nickel's address in the newsletter I can sort through these result lists, put together a printed package and mail it to him. If that'd be convenient for you let me know and I'll do it over the weekend.

http://naca.larc.nasa.gov/naca.cgi?search_words=external+airfoil+flaps
http://www.google.com/search?client=googlet&q=external%20airfoil%20flaps

Norman Masters
philadelphus@gjct.net

PS: I enjoyed visiting with you and the guys last time I was out there, I only wish I had planned my time better so I could talk to everybody. I am trying to arrange another trip. I'm not sure when I'll be ready but I'll let you know.

Monarch Model G

Span	42.6 ft.
Wing area	163 sq. ft.
Aspect ratio	11.1:1
Wing loading	1.8-2.6 lb./sq. ft.
Empty weight	180 lb.
Pilot weight range	120-220 lb.
Gross weight	420 lb.
Flying weight	300-420 lb.
V_{NE}	70 mph
Cruise speed	25-70 mph
Glide ratio	22:1 @ 36 mph
Sink rate	138 fpm @ 30 mph
Tow takeoff roll	60 ft.
Landing distance	500 ft.

(ed. – I asked Norm to go ahead and mail the material to Karl, which he did. My thanks to Norm for taking care of this. He also included the following with it.)

Dear Dr. Nickel--

Enclosed are NACA reports No. 541, No. 573, No. 603, No. 604, and No. 614. I believe that these reports contain most, if not all, of the data that was available to Don Mitchell when he designed his "stabilators" because they were published between the time that he graduated from the Boeing school of aeronautics and the time he started designing his first glider with that control arrangement. I tried to look at the Experimental Aircraft Association's archive, to see if they might have published an article about Mitchell's stabilator, but it's for members only and I'm not a member. Below are the web addresses of some pages that show various current applications of external airfoil flaps. I couldn't find any examples of the flap being turned upside down, like Mitchell did it, but none of the others are tailless either, except for Michael Schönherr's.

Professor Michael Schönherr uses external flaps on his "Stromburg" model glider. I remember some messages he sent to the nurflugel list, quite some time ago, said that he considered this type of control the best for his models. His e-mail is mech@net-art.de

This is from his web page: "Die Ur-Stromburg zeigte beste Leistung, hatte aber noch unangenehmen Strömungsabriß. Erst die Querruder mit Junkers- Spalt brachten die Lösung. Weiler/ Monzingen September 1986" *(ed. – This loosely translates to: The Ur current castle ?? showed best achievement, had however still unpleasant flow separation. Only the ailerons with Junkers gap brought the solution. Weiler/Monzingen September 1986.)* The address of one of his pages is: http://www.net-art.de/mech/Stromer/

This is the address of Tom Speer's web page: http://www.tspeer.com/Wingmasts/airfoils.html. Most of his pages are about sailboats but on this page he talks about rigid wings and an airfoil he designed for an ultralight airplane, with an external airfoil flap. His e-mail is tspeer@tspeer.com

Doug DuBois is building an ultralight called a " Tandem AirBike". He is fitting it with Junkers flaps, this page has his builders log. http://www.questiongravity.com/airbike/index.htm. With advice from the kit designer he has made several modifications to the basic kit, including replacing the stock flapperons with Junkers flaps. While planing the change to the flapperons he looked at several other manufacturers' products and the log contains links to their web pages.

December 7, 2002

In the November 02 issue of the T.W.I.T.T. newsletter Karl Nickel asked about what design data Don Mitchell had when he designed the "stabilators" on his flying wings. Andy forwarded Karl's question to Richard Avalon, of

U. S. Pacific, but he wasn't able to offer the hard numbers that Dr. Nickel was looking for. I, in a fit of youthful exuberance and naiveté, assumed that Mitchell had gotten data from the N.A.C.A. reports on external airfoil flaps that had been published in the few years before he started designing his 'wing and drew something up that looked about right for his application. Dr. Nickel doesn't have Internet so I searched the NACA LARC server and printed out 5 reports dealing with external airfoil flaps and mailed them to him. Most of these tests used full span external flaps, rigged as flapperons. One used full span external flaps, with conventional ailerons on the main wing, which I thought was interesting because the movable aileron gave a lot of different slot geometry. Profiles of the flaps were NACA 23012 and Clark-Y, none used an inverted airfoil like Mitchell. Yesterday (12/7/02) I got a letter from Dr. Nickel saying that the reports are interesting but not quite what he's looking for. He said he wants to know what the CLmax is with the flaps up, and how they affect the shape of the lift curve at stall. He also want's some real data on their effectiveness as ailerons when the main wing is stalled. I'm afraid that's I've done all I can to help him with this, anybody ells have any ideas on where to find hard data on stabilators as implemented by Don Mitchell?

Norm Masters

December 8, 2002

Norm and Andy (for Dr. Nickel):

I just belatedly looked into my files for information on Don Mitchell's "Stabilators". My first thought was to look closer to Dr. Nickel's own home in the developments of Lippisch and Junkers. I had remembered a patent by Lippisch and external flaps used by Junkers. The one Lippisch patent on hand, U.S. Pat. #1,931,928 (10/24/33) includes the basic idea, but while shown as an inverted airfoil, the controller is not under slung, but in fact raised. The purpose was presumed to eliminate control reversal of reflexed sections and retain control at the stall. A more specifically detailed diagram of this device is shown in A.R. Weyl's article "Tailless Aeroplane Control Systems", Aircraft Engineering, 5/45, p.141 (Weyl also mentions a 1932 Dornier patent for a raised external aileron). A quick perusal of Dr. Lippisch's book revealed no further details, although photographs indicate that he may have been using this arrangement during the 1930's. Weyl adds that such devices used on conventionally cambered wings make them stable with a 10-15% lift loss, but no profile drag penalty.

Later I finally thought to look at the obvious: Don Mitchell's own works. It suggests that Don may not have used any quantitative data. >From Don's "Flying Wing Sailplanes", Soaring, 5-6/48:

> "In 1942, by gathering information on flying wings built up to that time, the author came to the conclusion that the method of control being used in these ships was inadequate, with little hope of attaining popular acceptance.
>
> "After study of free flight models he developed a new method of control by using an external surface for elevator control and longitudinal stability.
>
> "Both the Mitchell Super Skywing, which has been successfully flown as a glider and as a power sailplane, as well as the Super Osprey, to be test flown in the latter part of August, incorporate these advantages.
>
> "External surfaces have been used as ailerons and flaps, but NEVER previously been made to function as an elevator on a flying wing *[apparently not true - SK]*."

He proceeds then to explain advantages regarding tip stall, as well as structural advantages. He gives specs and performance data for the "Super Skywing":

A = 230 sq.ft.
A/R = 11
Taper Ratio: 4.3:1
Airfoil: "modified N.A.C.A."; symmetrical, no twist

For the glider version, he claims these performance figures:

Glide Ratio: 35:1
Max Gliding Speed: 130 mph
Landing Speed: 27 mph
Takeoff Speed: 34 mph
Min Sink Speed: 2.5 fps

For the powered version (28 hp Nelson, pusher):

Top Speed: 90 mph, Cruise: 79 mph
Climb: 380 ft/min
Landing Speed: 28 mph
Takeoff Speed: 35 mph

He states that a patent for the external elevons had been applied for, but in my extensive tailless aircraft patent research, I have run across none in his name. So I suspect that Lippisch, Dornier, and Junkers beat him to the patentable ideas.

The "Super Osprey", not pictured in this article, used the Goettingen 549 airfoil. Specs (calculated performance??):

Span: 46.5 ft.
Length: 10.5 ft.
Area: 113 sq.ft
A/R: 18.7
Wt: Empty - 210 lbs, Max - 410 lbs
Wing Loading: 3.6 lb/sq.ft.
Sink @ 34 mph: 1.4 ft/sec
L/D @ 65 mph: 39.5
Max Des. Speed: 145 mph

The earlier Bowlus-Mitchell Wing glider employed NACA 0015 and 0018 sections with these devices, since the plane had originated as a twin-boom tailed aircraft. Its specs included a span of 46 ft, area of 235 sq.ft., A/R of 9, weight of 275 lbs (empty), and wing loading of 2.3 lb/sq.ft., to give an L/D of 18.

Later articles discuss the external controllers and state that the wing section used is the NACA 23015. The 5-digit sections have, as I recall, no reflex, but a very far forward max camber point and a straight camber line rearward from there to the trailing edge. I had thought that the NACA had run tests on just about every possible combination of devices mated to these sections. If Norm didn't find an applicable report, there probably isn't any such data. How about CFD results?? Performance data is given for the various Mitchell Wings in much of the late 1970's- early 1980's literature; so Karl probably has all that stuff. The U-2 might be easier to analyze and give ballpark figures.

The Mitchell "Stealth II", completed after Don Mitchell's death, employed the NACA 0015 airfoil again, with the drooped surfaces. An article in Hang Gliding Magazine (Les King, 'Mitchell Wing Stealth II - An Update', 11/94, pp.22-23) shows a truck-top test rig with Mark West of the Hang Glider Manufacturers Assoc. Perhaps he took some quantitative lift data, but only pitch stability, stall speed, and structural integrity are mentioned. Terrence O'Neill wrote about lawsuits in his 8/95 Kitplanes article, "Improving on a Winner". A noted designer/experimenter with unorthodox aircraft, O'Neill lists a large set of modifications he made.

Well, all of my Mitchell data comes from the popular literature, but there may still be some unpublished data out there somewhere. Perhaps someone else on the list can help further. I hope this is of SOME use.

Serge Krauss

December 9, 2002

Thanks, Serge, the excerpt from "Flying Wing Sailplanes" was new to me (in fact I don't have anything that Don Mitchell wrote). My copy of the A. R. Weyl articles is loaned out at the moment, and the gentleman that borrowed it went to Africa to view an eclipse, when he gets back I'll look up the article you mention. I also remembered seeing an auxiliary surface, on the I Ae 34, in "Nurflugel". They call the auxiliary surfaces "doppelflugel" and one of the captions mentions that the part of the wing it's attached to stalls later, unfortunately that chapter isn't translated (except for 3 paragraphs at the beginning and the captions) so all I know is what the pictures show. If the data from that experiment still exists it may be in the Horten archives.

It looks like all the European countries have their patent databases on line now, so it wouldn't be too hard to look up the Junkers patents (at least not for somebody who could read German). Here's the URL of the European Patent Office: http://www.european-patent-office.org/online/.

Actually he may not need any more help because, even though the N.A.C.A. reports weren't exactly what he wanted, I also gave him some e-mail addresses of people who have done similar work and one of them may be willing to share data.

Norm

December 10, 2002

To: Nurflugel:

Hello everyone you folks in this message group seem to really know a lot about the technical aspects of wings and aerodynamics in general. I have a question I would love some good technical answers to. I fly a Mitchell Wing A-10 and it has Don Mitchell's stabilators. I get this question all the time. "Why are they called stabilators?" I believe I understand the difference but I would like someone's technical explanation that I can pass on. Would someone please explain what all these controls devices are exactly: Stabilators, Elevons, Flapperons, and any other term for this control area I may have missed?

Thank you

Rex
Rex@mitchellwing.com
http://www.mitchellwing.com
http://groups.yahoo.com/group/Sport_Aircraft/

December 10, 2002

Stabilators: Independently movable surfaces that affect pitch and or roll. The all-flying tails on many modern fighters are often called Stabilators. I believe the control surfaces on your MitchellWing are called stabilators because they are attached to the wing but not part of it. The slot between the TE of the wing and LE of the stabilator probably makes it a more powerful control surface than a plane trailing edge surface.

Elevons: Trailing edge surfaces that function as elevators and ailerons. Often mixing the two functions in the same surface requires some compromise in terms of pitch or roll authority but if they're designed right control is adequate.

Flapperons: Surfaces that function as flaps and ailerons. Often they lose some roll authority when the flap deflection is more than 20 degrees and become completely useless as ailerons when flaps are more that 45, so they're not very useful on planes that need landing flaps but might be ok as trim flaps.

Norm

December 18, 2002

To: Nurflugel:

I am away from my archives, but does anyone recall a swept wing, prone pilot experiment by Dr. Farrar of TN in the 50s. A very clean design, with vertical swept center fin and rotating wing tips for control. Probably tried too much at one time, and his ground tow experiments wound up with a very painful face scraping on the impact. He survived and went on to conduct very light wing loading experiments, seeking a 1 fps sink rate to follow and observe soaring birds. I saw that ship, conventional long wing, very light construction in the rafters of a East TN hanger about 20 years ago.

Bob Storck
bstorck@sprynet.com

(ed. – At this point I took the picture shown on last month's cover and Bruce's text to make a quick addition to the website so the Nurflugel group could see a better picture and have more information on the Farrar wing. Bob then replied with the following.)

I knew there were more uncommon design aspects than the rotating tips and the prone position. As I recall, the controls involved pulling and twisting the grip handles in the wing roots. No foot pedal action. Add all this to a less than experienced test pilot, and success is doubtful. I do believe it was trial tested on a rig on top of a car, a scheme that Raspet favored, and also used in the Backstrom EPB-1 Plank. Before its final flight, it did gain a good-sized swept central fin, but I don't believe it had a rudder.

Bob Storck

AVAILABLE PLANS & REFERENCE MATERIAL

Coming Soon: Tailless Aircraft Bibliography Edition 1-g

Edition 1-f, which is sold out, contained over 5600 annotated tailless aircraft and related listings: reports, papers, books, articles, patents, etc. of 1867 - present, listed chronologically and supported by introductory material, 3 Appendices, and other helpful information. Historical overview. Information on sources, location and acquisition of material. Alphabetical listing of 370 creators of tailless and related aircraft, including dates and configurations. More. Only a limited number printed. Not cross referenced: 342 pages. It was spiral bound in plain black vinyl. By far the largest ever of its kind - a unique source of hardcore information.

But don't despair, Edition 1-g is in the works and will be bigger and better than ever. It will also include a very extensive listing of the relevant U.S. patents, which may be the most comprehensive one ever put together. A publication date has not been set yet, so check back here once in a while.

Prices: To Be Announced

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Tailless Tale, by Dr. Ing. Ferdinando Gale'

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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).

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VHS tape of Al Bowers' September 19, 1998 presentation on "The Horten H X Series: Ultra Light Flying Wing Sailplanes." The package includes Al's 20 pages of slides so you won't have to squint at the TV screen trying to read what he is explaining. This was an excellent presentation covering Horten history and an analysis of bell and elliptical lift distributions.

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VHS tape of July 15, 2000 presentation by Stefanie Brochocki on the design history of the BKB-1 (Brochocki,Kasper,Bodek) as related by her father Stefan. The second part of this program was conducted by Henry Jex on the design and flights of the radio controlled Quetzalcoatlus northropi (pterodactyl) used in the Smithsonian IMAX film. This was an Aerovironment project led by Dr. Paul MacCready.

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An Overview of Composite Design Properties, by Alex Kozloff, as presented at the TWITT Meeting 3/19/94. Includes pamphlet of charts and graphs on composite characteristics, and audio cassette tape of Alex's presentation explaining the material.

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VHS of Paul MacCready's presentation on March 21,1998, covering his experiences with flying wings and how flying wings occur in nature. Tape includes Aerovironment's "Doing More With Much Less", and the presentations by Rudy Opitz, Dez George-Falvy and Jim Marske at the 1997 Flying Wing Symposiums at Harris Hill, plus some other miscellaneous "stuff".

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VHS of Robert Hoey's presentation on November 20, 1999, covering his group's experimentation with radio controlled bird models being used to explore the control and performance parameters of birds. Tape comes with a complete set of the overhead slides used in the presentation.

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