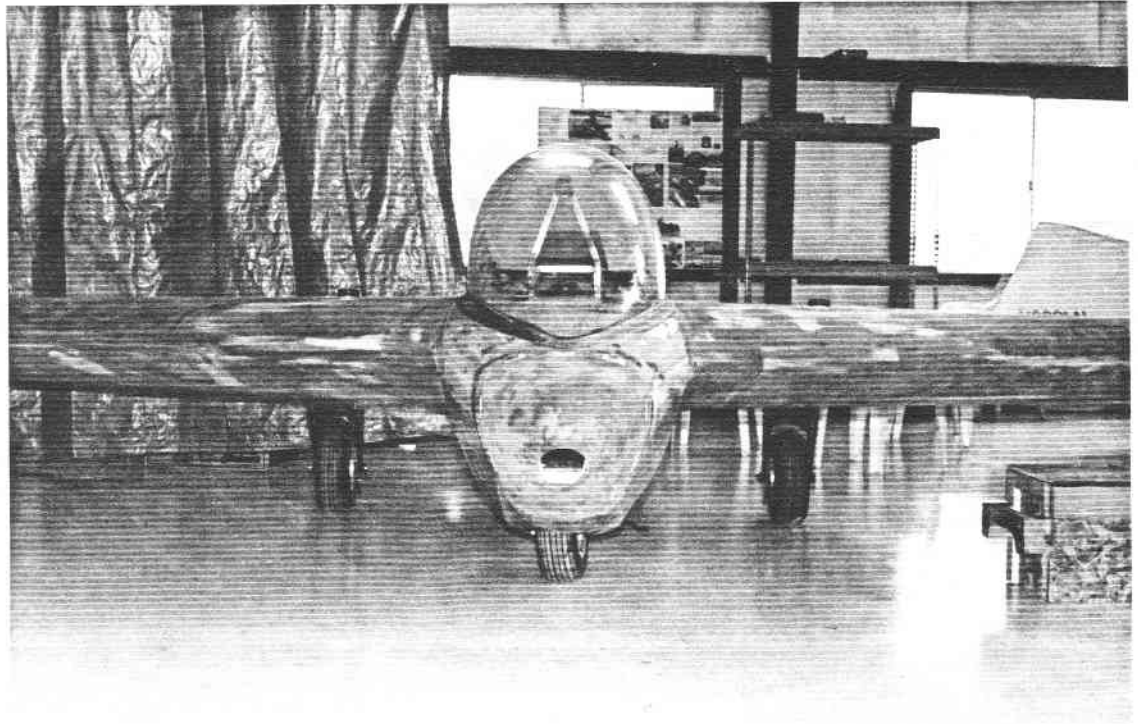


# T.W.I.T.T. NEWSLETTER

Front view of Scott Bridges Mitchell U-2. Main gear will be converted to retracts after initial flight trials.

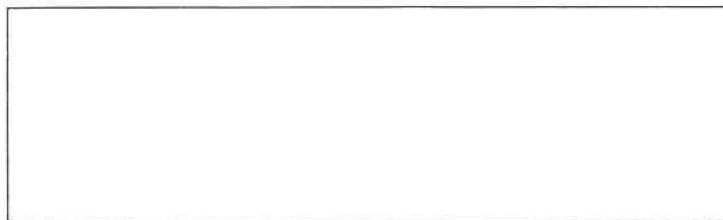
For more information, see Letters to the Editor on page 5, and pages 6 & 7 for more pictures of this flying wing project.

Photo by Scott Bridges.



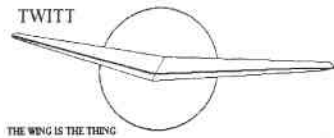
## T.W.I.T.T.

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., **9808** means this is your last issue unless renewed.

**Next TWITT meeting: Saturday, September 19, 1998, 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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- Editor: Andy Kecskes**

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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**

Last month's meeting was a joy with Taras Kicienck keeping everyone's attention glued to the slide screen as he went through his life and history of hang gliding (which are kind of one and same according to some people). I was surprised at the number of members that sat back down after the ice cream and cake to watch the video of his Super-8 film which had been converted to VHS format. There were a lot more questions asked, but unfortunately I forgot to turn the tape recorder back on to pick up some of the real jewels that came out of that session. As you can see we also had a short outside session where Taras "put on" an Icarus II we had set up for the meeting.

I would like to thank Scott Bridges for his contribution of black and white photos of his Mitchel U-2 project. I hope everyone enjoys the look at a real project that is underway and reaching the point of almost being completed. I am sure we will hear from him after he has flown his pride and joy. We will look forward to it.

For you computer nerds out there, I will be upgrading my internet connection next week to a very high-speed data line. This should allow me to reach more web sites faster and easier, including downloading more of the better quality pictures available on some of them. At some point in time we may also be able to offer the newsletter on line for those who would like to take advantage of that method. One advantage to this is the ability to include color pictures in with the text so that you can get the full effect of what we are trying to show you. This will also change my e-mail address, and I think I will be able to get a separate address for TWITT in association with a home page of our own. I'll keep you posted.



**SEPTEMBER 19, 1998  
PROGRAM**

**T**he September program is lining up to be a real treat. We are trying to confirm a speaker who will talk about his experiences with a Kasper wing. If everything goes as planned, we will have a Kasper flying wing from Alturdyne at the meeting for everyone to inspect, along with the parts of another wing sent to us by R.W. Long, a TWITT member in Florida.



**MINUTES OF THE  
JULY 18, 1998  
MEETING**

**A**ndy welcomed everyone to the usual El Cajon summer heat festival that punctuates our meetings at this time of year. He quickly covered the house-keeping items so everyone knew the what's and where's of personal need items. He also announced that we would be having cake and ice cream at the end of the presentation to celebrate TWITT's 12th Anniversary (ed. - it's hard to believe we are still around after all these years).

Bob Chase took the floor to announce that he had donated his Mitchell B-10 wing to the Sailplane Homebuilders Association (SHA) with the anticipation that they would offer it for sale during the SHA Western Workshop auction on Labor Day weekend Saturday night at Tehachapi. The wing is covered and painted up through the first silver coat so it has been FAA approved since it also had a "N" number when he purchased it from the original builder. Proceeds from the sale will go to SHA. This move was preceded by Bob having continuing heart problems that necessitated a change in life-styles that didn't include flying anymore. He still plans on testing his various theories, but now he will have to do it through radio controlled models.

He then tendered his resignation as Vice President of TWITT since he didn't feel he would always be available to fill in if Andy wasn't around to conduct the meetings or take over other presidential duties should the need arise. Andy expressed the group's reluctance in accepting his resignation, but that we understood his desires and wished him good health in the future.

Andy talked briefly about the SHA Western Workshop pointing out who some of the speakers would be and what could be expected during the 3 day event. (ed. - see the formal announcement sheet and registration form later in this issue.)

We then had a quick round-robin with everyone telling us who they were and where they came from. It was very

evident that the Fronius family was really into aviation since there were four of them in the audience today.

There being no other business or announcements from the group, Andy introduced Taras Kicienck, Jr., who was going to tell us about the early days of hang gliding and the use of tailless aircraft, both rigid and flex wing type, during this development period.

Taras opened by thanking us for having him, since was his first opportunity to come to the Fronius hanger and see some of the nostalgic items, as well as, acquaint himself with areas he used to frequent as a boy. His program was to be broken down into three phases, including a series of slides, demonstration models and, video tape of his early experiences with flying wing hang gliders.

The slide show began with a shot of Taras flying an Icarus I of the dunes at Torrance Beach. It was one of his first soaring flights with the aircraft. The wind was very strong that day, equaling just about the forward speed of the glider. Later we would see video of him almost hovering over the edge of the slope, or flying nearly sideways up and down the slope due to the excessive crab angle necessary. Someone asked about the comparison between the Icarus I and the EasyRiser. Taras indicated they were somewhat similar, but the ER had a little shorter wing span and a thicker airfoil.

The next shot was of the Icarus II which was aerodynamically about the same as the I, but had a number of structural changes. He thought the picture was of his first or second time flying the glider at Torrey Pines. One of the changes was streamlining the inter-wing struts, and the covering had been changed to polyester dress lining because it was stronger and had a better color than the older 2 mil polyethylene.

A series of pictures next showed various phases of the flying session at Torrey Pines with the Icarus II in about late 1972. The shots showed the different sitting positions he could use, including a seat to take the pressure off the arm pits or by putting his feet up on the front bar. This latter position also improved the aerodynamics of the glider, was more comfortable and provide a gap cover between the two lower wing surfaces. He thinks he was the first to ever do a soaring flight at Torrey Pines with a hang glider, and he had one flight that lasted over an hour.

Alex Kozlof asked Taras what the inspiration was for the design of the Icarus series. The Icarus one came from two sources: Jack Lambie's Hang Loose based on a Chanute type glider and; Richard Miller's Conduit Condor which was similar what eventually turned into some of the more modern hang gliders. Taras felt Miller was probably very much ahead of his time with the design and with his development of the rogallo type wing (he called it the Bamboo Butterfly). This design was further promoted by Jim Forman from Texas who got it out into a wider population of the young daredevils of the day.

Taras talked a little bit about his attendance at the first Montgomery hang glider meet held in Corona Del Mar or Costa Mesa (he couldn't remember exactly). This is where he saw some of the gliders that eventually led to the Icarus

series. He and his partners had brought along their Batso rogallo type glider made out of bamboo, polyethylene plastic covering and held together mainly with some old fashioned baling wire. He had an aspect ratio of about 1 on a 16' wing span, with about at 3:1 glide ratio and 7-10 fpm sink rate. It was difficult to soar it, but he did have a couple of experiences with long glides off of the steep slopes in high wind conditions. However, these also resulted in several wing inversions which he said was quite scary.

imagine this is where the true idea of the Icarus series came from, what with the sun and heated wings, etc.).

The Icarus I had already been built before someone asked Taras if he had been influenced by the Burgess-Dunn designs. When he went back and looked at the Burgess-Dunn he could see the similarity, but it didn't have as much decalage although there was more sweep. He thought that the Icarus was closer to the Estes model rocket that used a bi-plane flying wing called the Flying Jennie. He had built one of these rocket boost gliders while in high school so that was probably more in his mind than an actual Burgess-Dunn design.

The Icarus V was the next evolution in the series with a better airfoil and a single, larger wing. Paul MacCready and his assistant, Peter Lissaman, came up with a Liebeck type of airfoil for the Icarus V. This airfoil was designed to get all the lift at the leading edge section of the airfoil by having a pressure distribution that was sort of squared off at the stall angle where the pressure jumped to a high suction value. The aft part of the wing was then used to regain the pressure back to atmospheric without stalling the wing.

They started with a small copy of Liebeck's airfoil and kept blowing it up on a copying machine. It didn't have the amount of chord they wanted, so they redesigned the aft portion and put in some reflex to get the stability. Peter ran the airfoil lift distribution pressures on a computer and they did some more refinements to eliminate any possible stall points. This airfoil gave the Icarus V a glide ratio almost double what anything else of the time was achieving.

The V had about 15 degrees of sweep and almost 7 degrees of wing twist. The twist was probably more than it needed since it was very stable. He said you could get it up to about 60 mph but it took a very quick weight shift forward and then it would recover to level flight almost immediately. If you just moved the weight forward slowly the glider probably wouldn't exceed about 35-40 mph since it was so stable. It weighed about 65-79 lbs. when loaded with the usual instruments. The V had about 160 sq. ft. of wing area compared to the II's 190 sq. ft. Stall speed on the V was a little lower than the II, but due to the abruptness of the stall the V had to be flown onto the ground instead of trying to bring it in just above the stall before letting your feet touch.

The Icarus V was built from all metal except for the covering. The ribs were bent aluminum tubing top and bottom with no bracing in-between. There were several compression ribs and cross bracing within the wing. The spars were 2" aluminum tubes which was twice the



ABOVE: Taras reunited with an Icarus II outside the hanger. It was built and flown by Wayne Donaldson for a number of years before he put it away until this meeting. The wind was almost strong enough down the channel formed by the hangers to lift Taras' feet off the ground. Wayne decided to hang the hang glider from his hanger ceiling so it could be enjoyed everyday. Photo by Wayne Donaldson.

Taras and his friends had been able to do some test flying of their Batso before arriving at the meet, which was unusual in those days. Much of the meet consisted of test flying by most of the participants (the video seen after the meeting was adjourned showed very graphic footage of these "test flights" as their designers tried everything to get off the ground). Some of them were actually still trying to finish their gliders at the meet before doing their first flights. Since the wind wasn't very strong on one day, they used the tried and true bridal method and towed many of the gliders into the air. "Into the air" could mean the pilot lifting his feet off the ground long enough for the glider to float a few feet down the hill before falling off on a wing or incurring some other type of "landing".

Richard Miller probably had some of the best flights with the Conduit Condor. Its performance was somewhat hampered when the plastic covering stretched from the heat of the sun and changed the airfoil shape (ed. - I

diameter from the Icarus II. Taras did all the stress testing on the V and he found it would take almost a 2000 lb. load which for his weight was about 9 g's.

The next series of pictures covered some of the other types of hang gliders being flown around the 1973-74 time frame, but there wasn't a lot of discussion about each of the designs. One slide showed a Marske Monarch in-flight, he thought over Oshkosh.

From this point Taras moved onto his experiences with human powered flight aircraft. This was an attempt at the Kremer prize some time before Paul MacCready and his team built the Gossamer Condor. They had taken the approach of building a shorter, low winged aircraft that would operate better in ground affect and then take a short burst of speed to clear the required 10' high obstacles at each end of the course. In retrospect, he has reanalyzed it and found that the friction caused by the air bubble dragging along the rough ground actually caused more problems than it solved.

It had a span of 41' and a 6' chord so it had a lot of wing area. It was supposed to weigh 100 lbs., but came out at about 140 lbs. due to the liberal use of expanded polystyrene foam. Their construction techniques resulted in a fairly strong aircraft since it survived many attempts at flight without breaking too badly. They finally achieved the first man powered flight in the US one day when the plane left the ground for about 4 seconds.

Hindsight says they probably should have had a longer, higher wing with only the tips being close to the ground. The idea here is for the tips to hold the air in under the wing and reduce the induced drag since it would equalize the upwash in front of the wing and the downwash at the rear.

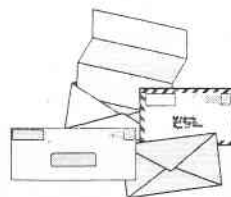
Taras explained a little about why he thought the Americans had won the Kremer prize over the Brits who were sponsoring the competition. A lot of it had to do with the methods used to produce the various aircraft. In the case of the Brits he thought that they had a rather formal design, construction and testing system which served only to slow down the development process. On the other hand, the MacCready team built a relatively simple machine very quickly and it was easy to repair and/or modify with new design ideas so development progress was much more rapid. The final Gossamer Condor wasn't anything like the original plane, which was the result of all these changes in design and construction.

The next series of slides included shots of the Condor during the latter part of its development and while in the flight where it won the prize. The question was asked about why the Condor's canard was mounted so low in front of the pilot pod. Taras speculated that it was for several reasons, including allowing the pilot to view the surface's position since it provided some of the turning control as well as pitch control. During this period there was some general discussion on the general construction and layout of the Condor and then moved on to the Gossamer Albatross that eventually flew across the English Channel to win the other Kremer prize.

Another Kremer prize was offered for the fastest human powered flight and this started the project called the Bionic Bat. It won one of the legs for the prize using a stored energy system for augmenting the power the pilot needed for the speed dashes. Taras commented that this could actually be considered an initial prototype for future ultra-light soaring gliders using augmented power to get airborne and assist if the lift got weak. (ed.- we may hear more about this concept from Bruce Carmichael at the November meeting.)

After Taras finished with his excellent presentation, the meeting was adjourned so everyone could have cake and ice cream, a welcome relief to the heat of the day. We also had some model flying going on both inside and outside the hanger. A small group then sat down and watched about 30 minutes of the video tape Taras brought showing some of the very early hang glider activity in Southern California.

Once finished with the video, Bob and Floyd Fronius convinced Taras to get into Wayne Donaldson's Icarus II that was set up outside the hanger. It appeared to bring back some good memories for Taras as he struggled to keep the glider headed into the wind that was flowing in-between the hangers. The lift produced by the wings was almost enough to get Floyd's and Taras' feet off the ground as they held on to the pilot bars.



## LETTERS TO THE EDITOR

July 15, 1998

Dear TWITT:

I am a professional aviation writer, a regular contributor to several reputed French and English aviation magazines such as Air Enthusiast, and the author of some 25 books as well. At present I am writing a World's History of Flying Wing and Tailless Aircraft, and I thought you - or one of your members - could be of some help to me.

I am looking for an enthusiast able to provide me with a few photographs depicting little-known American tailless aircraft such as the Arrowhead Safety Airplane (1930), ARUP S-2/-2/-3/-4, Johnson Uni-Plane (1934), Hoffman Flying Wing (1934), University of Minnesota T-1 (1936), Bowman (1940), Cornelius Mallard (1941), Eshelman FW-5 (1942), Sebring Wee Wing (1949), etc.

This will be of great help to me for a part of my book will be devoted to a comprehensive inventory of aircraft and projects (some 300 on inventory by now).

I would greatly appreciate if you could forward this letter to the right man in TWITT, and I now remain looking forward to hearing from you soon.

Yours sincerely,

Alain J. Pelletier  
28, allée du Champ Tortu  
f-91190 Gif-sur-Yvette  
FRANCE

*(ed. - I have provided Alain with the names and addresses for Serge Krauss, William Foshag and Richard Snyder as possible sources of information for the aircraft he has mentioned, as well, as others he may not be aware of from his research.*

*If any of you would like to contribute to his collection and possibly see your favorite flying wing come to life in a book, please send your photos directly to him.*

*I also asked him to keep us up to date about this book so that we can print an advertisement when it is published, hopefully, in English. I'm sure I will hear back from him again when the time comes.)*

July 20, 1998

Dear TWITT:

I am starting to see why you have some months with issues that you need more from the readers. Getting black and white film developed was a chore.

My U-2's wings are covered and primed along with the elevons and rudders.

The mid section is almost ready. I want to install my two rear tanks in the landing gear area. Fuel with all four tanks will be 20 gal. If dry hang test confirms that the 12 gal. aft tank is not needed, then I won't.

Shock system is to be changed once flying to retract type.

My slow point now is trying to figure where the engine mounts on the 14" tray that moves 6.5", because the engine cowl is going to be very tight and has to be in sink with the engine moving and the CG almost perfect. I don't have everything done to know that yet. Had a few questions about airfoil used on the wing with negative reflex on the inboard section, from the readers. Was debating on changing at one time, but like Richard (Avalon) says, "Just get it done, get it flying". He has been a very big help with his background in the U-2.

Thanks,

Scott Bridges  
54312 Armstrong Road  
Scappoose, OR 97056

*(ed. - Scott sent along a nice collection of B&W photos of his progressing project, enough to cover over 3 pages of the newsletter. Obviously, we can't publish them all, but I will include several in this issue [page 6 & 7] and use some of the others as filler in the future. I would like to thank him for sharing his project with our members.*

*It's a nice looking aircraft and appears to have received a lot of thought as it was constructed.*

*Just as a note, member's don't have to send in B&W photos since we quite often get them half-toned a sheet at a time so they can be used in the newsletter. This is a little more expensive for us, but if it makes it easier for you, please send in color photos rather than going to a lot of trouble taking and developing a B&W roll of film. I am hoping we will have a good quality flat-bed scanner in the next several months that we can use to produce our own half-tones. It will eventually pay for itself this way.*

*Many of the photos I have used lately were taken from internet web sites as color and I then converted them electronically to B&W so they would reproduce better in the newsletter. So far this has been relatively successful.)*

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## THE COLLECTED WORKS OF STAN HALL

**The Collected Works of Stan Hall** is now available for sale from the SHA. A compilation of all the writings of Stan Hall, a prolific author of sailplane design, construction, flying and testing, the Collected Works is a must for any sailplane designer, builder or pilot. Writings in the collection encompass the 1950s into the 1990s, and include all his articles in Sailplane Builder and SHAptalk, and all of his very popular column, Homebuilders Hall, from Soaring magazine. Also included are articles from other newsletters and presentations, including the Barnaby Lecture and SSA presentations.

This is a marvelous addition to any airplane and sailplane enthusiasts library. It is over 300 pages long, and through the generosity of Stan Hall, all profits go to the SHA to support its activities.

Order your copy now! Price per copy is as follows, prepaid in US dollars, price includes tax, postage and handling (make check payable to SHA):

Sent to any US address	\$23
Sent to Canadian/Mexican address	\$26
Sent to any other address	\$28

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## NEW MODEL WINGS

**T**he May 1997 issue of R/C Soaring Digest contains an advertisement for two slope soaring flying wings and a construction critique of combat wing version.

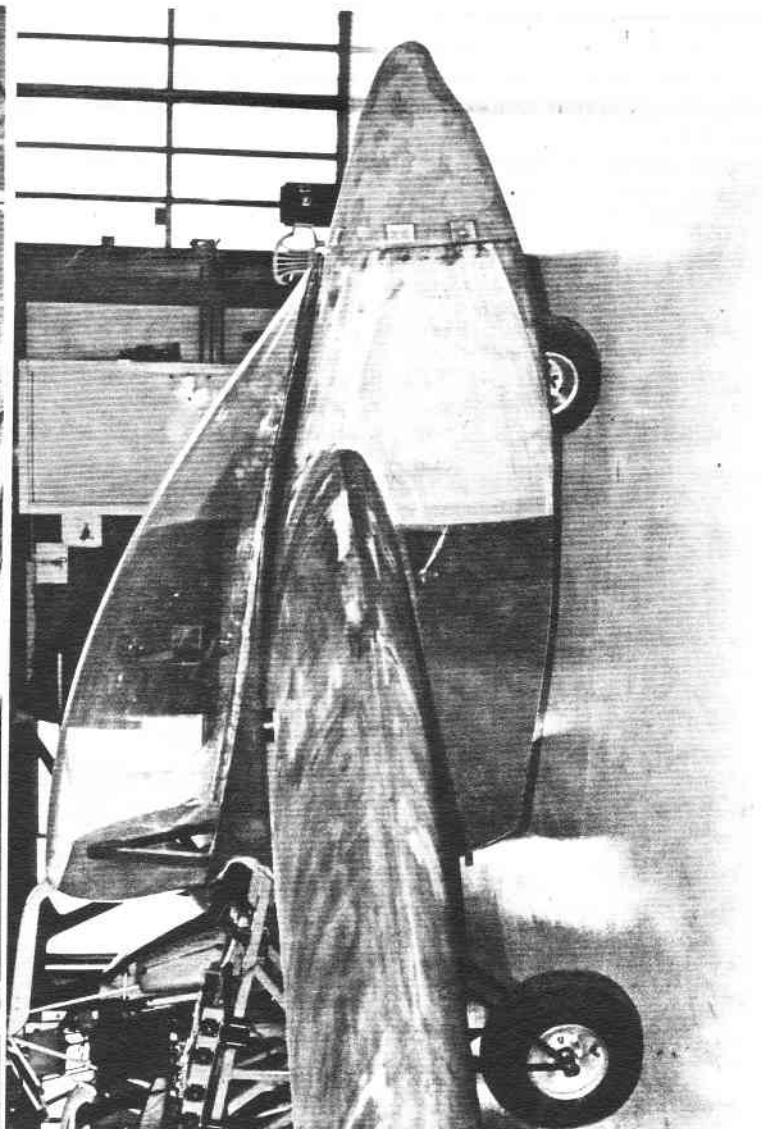
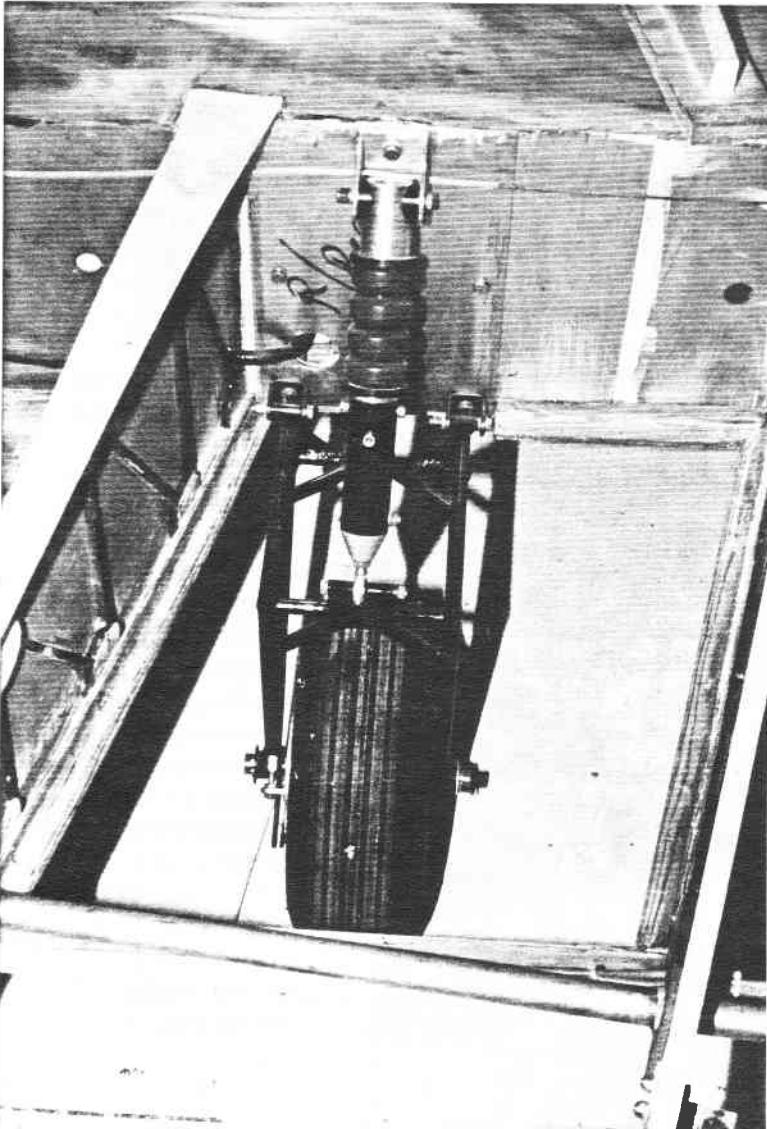
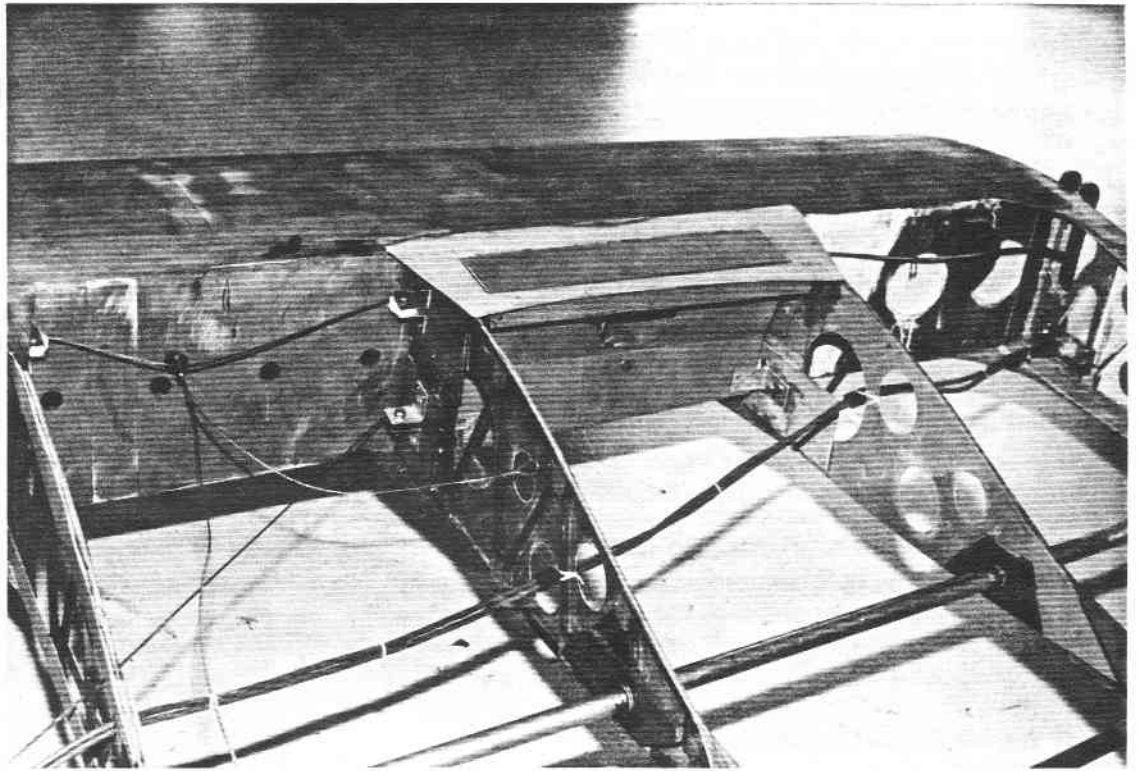
The two models are offered by TRICK R/C, 938 Victoria Avenue, Venice, CA 90291, Tel. (310) 301-1614, e-mail [Zod@Zagi.com](mailto:Zod@Zagi.com), or can be viewed at <http://www.Zagi.com>.

They both have 48" wing spans, 408 sq. in. of wing area and operate on 2 channel radios. The RAZOR (@ \$65)

RIGHT: Mitchel U-2 wing structure showing the spoiler and what appears to be the aileron torque tube.

BELOW: Urathane shock system (same as on a sport copter) that will be replaced with retracts.

BELOW RIGHT: Side view of the fuselage and wing structure. Light grey area is probably clear glass with a protective covering now. Engine not installed yet, but will have side air intakes. Rail mount can be seen.



uses a Zagi 12/1 airfoil and the ZAGI-LE Combat Wing ( @ \$45) uses a Zagi 12/5 airfoil and operates at about an ounce less per square foot of wing loading than the RAZOR.

The RAZOR is a high performance slope combat wing using all EPP foam cores and beds, carbon fiber spars with steel joiner, formed balsa trailing edge and elevons with Coroplast ramped winglets.

The ZAGI-LE Combat Wing has an expanded polypropylene EPP foam leading edge laminated to the tough 2 lb. foam core covered with 2.4 mil poly-tape. It's available in six colors and only requires 3 hours to build.

*(ed. - Here are some excerpts from the article "SHORT CUTS" by Steve Savoie, as published in R/C Soaring Digest, May 1997, pp. 30-31.)*

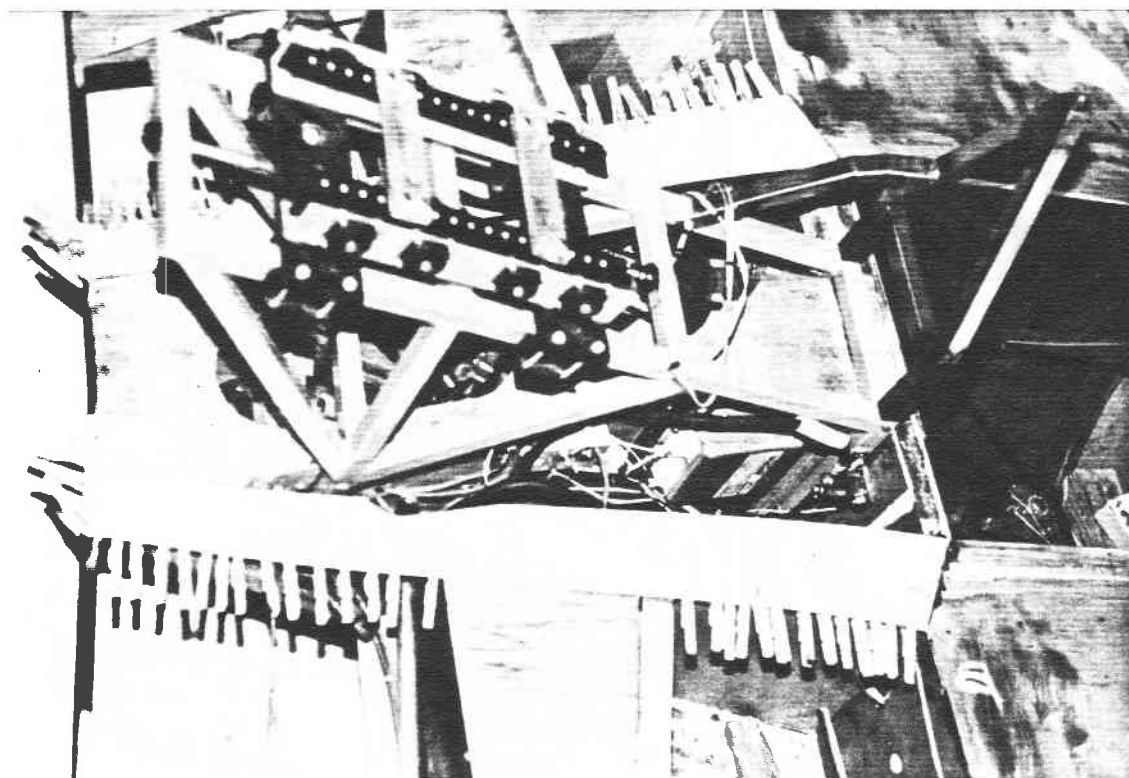
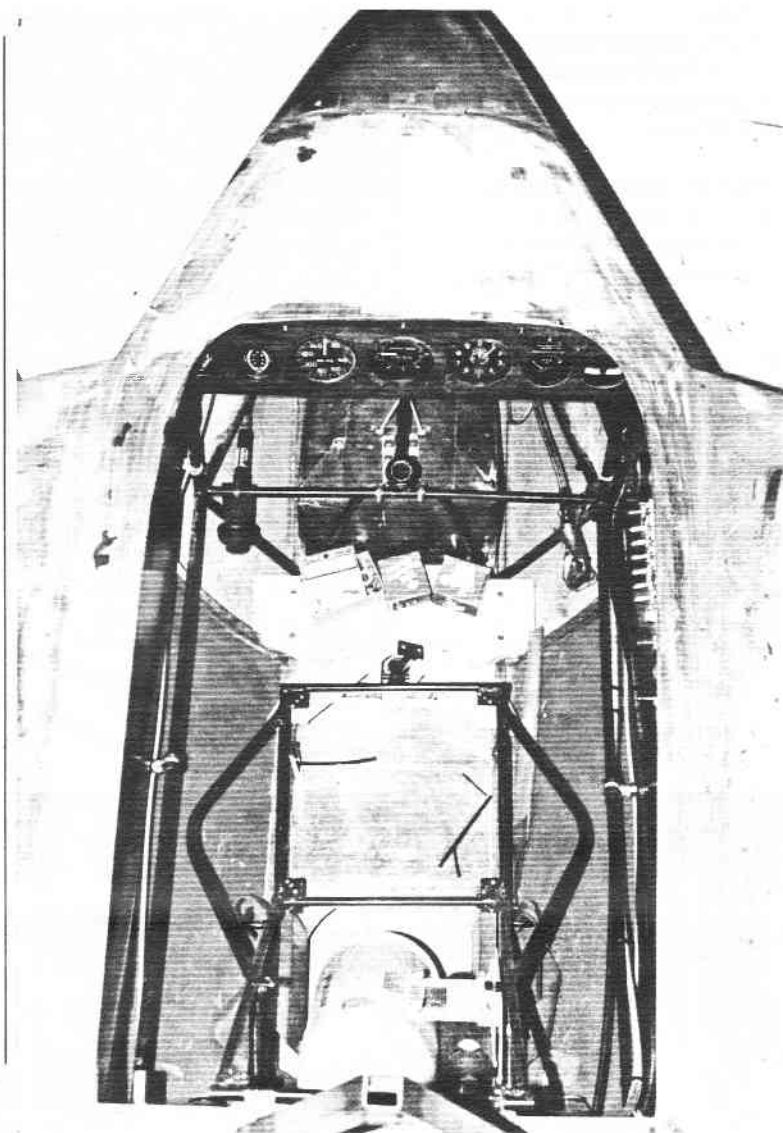
"The plane wing was built by six members of the Club in less than 3 hours, and flown the very same afternoon at one of our more challenging slopes."

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**RIGHT:** Top view of the cockpit area and instrument panel. Note location of ballastic recovery system cannister at the bottom of the picture (behind & below the pilot seat). The roll bar can also be seen at very bottom.

**BELOW:** Fourteen inch engine mounting platform that can move 6.5" anytime, including in-flight. This is one of the problems Scott mentioned about the fit of the coweling and how to allow for engine movement.

---



"The construction was simple and the instructions were clear, even with six builders working at once. I'm not sure that the center section reinforcement step (optional EPP foam inserted in center nose area) did much good, since most of this foam gets cut out for the equipment bay."

"We deviated from the directions slightly by routing out the recesses for the electronics, servos, and antenna prior to



marks on the wing, and then try to cut through. The position of the CG on the plans was perfect for the first flights."

"It flew surprisingly well in the turbulent light lift conditions that day."

"Construction was very straight forward. We used the alternate (combat) building method for a reinforced nose. This option used a plywood brace (not included in kit), with additional EPP foam (included) in the nose."

"The first flight was great; the plane (wing) flew great in the light conditions, and didn't need any trim."

"The recommended throws were fine, stalls (forced) were straight forward mush with no tip stall. With dual-rates on high, the wing performed loops and rolls with ease in relatively light lift."

"Even after hitting a tree at 30+ mph, the Zagi recovered nicely from the in-flight flip and continued to fly without any ill effects."

*(ed. - The current issue of R/C Soaring Digest no longer has the advertisement for this glider. However, if you are interested in building something like this, you might give them a call and/or check the web site to see if the kits are still available.)*

---

**AVAILABLE PLANS & REFERENCE MATERIAL**

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**Tailless Tale**, by Dr. Ing. Ferdinando Gale'

Consists of 268 pages filled with line drawings, tables and a corresponding English text. It is directed towards modelers, but contains information suitable for amateur full size builders. Price is \$38.

**On The Wing...the book**, by Bill and Bunny Kuhlman (B<sup>2</sup>) A compilation of their monthly column that appears in RCSD. Many of the areas have been expanded and it includes coding for several computer programs to determine twist and stability. Priced at US\$28.00.

**On the 'Wing...the book, Volume 2**. Contains "On the 'Wing.." articles from January 1993 through 1997. 234 pages of technical and non-technical articles on the wide variety of topics of interest to enthusiasts of tailless configurations. Priced at US \$28.00, packaging and postage included.

Prices include packaging and postage to any destination worldwide. Washington residents must add 7.6% sales tax.

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**Personal Aircraft Drag Reduction**, by Bruce Carmichael.

This 207 page, soft cover, 8½ x 11" book starts with a chronological history of experimental verification of large theoretically predicted drag reductions on aircraft components having extensive laminar boundary layers. Practical problems which could limit attainment of these large drag reductions are discussed and methods to minimize the problems are suggested. The book is limited to aerodynamic considerations, principally on drag reduction. 195 illus., 239 ref. Priced at \$25.00 postage paid:

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An 8'x 11", soft cover booklet containing 70 pages of 44 illustrations, 24 3-views, characteristics of 22 ultralights, 13 lights, data from 18 sustainer engines, reducing propeller drag, available plans, kits and safety. Priced at \$15.00 postage paid.

Bruce Carmichael  
34795 Camino Capistrano  
Capistrano Beach, CA 92624

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**VHS VIDEOS AND AUDIO TAPES**

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

Cost: \$8.00 (postage paid)

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

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