No. 88 OCTOBER 1993

# T.W.I.T.T. NEWSLETTER

## CONVAIR XFY-1 POGO


The Convair "Pogo" has the distinction of being the first successful VTOL fighter in the world, this feat being completed in August, 1954.

The Pogo had a short, stubby fuselage, on which were mounted two near-delta wings and two enormous fins, one ventral and one dorsal, giving the arrangement a cruciform appearance.

Power was supplied by a 5,850 hp Allison YT40-A-6 turboprop engine, driving two coaxial propellers and a large spinner. The ventral fin could be jettisoned in flight were it necessary to make an emergency belly landing.

There was no doubt the Pogo project was a success, but the Navy did not feel it was a practicable proposition. There were still many problems to overcome; not least the pilot's uncomfortable accommodation, as well as, the need to develop a zero altitude ejector seat for his safety.

Before the test program was halted, it had flown a total of 40 hours.

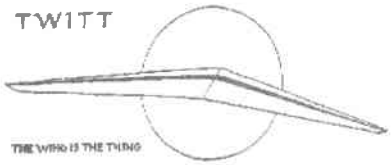
Contributed by: Kevin Renshaw

From: The American Fighter by Enzo Angelucci and Peter Bowers.

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., **9310** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, November 20, 1993, beginning at 1330 hrs at hanger A-4, Gillespie Field, El Cajon, Calif. (First hanger row on Joe Crosson Drive - East 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. 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

A quick reminder that effective October 1, 1993 the membership fees go up to $18, and meetings are changed to every other month (newsletters every month). The next meeting is November 20, so mark your activity calendars to make sure you don't forget.

We took advantage of a going out of business sale at Builders Emporium and picked up 16 new metal chairs for $5 each (regular $10).

I haven't heard from anyone about the proposed auction, or had any further donations. I would like to have it set for opening bids during the January 1994 meeting. If you contribute something we would also like a suggested minimum price to guarantee at least some revenue if only one person bids.

I hope those of you who have ordered the First Flights tape on flying wings were pleased with what you received. I gave you some of the other pertinent material from the library tapes (ME-163 and The Wing Will Fly). The price was only $8 so we put your extra amount into the new equipment donation pot.

We have had several requests for a list of the material in the library. Since we have reduced the number of meetings, it has been suggested that we use the minutes space to start passing this information along. It would mean that everyone would get the information without having to mail a separate listing.

We will be adding some of the appropriate presentations from the SHA Workshop to the video library by the end of this month.

**For those of you who visit the hanger the new gate combination is now 354.**

That's about it for this month's ramblings.

Andy

*** THERE WILL BE NO MEETING ***
*** IN OCTOBER. NEXT MEETING ***
*** WILL BE NOVEMBER 20, 1993 ***

## MINUTES OF THE SEPTEMBER 18, 1993 MEETING

**Andy** opened the meeting by stating that this would be the last monthly meeting. We will skip October, so the next meeting will be November 20.

He reminded everyone that the dues were going up to $18 on October 1, but any renewals received by the end of September would still be at $15. He said we would take up to at least two years of renewal at the $15 rate. (Ed. Note: By the time you read this the rate will be $18, no matter how many years you renew for.)

**ABOVE: Layout of the Mitchell Stealth II in Dave Swanson/Les King's workshop at Tehachapi.**

The program for the day was to consist of viewing the First Flights video, then Les King on Stealth II, and Budd Love covering blown flap configurations.

Raffle prizes for the day were to be the book Eagles High, "The Battle of Britain - The 50th Anniversary" along with a small water jug, and a larger Igloo water jug with built-in pouring spout.

Bob announced that the Pond Racer was destroyed in an accident at the Reno Air Races. It was a twin engine (auto engines) racer designed by Burt Rutan. Apparently, one engine caught on fire and he had to pull back the other engine to try to maintain control. This lack of power caused an emergency landing that was not successful.

We received a letter from Dr. Karl Nickel advising us of Dr. Reimar Horten's death in August. It is a great loss to the flying wing movement since he was still producing design information. At a Tehachapi workshop, Eric Raymond showed several pictures from his recent visit to Dr. Horten's residence, including some very deteriorated aircraft and one that was still in relative good shape.

Andy thanked Wayne Donaldson, our next door hanger neighbor, for the donation of an RCA VCR that was making some loud noises. Andy took it to a repair shop, got it fixed for a reasonable price, and we now have a reliable tape machine for the meetings. (Ed. Note: It was used to produce the First Flight tapes for two of our members, so it is getting a lot of use.)

We also went out the previous weekend and purchased a 25" GE color TV for use at the meetings (versus 2 20" TVs that would have required a lot of rigging and wiring). It was also cheaper to buy the one set that would be visible from the gallery, then buying two TVs. Everyone seemed to have enjoyed the First Flights video on the new set.

Andy covered the proposed auction we are trying to put together to help pay for some of the equipment and offset the storage costs for it. All donations are tax deductible, and a receipt will be provided with the applicable tax information to satisfy the IRS. We are looking for anything you think someone else might be able to use, e.g., aircraft parts, building tools, plans, etc.

The auction will be conducted by sealed bid so everyone has the same chance to win the bid. Harald Buettner suggested putting a minimum bid amount on the items so they don't go out the door "too cheaply". Any shipping costs to get an item to the winning bidder would be covered from the auction proceeds.

**Bob** introduced a surprise guest, Addison Pemberton, who had recently completed a flight over some historic air mail routes in his restored Stearman Senior Speed Mail. It was the 75th Anniversary of the Air Mail Service which started with a flight from Washington D.C. to Philadelphia in an airplane ferried to Washington by Rueben E. Fleet.

In 1921 the Trans-Continental Air Mail Route was initiated between Newark, NJ and Oakland,

CA. Addison flew the legs between Reno, NV and Iowa City, IA which was 1600 miles of the route. There were two Speed Mails, the other being the sister ship to Addison's, carrying 1,500 pieces of mail.

At each of the original air mail stops were having official celebrations with their own anniversary cancellation stamps. In some instances they carried a postmaster or official postal employee from one stop to another. Many of the stops had large crowds gathered at the airports and it took over 3 hours to sort and stamp the mail each of these stops.

Addison's most overwhelming comment was that he was amazed the trip was ever flown by a DH-4 due to the density altitudes and the lack of supercharged engines. They found some of the remaining beacon towers and large concrete arrows laid out along the route of flight.

A humorous note to some of the tragedy that occurred on the mountain legs was a telegram from one of the pilots that read: "Engine quit; Killed cow; Scared me; Mail safe." He was lucky since the life-span of the early pilots was 90 flight hours.

A side-note to this was that Jeppeson was one of the air pilots and started drawing accurate maps of the routes and making carbon copies for other pilots (remember they didn't have photocopy machines back then).

**ABOVE: Right wing outer panel joint showing rear sub-spar and fittings. Stabilators (elevons laying on top of wing.**

**BELOW: Closeup of the Stealth II center section construction with the left spoiler in the raised position.**

Andy then ran the video of A&E's First Flight program on flying wings.

Andy then introduced Les King who is assisting Dave Swanson in completing the Stealth II that Don Mitchell was building for Dave.

**Les** King is the head of Working Design that does all kinds of neat, weird flying machines. He began his presentation with a little history of foot launched aircraft and how we got to the higher performance machines of Don Mitchell.

Don built a flying wing for Howard Long, which was one of the first ones to appear in the fledgling hang glider arena. George Williamson then set several world records with the Mitchell wing. The designs went through a number of iterations, leading to the Stealth II, and 40' span, high aspect ratio wing.

Dave Swanson contracted Don to built a Stealth II for him, but Don passed away with the aircraft about 3/4 completed. Dave approached Les to help him with the engineering aspects of the project. Les decided it would be interesting, especially since there was almost no formal documentation of the design and construction.

Les began researching prior Mitchell wing

designs and talked with people who had experience with them. He was concerned about flutter of the stabilators (Mitchell's version of elevons) and found one flier who said there had never been a problem. Later he found someone else who commented there had always been some problems with flutter, and then he ran across one aircraft with mass balances on the surfaces. So this is one problem they are going to have to address as they finish work on Stealth II.

One well known aeronautical engineer that Les talked with was Irv Culver, who had had numerous conversations with Mitchell about flying wing performance. Irv suggested Don use the Culver Twist which is a twist distribution which gives washout that progresses very rapidly from the root, reaching zero at the tip. The results were better stability and efficiency numbers for the wing.

On the control surfaces, Don had built in 10° of twist in an area where the wing had only 2° of twist, which bothered Les. He also didn't like the airfoil Don had chosen for the control surface. Les, Dave and Irv discussed it and decided to go with a 0015 airfoil and twist it match the washout of the wing.

**ABOVE: Left outer wing panel looking at the tip end with tube for mounting tip rudder. The three protrusions from trailing edge are hinge points for stabilator.**

Irv also suggested a speed trim, or trim tab, on the stabilator so that at higher speeds the surface trailing edge would go up creating a nose up condition and speed stability. They are going to incorporate this into the plane.

Les also talked with Tasso Proppe about some structural concerns that will be addressed by static testing and aerodynamic testing on a truck rig for hang gliders. Tasso also had some questions about the takeoff attitude.

It seems the wing has a tendency to rock back onto the trailing edge when sitting statically. To correct this, you have to aft mount the landing gear which then creates a problem with takeoff rotation. Les has solved this problem by moving the gear forward and putting some skids out the back to keep it from rolling back. This is not quite as much problem for the foot launch version, and he feels they have a handle on the corrections.

Control authority was another concern of Tasso's in the area of using cross controls to maintain coordinated flight in slow, high banked turns. They are going to work on this through proper sizing of the control surfaces, but for the present they are staying with what Don has in the design.

They have put some simple spoilers on the top of the wing for glide path control. In order to prevent unwanted pitch changes, Dan Armstrong suggested having the spoilers come out with the leading edge above the surface. This would allow the air to flow through, maintaining the camber line, but providing plenty of drag.

Construction of the stabilators is foam and fiberglass, with the airfoil cut with a hot-wire system. The airfoil will be 0015 so it won't be a pitching airfoil.

Dave is working on a faring that will go around the tricycle cage. It will still be foot launchable, with completely retractable gear (his legs).

They are thinking about changing the tip rudders to provide more effectiveness, but this will come after flight testing with the present size. Les commented that they should have good power due to the moment arm of the longer wing.

Early testing will done on Mark West's hang glider test rig. It is a large size truck with a very powerful engine and a very sophisticated sting mounting with electronic force transducers for measuring lift and drag. The pitch of the wing can be changed while in motion, getting up to speeds of about 70 mph.

Dave is planning on doing some wave flying with the Stealth II, but the good news is that they plan on doing some test flying at Torrey Pines. They may try to do it on one of our meeting days (no promises yet) so we can have it at Torrey and observe Stealth II's performance first hand.

Don used the NACA 0015 airfoil, apparently due to the low drag. Someone else thought he had used it so that only one set of molds would have to be made if a different type of construction were used in the future. Les pointed out that this wouldn't work due to the Culver Twist, which is not symmetrical on the top and bottom.

Although the 0015 may be low drag at low coefficients of lift, such as speeds control

surfaces operate at, it not very good at higher coefficients of lift. Les feels that the 230-15 airfoil Don used in earlier wings was one of the best decisions he made. Dan Armstrong is suggesting HQ-34 airfoil, developed by the Darmstadt folks in Germany, for their flying wing. It has good performance, but the stall characteristics are worrisome due to the washout parameters.

Other things they are considering for follow-on developments of the Stealth II are changing the taper ratio and using diffuser tips. They plan on talking extensively with Irv Culver on the future of the plane.

Construction changes might include molded D-tubes, fiberglass and carbon fiber spar which could be easy and cheap, and possible foam ribs with plywood or fiberglass cap strips.

**ABOVE: Right outer panel looking from the center section joint. Tip rudders move outboard only, and be move simultaneously for drag control.**

Les wrapped up by commenting there will be constant evolution in the Stealth II, including renaming it something more appropriate as the changes occur. There are no definite plans for what the future will hold, so they too will just evolve.

Andy passed around some pictures he took of the Stealth II as it sat in Dave's hanger at Tehachapi. (You have seen these as you read through these minutes.)

Ralph Wilcox asked about the future use of fiberglass reinforcing material for some types of construction. Les thought that Don had experimented with this technique in the Victory Wing, but was not certain. Les indicated commented that you can get the rod material right of the shelf, however, it was hard to tailor it to a specific use within the wing.

They are planning on using the technique of creating a channel the size of the spar and then put in one layer of 45/45 glass for a spar web, and then lay in carbon fiber in the corners so they can be tapered. This allows you to select the number of shear webs you want and the number of strands of carbon fiber for the cap strips. Another thing you can do is put in pins and wrap the carbon fiber around them so you don't have to drill holes.

Bob Chase asked about an extended wing version of the B-10. Les had heard of a Super B-10 with a 40' span, but had not seen one. Dave indicated the it was to be the B-10E using extra sets of the #6 ribs (root rib) to extend the span. Don had planned on creating this variation after finishing the Stealth II. Dave has tried to get whatever plans or sketches might be available from Richard Avalon or other builder, but so far has been unsuccessful.

Bob Chase also asked Les about ultimate load factors and what he thought were acceptable limits. Les felt the minimum should be 4.4Gs, but it depends on the particular application. He noted that the Gs aren't all the problem since the pilot can come in contact with the airframe and do damage that will destroy the structure versus a g-loading causing failure.

After Les' presentation, the raffle was conducted with Bob Chase taking the big Igloo jug, and Doug Babb winning the book and smaller jug.

The floor was then given to Budd Love for a discussion of jet powered flaps in the context of the HIAM wing.

**Budd** had a handout with an equation for computing horsepower from a jet compressor. This has provided some very useful information for determining what will be needed to produce the necessary air flow over the flaps to provide the lift. He was pleased that this formula had come from a NASA scientist, Dr. Daniel C. Mikkelson of the Lewis Research Center, who had heard of HIAM. The formula is: $HP = 208\ W\ [\ (P/14.7)^{.286} - 1\ ]$

where: HP = Horsepower
P = Pressure, psia
W = Compressor flow, lb/sec

Budd and Les had a brief discussion on the compressor requirements needed to produce the lift coefficients shown in a graph on the handout. Budd indicated that there may not be an engine currently available, but by the time HIAM becomes a reality there will be one with the capability to support the horsepower and flow requirements.

Ralph Wilcox asked if there were plans for

a test plane to show proof of concept. Budd indicated a Cessna Skymaster would be a perfect airframe, since you could mount a compressor in the aft engine compartment to provide the air for a modified wing.

Ralph also asked about whether or not the ailerons and tail surfaces where blown to keep everything in balance. Budd responded that they were, and that high pressure lines can be run anywhere in the aircraft necessary to produce high air mass flows. Ralph indicated that he had heard the lines would have to include triple redundancy, but that manufacturers didn't know how to produce such a line, at least at that time.

There was a discussion between Budd and Phillip Burgers on the powerplants ability to overcome the increase in CL due to the external flow of air. It started to get lengthy, so Andy suggested that it might be a good subject for a future meeting.

With that in mind, Andy thanked everyone for coming, and reminded them that the next meeting would be in November.

## LETTERS TO THE EDITOR

9/1/93

TWITT:

**Enclosed** is a sort of overlooked tailless design, the Convair XFY-1 Pogo. Everybody get so fascinated with the VTOL aspects of the design that we seem to forget that this was another example of the Convair delta wing family from the 1950s.

The three view and data are from "The American Fighter" by Enzo Angelucci and Peter Bowers. The line drawing is from the instruction t an Airmodel vacuform plastic kit. KP Models also recently released a nice 1/72 scale injected model of this aircraft.

Enjoy,
Kevin Renshaw

*(Ed. Note: Thanks to Kevin for pointing out the "error" of our ways in overlooking this obvious tailless aircraft.*

*Your letter works perfectly into an item on a recent letter from Gunther Rudat. He comments: Are there no voices in the US to claim a change in your inches system? In you money system $1 = 100 cents and not 120. It is so easy with a decimal or metric system - 1 centimeter (CM) = 10 millimeters (MM) or 100 CM = 1 meter, etc. I saw on an english measure plan set: 1/4, 1/8, 1/16, 1/32, 1/64, but in metal sheet thickness they take a mixture of the inch and decimal system like 0.0125" or others. In your schools don't they teach about the facility of this system (10 -100 - 1000) and their divisions?*

*In answer to Gunther's question, there is some exposure to the metric system in the American school system, since there is a mixture of the measurements throughout our industries. Unfortunately, we have been unable to decide as a people which system should be the official one and convert fully to it.)*

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9/20/93

TWITT:

**I** love your Don Mitchell "Five Place Amphibious." There just aren't enough sea planes around.

I build radio controlled models. The best way to do this one will be to copy the Waterman "Aerobile" for the wing, rudders and power source, then place them on the body of a Republic "Sea Bee" and you got it.

The idea of a "foldout" or center fold is great.

Thank you very much,
Eugene Turner

*(Ed. Note: Hopefully you have given someone an idea for a new winter project. If anyone does try this concept in any fashion, i.e., hand launch testbed, RC, etc., please let us know the results (preferably with pictures)).*

## BITS AND PIECES

**FROM: Rigid Wing Reader, Volume 1, Issue 5, Fall 1993.**

"MORE RIGID-WINGS! Here they come, more rumors of rigid-wings. Eric Raymond indicated at the Tehachapi SHA Workshop that he wants to design a collapsible rigid-wing to roll up and transport on your roof-top rack just like a flex-wing. According to Mike Meier, 'right now, Monte Bell of UP has a serious interest in developing a rigid-wing based on the Klingberg wing, with which he is personally very impressed.' Add these to the prospective rigid in Albuquerque, the Stealth II in Modesto, Danny Howell's APEX, and, of course, the Bright Star SWIFT and the Carbon Dragon (the latter two available now) and you have what appears to be an exciting rigid-wing future right around the corner. I have a feeling that there are other projects out there somewhere, and I hereby deputize all RWR readers as reporters in charge of ferreting out the unknown(s)!"

*(ed. We would like to thank Chuck McGill for his comments on the efforts of the TWITT Newsletter in furthering the*

*development of flying-wings within the realm of foot-launched sailplanes.)*

**FROM: R/C Soaring Digest, "On the Wing." by B², Volume 10, No. 8, August 1993, p. 17.**

This short article in the monthly column written by Bill and Bunny Kuhlman (TWITTers) describes the efforts of Dr. Ing. Ferdinando Galè (also a contributor to TWITT's newsletter) in putting his theories into flight. He has built a free flight, hand launched glider (Ubara) which was intended to be a proof of concept for a larger RC version later on. The following comments seemed of interest to all flying wing enthusiasts.

"The lifting area between the two vertical plates has a flat bottom airfoil set at four degrees, while the outboard stabilizing tips are just flat plates set at minus four degrees. (ed. The planform is a sweptback wing similar to that of Klingberg, but with fences inboard of the tips that look more like tip plates if the outer portion were removed.) The cuspidate tail, a la Horten, has a reflexed trailing edge. The initial idea was to alleviate the burden on the two stabilizing tips. The adjustable elevons, of thin aluminum, had to be set at neutral because Ubara turned out to be ultra stable. The measure glide ratio is about 9:1, which is not bad for such a rough arrangement.

"Now the funny part of the story. After many hand launches, the tips were so damaged that I decided to tear them off before scrapping the model. The big surprise! Without the stabilizing tips the model is as stable as with them. The glide path seems to be better, too."

The questions of why the tip removal didn't adversely affect performance, was performance actually improved and why, and how can this information be used in future designs are being asked by B².

They are good questions, and if any of you out there have some explanations, we would be glad to hear from you. It will be interesting to see what B²'s readers come up with compared to that of TWITT readers.

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**FROM: R/C Soaring Digest, Volume 10, No. 9, September 1993, p. 15.**

Jim Gray received an advance copy of a new book from B² Streamlines titled "On the Wing...the book" by Bill and Bunny Kuhlman. It is a compilation of the "On the Wing" columns written over the years and has received very high praise from Jim.

"The book is dedicated to the memory of the late Dr. Ing. Walter Panknin (1944-1992), who was famous for his "Flying Rainbow" colorful tailless sailplanes, and for his lecture at a MARCS Symposium in November , 1989; Basics, Building and Beauty of Tailless Sailplanes."

Jim goes on to say that it is fascinating and easy reading, and that B2 have made an effort to improve the readability of the text and update the source listings, plus provide additional and supplemental information toward the goal of comprehensiveness and completeness.

It is arranged in chronological order of events, designs, philosophies, and engineering information as they occurred and became available. There are 3-views aplenty, entire computer programs in BASIC that you can use to determine wing twist and sweep for stability, a program to help you adapt the Werner series of reflexed sections, a program to use the Panknin twist formulae, Al Halleck's RAZER 1 design, and the Irv Culver formula.

There is much more to this book then briefly covered here. If you are interested in obtaining a copy, send your check or money order for US $28 to:

B² Streamlines
P.O. Box 976
Olalla, WA 98359-0976

They also have Dr. Ing. Ferdinando Galè's new book on structures and design for model aircraft: Structural Dimensioning of Radioguided Aeromodels. Its 105 pages, fully illustrated. The price for this is US $18. If you enjoyed his book Tailless Tail, you are sure to want this one also.

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**ALSO FROM: The September 1993 issue of RCSD:**

An advertisement for the FANTASQUE, a flying wing designed for thermal flight. The all composite hollow core construction is prepainted, with a 3-part wing for easy transportation. The specifications are:

| | |
|---|---|
| Span | 115.0" |
| Length | 67.2" |
| Weight | 15.2" |
| Total Area | 9.9 sqft |
| C.A.L. | 7.8 sqft |
| Airfoil | SD-3016 at root<br>Symmetrical tip |

For more information call: Nichols Research, (602) 582-0768, or write 20614 N. 18th Ave., Phoenix, AZ 85027. The price was quoted at $210 post paid, or $260 radio ready.

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## AVAILABLE PLANS & REFERENCE MATERIAL


**Tailless Aircraft Bibliography**

by Serge Krauss

3rd Edition: An extensive collection of books, articles and other items

*(Ed. Note: These two pages were extracted from Sailplane Builder, Vol. XII, No. 8, August 1993, pp. 14-15. The title indicates the original source of the material.)*

# The SWIFT

**Reprinted from the "Rigid Wing Reader (Summer '93)**
**(adapted from Bright Star Gliders promotional brochure)**

Finally, the SWIFT, the missing link between hang-glider and sailplane. Combining the fun and versatility of a hang-glider and comfort of a sailplane, the SWIFT offers the ability of foot-launch and soar cross-country with greater confidence than ever before.

## DEVELOPMENT

The SWIFT, which stands for Swept Wing with InboaRD Flap Trim, is the culmination of over six years of design and development by renowned aeronautical engineers Ilan Kroo and Stephen Morris at Stanford University, with BRIGHT STAR Gliders' Brian Robbins, Eric Beckman, and team pilot Brian Porter. Rigorous flight testing of three full-size prototypes, several radio-controlled models, and thousands of hours of computer analysis have gone into creating the SWIFT.

Built for ruggedness and reliability, the Swift is a composite flying wing, primarily made up of a foam core surrounded by aerospace KEVLAR,WiTH carbon fiber reinforcements. Aircraft aluminum, chrome-moly steel, and aviation hardware finish out the structure. The SWIFT is manufactured to rigid specifications and exacting tolerances, and each aircraft is factory test-flown before delivery. The SWIFT was designed to meet the Sailplane strength and stability standards as described in FAR Part 23, and has been positive load tested to over 9 G's. Extensive vehicle testing has demonstrated the SWIFT's excellent pitch stability through all angles of attack. HGMA certification is being sought, and testing is currently underway.

## PERFORMANCE AND CONTROL

Being a hang-glider that looks and acts like a sailplane, the SWIFT is the highest performing totally foot-launch and landable aircraft produced in the world. With the optional pilot fairing, the SWIFT has a maximum L/D of 25:1. More importantly, the L/D is still greater than 15:1 at 60 mph (97 kph) IAS. Initial performance tests revealed an L/D of 20:1, even without the pilot fairing attached. It is the SWIFT's excellent glide at higher airspeeds that produces its sailplane-like performance. The large tip chord and full-flying winglets, combined with the SWIFT's balanced sweep and twist, add up to a rigid-wing that climbs in small thermals as well as the best flex-wings currently available.

At the recent hang-gliding X-C International (Pre-Worlds) competition in the Owens Valley, two SWIFT's completely dominated the meet. Due to the unseasonable weather, only seven tasks were flown with distances of 72 to 117 miles (115 to 187 K). Conditions were demanding on the 120 international pilots (including 4 World Champions). Scoring was by Total Elapsed Time, and by the end of the meet, the two SWIFTs were less than ten minutes apart, yet they were more than four hours ahead of the fastest flex-wing.

Unlike flex-wing hang-gliders, the SWIFT achieves increased performance without sacrificing any handling qualities. By using aerodynamic control surfaces (elevons and inboard flaps) instead of weight shift, positive control is maintained at all flight speeds. The elevons (combined elevator and aileron) are operated from a single side-mounted control stick that predictably mixes the pitch and roll of the glider, while the fixed winglets stabilize the yaw and interact with the elevons to coordinate turns. The flaps are controlled with a rope and a camcleat. Flaps are primarily for glide slope control, and slowing the wing for launching, landing, and thermaling.

## PORTABILITY

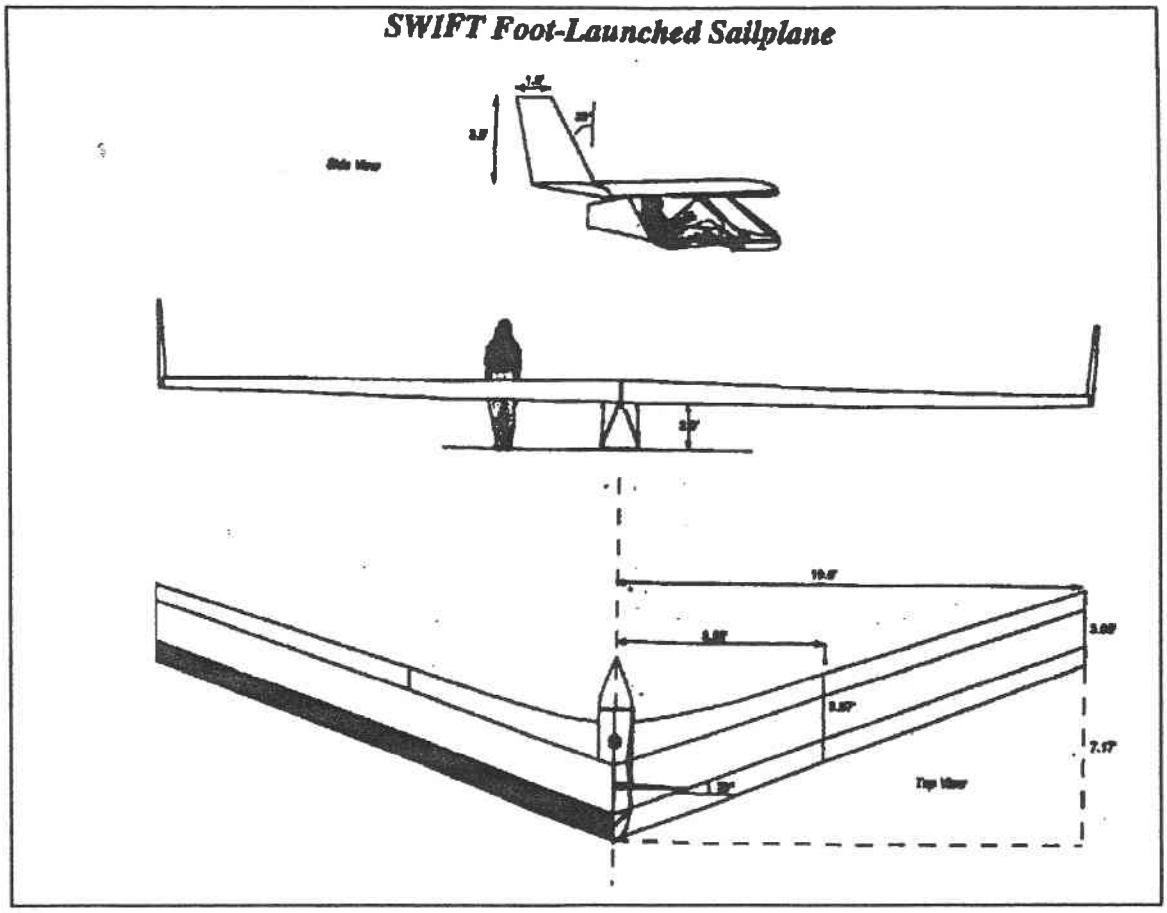
The SWIFT is a true composite rigid-wing that can be assembled by a single person in about 30 minutes, without the fairing. The pilot fairing adds a few minutes more. After flying, the glider disassembles into two halves with the control surfaces flipping over to lay on top of the wing. The winglets and fairing are removed, and the hang-cage disassembled, The entire package fits into an optional carpeted cartop transport box. The dimensions of the box are: 35 in. wide X 22 in. tall X 21.5 ft. long (.89 X.52 X 6.5 meters), and utilizes two wing and one component shelves, with front, rear, and side access doors. The box is easily cartopped on most hang-glider rack systems along with one or two flex-wings.

## FLYING THE SWIFT

The SWIFT has excellent static balance, with the wing being supported by shoulder straps which leave the pilot's hands free to operate the stick and flaps. Foot-launching the SWIFT is in some ways easier than a flex-wing glider, as the control surfaces provide better pitch and roll authority any time the wind is greater than 3 or 4

miles an hour. Launch assistance is generally not needed except in very turbulent launch areas. The SWIFT has been launched in many conditions, from sea-level to over 9,000'. Landing the SWIFT, like any high performance flex-wing, is easiest when the surface winds are greater than 3 or 4 mph. In calm wind the SWIFT can be landed on the wheel. Tow launching the SWIFT is easily accomplished with any conventional method for hang-gliders. Extensive flight testing has demonstrated the SWIFT's docile stall characteristics and extreme reluctance to spin. Pilots are finding the transition from flex-wings and other aircraft very straightforward. While the SWIFT is easy to fly, it still takes some getting used to. A mandatory two-day training program is included in the purchase price of each SWIFT.

More information on the SWIFT may be obtained from Bright Star Gliders, 48 Barham Avenue, Santa Rosa, CA 95407. Ph.: (707)576-7627.




| SWIFT Specifications: | Classification | FAI Class II Hang Glider |
|---|---|---|
| | Wingspan | 39 Feet (11.89 Meters) |
| | Wing Area | 135 Sq. Ft. (12.54 sq. m) |
| | Aspect Ratio | 11.5:1 |
| | Weight | 115 lbs.(50kgs) + Emerg. Chute |
| | Rated Load | +6g to -4g |
| | $V_{ne}$ | 72 mph (115 kph) IAS |
| | Taper Ratio | 0.75 |
| | Flap Chord | 15% |
| | Twist | 8 degrees |
| | C.G. Location | 4.0 ft. from nose |

**BELOW: The illustrations below were prepared by Tasso Proppe and published in the September 1938 issue of Model Airplane News. Maybe they will give some of you an idea or two for a model project to fill in the winter months.**

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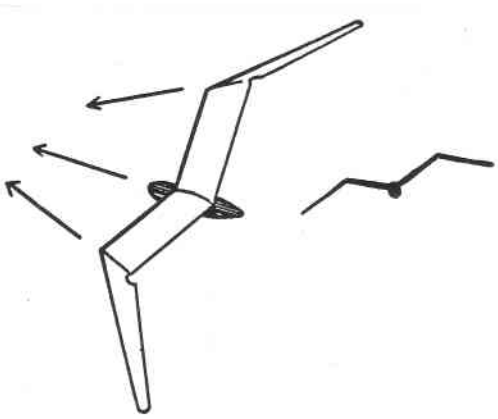

***ABOVE:*** *"Weltensegler" of Mr. Wench, 1921. Note absence of rudders. Designer believed in getting sufficient directional stability only by means of a suitable position of the wing panels to each other.*

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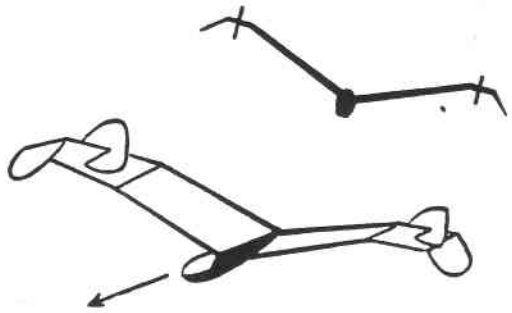
***BELOW:*** *The "Leipziger Flugel" Leipzig wing. Constructed according to the principles of elliptical distribution of lift; showed extraordinary gliding angles; directional stability is likewise good.*



***TOP OF NEXT COLUMN:*** *The "Stork" of Mr. Lippisch, 1922. Procured directional stability by shewing the profile from the inner to the oute side (by flattening the vault), and diminishing the angle of incidence by nearly 10 degrees.*

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***LEFT:*** *The "H.A.W.X." of Hans Adenaw. Strove for longitudinal stability by changing the profile (washout) in the following manner; the inner parts of the wing were vaulted flatly positive, the outer panels slightly negative.*