

April, 2000

Vol. 17, No. 4

U.S.A. \$3.50

R/C
SOARING

Radio controlled

DIGEST

THE JOURNAL FOR R/C SOARING ENTHUSIASTS



R/C Soaring Digest

Radio controlled

THE JOURNAL FOR R/C SOARING ENTHUSIASTS



AN EPP SLOPE JET

Richard Loud, Ballston Spa, New York, launches his RPV Industries EPP U-2 on one of its initial test flights. The look of the U-2 is unique and the RPV Industries' kit does it justice. U-2 angle captured in the photo is very similar to the angle that the full size U-2 is most often photographed.

Richard's kit review is included in this issue. Photography by Dave Garwood, Scotia, New York.

R/C Soaring Digest (RCSD) is a reader-written monthly publication for the R/C sailplane enthusiast and has been published since January, 1984. It is dedicated to sharing technical and educational information. All material contributed must be exclusive and original and not infringe upon the copyrights of others. It is the policy of RCSD to provide accurate information. Please let us know of any error that significantly affects the meaning of a story. Because we encourage new ideas, the content of all articles, model designs, press & news releases, etc. are the opinion of the author and may not necessarily reflect those of RCSD. We encourage anyone who wishes to obtain additional information to contact the author. RCSD was founded by Jim Gray, lecturer and technical consultant. He can be reached at: 210 East Chateau Circle, Payson, AZ 85541, (520) 474-5015, <jimgray@netzone.com>.

RCSD should not be considered to endorse any advertised products or messages pertaining hereto. An advertising rate card is available for businesses and clubs.

RCSD Staff

Jerry Slates - Editor/Technical Editor
Judy Slates - Managing Editor, Subscriptions
Lee Murray - RCSD Index/Database
(available on-line)
Bill & Bunny Kuhlman - RCSD Web Masters

Please address correspondence to:

Jerry & Judy Slates
R/C Soaring Digest
P.O. Box 2108

Wylie, TX 75098-2108 U.S.A.

(972) 442-3910, FAX (972) 442-5258

e-mail: rcsdig@aol.com

<http://www.halcyon.com/bsquared/RCSD.html>

Feature Columnists

Scott Gradwell, Bill & Bunny Kuhlman (B'),
Robin Lehman, Lee Murray, Tom Nagel,
Mark Nankivil, Dave Register, Dave Sanders,
Steve Savoie, Jerry Slates, Gordy Stahl

Artwork

Gene Zika is the graphic artist
who designs the unique ZIKA clip art.

Copyright © 2000 R/C Soaring Digest.
All rights reserved.

TABLE OF CONTENTS

- 3 "Soaring Site" Judy & Jerry Slates
Editorial Montague Cross Country Challenge, RCSD index, Rahm Winches
- 4 "Jer's Workbench" Jerry Slates
Construction Techniques The Baby Albatross - Part II
- 6 "On The Wing..." Bill & Bunny Kuhlman
Flying Wing Design & Analysis Swept Wings and Effective Dihedral - Part 4
- 8 Tech Topics Dave Register
Design Considerations Battery Management Systems
- 10 "Hot Air" Robin Lehman
Large Scale Sailplanes A Letter from Frank Oest, Germany
..... International Alpine Slope Festival
..... 2000 NATS Sailplane Scale Event & Logic Behind Proposed Changes
- 12 Radio Antennas Lee Murray
Design Analysis Rubber Duck Antenna for the Airtronics Stylus Transmitter
- 14 "Gordy's Travels" Gordy Stahl
Frequency Control Why Sailplaners Do It Different
- 16 Kit Review Richard Loud
..... RPV Industries EPP U-2
- 18 "Have Sailplane, Will Travel" Tom Nagel
Travel Saga Flying In North Dakota
..... Al Nephew Reports on Hobo Sloping the Giant Holstein Butte
..... More Adventures in the Badlands
- 21 "Cross Country Soaring" Scott Gradwell
Cross Country Soaring Basics & Techniques Cross Country Achievement Badges
- 22 "The Natural Side of Thermal Soaring" Lee Murray
Weather's Impact on RC Soaring Clouds and Thermal Development
- 24 "Short Cuts" Steve Savoie
Construction Techniques X-4 Part 3

OTHER GOOD STUFF

- New Products
- 27 Classified Ads
- 26 Schedule of Special Events
- 28 R/C Soaring Resources
- 30 Advertiser Index

Damaged or Improperly Bound Copy?

Please let us know, and we'll replace it.
Something always slips by every month!

RCSD ON THE WEB

<http://www.halcyon.com/bsquared/RCSD.html>

Subscription Information

Advertising Rate Card Adobe Acrobat PDF format

Highlights & Mailing Status of the Current Issue

RCSD Feature Columnists, Reporters, and Editors

..... E-mail/web addresses, plus general information about their areas of interest.

"Getting Started in RC Soaring" Getting started guide - Adobe Acrobat PDF format

"Building Along" Construction Aids

..... Modifying & Building the MB Raven (Parts 1-4) Bill & Bunny Kuhlman

..... 1/5 Scale Pilatus B-4 Jerry Slates

..... Low Tech Design & Construction - RES Model Coming Soon

..... 1/12 Scale U-2R/TR-1 Coming Soon

Links to Clubs & Organizations

Hot Topics

Event Coverage (Color Photography!)

"In the News" - A compilation of news items of interest to soaring enthusiasts.

On-Line Articles - Great articles originally written for the printed version of RCSD.

Bookshelf Listings - A listing of recently published books of interest to aeromodelers.

Complete RCSD Index, 1984-1998

The Soaring Site

Montague Cross Country Challenge

For those of you interested in Cross Country soaring, Dean Gradwell says that 60 folks, 15 teams, have signed up for the Montague Cross Country Challenge, scheduled to be held June 10-11 at the Siskiyou County Airport in Montague, California. That's a **lot** of cross country soaring. Wish we could attend, Dean!

RCSD Index

We have an update on the status of the index from Lee Murray, Keeper of the RCSD index:

"Back in January, Bill (Kuhlman) provided a compressed file of the index that can be read by the Macintosh. The PC-Soar web page has been modified to offer both the PC/DOS & Windows version and a Mac OS version. I can't really test the Mac version, but I can download it from my page, which is a good sign. It is a file called 'Mac-RCSD.sit'."

Our RCSD web weaver, Bill Kuhlman, says:

"The file is in Text-Edit Plus format, but should be readable by just about any application which can read text files. Since the resulting file is so large, Apple's TeachText and SimpleText, which in some versions are limited to 32K file size, may not work. The file can be imported into such applications as WordPerfect, Microsoft Word, Nisus Writer, etc., and then saved in that application's formatted style. If anyone has problems downloading

the file, they can contact us for assistance."

Thanks Lee and Bill!

Rahm Winches - Retired

We received the following from Lawrence D. "Larry" Rodger in North Carolina:

"Just got off the phone with Mrs. Rahm and learned that Cy has retired due to age and health. Since his winches, and retrievers, have earned a world wide reputation, I thought it might be appropriate to post such notice in the "Digest".

"Mrs. Rahm told me her husband had been a master machinist with Hugh's Aircraft for many years, and he would manufacture

his winches in his back-yard shop from plans off the top-of-his-head.

"There are no plans to "sell the business" and some of his shop has already been disposed of.

"I asked Mrs. Rahm to tell Cy the world wishes him well, and we all express our appreciation for his contribution to this hobby."

Thanks for letting us know! Indeed, Rahm winches are well known all over the world. Our deepest thanks to him for his significant contribution to our wonderful hobby!

Happy Flying!
Judy & Jerry Slates

F-80c

SHOOTING STAR
EPP INDESTRUCTIBLE
PSS FORMIE JET FIGHTER
SPAN: 48" AIRFOIL: E374
Only In MiG Alley



\$64.95 + \$6 S&H each
Send A SASE For A FREE CATALOG

MM Glider Tech

phone: 562-927-2583
P.O. Box 39098, Downey, CA 90239
e-mail: mmglidrt@keyway.net
http://www.mmglidertech.com

The Great Midwest

Oc-Tow-Berfest

2000

Three Days September 29 - October 1

St. Louis, MO. area Fun Fly Aerotow

for Giant Scale R/C Sailplanes.

Sponsored by the Midwest Air Wing R/C Club.

Pilots Choice Awards for Best Modern and

Vintage Sailplane as well as Best Towplane.

Food available on Saturday and Sunday.

Field open to early arrivals on Thursday.

\$20 Entry Fee / Towpilots Free

Event Coordinator Peter George 314 664 6613

twometer@worldnet.att.net

Flying begins after 9AM pilots meeting.



Jer's Workbench

Jerry Slates
P.O. Box 2108
Wylie, TX 75098-2108
(972) 442-3910
RCSDigest@aol.com

Bowlus Baby Albatross - Part II

Looking at the photographs of the Baby Albatross, with its pod and boom fuselage, one would think that this would be an easy model to build. Unfortunately, it's not.

The pod portion of the fuselage is built on a keel, just like a boat. (See photo #3.) The keel is 25 1/4" long, 1 1/4" wide, by 1/2" high. While I really wanted to cut the keel out of plywood, the wood supply at the local hobby shop consisted of only 24" plywood. So, I elected to build the keel by laminating 8 pieces of 1/16x1/4" spruce together.

As shown in photos #1 and #2, the keel was constructed by first tracing the shape onto a pine board, making a single cut using a bandsaw. The 8 pieces of 1/16x1/4" spruce were glued together and clamped as shown in photo #2. For any of you building along, I would like to offer a suggestion. If you plan to do any laminating like I did, don't cut the wood to size. Rather, add an inch or two to each end of the project; cut to the correct size later. If you cut the wood to the final size first, when they're bent around a curve, the section on the inside of the curve will be correct, but the outside of the curve will come up short.

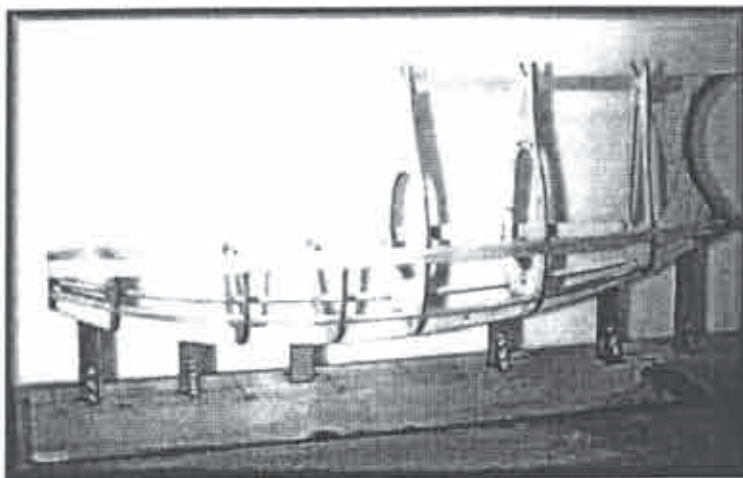
After the glue has cured, the keel can be removed from the clamps, and the wood will be nicely curved.

Time to Lay the Keel

But, how?

Starting with a 2x4, I marked a center line from one end to the other. The position of each former was then marked on the center line.

The next step was to find the center line of the fuselage on the plans. I drew a parallel line about 1" below the fuselage bottom. Let's call this my base line. Positioning the keel on the plans, I measured from the



#5 Bare bones, start of construction.

visited the copy machine and made a copy of the formers. The copies were glued onto a sheet of 1/8" plywood with 3M 77 contact cement. Once satisfied, the formers were cut out as shown in photo 4.

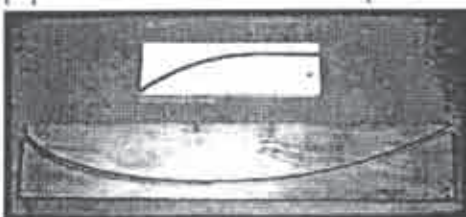
Once the keel has been layed out, and the formers are ready to go, construction can commence.

Each former was positioned on the keel and glued in place, with the aid of a square. Stringers were added as shown in photo #5.

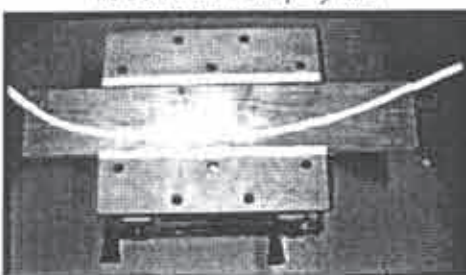
And, that's as far as I got this month. Until next month, keep your batteries dry and the wind in your face! ■

bottom of the keel to the base line. It is now evident as to how long to construct the stand-off's. Each stand-off is then placed between each former. When each stand-off was cut to the correct length and glued to the keel, this unit was then glued onto the 2x4 as shown in photo #3.

The next step is to cut out the formers. I don't know about you, but I don't like to cut up my plans, nor the little scraps of paper that litter the workbench top. So, I



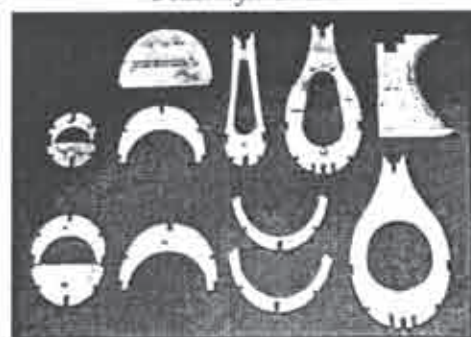
#1 Board cut to shape of keel.



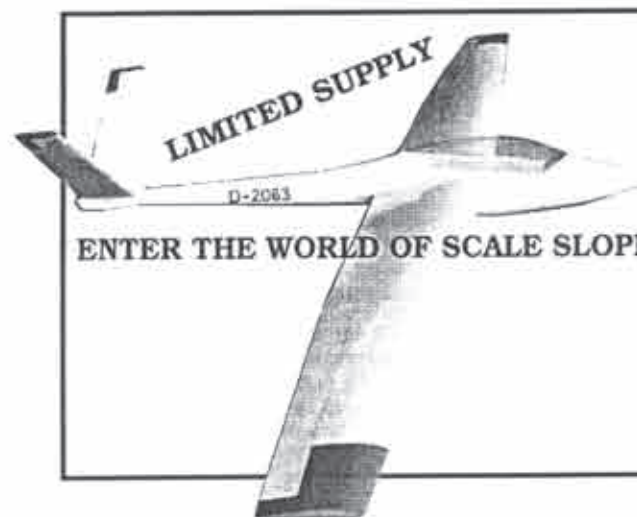
#2 Eight - 1/16x1/4" spruce strips glued and clamped together for keel.



#3 Keel layed on 2x4.



#4 Formers all cut from 1/8" plywood.



ENTER THE WORLD OF SCALE SLOPE FLYING WITH THE H101 SALTO

H101 SALTO SPECIFICATIONS:

Wing Span	90"
Wing Area	540 Sq. In.
Flying Weight	Approximately 64 oz.
Airfoil	Modified E-392
Controls	Ailerons, V-Tail Mix
Kit Price	\$399.95 + \$25.00 S&H USA (Texas sales-tax: 7.25%)



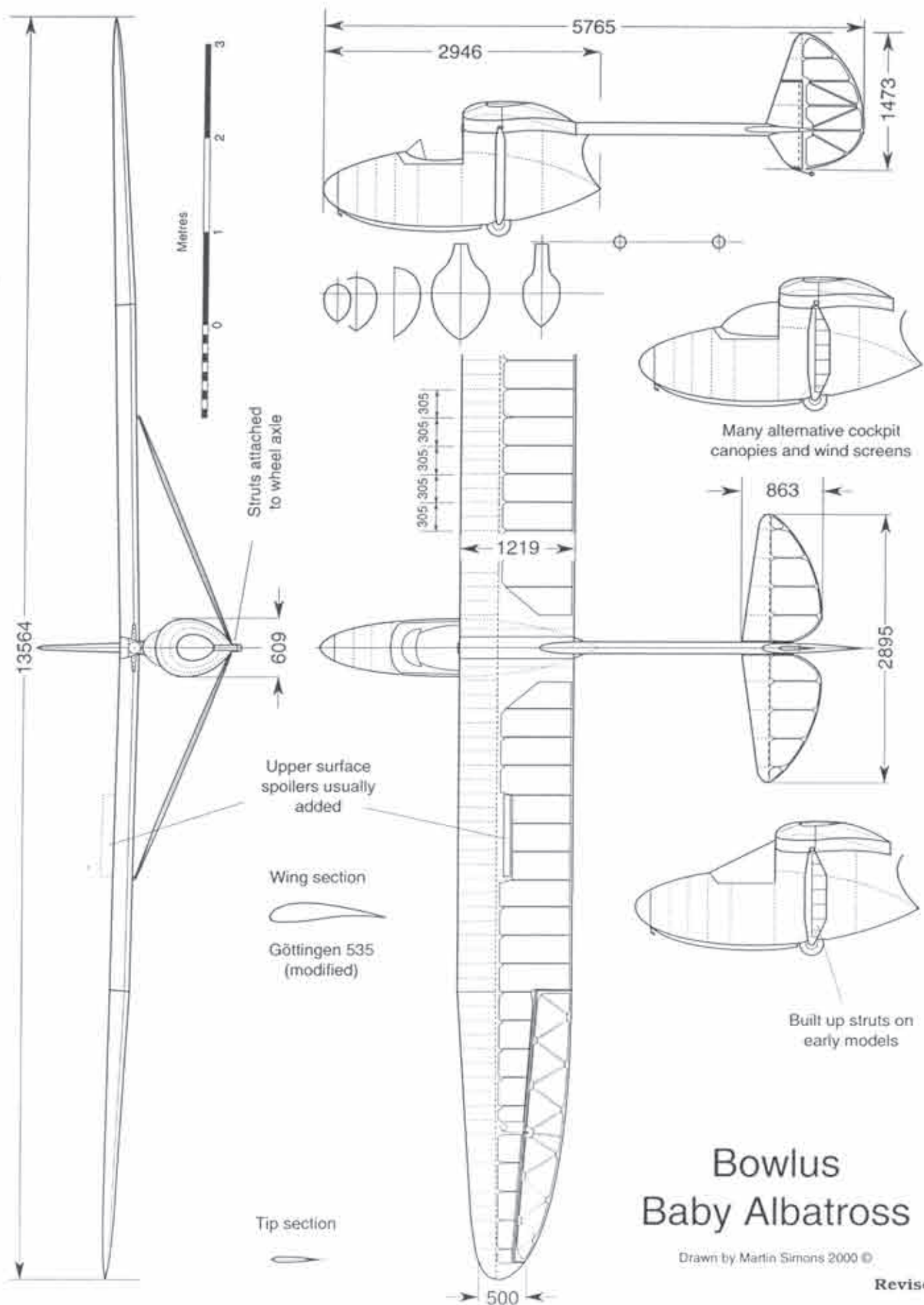
VIKING MODELS, U.S.A.
Serving Scratch Builders Since 1979

2 Broadmoor Way
Wylie, TX 75098-7803 U.S.A.

(972) 442-3910
RCSDigest@aol.com
9:00 A.M. - 5:00 P.M. CST

KIT FEATURES:

- Epoxy Kevlar™ reinforced fuselage with wing rod tubes installed.
- Obechi covered wings with ailerons cut out and faced.
- Obechi covered stabilizer with elevators cut out and faced.
- Complete hardware package & construction manual.
- Easy construction - kit is designed to be completed in a matter of days, as opposed to weeks.



Bowlus Baby Albatross

Drawn by Martin Simons 2000 ©

Revised



P.O. Box 975
Olalla, Washington
98359-0975

E-mail: bsquared@halcyon.com
http://www.halcyon.com/bsquared/

Swept Wings and Effective Dihedral Part 4

Last month we built upon the foundation established in Parts 1 and 2, and described how sweep and winglets influence effective dihedral. We also provided a basic means of computing total effective dihedral, and offered a couple of ways of combating excessive effective dihedral.

This month we present a case study which illustrates the estimation of total effective dihedral and a simple means by which it can be reduced if too large. Also, Eduardo Molino provides insight into a spectacular behavior of some swept wing planforms, the flat spin. This four part series on swept wings and effective dihedral is completed with a summary of the major points covered, and a complete list of resources for the inquisitive reader who wants to learn more.

A Case Study

CO8 V2/3, the latest design from Hans-Jürgen Unverferth (see included planview, Figure 13), incorporates one degree of anhedral (negative dihedral). Let's take a look at the various contributors to effective dihedral for this planform. With a sweep angle of 25 degrees, plus winglets, some amount of compensation is most likely needed. The winglets contribute 3.85 degrees, and at $C_L = 0.1$, the

effective dihedral angle due to sweep alone is 1.5 degrees. The difference between the geometric dihedral (-1.0 degrees) and the effective dihedral, $(3.85 + 1.5 \text{ degrees} = 5.35 \text{ degrees})$ is 4.35 degrees. This gives an adequate amount of yaw-roll coupling, and there is not much chance of the aircraft inverting while flying through turbulence.

While thermalling ($C_L = 0.6$), effective dihedral becomes 15 degrees $(3.85 \text{ degrees} + 11.2 \text{ degrees})$. The single degree of anhedral still leaves over fourteen degrees of effective dihedral. This amount of effective dihedral is not so extreme as one might think (see Blaine Beron-Rawdon's "Spiral Stability and the Bowl Effect"). CO8 thermals hands off. An additional benefit occurs during winch launching — the anhedral lowers the center of gravity so towline tension works through a smaller arm, thus inhibiting over rotation during the initial launch phase.

Anhedral and the "Flat Spin"

There is an additional, and somewhat surprising, benefit to be derived from incorporating anhedral. Eduardo Molino, who lives in Argentina, has been experimenting with tailless sailplanes for some time. Eduardo is a regular contributor to the nurlugel e-mail list on the internet, and was, along with Steve Morris, a reviewer of this article.

Eduardo says, "I built several swept wing models, of several sizes and criteria. Many of them did not survive the initial trimming phase due to brutal crashes. I don't care to recognize my mistakes, because I learn from them. The achieved experience was big, even if I was not able to translate it in formulae. I experienced all the effects described in your essay on every single wing I built."

"Here is the interesting part: I found some other problems too, noticeable only under extreme flight conditions. The main stability problem found on most models was the tendency to flat spin when

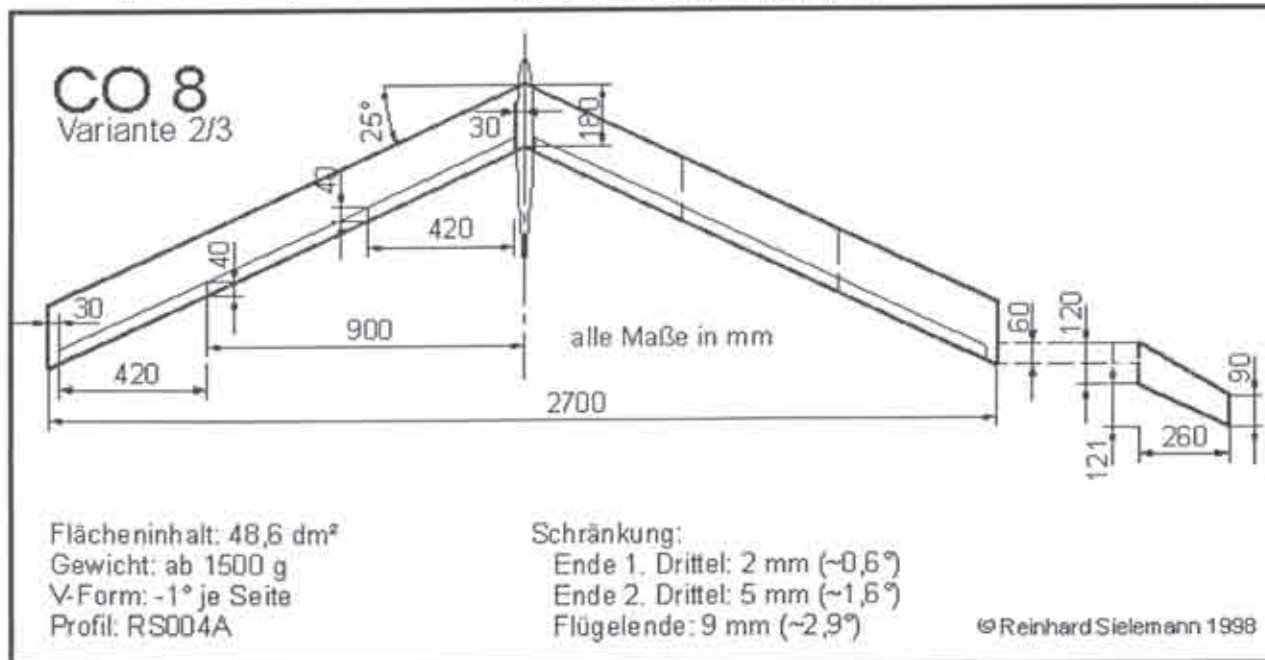
thermalling or steep turning at low speeds. The best models were not falling into flat spins under normal flight conditions, but sometimes in strong turbulent thermals they did. The height losses to recover from flat spins were different for each model, ranging from a few meters to infinite. Some of them never recovered from the flat spin, no matter what you did with commands. Only ground contact stopped them!

"After lots of tests I found a way for the wing to self-recover from flat spins, without pilot input. The main problem on low loaded wings ($<25 \text{ gr/sq dm}$) is that the flat spins were some kind of stable rotating stall condition, with such low speeds that aileron deflections were not able to break this "stability" and recover a normal flight path. In extreme cases, this rotation caused one wing tip to fly "forward" while the opposite wing tip was flying "in reverse."

"Carefully analyzing the situation, the conclusions are: (1) Some airfoils reach a self stabilizing pitch condition when stalled. That means that C_m was achieving high positive values under strong stall conditions, hence the forward CG position was not enough by itself to give "nose down" pitch in order to recover speed and control. (2) Control surfaces have almost no effect due to lack of airspeed and massive flow separation. (3) Aerodynamic forces in this situation are in a new kind of balance that normal control surfaces cannot break. (4) If the CG is lower than this "new balance" lift force, we have a full pendulum equilibrium, hence large flat spin stability. The lower the CG, the stronger the effect — like a rotating parachute.

"Explained in poor terms, the solution was to shift the CG up. This leads to instability on flat spins, hence the model will have a "nose down" and "inverted flight" tendency if aerodynamic forces go to zero for a while.

"The self recovering maneuver in the air is funny. If the wing stalls on a steep turn at low speed, a full turn around the vertical axes will be performed, while the nose goes down pretty fast, sometimes 90 degrees or more. With a small height loss the speed is recovered, and control and stability becomes "normal" again. "On the practical side, the difference can be made



with the ballast position. I fix it high within the airframe, instead of low, and some negative geometric dihedral completes the feature."

Summary

- Spiral instability is caused by too large a fin area, that is, by too much directional stability.
- An aircraft which is very stable laterally, with large amounts of dihedral, will be unstable directionally and prone to Dutch roll.
- Dutch roll: direction of the turn is always out of phase with the rolling motion.
- The contributors to spiral instability and Dutch roll are in opposition.
- The dihedral effect will remain constant through the angle of attack range if the wing has no sweep. Dihedral effect will increase with increasing C_L if the wing is swept back. The greater the sweep angle, the greater this effect.
- Positive effects of anhedral during launch of swept wing aircraft: lower effective dihedral at high C_L and tow hook higher in relation to CG.
- Anhedral can also have a positive effect on recovery from a "flat spin."

Swept wing tailless sailplanes are able to demonstrate excellent spiral stability while thermalling because effective dihedral is increased at high C_L . Since effective dihedral decreases as the C_L gets lower, they show no tendency toward Dutch roll at high speed. During thermal turns, effective dihedral is increased, and opposite aileron is not usually needed to prevent a spiral dive. These are distinct advantages over conventional tailed sailplanes.

Some amount of anhedral may be used to reduce effective dihedral. Anhedral also has a positive effect during launch as it lowers the CG. It should be remembered, however, that since anhedral reduces effective dihedral by a constant amount, regardless of flight regime, too much anhedral

can cause the aircraft to invert at high speed.

So, do swept "wings" violate the rules? No, they just behave according to an additional set of rules which take into account the effects of sweep as the coefficient of lift increases or decreases. Once these additional rules are taken into account, the design of a swept wing tailless sailplane is only slightly more complicated than the design of a more conventional tailed aircraft. The increased performance potential is, however, certainly worth striving to achieve.

We hope you've benefited from this examination of effective dihedral and how it is affected by various design parameters. Anyone wishing a printed copy of all of the formulae used in this article need only submit a request to us through either regular mail (B², P.O. Box 975, Olalla WA 98359-0975) or an e-mail message <bsquared@halcyon.com>. This series of four columns will soon be on our web site at <<http://www.halcyon.com/bsquared/effdih.html>>.

Our sincere thanks to Al Bowers for providing resource material and book suggestions, to Steve Morris for reviewing the article and suggesting a number of improvements and additions, and to Eduardo Molino for reviewing the article and for providing his insights into the specialized problem of recovery from flat spins.

Suggestions for future topics may be sent to us at either P.O. Box 975, Olalla, WA 98359-0975, or <bsquared@halcyon.com>.

Resources

Beron-Rawdon, Blaine. Dihedral, a four part series. *Model Aviation*, Academy of Model Aeronautics, Reston Virginia, August, September, October, and November 1988.

Beron-Rawdon, Blaine. Spiral Stability and the Bowl Effect. *Model Aviation*, Academy of Model Aeronautics, Reston Virginia, September and October 1990.

Bowers, Al. Personal correspondence. 1998,

1999.

Bullard, Doug. <www.nurflugel.com>, and the nurflugel e-mail list.

Dommasch, Daniel O., Sydney S. Sherry, and Thomas F. Connolly. *Airplane Aerodynamics*. Pitman Publishing Co., New York, 1951.

Galè, Ferdinando. *Aerodynamic Design of Radioguided Sailplanes. B²Streamlines*, Olalla Washington, 1996.

Kermode, A.C. *Mechanics of Flight*. Pitman Education Ltd., London, 1980.

Kuhlman, Bill and Bunny. Hans-Jürgen Unverferth's CO8; Part 2, the Airframe. *RC Soaring Digest*, Wylie Texas, June 1998.

McCormick, Barnes W. *Aerodynamics, Aeronautics, and Flight Mechanics*. John Wiley & Sons, New York, 1979.

Molino, Eduardo. Personal correspondence. 1999.

Morelli, Piero. *Static Stability and Control of Sailplanes*. Organisation Scientifique et Technique Internationale du Vol à Voile (OSTIV), Voorburg The Netherlands, 1976.

Morris, Steve. Personal correspondence. 1999.

Nickel, Karl, and Michael Wohlfahrt. *Tailless Aircraft in Theory and Practice*. Translated by Capt. Eric Brown RC. American Institute of Aeronautics and Astronautics, Washington D.C., 1994.

Perkins, Courtland D. and Robert E. Hage. *Airplane Performance, Stability and Control*. John Wiley & Sons, Inc., New York, 1949.

Shevell, Richard S. *Fundamentals of Flight*. Prentice-Hall, Englewood Cliffs New Jersey, 1983.

Simons, Martin. *Model Aircraft Aerodynamics*. Argus Books, Hemel Hempstead Herts, 1994.

Smith, H. C. "Skip." *The Illustrated Guide to Aerodynamics*, Second Edition. TAB Books division of McGraw-Hill, Inc., Blue Ridge Summit Pennsylvania, 1992.

Whitford, Ray. *Design for Air Combat*. Jane's Information Group Limited. Coulsdon Surrey, England, 1989.

STREAMLINES

SPECIALTY BOOKS FOR AIRCRAFT MODELLERS

- tailless and flying wing design
- design of aircraft structures
- polar diagrams explained
- sailplane aerodynamics
- fundamentals of RC soaring

For a complete catalog of available titles, write to P.O. Box 976, Olalla WA 98359 USA or visit our web site <<http://www.halcyon.com/bsquared/>> E-mail <bsquared@halcyon.com>

TECH TOPICS

Dave Register
Bartlesville, Oklahoma
regdave@aol.com

Battery Management Systems

Not too long ago, I started looking at Battery Management Systems. That's a fancy term for chargers and cyclers. In addition to the little gizmos that come with most radios (the ubiquitous 'C/10' or 'trickle' charger), many pilots are adding fast chargers, cyclers, programmable discharge/charge systems, etc., to their electronics arsenal.

I'm not really a Neanderthal on this topic. I used to make Rx/Tx variable chargers from doorbell transformers and bridge rectifier circuits. But I've been a bit slow on changing out from the home made gear to the more capable commercial stuff. (My long suffering spouse, Adele, believes I just barely made it into the 20th century before it became the 21st.) Having seen a couple of these systems in action at the field, the options they offered were just too good to pass up.

These days we really don't talk too much about simple battery chargers. The little wall plug devices that come with the radio system are fine little chargers and will handle your Tx and Rx batteries nicely. But to really do it right, you need something that will evaluate the battery capacity, fast charge, trickle charge and cycle to erase memory. So instead of simple chargers these days, we're using what we'll call battery management systems. This sounds a bit like calling the library the 'learning resource center' but it kinda makes sense.

NiCd (Nickel Cadmium) and NiMH (Nickel Metal Hydride) batteries are commonly used in our radio systems. By far the most often used battery style is NiCd. The NiMH systems are higher energy density (more charge per unit weight) but are still relatively new and require a little more care and feeding. For comparison, the batteries in most digital cameras are metal hydrides (nickel or sometimes lithium). If you check the capacity of these cells, they are identical in size to AA alkalines but are rated for 1400mAh or more. A typical AA size NiCd is ~ 500mAh.

Oops, reality check here. What's a mAh? Phonetically it sounds a bit like a cow with a sore throat but it's really the abbreviation for milliamp-hour. That's a rating of battery capacity. A 110mAh battery pack, for instance, can supply 110mA of current for one hour. Or 55mA of current for two hours. And so on.

So how much capacity do you really need? Depends on your system requirements. Let's look at a Tx for a start. By FAA regulations, the radio frequency (RF) power output from our transmitters can't exceed 250 mW (1/4 Watt). If you're running a standard 8 cell Tx pack (roughly 10 Volts), then your current drain for the RF section alone will be ~ 25mA. Let's allow for about 50% conversion efficiency and we find that the RF section will probably require between 30mA to 50mA. Ahead of the RF section, there's some logic

circuitry which converts stick motion into pulse widths for the RF to transmit to the receiver. These days, that logic circuit will contain a microprocessor, some memory and a Liquid Crystal Display (LCD).

Power consumption for this part of the transmitter is probably comparable to the RF section. So let's toss in another 30mA to 50mA for the proportional controls and we're up to somewhere around 100mA. With a typical 500mAh NiCd pack in your tranny, you ought to get ~ 4-5 hours flying time.

Prior to the advent of computer systems, this was probably a good number (at least once we got away from tube and escapement sets!). Early computer radios used relatively inefficient microprocessors and related circuitry which had high current drains. The Airtronics rigs were a good example. The power drain was so high that you were lucky to get an hour out of the battery pack. That's why you'd see guys with these auxiliary packs hanging off the back of the Vision systems.

With the advent of CMOS processors and more efficient LCD displays, the power requirements came back to a more reasonable level. My Futaba 7 channel, for instance, can easily get 4 hours of flight time and is actually rated at 6 hours or more. I think the new Stylus radios have improved greatly in this area as well. So a 500mAh battery pack is now a pretty reasonable size for the Tx.

For the Rx, you have to look up the specifications for your system to get an idea of what to expect. Even then, it's a shot in the dark. A well designed Rx, for instance, really shouldn't draw more than 25mA of current. Your servos at idle are probably drawing around 15mA. So for a 6 servo ship, you're looking at maybe 110mA quiescent current. With a 500mAh pack you should be able to stay up ~ 4 hrs or so, right?

WAY wrong. When those servos are running, they're drawing many times the quiescent current level. If you have any binding in your linkage, they can draw a heck of a lot more than that. If you've got higher torque servos for ailerons and flaps, they draw more still. And finally, we like quick response so the initial current draw to start a servo motor in motion from a dead idle can require a large current spike.

Bottom line. How do you know the lifetime of your flight pack? Well, in the old days, you flew as long as you wanted and if it didn't auger in, the battery was probably still OK. If you lost it, you learned to fly a bit less before you started to get nervous and go home. Once you established a pattern, say total flight times of about 1/2 of what you knew you had for battery capacity, you'd often just put in that amount of 'safe' time and then call it quits, re-charge and come out the next week.

So one day you catch a nice thermal and you know you've got about 20 minutes left before you usually wrap it up. But you've got a 50% safety margin so you go for your LSF IV flight. In the 53rd minute, your plane goes inverted and smacks into a tree.

Battery Temperature Dependence

During a late season contest a few years ago, the weather turned cold (probably in the low 40s), but we kept on flying. After a rather short amount of time, the winch battery decided to call it quits. It had been fully charged just before this session and having it croak so early in the contest was a surprise. After hooking a charger to it, we kept on flying.

That event got me a little curious about the capacity a fully charged battery could deliver at lower temperatures. As an example of the things you can do with a BMS, I took a look at the available capacity of my HLG batteries (Rx and Tx) at several different temperatures.

In all cases, the batteries were charged at room temperature, conditioned at the test temperature for about 30 minutes and then discharged. The observed capacity vs. ambient temperature is shown in the accompanying figure. Each condition was repeated 3 times to generate the error bars shown in the plot.

Going from room temperature to around 40F (immersed in ice water in a plastic zip-lock bag) cost about 10% in the transmitter capacity but a little over 25% in the receiver pack. Since the FMA system uses a constant current for the discharge cycle, it may be that the longer time required to deplete the 500mAh pack allowed a little ohmic heating to raise the effective temperature.

Although this doesn't necessarily duplicate the conditions we'd see at the flying field, it does show that you should expect reduced flying time on cold days even though your batteries are still in great condition. Since that 110mAh pack gives me about 60 minutes of flight time, a cold winter day will cut that down to 45 minutes or less.

This is something to keep in mind as you start wringing out your equipment this spring. It could also make a great Science Fair project for your kid. Great excuse to get one of these systems. Your daughter/son gets a good grade and you get a great battery system. Sounds like a win-win situation to me!



What happened?

MEMORY! If you consistently run a NiCd pack down to some capacity level (say 50%) and then recharge, it becomes conditioned to deliver that amount AND NO MORE! So when you asked for 65% it told you what you could do with that extra capacity demand in a very unforgiving manner.

Does this mean the pack is no good? Nope. You just need to whack it up 'side the electrodes to get its' attention again. You do this by deep cycling the battery; drain it of 100% of its capacity before charging it again. After a few attention getters like that, you've earned its respect and it usually comes back up to full capacity.

Sorta like getting through to a teenage boy! This type of battery treatment applies to both the Tx and the Rx pack. But it goes well beyond the capability of the simple trickle chargers that come with new radios and so we're led back to where we started: Battery Management Systems.

A Battery Management System (BMS) can be as simple as slapping a 1/4 Watt, 10 ohm resistor across your Rx pack for an hour. Or as complex as a computer controlled peak sensing circuit. In most cases, it's far preferable to use the microprocessor controlled BMS.

In general, what these systems do is pull a relatively high discharge current out of the battery while monitoring the battery voltage. At about 1.1V, a NiCd (and NiMH) battery is entering its final death dive. So it stops the discharge at about that point. It then flips over into charge mode and will charge for a long period of time at a fixed rate, usually 1/10th the battery capacity rating. So for a 500mAh pack, you'd charge at 50mAh for at least 10 hours.

You've probably heard of a C/10 charge level? Well, that's what it means. Now C/10 for 10 hours doesn't account for heat loss so it's typical to charge at C/10 for about 16 hours.

In some systems, rather than charge at a low rate for a long time, it's possible to charge at a high rate and shut off the charge current once the battery voltage reaches a fully charged state. In very sophisticated systems, the BMS will charge for a short burst, then toss a load on the battery and read the voltage under load for a fraction of a second. If it senses a full charge, it stops the process. If not, it keeps on charging. Systems like this are said to operate in 'peak detect' mode.

Whichever way the system does the charge cycle, once enough time has expired, or peak voltage has been sensed, the BMS goes to 'trickle charge' mode. In this case, the charge current is reduced to a 'trickle' - maybe a few % of rated capacity (C/50 is typical) and maintains the battery charge without overheating the battery. Once the battery has a full charge, the power you

put into it will have to come back out as heat. So you don't want to maintain a high charge rate on a full battery. But a few mA of current won't do it any harm. A typical trickle rate might be 10ma or so.

Proper battery maintenance really takes quite a bit of work. Rather than doing this manually, we're fortunate that various manufacturers supply automated systems that take care of all of this for us. So now I'd like to highlight a few systems that have worked well for people in our area and note some of their features.

At the top of the list from anyone who has one is the Litco Alpha 4 charge system. This is a microprocessor controlled system that can handle 4 separate battery packs (Rx, Tx or both simultaneously) with up to 10 different charge functions. Each pack can be independently programmed for capacity, voltage (number of cells), type of cycle-charge, cycle, trickle, etc. It uses peak detection circuitry. It also has an LCD display for each battery channel and gives you a lot of information about what it's doing and how your battery checked out.

Also a plus with the Alpha 4 is that you can set it to a high charge rate and it immediately becomes a rapid charger for use at the field. All in all, the best system on the market right now.

So what's the down-side? It's also the most expensive system on the market (~\$200) and orders are backlogged for as much as 6 months. I've tried ordering a Litco several times but the backlog has been too great. If you can wait for one, it's a great system, but I got impatient and went another direction.

Another popular approach are the units put out by Sirius Electronics. These are relatively compact peak detection chargers with high charge currents that can be used for rapid charging your batteries. The Sirius standard will handle a Tx and Rx pack and automatically goes into cycle mode once it senses a battery pack has been attached to the unit.

Cycle indication is provided by a couple of LEDs on the face of the unit. Green means it's working, blinking green means it's

finished and on trickle. Red means there's a problem. Since these systems are set up for 4 to 8 cell packs, the Red LED indicates that battery voltage is below 3.5 or in excess of 13.75 volts.

I believe the Sirius system uses peak detect type of pulsed cycle so it takes care of the memory problem without having to go through a deep discharge cycle. These are great little units and are superb field chargers. At ~\$149 for the standard unit (one Tx and one Rx pack capability) and around \$50 for the micro unit (one Rx pack of ~100mAh capacity) they'll get you a lot of peace of mind at the field. Simply clip them to a 12 V battery, or make an adapter for the lighter outlet in your car and no more worries about charge level in your packs.

Splitting the difference between these systems is the FMA Einstein BMS. This is also microprocessor controlled but uses a conventional deep discharge, followed by a 16 hour charge and topped off with a trickle rate. The Einstein is a pretty neat unit in that it can handle from 2 to 12 cells on either of two channels and can be programmed for the appropriate C/10 rate for anything from 250mAh capacity up to 10,000mAh packs. It senses the voltage during discharge and shuts off that part of the cycle when each channel hits a fully discharged level for the number of cells programmed for that channel.

A really nice feature of the Einstein is the LCD display that indicates the amount of capacity removed from the pack during the discharge cycle. This is a great way to find out how hard you're working your batteries during a typical flight.

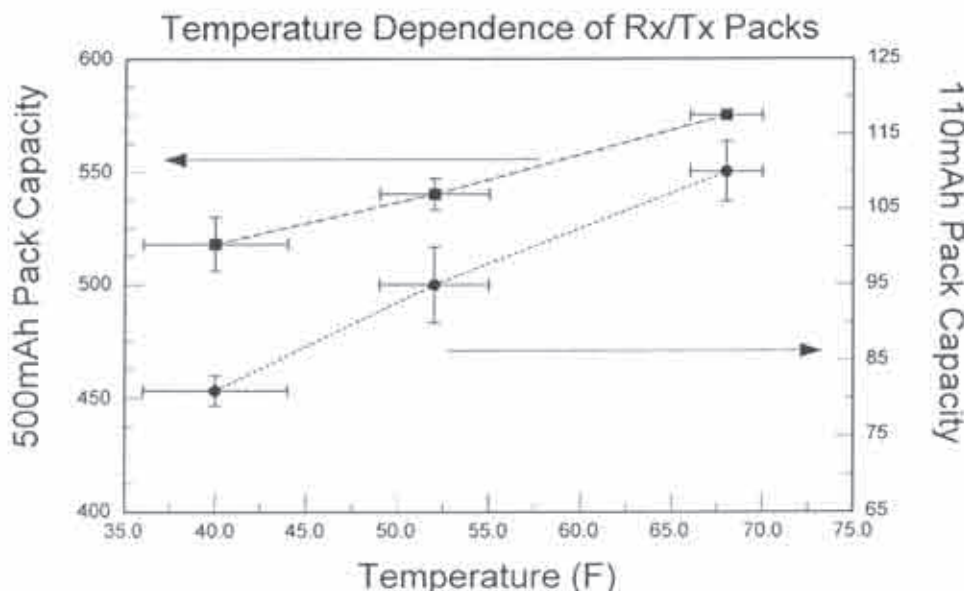
My 110mAh Sanyo pack rates consistently at 105mAh on the Einstein. After 45 min. of flying, it usually has ~10mAh to 20mAh capacity left. So I could fly just about one hour before my Rx pack runs dry.

The Einstein sells for ~\$129 and is a nice, flexible diagnostic unit for my purposes. It also has some adapter boxes so you can plug several different Tx charge plug types into the unit or use Futaba, JR, Airtronics or Dean's plugs for the Rx pack.

There are a number of other charger/cycler systems out there. Hobbico markets several styles. The Digi-Pace system also has a good reputation. These systems generally have the capabilities of the FMA or Sirius chargers. So when you're looking around at BMS units, be sure to check the features noted here. After that, availability and price should be the determining factors.

My solution has been to use the Einstein for normal diagnostics and battery conditioning. For field charging of my HLG batteries, a Sirius 100 does the trick very nicely. As mentioned, Alpha 4 could nicely handle all of these functions but I've already gone this other route and I'm not disappointed.

Whichever way you decide to go, using a BMS in place of the simple chargers that come with your system will provide a lot more information about the health of your battery systems. With as much money as we've got cruising around in the air these days, spending a small fraction of that dough on a good Battery Management System just seems to make good sense. ■





Robin Lehman
63 East 82nd St.
NYC, NY 10028
(212) 879-1634

This month, I wanted to share a letter from Germany, and details on the International Slope Festival, scheduled to be held in FISS/Tirol, Austria in July. On the home front, I've included information on the upcoming 2000 NATS Sailplane Scale event. Spring has obviously sprung, so happy flying to all of you as we enter another wonderful year of flying fun!

A Letter from Frank Oeste, Germany
Tel/Fax: 0049-6103-81801
Frank.Oeste@t-online.de

Hi folks all over the world!

"After a long and hard time of work, my friends and I are proud to be able to present you the new and latest version of the Letter of Invitation of the 3rd International German Championship for Akro Semi-scale Gliders 2000 of the DMFV.

"This competition is one of the fastest growing we have in Germany. In 1997 we started at my native club Dreieich near Frankfurt/M with 19 pilots and this past year we had 43 who signed up, but 34 actually competed.

"A lot has been written in the R/C magazines about the Akro Cup and on several pages in the internet there are links to the Akro Cup report, which is on Robin Lehman's Sailplanes Unlimited Ltd. web site: <http://www.sailplanes.com>.

"Thanks to all the guys who support our thing: aerobatic flying with semi-scale gliders. Thanks to Friedel Borst, who is now our representative for Akro Semi-scale gliders in the DMFV. He is doing a great job, working for many to bring our event forward. Without Harald and Ulrich Seitz, Klaus Dettmar, Uwe Schmuck, Andreas Bindewald, the judges of the DMFV and the model clubs which let us use their fields and their logistics, no Akro flying could be possible.

"Special thanks to Robin Lehman, who has become a very good friend and who supports us every minute. Thanks to Tony Baker from England who supported me with a lot of information about the scene in England. Thanks as well to John Derstine, who is there, whenever I have a question. And last but not least, a very special thanks to Gerhard Bruckmann from Austria, who builds the best Akro gliders of the world and who, with his skill and knowledge, made it possible for me to fly such wonderful aerobatic models today."

"On good note is that a lot of people all over the world are in contact with us and are excited about the future Semi-scale aerobatics all over the world!"

"I hope to meet you some day personally and that we can fly together in an Akro championship here in Germany or perhaps anywhere in Europe."

2000 NATS SAILPLANE SCALE EVENT


Sailplane Scale at the 2000 NATS this year will be flown as an unofficial event. This will allow implementing the new proposed rule changes next year instead of waiting until 2002 when they would go into effect if approved.

The rules will follow the Sport Scale Sailplane, EVENT 517, rules in the present AMA Competition Regulations rule book with the following changes:


1. Change Section 2 Page 157
"weight ready to launch, including ballast shall not exceed 55 pounds."
2. Change Section 3 page 157
"the builder flyer can be, in the case of a highly prefabricated or factory built model, the original owner and the one who make it ready to fly, regardless of the scope of the work required to finish the model"
3. Section 4 page 157
Add new Section 4.2
"As part of his declaration the entrant shall specify whether the model was designer built from factory drawings, built from plans, built from a kit, or bought built covered almost ready to fly. It will be the responsibility of the pilot to provide verification, and describe scope of work and prefab parts supplied."
This kind of information is to help the judges award points to a given model before the multiplier is applied.
4. Remove Section 5.2 Page 157
"eliminate judges approaching (closer than 15 feet) model for close inspection"
5. Add Section 5.2 Page 157
"no downgrade will be given for dark color under the wing or reflective tape

used to provide visibility at extreme altitudes."

6. Change Section 6 Page 157
"change static points from 100 to 30 10 each for:
A. Accuracy of outline
B. Finish, color and markings
C. Craftsmanship
After static judging is complete, calculate bonus points as follows:
A. Multiply score by 2.0 for designer built
B. Multiply score by 1.7 if plans built
C. Multiply score by 1.1 if kit built
D. Multiply score by .9 if an ARF
7. Change Section 7.2 Page 157
"Launch by winch or aerotow. (neither launch method will be judged, but climb to release remains a judged maneuver.) Winch specifications remain unchanged. Add weight limit for winch launch shall be 25 pounds. Two winch launches per round will be allowed if a pilot requires them to complete his flight maneuvers. In the case of two winch launches a given maneuver will be judged only once, the first time it is performed."
8. Change Section 2 Page 158
Optional Flight Maneuvers
"eliminate duration (2.1) as a maneuver eliminate aerotow (2.2) as a maneuver eliminate ground launch (2.3) as a maneuver"
9. General
"Due to limited frequencies at the NATS, tugs, adequate to tow models up to 55 pounds and tug pilots, will be provided by event organizers."
"These rules are the first version of the proposed rule changes. LSF and AMA reserve the right to make changes, but no changes will be made after the final NATS mailing so contestants will have adequate time to make adjustments."



Nimbus 4-D
130" Wingspan
\$599.95



Duo Discus
98" Wingspan
\$499.95

Specs:
Wing Span:
Length:
Wt:

ASW-24	PILATUS B-4	LUNAK LF-107	DISCUS (1.3.5)	DG 800 (1.4.5)	NIMBUS 4-D
64 in.	57 in.	66 in.	168 in.	137/165 in.	130 in.
28.3 in.	29.5 in.	28 in.	74 in.	62.5 in.	46 in.
11 oz.	10.5 oz.	15 oz.	200 oz.	123 oz.	54 oz.
\$159.95	\$149.95	\$159.95	\$1395.95	\$999.95	\$599.95

CALL FOR FREE CATALOG
P.O. BOX 6004, SAN CLEMENTE, CA 92674 - Phone (949) 240-4626/FAX 240-5931
Now available: complete line of glider accessories: Canopies, Markings, Retract L/G, Airbrakes, etc.

HOBBY CLUB WWW.HOBBYCLUB.COM

Logic Behind Proposed Changes

This proposal in no way endorses the entry of second hand models, or models built by other individuals and flown by another, or models repaired, rebuilt, re-kitted from a previous owner.

The accepting of the aerotow launch as a non-judged additional launch method speaks to its acceptance in the scale community as a normal everyday way to launch large, up to 50 pound sailplanes. By increasing the weight limit to the AMA 55 pound mark, the Sport Scale event would be open to a much larger class of sailplanes than previously allowed.

From my personal experience as CD of the Elmira Aerotow, it has been demonstrated that most scale soaring enthusiasts come to events to fly. While many enjoy the building and showing of their planes, flying has taken the forefront in all modern scale events, whether slope, aerotow, or winch. Hence, we endeavor to put more emphasis on the judged flying tasks, while retaining the static scale component in a graduated system using very simple multipliers to make things equitable.

Since everyone now launches scale sailplanes from the ground, we have, in this proposal, eliminated the ground launch option. The only launch points awarded are for climb to release using either stated launch method. This limits the launch points to a possible 10, for both launch methods.

The remaining rules change proposals address the use of tugs and the pilots responsibilities in this regard, the allowance of two winch launches per round as necessary for those using that launch method, and the allowance of dark colors on the underside of wings and flashy tape for safety reasons at high altitudes. There is also a change to restrict the judges to a fifteen foot distance from the glider in the static judging. This will hopefully level the field a little and streamline the process on the static judging portion.

By reducing the total static points to thirty, before the multiplier is applied, and by having a .9 multiplier for pre-built sailplanes, no entrant can be accused of stealing a win with a fancy factory finished model. The emphasis will be on the flying tasks. On the other hand, a designer built model with a multiplier of 2 has a real advantage in the static scoring, and has a potential for 60 total points.

It is the intent of these submitted rules to have the pilot not only declare which type of construction his sailplane is (designer scale, Plans built, etc.), but to have him within each category describe what was required and/or supplied by the kit manufacturer, or plans supplier. This information would be included in the pilot declaration so the judges could take this into account BEFORE judging and applying the multipliers.

This we feel would help the judges differentiate between the various levels of "kits", and/or plans with fuselages pre-built.

Having now attended the NATS and many other scale competitions/fun-flies in both the US and Canada, this seems to (within the framework of the Existing Sport Scale 517 event) reflect the general point of view in scale soaring today. ■

Event Announcement

International Alpin Slope Festival

The 5th Annual International Alpin Slope Festival will be held in Fiss/Tirol, Austria on top of the mountain on the highest official model glider air field of Europe (or the world!).

20-23 July 2000

We had a big building plot there on our landing field a few months in the last year. A 110 m long lake was built for the snowing machines to secure the skiing time in winter, when they have less natural snow. For us RC pilots, they have built a very new landing field beside the lake with a minimum range of 100 x 250m. It's now very easy to land, and the surface is well made. We invite you to have part at the official inductance of the new field at 2500m over sea level. All alpin soaring enthusiasts are welcome! Make this event an international event like the last events over the last 4 years!

Have your FUN and ACTION, but also RECREATION! The very comfortable village Fiss will welcome you. The alpine hydroplanes contest will be held during

the event on Saturday morning. If you have such an electric hydroplane, don't forget it! The winner will get a 1 week holiday for 2 people.

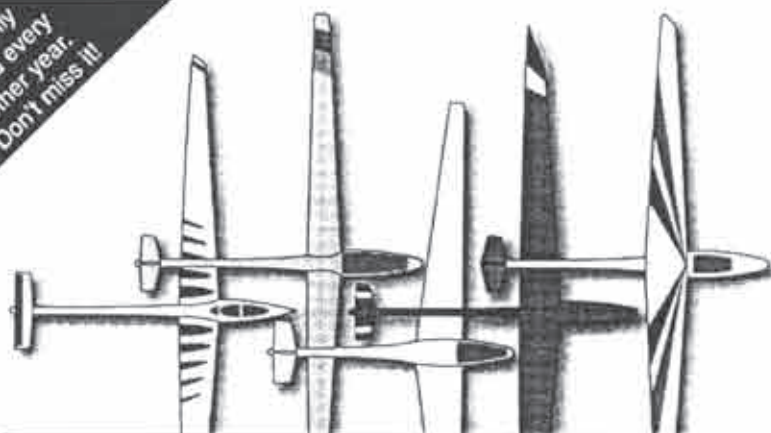
The model flea market will be held on Saturday evening in the city hall of Fiss. Come and see, and make a little shopping (perhaps). For more details about time and location, take notice of the info. flyers in Fiss. Then we will have a Country Evening with barbecue, roast meat, beer and music under the night sky. Also our traditional night time FUN-CONTEST for slow flyer in the middle of the village will bring a lot of fun. If you have a slow flyer of something like this, you have the possibility to win one of some nice prizes!

All alpin soaring enthusiasts are welcome, with your big scale gliders, to have part with a lot of European pilots. Also, non-scale glider pilots and beginners are welcome - and be sure to be helped by one of the most experienced pilots.

If you want to get more information don't hesitate to contact me or the official info. office in Fiss. Find more information on the web site of Flying Circus: <www.flying-circus.de/fiss-gb.html>.

Gerd Holzner
Flying-Circus Publications
info@flying-circus.de
www.flying-circus.de

SU
is only
held every
other year.
Don't miss it!



SOAR UTAH 2000

September 2-3-4, Labor Day Weekend
Point of the Mountain - Salt Lake City, Utah

This is your chance to fly at one of the best slope sites in the world and to see some of the top pilots and coolest planes do likewise. New this year is our improved, obstacle-free landing zone, suitable for large scale sailplanes. On Labor Day, we will fly from spectacular Francis Peak - more than a mile above the valley floor.

To register, or for more info, visit <http://www.silentflyer.org>
or call Scott Marshall (435) 643-9478 even, email marshall@silentlyer.net

Rubber Duck Antenna for the Airtronics Stylus Transmitter

by Lee Murray
Appleton, Wisconsin

I have used a rubber duck on my Airtronics Vision radio for many years. That antenna came from Manny Tau who sold quite a few based on the numbers I saw at large contests. I bought a spare in case I ever lost part at a critical time. My Vision is getting old and is well used. I had all 8 model slots filled up, and I wanted another new sailplane, so I purchased an Airtronics Stylus computer radio. The switch back to a full-length telescopic antenna on the new Stylus was not too smooth. I was warned of a weak point at the base of the antenna where the rotating ball mount allows dents to be made at the base of the telescopic antenna. My flying buddy, Bob Johnson, found that these dents can quickly turn into fractures and the loss of a day's flying. A new or spare antenna isn't all that expensive, but I really wanted to have a shorter rubber duck antenna. This desire led me to investigate the following:

- Who markets short or rubber duck antennas for the Stylus?
- What is the penalty in range I would have for the antenna?

In the March 99 issue of *RCSD*, Gordy Stahl wrote that Hobby Lobby markets a German Power Stick that will adapt for use on the Stylus radio with a separate thread adapter. This was not a cheap solution, but a claim was made in the catalog that there would be no reduction in range. The Power Stick is not a flexible antenna, so I wanted to look around for other options. I met up with Randy of Roper Electronics at a ham radio equipment show. Randy fixed me up with a rubber duck with the 4 x 0.7 mm thread needed for the Stylus centered on the channel 31 frequency I planned to use. This was not a common thread mount and we had a false start before getting the thread I needed. This simple mount matches the telescopic antenna base and has the advantage of not having a BNC connector like the Power Duck for the Vision. The antenna that Randy provided was 3" shorter, which gave me some concern since I had found in my investigation that the size of the antenna was also important. One requirement was that the outer diameter of the base of the rubber duck be smaller than the 7/16" opening on the ball mount of the Stylus transmitter. The male thread is recessed slightly. The Roper antenna had a rubber jacket that had to be ground down slightly at the base to fit into the mounting recess on the Stylus. This antenna cost me \$30.

I looked for a BNC to 4 x 0.7 mm thread adapter that would match the BNC connector of the spare Taucom Power Duck antenna. The BNC connector of the Power Duck screws off to expose a 6 x 32 thread base on the rubber duck. For those living outside the US, that thread specification is for a #6 screw with 32 threads/inch. I had an adapter made to go from the 4 x 0.7 mm male thread on the Stylus transmitter to the

female 6 x 32 thread of the spare Taucom antenna. That adapter is shown in the diagram.

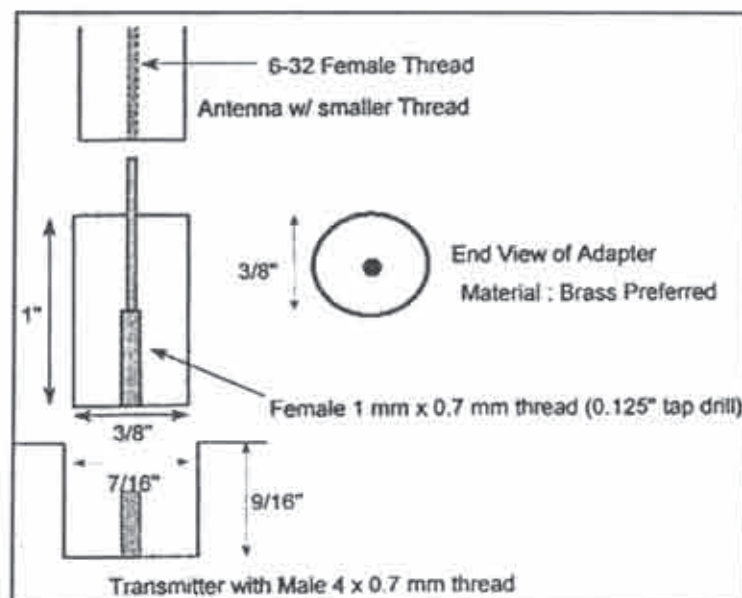
The next problem was to evaluate the performance of the antennas. Dave Beck gave me some references from the Internet. One article from Bob Witte (KB0CY) can be found on <http://members.aol.com/RogtWitte/gain.html>. This article compared a 1/2 wave twin lead antenna to a rubber duck, a 1/2 wave telescopic antenna, and a small Yagi beam antenna (should be the best since it is directional). Our transmitters put out about 0.75 watts. His results were relative to a twin lead 1/2 wavelength antenna. (The 1 watt results should be most relevant for us.)

My local hobby shop is Galaxy Science and Hobby operated by Wade VanRyzin. Wade has an HP spectrum analyzer with the knowledge on how to properly use it. This unit has a power meter for comparison of transmitter output. We conducted a test in his workshop where we positioned the Stylus in a precise position and operated the transmitter with the standard antenna, then the rubber ducks from Taucom and from Roper Electronics. The dB is a common way of comparing signal strengths. The dB unit is a log scale which equals $20 \log (E_1 / E_2)$ where E_1 is the signal strength in microvolts at the test location and E_2 is the signal strength at the reference location. A drop in 3 dB is equal to a power loss of 50%. A loss of 6 dB would be a power loss of 75%. It sounds simple, but other factors can be important also.

The Valley Aero Modelers have an AM receiver (car radio) with a converter donated by John Lang many years ago that is capable of monitoring frequencies in the 72 and 75 MHz range. We have a meter on the automatic gain control section that allows us to monitor the strength of signals. At the clubs Frozen Finger Fly on New Years Day, Dave Beck and I conducted a survey where we compared the Stylus with all three antennas relative to other transmitters being used that day. The monitor was set up about 100 yards from the flight line. The relative signal strengths

were about as indicated by Wade VanRyzin. But surprisingly, the Stylus with the Roper rubber duck antenna was as strong as some of the active transmitters on the flight line.

In his article, Bob Witte summarized that the reception distance for Ham Radio uses was as little as 50 miles for rubber duck antennas while the 1/2 wave antenna was useful out to 150 miles... 1/3 the range. What does that mean for the Radio Control flyer?

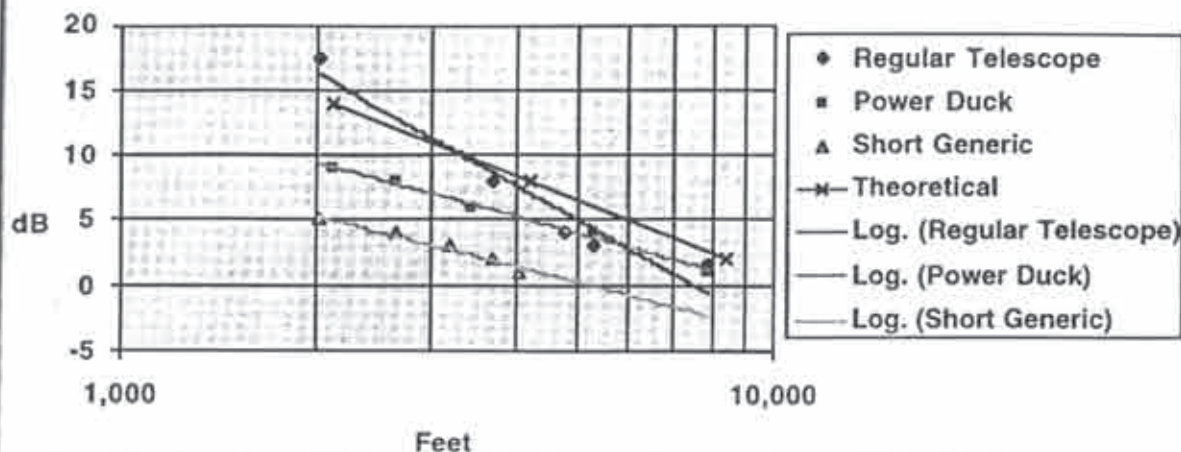


George Steiner, as many of you will recognize, is a very credible source of information about radio control. George wrote a booklet "A to Z - Radio Control Electronic Journal". The chapter "The Rubber Duck Report" is dedicated to this subject. As an evaluation tool, George uses missing pulses at the receiver as an indication of the quality of the RC link between RC transmitter and receiver. George noted a slight decrease (about 30% or -1.5 dB) in the signal. His conclusion was that the only time this would prove important would be when the model was at a great distance. A comment is made about the antenna radiation pattern being better for the rubber duck as compared to that of the telescope antenna which has lobes and valleys. His book is available at \$19.95 post paid from GSP Journal, 2238 Rogue River Dr., Sacramento, CA 95826. This is an excellent resource for anyone wanting to know more about the radio control technology in use today.

Not being satisfied that I had evaluated the antennas at practical ranges, Dave and I went out into the frozen country side of Wisconsin on a clear but very cold day. I proceeded to get my van stuck in a ditch hidden by a snow drift... But that's another story. Our plan was to be in an area as free from reflected signals as possible. I put the Stylus on the top of the van in a tray where the antenna would be vertical and always be in the same position.

Dave used a ham radio receiver with a signal strength readout in dB. His antenna was also on the roof of his van. My van remained stationary and Dave's van was driven away. We had some very strong readings when he was close to me. The readings out to about 0.4 miles were not very reproducible for what we believe were reflections from some wires on telephone poles along the road. First Dave drove away when I had the shortest duck antenna on the Stylus. Then we switched to the larger Taucom Power Duck and Dave came back toward the van making measurements along the way. Lastly, the standard antenna was used and measurements were made with Dave driving away.

Signal Strength by Antenna



Power Output	Rubber Duck	Telescope Antenna	Small Yagi Beam
100 mw	-20 dB	-10 dB	-4 dB
1 watt	-10 dB	-0 dB (Same)	6 dB

Test At Galaxy Science and Hobbies

	Taucom Rubber Duck	Roper Rubber Duck	Collapsed Antenna
Length, inches	10	7	5
Gain relative to Standard Telescope Antenna, dB	-4	-7	-25

The results are displayed in two ways relative to a theoretical curve based on the principle that the signal power will decrease by a factor of 4 every time the distance between transmitter and receiver is doubled. The curve becomes a straight line if you use the log of distance vs. dB. The transmitter antennas show the expected relative response at about 0.5 miles, but the loss of signal with distance was not the same for all antennas. The

reason why the standard antenna lost range faster is unknown. One possible explanation was that the standard antenna was tested last, the transmitter battery was getting cold and the voltage was falling. I measured a drop from about 10 volts to about 8.5 volts during the test.

Conclusions:

1. The standard antenna is clearly the best for getting the signal out.

2. Smaller antennas can't perform as well as large antennas but the extra efficiency may have little or no value.
3. The transmitter has much more signal than required to control your model with the model in the normal range of the transmitter, especially HLGs.
4. If you are going to fly XC, think twice about a rubber duck antenna.

5. Reflections from objects and buildings cause major changes, both positive and negative, to the strength of your signal.
6. The orientation of your transmitter antenna and receiver antenna causes major changes to your received signal strength. At great distances this might prove a more important difference between standard and rubber duck antennas.



RCSO
Subscribers Special
\$30.00 (plus \$5.00 shipping)

SPEED 400

the LITTLE BIRDY

A MULTI-TASK SAILPLANE WITH A WING SPAN OF 52"

Shipping and Handling (USA) - \$6.50 • Call for International Freight Charges.

E-Mail: buzzwaltzrc@excelfonline.com
68-320 Concepcion, Cathedral City, CA 92234
(760) 327-1775

BUZZ WALTZ R/C DESIGNS

CURTISS P-40 WARHAWK

The Curtiss P-40 Warhawk accepts standard wire radio equipment.

This handsome warbird flies in light BFT and is extremely fast. This plane can be enjoyed by the scale modeler or combat flyer with pure enjoyment. It is very scale looking and has been turning heads at the show. Again, this kit, with all of our kits, comes with a comprehensive manual and all the hardware necessary to finish your P-40.

ME P.1111 FLYING WING

The all EPP foam and balsa backbone construction make this plane virtually indestructible. The 45 degree sweep gives it a low profile, great maneuverability, and a quick recovery rate. All of this is ideal for combat conditions. Requires a radio with mixing or a separate mixer.

Kits: \$59.99 each plus \$7.00 shipping
(California residents add 8.25% (7.75% sales tax))

MAD Aircraft Design

15268 Rolling Ridge Drive,
Chino Hills, California 91709
(909) 606-0363

<http://www.madaircraft.com>
email: madairc@madaircraft.com

VISA

GORDY'S TRAVELS

Frequency Control Why Sailplaners Do It Different

Gordy Stahl
Louisville, Kentucky
GordySoar@aol.com

A recent trip ended in heartbreak. Oh, I had fun. I always do when I fly, but my favorite slope ship got hurt. All because a club confused Power Freq. control with sailplanes... Here's the story.

When I left home two weeks before, it was with the hope of doing some sloping off the cliffs of southern California. So, I left the house armed with my old, but pristine, RnR Synergy 5, a hollow molded F3B ship, that I got on a super deal and have soared off both coasts, as well as inland slopes; even DS'd it at Parker Mountain. With all that experience, it never even picked up a fuse crack.

Well, luck wasn't with me this trip and it rained for the whole visit in California. Next stop scheduled was in Orlando and, while the Syn isn't a TD ship, it does okay. Saturday was great weather with good thermals. I hooked up with Pat K., one of Florida's best thumbs and a fun guy. He picked me up at the condo with his Goldwing and trailer, and off we went to his secret site. Hours of soaring ensued and I had a pretty good sunburn by the end of the day.

That night, I got an e-mail from a good friend and a good guy; there was a club contest not too far from my location. Of course, I said I'd be there.

That morning was bleak, cold and windy with rain an almost sure thing. I headed out anyway.

When I got there, I found a really nice, power club site; the winches were already set up. Strange as it sounds, I actually paid attention at the pilots meeting. The CD announced that there was only one Freq. conflict between two guys... "Cool," I thought. "No hassles with that to worry about."

I put my plane together and went to the Freq. board to get the pin and, as I approached, something seemed weird. There were almost no pins on it. A kid had just put up the pin for my Freq., which had me freaked, since I thought mine was clear?!

I asked him if he was finished with the Freq. and told him I was taking the pin to do a hand toss test. He looked kind of puzzled but said, "No problem."

I had my mind on this turn of events while I gave my bird a heave; it went out nice and flat, then healed over hard on one wing tip. Then on the nose. Damaged for sure and no doubt a hit.

Turns out there were three of us on 42. Was I surprised?

What happened??? Power club...

You see, power club guys come to the field (mostly the same field every time), pop their AMA card into a Freq. slot, and then sit on a wooden, cable spool table for a couple hours solving all the world's

problems. If someone comes out that actually wants to fly, he determines who is in his Freq's slot, then yells out, "Hey, Harry! You gonna fly?" Then, pops his card on top and flies.

It's a system that works great. When he forgets to take his card, it's there the next time he comes to fly, still in the slot.

However, it doesn't work for sailplaners. And, no; not because we are too lazy to carry those wooden, cable spools in our cars!

First, if we were to put our cards on a board, we wouldn't have 'em; they'd be lost. We travel to too many fields, and we have too much on our minds to keep track of our cards. Heck, we're lucky to remember our stab joiners or TX half the time!

So, since we are so pre-occupied, we need a really 'fool' proof and universal system for Freq. control.... Oh, and cheap too! (That's why clothes pins were invented.)

When we show up at a field, we walk to the board and pull our Freq. pin. We KNOW that he who has the 'pin' has the freq. Course, this system is annoying since guys like me always (forget?) to give the pin back before we leave, and some poor club guy has to magic marker another pin.

Okay, let's go back to that fated day. No one thought to explain the Freq. control system, especially since the CD was a power guy, and the system of the day was to 'clip your card onto the Freq. numbered spot of your choice'. Simple, right? No problems? Well, guess what. Not only did I end up surprised, but so did three others...

And, they belonged to that club! A second crash was avoided by reacting to yelling, before a plane hit the ground. What happened this time?

The guy who turned on forgot his card/clip and, since it wasn't him that had a conflict (according to the announcement), he figured, "No problem."

Let's say the system was 'he who has the pin has the Freq.', the sailplaner's system. Same pilots meeting announcement about conflicts. I walk up to the board, and find my Freq's pin missing. What do I do? I know I don't turn on without a pin, so I hunt down the CD who tells me that the pin is missing. Do I just take it for granted that I have the Freq.? Nope, I go to every guy there to make sure that I am clear.... Maybe, just maybe I trust that it really is missing and go fly. However, the next guy that comes up discovers that

OUR Freq. pin is gone. Ain't no way he is just gonna turn on. He's gonna poll the entire crowd to see if anyone has the pin (and the Freq.).

Sailplaners don't turn on without the pin, or at least without aggressively checking. (Accidents happen, sure, but I am not talking freak stuff, I am talking Freq. stuff.)

So, what about that annoying problem of missing clothes pins? Big deal; they don't add up to a crashed plane. If it's a contest or a club day, the winch box should be stocked with spare pins and a magic marker; just don't let me leave your field without demanding the pin back!

Moral of the story? **Take the pin, own the Freq.**; use a different system, and break hearts... And sailplanes. Our minds are on thermals and tasks and landings and on our next soaring beauty; we need uniformity for the extraneous things.

Power clubs love meetings, Roberts Rules, and procedures. Sailplaners love soaring and sailplanes.

It was a good day and I learned something about why we do it the way we do — and now you know. You can't have pins off on Thursday and Cards up on Sunday, without watching planes spiral into the ground. Again, have the pin, own the freq. — simple.

My Synergy survived, and I shared the day with some excellent soaring guys. However, unlike my other travels, this is one 'trip' I hope you don't ever get to experience.

Next month? Why not build a super-trick, new design winch.

Oh yeah, looks like down the road there will be a review of the plane JW used to win Arizona this year: the Stratos.

Back on the road,

Gordy





2000 MONTAGUE CROSS COUNTRY CHALLENGE

- Location -** Siskiyou County Airport, Montague, CA
- Date -** June 9th - Practice and LSF Task Days
June 10th & 11th - Contest Days
- Time -** Pilots meeting at 9am, flying begins at 10am
- Task -** Saturday - Free Distance within a prescribed course
Sunday - Speed Task, 2 hour minimum, 3 hour maximum
- Classes -** Open, Electric, Sailair
- Rules -** All sailplane pilots must be AMA members. The team will decide who and how long each pilot flies the sailplane. Sailplanes must be winch launched. There will be unlimited attempts allowed, no relauching on course. Each sailplane must be identified with the last 3 numbers of the team captain's AMA number. The numbers must be 3" high and placed both sides of the vertical fin.
- Prizes -** Plaques will be given to 3 members of the top 3 finishing teams in each class.
- Entering -** Entry fee is \$65 per team, each team will receive 3 event T-Shirts, and 3 tickets to a Saturday night BBQ. All entries must be received by May 9th, 2000. There will be a limit of 20 teams, so don't delay.
- Lodging -** Camping is available on-site, no services available. Motels are available in Yreka, approximately 12 miles away.
- Info -** For additional info please call Dean, Scott, or Randy at (541)899-8215 days, or Dean (541)899-7034 evenings, or e-mail us at dgair@cdsnet.net



**VIKING
MODELS,
U.S.A.**

*Serving
Scratch
Builders
Since 1979*

2 Broadmoor Way
Wylie, TX 75098-7803 U.S.A.

(972) 442-3910
RCSDigest@aol.com
9:00 A.M. - 5:00 P.M. CST

Vacuum Formed Products & Canopies

An in-house vacuum form machine allows us to produce our own canopies, which are made using PETG .040. If you are looking for a canopy or other vacuum formed accessories (including sailplane, power, etc.), please let us know. We have a large inventory of canopies and do short production runs. Manufacturer inquiries are welcome.

Glider type from 11" - 24"
Standard type from 4" - 18"
Detailed type from 6" - 13"
Others - Various Sizes

Price Range Sample:

Glider Type	\$5.00 - \$18.00
Standard Type	\$4.00 - \$12.00
Detailed Type	\$4.00 - \$12.00



S&H via U.P.S. - Continental U.S.A.
(Texas residents add 7.25% state sales tax.)

Check or money order only, U.S. funds, please.
C.O.D. \$10.00 additional. Prices subject to change without notice.

SLEIGERS INTERNATIONAL

<http://www.sleigers.com>

(908) 879-9964
FAX (908) 879-8177

*Dave Squires
Wing Rods
Available only through
Sleigers International.*

CASE HARDENED STEEL WING RODS

ANY DIAMETER 5/32" TO 5/8"
LENGTHS TO 35"

GUARANTEED AGAINST BENDING
ON THE WINCH OR IN FLIGHT!
ONLY 10 REPLACED IN 6 YEARS!

PO. BOX 364, LONG VALLEY, NJ 07853
(SHIPPING: 35 HACKLEBARNEY RD.)

VISA • MASTERCARD • DISCOVER

**Available
Now!**

EPP Foam

1.3 lb./cu. ft. Expanded Polypropylene Foam.
Similar in appearance to beaded white foam
with high impact resistance. Makes a NEARLY
INDESTRUCTIBLE slope combat or sailplane trainer.

**AEROSPACE
Composite Products**

14210 Doolittle Drive, San Leandro, CA 94577
Orders: (800) 811-2099 Info: (510) 352-2022
E-mail: info@acp-composites.com
Web Site: www.acp-composites.com

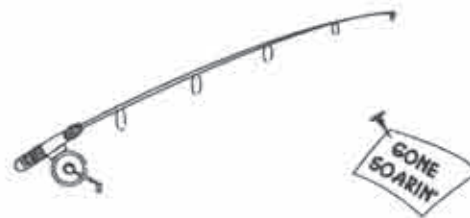


2 3/8" Thick

12" x 36"	\$9.00
12" x 48"	\$12.00
24" x 36"	\$17.50
36" x 48"	\$35.00

4 3/4" Thick

12" x 36"	\$18.00
12" x 48"	\$24.00
24" x 36"	\$35.00
36" x 48"	\$70.00



ZIKA



The author doing his best to keep the U-2 on the ground with a 20 mph wind at his back. The size of the U-2 makes it fit for one-man launch, although with those long wings, if the wind is howling, it helps to have someone else throw it for you. Richard found the "hand in front of the intakes" position best for a positive grip. (Photo by Dave Garwood.)

kid at Christmas. There it was: blocks of roughly shaped EPP, two long slender wings, a bundle of wood spars and trailing edges, four carbon fiber wing spars, a bag of miscellaneous hardware, and Coroplast fin and stabilizer.

Construction

I started construction just the way the instructions stated. First the nose cone, canopy and tail cone were attached using 5-minute epoxy. Then the fuselage sides were attached using 3M-77, being careful with their alignment to ensure symmetry. At this point you can pretty much discern that this it going to be a U2, although it's still very boxy.

The next step was to shape the fuselage. The seven pages of diagrams supplied with the kit are very helpful for this step. If you're going to try for a very scale appearance, you may find it useful to look for additional sources of information. There is an excellent monograph by Jay Miller available from Aerofax, Inc., P.O. Box 20006, Arlington, TX 76006. With the supplied diagrams, it's easy to get

the curves and straight lines in the right places.

For a first step in shaping the fuse, I used a Sharpie to mark lines parallel to the edges on all sides to guide me while rough cutting the shape. The lines along the aft fuse, from the intakes to the tail, were marked at 1/2 inch from the edge. In front of the intakes, the lines were marked 1/4 inch from the edge. There is a lot more foam aft of the intakes and I wanted it as round as possible, so I whacked off more material, hence the more aggressive rough-cut.

With the curves roughly cut, out came the 80 grit sanding block to make this thing really look like a U-2. Even having cut some rather sizable corners off the aft fuse, there was still a lot of sanding required to get that nice, round shape. I was also careful not to jeopardize the strength of the forward fuse by removing too much material. After about an hour of making EPP dust, I had what looked very much like a U-2 fuselage.

After shaping the fuse, it was time to install the radio. The diagram shows the layout for the airborne gear, so it's a simple matter to cut holes and slide in the components. My intent was to use an inexpensive radio so, at this step, I installed a Hitec Focus 2 receiver, HS-300 elevator servo and a 600 mah battery.

Specs:

Airfoil:	RG-15
Wingspan:	76 inches
Wing Area:	532 sq. inches
Weight:	37 oz.
Wing Loading:	10 oz./sq. foot
Price:	\$90 + \$5 shipping

I found it a little gut wrenching to cut a pushrod slot in the fuselage I'd just sanded to shape. Routing the elevator pushrod at this stage takes some careful three-dimensional thinking to get it to end up at the right spots without either binding or requiring a very deep gouge in the fuselage. I'd suggest cutting the elevator servo pocket and installing the pushrod *before* gluing the fuselage sides in place. This way, the pushrod can be run in a shallow groove along the side of the center fuselage from the servo cavity to the exit at the tail. The fuselage side will then cover the groove and no post-shaping, clean up work will be required.

At this point, the instructions suggest taping and covering the fuselage. However, having read ahead, I knew that mounting the wings was going to require drilling two holes all the way through the fuselage with the carbon fiber wing rods - after covering. Since this is a "freehand" operation, I didn't trust my ability to pull it off accurately on the first try, so I chose to do the drilling before covering to allow for easier patch-up, in case I missed my mark. Good idea! It took a couple of tweaks, but I finally had two holes that would mount the wing at the proper location with the required four degrees of positive incidence.

The last step prior to taping the fuselage was to install the aileron Y-connector from the receiver cavity to the wing root location on each side of the fuselage. The wires were run in a shallow slit that was later glued closed with Household Goop.

Taping and covering were done in the typical foamie fashion with 3M-77, strapping tape and Ultracote. Again, the diagrams supplied with the kit were helpful in attaining a scale NASA, ER-2 finish.

I started the wings by trimming the roots to match the curve of the fuselage. Using five-minute epoxy, I then glued the front and rear spars and the spruce sub-trailing edges in place. The balsa trailing edge stock was cut for each wing to make the 12 inch fixed portion with the remainder being the aileron. The fixed portion was epoxied to the spruce sub-trailing edge being sure to leave enough overhang at the root to trim to match the fuselage. The ailerons were tacked in place with CA for shaping to the surface of the wing. I also took a few minutes here to sand a nice, round shape on the leading edges.

After a break to solder some aileron servo extensions, I cut cavities for HS-81s at the thickest part of the wing. The wing is rather thin, so micro servos are required here. The servo wires were run in a slit to the wing root in which I'd cut a small cavity to stuff the connector. I also took care to make sure that the wire exited the wing at the same place the Y-cable exited

Kit Review

RPV Industries EPP U-2

by Richard Loud
Ballston Spa, New York

A few months ago, I watched a thread unfold on the internet *RC Soaring Exchange* about the development of an EPP U-2. I don't recall exactly when it was, or how it started, but Rick Powers, of RPV Industries, was recording all the steps of the U-2's development and publishing them on the *Exchange* for all to read and comment. I'm generally a watcher on the exchange, so I just sat back and enjoyed the reading, conjuring images of the long winged spy plane bouncing off other foamies at the slope.

Sometime around Christmas, the opportunity came my way to write the kit review for the RPV Industries EPP U-2. How cool is that to be given the opportunity to review the very plane whose development I had so voyeuristically watched months before? And a U-2, to boot! We have all looked at pictures of the U-2 spy plane and thought it would make a great subject for a R/C sailplane. After all, it is basically a jet-powered sailplane, isn't it?

The Kit Arrived

Just as with any new kit, the first thing I did when I received it was to open the box and inspect all the stuff... Just like a

the fuselage. The wire slits were then glued closed with Household Goop and taped tight until the Goop had set.

The wings were taped using a light coating of 3M-77 and strapping tape. The instructions called for a different wing-taping scheme than I'd done before. Instead of running the tape span-wise, the instructions called for two layers of tape on a 45-degree bias to the wing span with the second layer at 90 degrees to the first. This method imparts greater torsional rigidity to the wings. As with the fuselage, the wings were covered with Ultracote.

Tail assembly was pretty straightforward. I cut a slot in the top for the Coroplast fin and glued it on with five-minute epoxy. Since I had no rudder, that was it.

I made the elevator hinge by cutting out one side of the Coroplast for two bays all the way across the stabilizer. Then, with the stabilizer held in position, I marked the location of the fuselage so I could make two cuts and separate the elevator into two panels. The instructions call for making a connector out of spruce to tie the two elevator panels together, but I opted to deviate a little and make a connector out of an eight-inch piece of one-sixteenth inch piano wire. I bent the outer inch of each end forward to create the connector. All I had to do was poke the ends through the ribs in the Coroplast to connect the two elevator panels together. This way the connector tucks neatly up into the Coroplast hinge and becomes invisible. I put a spot of epoxy at the entry point on each panel and that was it: instant connector. Once the hinge was complete I could epoxy the stabilizer into the fuselage.

Setting up the radio is straightforward. The instructions call for aileron throws of 1-1/2 inches up and 1 inch down. Even with the maximum throw, I could squeeze out of my set-up, I could only get 1 inch up and 3/4 inch down. This would later prove to be plenty. The differential was achieved, even with a simple radio, by offsetting the servo arms a couple of notches forward. The instructions also call for 1 inch up and down for the elevator. I got close to that, so I was happy.

First flights...

Wind favored our local south-facing slope, which is really just a sloping farm field. There isn't much vertical component, but it's good for initial flight tests. First toss showed I needed a click or two of up trim and a click of right. Roll control was quick, especially with increased airspeed. My 1 inch up aileron and 3/4 inch down is more than adequate for me and probably too much for inexperienced pilots.

Control was also good at low airspeed. With spotty lift, I found myself in this regime quite a bit. Straight on stalls broke gently and straight-ahead. I did encounter a tendency to tip stall when turning with obviously too little airspeed. Even though I knew I was flying on the edge of stall, the break was a violent and unexpected roll in the direction opposite to the turn. Luckily, the altitude gods were smiling on me (twice!) and I was able to recover. In my rush to fly, I neglected to add the suggested

1/2 inch washout in the wings. Something I remedied before the next day of flying.

More Wind, More Flying...

After waiting a couple of weeks for a favorable combination of wind and temperature, I had another chance to fly the U-2 at a more vertical slope. In 15 to 20 mph winds, the U-2 took to the air like it was meant to be there. I nosed her down a little to pick up airspeed and she was off on her mission. The first turn to the right showed control was positive and quick. Pulling through the turn, I learned that the short-coupled elevator results in pitch sensitivity; not enough to be a problem, but something to keep in mind so you don't get into trouble.

I lowered the airspeed to check the results of adding 1/2 inch of washout to the wing tips. Although there is still quite a bit of adverse yaw at low airspeed, I didn't experience the tip stall of the previous session.

But who wants to fly slow anyway? This plane likes some airspeed, so fast is the way to fly it. Diving down for a high speed pass, with a pull up into a wingover, you can see how the wings just want to fly and, looking up the tailpipe, your mind starts to hear the roar of the engine. I even pulled a few pylon turns and she just whipped around with no noticeable loss in airspeed.

The flight this day was spent mostly horsing around in front of the camera and getting the feel for the plane. On one low pass, I came in a little too low and, well, I did a toughness test with the ground. No damage done to the airframe, the wings pulled apart slightly, but they're supposed to do that. You gotta love EPP for durability! Unfortunately, both aileron servos suffered stripped gears, so my flying ended before I could try any aerobatics. That will have to wait for yet another day when the wind and temperature are favorable.

RPV has done us all a favor by answering our fantasies about flying a U-2 sailplane. This bird looks awesome in the air,

especially flying head on and directly away. Everybody needs at least one slope jet!

The EPP U-2 kit is available from Rick Powers at:

RPV Industries
3428 Middlefield Rd.
Palo Alto, CA 94306
rpvi@aol.com

<http://members.aol.com/Rpvi/home.html>

EPP FOAM

24" x 36" x 2" Sheets

All Densities Available

0.9, 1.3, 1.9 lb/ft³

-Lowest Price

-Special Sizes

-Cut to Order

-Best Shipping Rates

Call for Current Prices

Custom Wing Cores too!

Home of the F-21 Predator and
the U-2 Spyplane EPP slope glider kits

RPV Industries
3428 Middlefield Rd.
Palo Alto, CA 94306
(650) 493-5502

RPVI@AOL.COM

Visit our great web site!
<http://members.aol.com/Rpvi/home.html>

Announcing the FIRST ALL LASER CUT Sailplane Kit!

The precision of CAD-CAM Laser cut parts are far superior to previous methods of designing and manufacturing. Parts fit so well, it makes this complex kit easy to assemble. The strong, full

D-Box, double shear-web wing allows for super winch launches; the large flaps and ailerons add to the great

SD7037 airfoil performance.

Terrific performance, style, accuracy of parts, and at an affordable price!

The Mystery Ship has ailerons, flaps, rudder, and full flying T-tail. The wings are plug-in; 2 micro servos for ailerons and 2 mini servos for flaps are required. Standard size gear will fit in fuselage.

Retail \$169.95
only \$149.95

FREE shipping in continental U.S.

Wing Span 118 in.
Wing Area 973 in.²
Airfoil SD7037
Aspect Ratio 13:1
Fus. Length w/Rudder 53.25 in.
Wing Loading 8.8 to 10 oz./ft.²
Flying Weight 62 - 68 oz.

Say you saw it in RCSD and save \$5.00 more! *The mystery is why pay more?*

Major Hobby, 1520 "B" Corona Dr., Lake Havasu City, AZ 86403
Orders Only: 1 (800) 625-6772 Info: (520) 855-7901 FAX: (520) 855-5930

HAVE SAILPLANE, WILL TRAVEL!



By Tom H. Nagel
904 Neil Ave.
Columbus, OH 43215
tomnagel@iwaynet.net

This column is dedicated to soaring vacations. This month, Al Nephew takes us on a trip to the Badlands of North Dakota.

Hobo Sloping the Giant Holstein Butte

More Adventures in the Badlands

By Al Nephew
Duluth, Minnesota

This past October I had the opportunity to make a quick trip out to western North Dakota. Aunt Bea had died at age 92 and was to be buried in Golva, three miles from the Montana border and ten miles from Sentinel Butte. I have long wanted to slope Sentinel Butte! Bea was the favorite aunt of my wife Anne, having treated Anne to all sorts of good things, including a summer in Golva when she was seven, so she wanted to make the ten hour drive to the funeral. Good idea, I said, and set up tests for my lucky students and began rearing my flying toys for probable use. You are a true fanatic if you will make a twenty hour trip for a few hours of flying, but the butte country of western North Dakota is worth it. Many of the buttes there are flyable in any wind direction, or you can drive quickly to a better one if you don't like the one you are on. And if the wind is down, the thermals are up. In addition, little precipitation falls there, so good flying weather can be counted on quite reliably. In addition, for those with families, there are lots of vacation entertainment opportunities for everyone as described below.

Thursday evening we crossed Minnesota and spent the night in Fargo, picked up Bea's brother Bert Friday morning, set the cruise control for 70 mph, headed West on I-94, roped the steering wheel into position, and prepared to snooze. Driving across flat North Dakota isn't very exciting, but it isn't stressful, either. By mid-afternoon we were

at our motel, the Westgate, in Beach. Minutes later I was jogging down the road to the football practice field, about a block away, where I caught thermals with my HLG. Soon I had collected a clutch of boys around age ten who had nonstop questions about HLG, and who assured me that the road to the top of Sentinel Butte was no sweat for a Ford Taurus wagon. Then we and the relatives had to have dinner and darkness fell.

Saturday there was the funeral. After the funeral there was the usual chicken, Jell-O and cole slaw luncheon; then we headed for Sentinel Butte, seven miles east of Beach on old US 10. At the town of Sentinel Butte you go south at the only crossroads in town (it comes south from Exit 10 on I 94), and proceed on a gravel road about half a mile. Turn right onto the road that points at the butte at the Y, then keep left at the next Y, and ignore the No Trespassing sign at the fence with cattle guard that signals Terry's land, mostly because it only applies if you leave the road which runs along the easement through his land, but also because there is no one there to care, anyway. By now you are climbing and pretty soon, after leaving his next fence and cattle guard behind, you are climbing smartly, for the butte is over 3400 feet at the top, whereas the surrounding land is 2700-2800 feet; the sides are steep, some vertical rock. There are great views from the road as well as from the top.

The top of the butte is a large area, and quite flat. The area is probably at least that of a couple of football fields. There are antennas here and there, some on large, tall towers, and some wires are strung between some of them. Also, since it is a twin-topped butte, there is another area from which you can fly, but you can't drive there with a station wagon. I looked for a place to fly the TG-3 from the top we were on, but the wind, being from the southeast and coming past the other section of the butte, was a bit tricky with eddies, and the rotor was right behind me when I was 5 feet back from the rim, with a strong wind blowing from my back, so landing would

Al Nephew launching the TG-3.



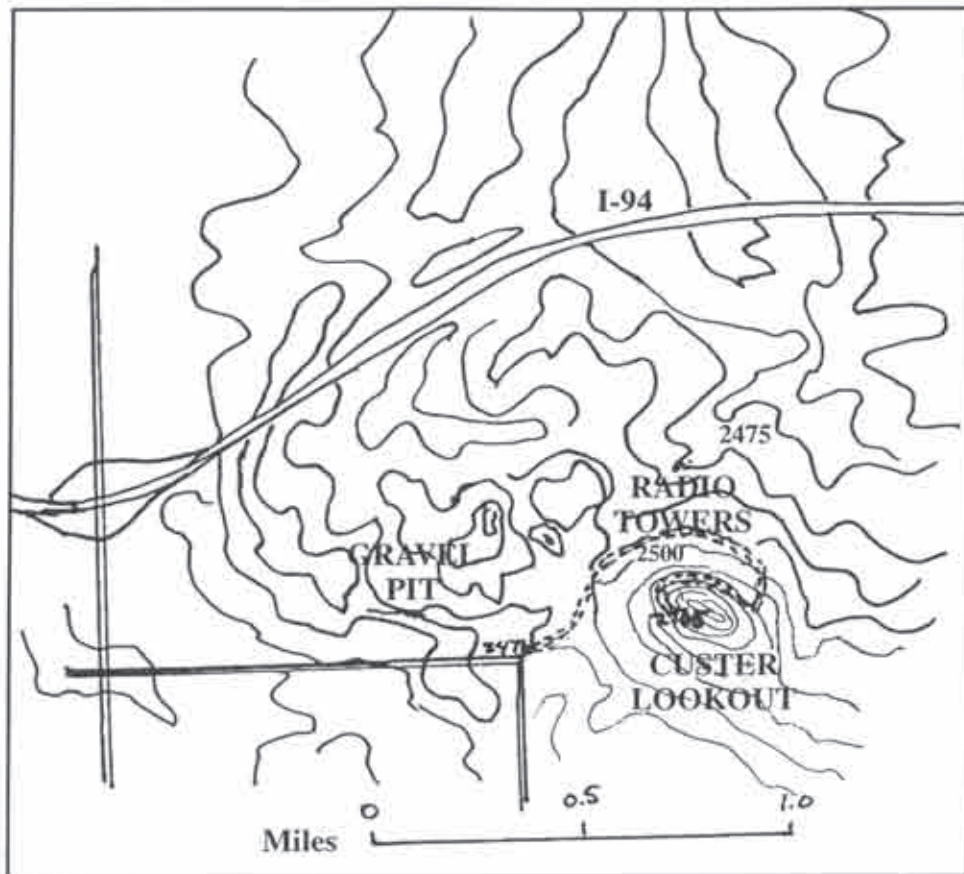
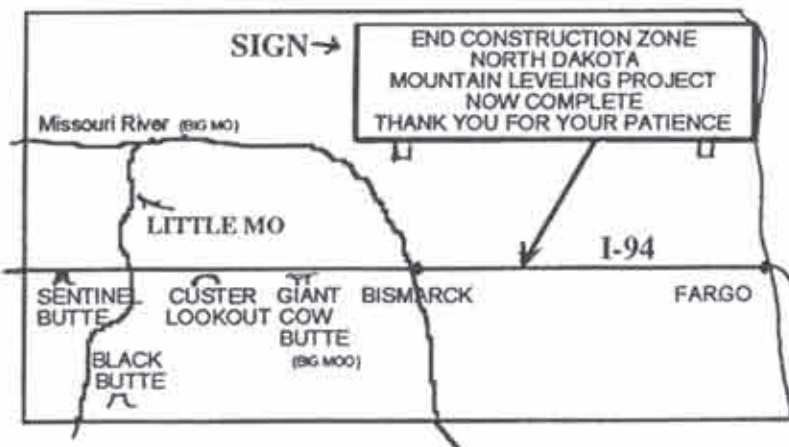
be a challenge. When I was right at the rim, the wind from the front was over 20 mph. Temperature was around 60 degrees F and there were no clouds in the sky.

Marge, the antiques lady in Medora with whom I had a phone conversation back when I was beginning to gather information about the area, told me that some guy crashed his hang glider trying to fly from Sentinel Butte, because of the wicked winds there. Probably those eddies got him, poor guy.

If we had more time, we could have hiked over and found a place to fly out on the other top. Of course, many bold slopers would be eager to try out the eddies and the wicked rotor, but I knew that Custer Lookout at Exit 90 would be perfect in the wind of the day, so we went there, noticing along the way the many other buttes that would be fine for flying in various winds, prime territory for Hobo Sloper Signs after checking with the owners or finding out no one cared if one tramped on their land for sloping purposes.

Custer Lookout (Yep, Gen. George Armstrong Custer used this butte as a vantage point on his trip west to the Little Big Horn in Montana.) is as convenient as a slope site could be for a freeway traveler, and my loaded Taurus wagon cruised right up, no high centering, just as at Sentinel Butte. (You can be confident the road will be okay if there are antennas on the hilltop, but watch out for slippery conditions in or after wet weather.) You leave I-94 at Exit 90, turn south for a half mile, turn east for a mile, and make a turn NE across or past the cattle guard (the fence is down—no one cares) and on up to the top, 250+ vertical feet above the surrounding plain. You will be presented with a vista that includes miles of flat land in nearly every direction. Smooooothe, laminar flows greet you with a lift band that doesn't seem to have limits. The top of the butte is fairly flat, littered with antenna towers and their guy wires installed by a number of companies, but it isn't difficult avoid them. Anyway, they're in the rotor, which is far enough back for comfort.

Conditions here at Custer Lookout were about perfect. On the way up a turkey vulture took off from his/her resting place on the side of the butte and soared away. Good omen. The wind was south there, a steady 20 plus mph. I had no trouble with the wind wrapping around the hill and



carrying the plane off in back of the hill from me; I flew as far as I wanted to right and left, as well as above and out in front. That TC-3 looped and barrel rolled like crazy. It was great fun and I didn't want to quit, but we had a schedule to keep.

Here are some other places that desperately want to be Hobo Sloped:

Miles south of Sentinel Butte is Black Butte! The very name conjures fear in the hearts of all but genuine back country super slopers. I haven't been there, but I have carefully examined the topographic map at Topozone.com, and judge it workable, that is, reachable and flyable. But that's just a guess. Try it and join us by reporting on it here! To get there from I-94 you turn south onto US 85 at Belfield, Exit 42, and proceed past Amidon. Turn west from US 85, six miles south of Amidon, onto a dirt road and follow the map you printed from Topozone.com. A lot of "roads" crisscross

the badlands here.

There is even a spring shown on the road to the top of the butte, but bring water with you. The road becomes a "Jeep Trail" from the spring on up, according to the map. The butte is mostly on federal land, and you are welcome to go there. Black Butte is almost as high as White Butte several miles to the SE and the highest point in North Dakota at 3506 feet above sea level. Black Butte and Sentinel Butte are a hundred feet lower. But they are still high enough, and judging from the map much better for flying than White Butte, which has a road up, but not as shown on the map. You are welcome to try it too. These buttes will get you started. Take a supply of Hobo Sloper signs with you and festoon the countryside with them according to your judgment. Then tell us about it.

Directions: Here's how to get to the North Dakota Badlands, er — Sloping

Goodlands:

Driving from the west on I-94 from Miles City and Glendive, Montana; from the east on I-94 across North Dakota (351 miles wide divided by 70 or so MPH - quick trip). From the south you will be on US 85 from Ludlow, SD, and Bowman, ND; from the north on US 85 from Williston, ND, and Moose Jaw, Saskatchewan. Don't let your gas tank gauge get low in these parts, especially as evening approaches.

Flying: You can get a scheduled airline flight into Dickinson in a puddle jumper; Dickinson is about 60 miles east of Montana (that will be three Exits with the numbers around 60). You can even get a local bush flier charter into any of the many little airports and airstrips in the area. But you might want to rent a car or an SUV in Dickinson or Bismarck (Exits with numbers around 160). The big planes fly into Bismarck, the state capital.

The Rails: Hobos ride the rails, of course, and you can get to Williston, ND, on Amtrak. Hopping freights is probably out, even though the BNSF goes right past Sentinel Butte (remember to land first on your inside foot when you exit the moving train), unless you can pack your planes and other goods sparsely.

Lodging: You'll find enough, but you might have to drive a few miles to and from it unless you have an RV or a tent. You can camp most anywhere on National Grassland land, no charge. Lodging selections run from your basic western motel such as the Westgate in Beach, with inexpensive rooms (How's \$24 for a nice room for two?), friendly service and plenty of orange juice, milk, cereal, fruit, etc., provided in the morning at no extra charge, to chain motels in Medora and Dickinson, to Dude Ranches such as the Dakotah Lodge (check it out on the Web), 23 miles south of Medora, where you can bring your family and they can do a genuine Western scene including a cattle drive complete with calf roping and branding, a night camping out, chuck wagon — your kids will regard you extra fondly if you take them here if they are the right age or if you bring one or two of their friends and let them be cowboys for a week (for the not-yet-pc, cowgirls are now called cowboys, just as hostesses are now hosts, concert mistresses are concert masters, and bumesses are bums).

Other Attractions: You and your tagalongs have to visit Theodore Roosevelt National Park, the no-sloping gem at the center of this sloper's heaven in the Little Missouri National Grasslands. Anyone and their family will love this park, which has buffalo, herds of mustangs, bighorn sheep, pronghorn antelope, coyotes, prairie dogs, and more, all for the seeing if you cruise its roadways day and night, especially at 5 am in the summer if you want to see coyotes hunting prairie dogs and much else. Unfortunately, there is no model plane flying allowed in national parks!!!

But the horseback riding is great at the stable a couple of miles north of the campground in the south unit. They take you for a very entertaining jaunt around the area across the Little Missouri, all the while telling stories about the colorful

history of the place. Be at the corral before they drive the remuda in from the pasture, and you and yours will get an adrenaline rush from seeing and hearing 50 horses come galloping in from afar, dust cloud, cowboys whistling and yelling, horses thundering in at you so fast you think they won't be able to stop in time. Cameras click and people grin at this one. Maybe The Spouse will take the kids for this entertainment, while others head out for a day of sloping, but the slopers will be envious when they hear the stories.

TD sites abound in the area, with many fields without crops or fences, and an airport at Beach with no one on duty and no traffic the whole time we were there. It has a NW/SE runway that is paved and a mile long. That runway would cook up great thermals, but probably one would need to ask permission of someone to use the place for flying models. Or maybe just do it.

There are lots of buttes to try out in the vicinity of the Little Missouri National Grasslands as well as other slopes at Bismarck along the bluffs by the Missouri River, and at Mandan at a scenic overlook just outside of town. But the real gem in an east or west wind, is School Hill, the butte with the World's Largest Holstein Cow Statue on it at New Salem, right at Exit 127. The cow (which is big enough itself to slope soar) is on a flat spot halfway up on the north side of the hill, but the top behind the cow's tail is long and horizontal, and just about a knife edge. The slopes on both sides, east and west, are alike in angle, steep and grassy. It would be perfect for Dynamic Soaring in either an east or a west wind. The hill looks like it was made by someone who backed a supersized dumptruck to the spot and dumped a mega-sized load of dirt. You can conveniently drive right up, too.

The statue of the cow shouldn't bother your flying unless you want to slope the hill when the wind is from the north, the direction the cow faces. Then you can try to get your Logic to go between the dilemma of the horns, zigzag between the legs with your Zagi, tickle the tummy with your Feather, shave the tail with your Gillette, slice right through the nostrils with your Samurai, and for the Climmax of your act, ski jump your Flamingoid down the forehead and out off the nose so it swoops back for a hand catch! Conveniently they have food and facilities right there in New Salem.

Photo Credits: Anne Nephew and Al Nephew. For information about the Little Missouri National Grasslands, contact Medora Ranger District Rt. 6, Box 131-B Dickinson, North Dakota 58601, phone 701-225-5151. Nice topo map for \$4 postpaid. For information about the Medora, ND, area sloping or antiques, contact Marge Gratton at Butte Antiques 701-623-4555. Call the Teddy Roosevelt Nat'l Park at 800-633-6721 or 701-623-4466. Sherri's Dakotah Lodge website, which has lots of photos of the Badlands landscape, though no close-ups of higher buttes, is at <http://www.dakotahlodge.com>, or search Badlands vacations on Yahoo.

Thanks, Al!

Al Nephew teaches philosophy at the College of St. Scholastica in Duluth, MN, flies HLG and dreams about hobo sloping the badlands in his spare time between duties as a college instructor and grandfather. He has been modeling since 1950 and is AMA 12118. N.B. "Butte" is pronounced "beaut."

If you have a favorite sailplane saga, consider writing it down for *RCSD*. If you are planning a vacation that includes your plane and transmitter, consider making notes as you go, and working up an article later. Take photos. Collect maps. And send your story to Tom Nagel at tomnagel@iwaynet.net for gentle editing and suggestions. Tom ■

Disclaimer: The information published about site access is believed to be accurate as of the date of publication; neither the author nor the publisher assume any

Los Banos Scale 2000

Los Banos Creek Reservoir, Los Banos, CA

May 20-21, 2000

Two-plus days of Scale Sailplanes

Aerotow Winch Slope Prizes Raffle Awards

Info: email - ohmktg@aol.com; or call

Bruce DeVisser: (408) 286-7396

Brian Chan: (650) 577-0687

CD: Lynsel Miller (408) 275-6403

liability or responsibility to any person or entity with respect to any loss or damage caused, or alleged to be caused, either directly or indirectly by the information included in this column. Flying site ownership, management and rules often change without notice. Fliers using this information are advised to proceed with good sense and politeness. Respect the owners and other users of the site. Fly safely.

■



CROSS COUNTRY SOARING



Scott Gradwell
Medford, Oregon
rcpilot@cidsnet.net

Cross Country Achievement Badges

I am sure anyone that has been involved in R/C soaring for very long has heard of the League of Silent Flight achievement program. Part of the tasks required to progress through the levels are Cross-Country tasks. These are 1km (.62 statute miles) for Level 3, 2km (1.24 statute miles) for Level 4, and 10km (6.2 statute miles) for Level 5. All of these tasks are out and return, meaning you must launch, go out to a turnpoint, and then land within 200m of where you launched from. You must also fly in contests and do duration tasks in order to achieve the level.

With modern all composite sailplanes and varios, the LSF tasks are not nearly as challenging as they used to be, plus you have to wade through all those launch and dork contests; I mean thermal duration contests. Before you send me hate mail, I *do* actually enjoy flying in those, also. *I was just kidding!*

While these are very good goals to work towards, the organizer of the Montague Cross Country Challenge felt they weren't adequate. Since he is also a full size soaring pilot, he came up with the idea of awarding badges. In the same way that full size soaring gives out Silver, Gold, and Diamond badges, he made up 25k, 50k, and 100k pins. These give Cross-Country pilots a more challenging goal to work towards.

So far, all the distance badges have been awarded at the Montague Cross Country Challenge, but they don't have to be.

The rules for awarding the badges are fairly simple. **First**, the pilot going for the badge must fly at least 90% of the time while on task. Some people might question why the pilot doesn't need to fly the whole thing but, after being on the course for over 3 hours and seeing the sailplane disappear right in front of my eyes, I think a short break now and then is a good idea.

Second, the route of flight can be a straight line, or around turnpoints. **Third**, the turnpoints must be at least 1km apart. This is so someone doesn't set a few stakes in the ground on the slope site 100 yards apart and make it into a pylon race.

Fourth, the sailplane must go around the turnpoint, not just the chase vehicle.

I know this might be a little controversial, because I have heard there are contests out



there where you fly your sailplane somewhere over the course and you drive your car like a bat out of hell around the turnpoints. This seems a bit strange to me; it would be like turning as soon as you can see the turnpoint instead of actually going around it in full size soaring. We are measuring the distance the sailplane has accomplished, not what the car has done.

Fifth, the distance is a direct line measurement from turnpoint to turnpoint, not road miles from a map, or an odometer reading. **Sixth**, you must fill out a declaration form and send it in.

So far, six 25k pins have been awarded, five 50k pins have been awarded, and no 100k pins have been awarded. Who will be the first one to get the 100k pin? A list of the pins awarded so far is shown in the chart. The pins are serialized, so the pin you receive will be unique.

That should do it for this month, and if you want to get started on your Cross-Country pin, e-mail me and I will send you back a declaration form.

E-mail

I actually received a question and was able to answer it. I am posting the question and

25k	50k
1. Dudley Dufort	1. Jim Thomas
2. Mike Bamberg	2. Mike Bamberg
3. Jim Thomas	3. Rich Spicer
4. Rich Spicer	4. Scott Gradwell
5. Scott Gradwell	5. Mike Gervais
6. Mike Gervais	

response here, in case it can help someone else out.

The question was, on the Multiplex Helios vario, "I would like to put the antenna wires in a tube in the wing, but the antenna wire is too soft. What can I do?"

I have had this problem myself, and my dad actually came up with the best solution. Go to one of those giant warehouse hardware stores and get a 3' length of heat shrink slightly larger than the antenna wire, and shrink it over the antenna. Remember to start at one end and work your way to the other end; you don't want to end up with a giant bubble in the middle. After that is done, the antenna will slide right into a pushrod housing or something similar.

Windows Plotting Programs

Airfoil Plot 8 \$35

Model Design 8 \$50

Airfoil Plot and Model Design are now available for Windows 95, Windows 98, and Windows NT. Features include the ability to use airfoils downloaded from Michael Selig's airfoil data base, export airfoils in DSF format for use with CAD programs, and plot airfoil templates for cutting foam cores upright or inverted. Nothing else to buy Over 400 airfoils plus NACA and Quaback airfoil generators are included. Airfoil Plot 7 and Model Design 7 are still available for MSDOS and Windows 3.1 users. Shipping \$5. Send #10 envelope with 55 cents postage for demo disk.

emiali canders@edge.net
Chuck Anderson, P. O. Box 305, Tullahoma, TN, 37388 Phone 931-455-6430

IMAGE is Everything

The two meter Image is now fully molded and pre-wired



Maple Leaf Design

www.mapleleafdesign.com
or 510-234-8500



(Above) Fair Weather Clouds Over Ft. Myers Beach
(Below) Heavy Layer of Cumulus Clouds Over Ft. Myers Beach, Florida

THE NATURAL SIDE OF THERMAL

SOARING

By Lee Murray
1300 Bay Ridge Rd.
Appleton, WI 54915
(920) 731-4848 (after 5:30 p.m.)
lmurray@athenet.net/~atkr065/psoar.htm
<http://www.athenet.net/~atkr065/psoar.htm>

Clouds and Thermal Development

Our last article dealt with cloud streets occurring following the passage of a cold front. This article will deal with clouds in a more general way. Most of us have become accustomed to looking to the sky, trees and flags to predict if the weather god might look favorably upon our soaring machines and us. When we know the probable flying conditions, we can adjust our expectations and even change sailplanes to accommodate the conditions. The information on cloud formations can be quite helpful in making our decisions if we know what to look for.

The Naming of Clouds Based On Their Nature and Appearance

Clouds are classified in three families: high, middle and low altitude. Within each family are classifications having to do with vertical or horizontal air movement. Clouds formed by vertical currents in unstable air are Cumulus meaning accumulation or heap¹. They are characterized by their lumpy, billowy appearance. Clouds formed by cooling of a stable layer are Stratus meaning stratified or layered. The prefix "nimbo" or the suffix "nimbus" means rain cloud, so a horizontal cloud that produces rain is called a nimbostratus and a thunderstorm cloud is called a cumulonimbus.

High clouds (above about 20,000 feet) are termed with the prefix "cirrus". Cirrus clouds are almost always ice clouds. In this

family you can have thin, high puffy Cirrocumulus clouds, stratified Cirrostratus, or simply wispy Cirrus clouds. In the middle cloud family (Alto prefix) we have altostratus, altocumulus and nimbostratus clouds. These clouds are found between 6,500 and 23,000 ft. Altocumulus clouds often have a wavy or roll like appearance.

High clouds and middle altitude clouds shield the earth from solar heating to some degree. They call the convective cooling process that follows that heating thermals. Spreading cumulus clouds caused by thermals can stop the cycle altogether if they remain over a wide area² due to their very effective shielding of the earth's surface from solar heating. Clouds are the most effective barrier to the radiant heating and cooling of the land surface, more than CO₂ and other environmental gases.

There can be different layers of clouds at one time. These clouds are forming in different horizontal air masses and by different processes³. High clouds sometimes move in a different direction than the low-level clouds. The low clouds tell us what is going on currently and what is about to happen. The high clouds reflect the direction of the jet stream. When the two differ, you should take note because the high clouds forecast the wind direction in a few more hours⁴. This could really be helpful to inland RC slope soaring pilots. At times it looks like the low-level clouds are moving faster than the high level clouds. This is an illusion due to



Postscript

As a postscript, I would like to share the kind and generous letter that Greg Ciurpita sent me last fall. Lee,

"When I saw your article, I was immediately interested. Your article has got me thinking about weather, and made me realize that very current weather information is at our fingertips because of the web. I now find myself staring at the clouds, and trying to understand, trying to relate it to the weather data we can get. I think this is wonderful.

"I had my first high altitude glider flight the other day. I was encouraged to fly because of the sounding info I had. After a mixed bag of flights, some meek, and a few of slightly longer durations, I finally caught one, and my glider climbed. I wasn't sure what to do, and getting worried, started trimming for forward elevator. After 11 minutes, it came down.

"Thanks. You've really opened my eyes to something. And its great to apply science to just a hobby."

Gregory Ciurpita
New Jersey

the great distance to the high clouds which are actually moving very fast.

Low clouds, between ground level and 6,500 ft, includes stratus, stratocumulus and fair weather cumulus clouds. These clouds are usually water in summer but can contain snow and ice in colder seasons and climates. A familiar low-level stratus cloud forms in San Francisco almost every evening and is called fog. Nimbostratus clouds are often thick rain clouds covering the whole sky and produce continuous rain, snow or ice precipitation.

Our soaring-friendly cumulus clouds sometimes follow a cycle where a layer of cumulus clouds will form from a convective cooling process of the solar heated ground. Later in the cycle they dissipate allowing another cycle of thermal development and subsequent cloud formation to occur. The cycle of thermal development starts about 10 to 11 am and continues to build until two or three in the afternoon when the maximum temperature is reached. After that, thermal development tapers off with evening releases of heat as late as 8 pm.³ Quoting Pagen; "Thermals of the evening are never as strong, abundant, high rising or as reliable as daytime thermals, but weak lift is better than no lift." Experience in flying RC gliders after work has verified that you can often have extended flying time as the sun is setting but you never "speck out" during sunset—at least in Wisconsin.

The two photos were taken at Ft. Myers Beach in October of last year. One photograph illustrates developing clouds, which are helpful to sailplaners looking for lift. The other illustrates an overdeveloped sky in the afternoon. In both situations you can see the sharp demarcation between clear skies over the Gulf of Mexico and the clouds over the land as the result of thermal activity.

Web Sites

RCSD reader, Gregory Ciurpita, took an interest in this column and has provided some very helpful web sites. Texas A&M University has a soaring forecasts service for lapse rate information from ROAB stations (places where data is collected via weather balloons). These stations are selected from pull down menus sorted by state and city that make it easy to use. The soaring forecasts page of this web site has much more than the soundings, and includes definitions and explanations for the various terms that have been used in this column and more.

Thermal Index (TI) Data

Estimated Maximum

Soaring Altitude

Estimated Lift. (3 methods) 1. Dry Thermal 2. CCL Method 3. Soaring Index. **Trigger Temperature.** The "surface temperature required to produce a dry-adiabatic lapse rate which will intersect the sounding at a user-specified altitude".

Soaring Forecasts: <http://csrcp.tamu.edu/soar/for.html>

Greg also found a web site with information about clouds. This site has great photographic illustrations and definitions of clouds.

Clouds Reference: <http://vortex.plymouth.edu/clouds.html>

References:

- 1 Aviation Weather – Government Publication, pg 53
- 2 Pagen, Dennis, Understanding the Sky, pg 196
- 3 ibid, pg 29
- 4 ibid pg 48

High Performance Epoxy Systems Pro-Set & MGS

Increase Strength Up to 65%,
Stiffness Up to 33% and
Heat Tolerance Up to 90%
over room temperature cure systems

Visit our Website for FREE
"How To" Articles and catalog:
www.cstsales.com

Order Desk: 1-800-338-1278



Composite Structures Technology

The Composites Store

Phone: 661-822-4162, Fax: 661-822-4121



ZWA

Our design criteria was simple...
Launch higher, fly farther, go faster.

The result?

Cutting edge technology with
performance that tears up the sky!

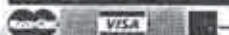
The Millennium...our best to date.



1120 Wrigley Way, Milpitas, California 95035
Voice/Fax: 408-WINGS-51 (408-946-4751)
Also Distributed by Slegers International 908-879-9964

Also available in Mid-Tail
and T-tail configurations.

Order direct from RnR



"SHORT CUTS"



Steve Savoie
926 Gage St., Bennington, Vermont 05201
(802) 442-6959

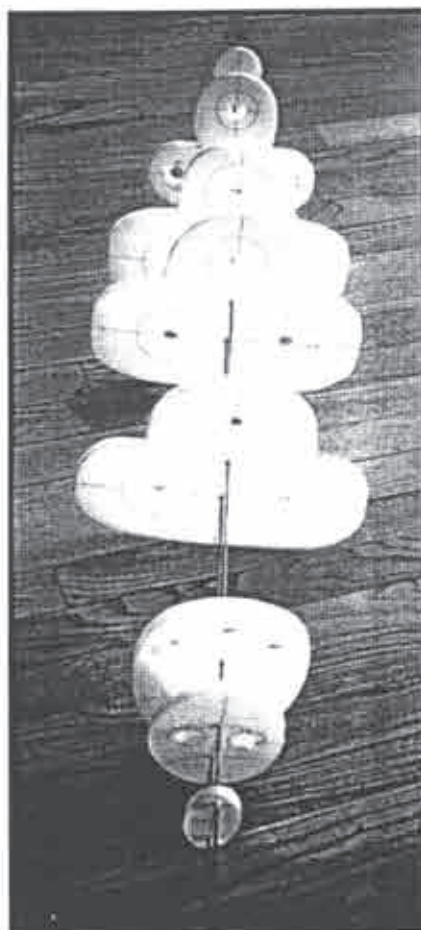
X-4 Part 3

The X-4 building project is slowly starting to pick up speed. To date, all the 3/8 Rohacell bulkhead sections have been cut out, drilled to accept two 1/8" alignment pins, and fitted with lightning holes. The next step was to cut sheet foam (1 1/4 sheets) to length and width, machine in the recesses for the alignment pins, and then bond them together using 3M 77 spray adhesive. Each group was placed in a vacuum bag (25" HG) to set the adhesive under several pounds of uniform pressure. This was the easiest way to clamp the foam without distorting it.

The two centerline blocks were marked up and machined with a 1/8" ball end cutter on a dremel router, forming a recess large enough to accept 1/8" music wire sections, which were used to align the foam. Additional blocks were cut and bonded to match the section profiles. The bulkhead section widths and bulkhead spacing was used to establish the block sizes. All cuts were carefully made on a table saw to ensure all faces were perpendicular.

When all the blocks were completed, they were aligned on the music wires (spaced 2" apart vertically) to check fit. The fit was good with both vertical and horizontal centerlines being maintained as well as keeping bulkheads perpendicular to the centerlines.

The next step will be to preliminarily shape the foam sections to the adjoining bulkheads, bond bulkheads to the foam blocks, and then shape to final size. Both the nose cone and the tail cone areas will be shaped from either R-71 or R-110 Rohacell foam. Hard balsa blocks can be used in lieu of the

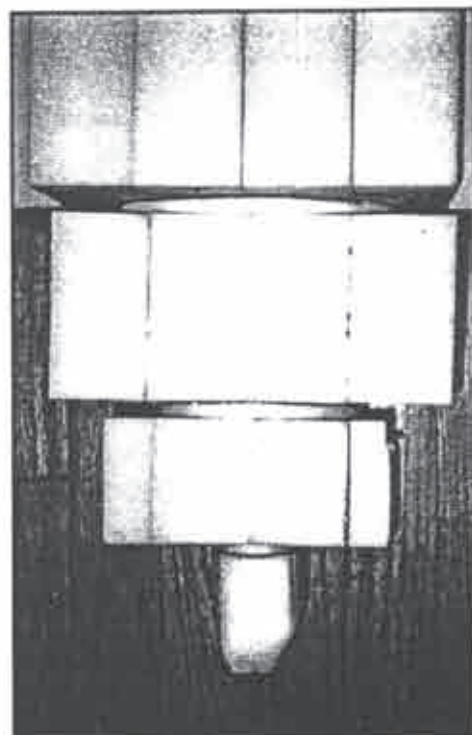


3/8" Rohacell bulkheads fitted onto 1/8" alignment pins.

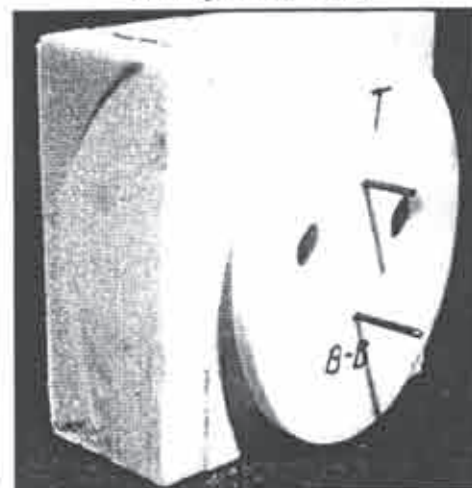


Group in vacuum bag. No clamps required.

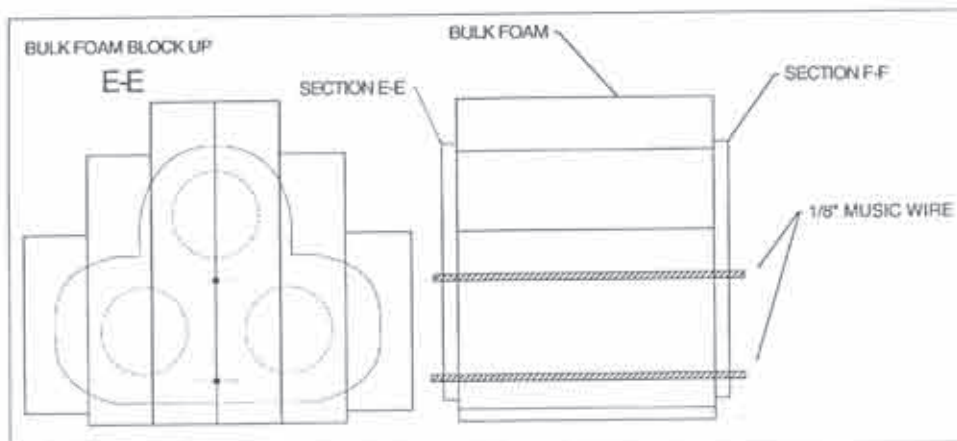
Rohacell in these areas and 1/8" light ply used for bulkhead sections.



After each group was assembled, they were joined together as one. Now, they are ready to cut to shape.



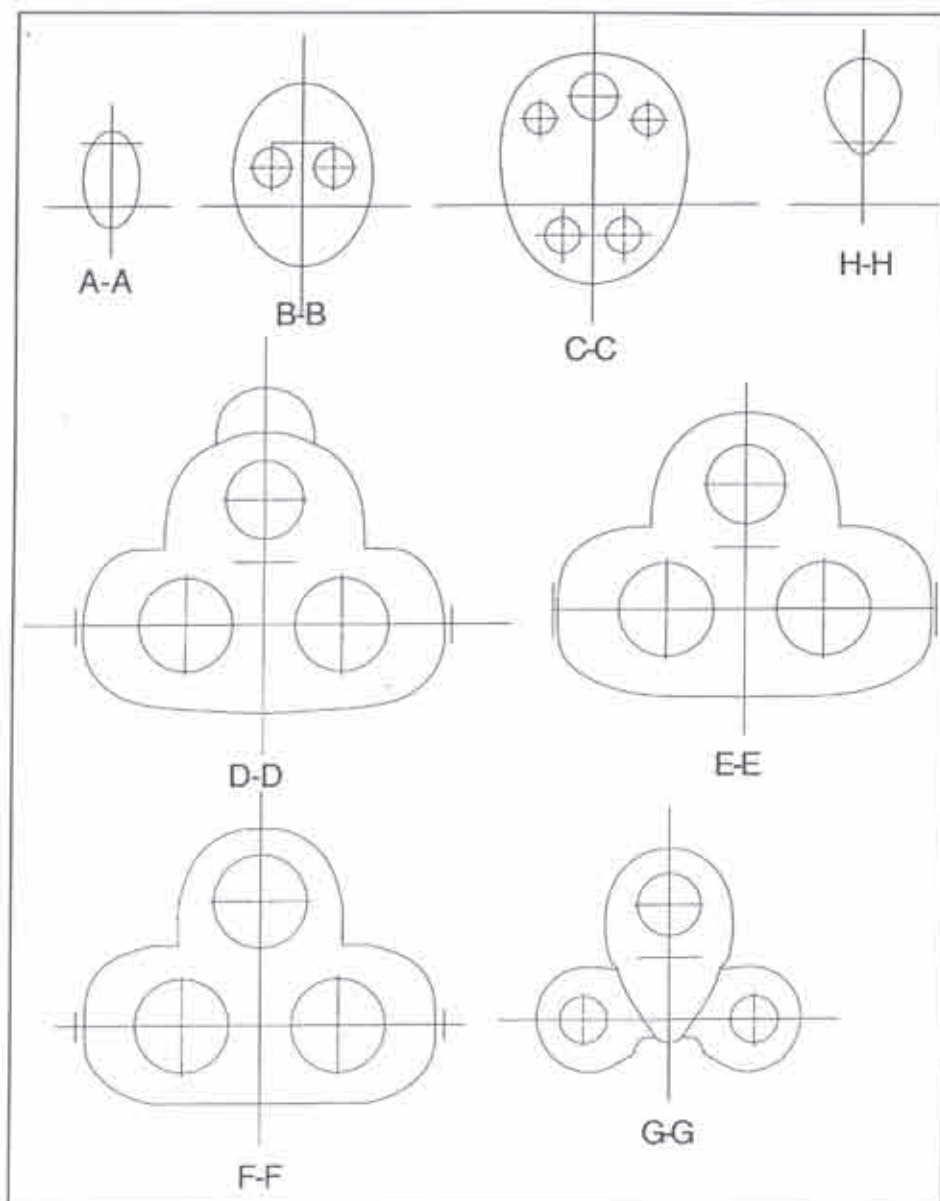
First group ready to vacuum bag together.



International Scale Soaring Association

There is a growing interest in scale soaring in the U.S. We are dedicated to all aspects of scale soaring. Scale soaring festivals and competitions all year. Source for information on plans, kits, accessories and other people interested in scale. For more information, write to:

International Scale Soaring Association
37545 Oak Mesa Drive
Yucaipa, CA 92399-9507
e-mail: 70773.1160@Compuserve.com
web site: www.soaringissa.org



ELMIRA AEROTOW 2000



COME FLY WITH US AND SOAR TO NEW HEIGHTS!

**June 7-10, 2000
HELD IN ELMIRA, NY
SOARING CAPITAL OF THE U.S.
HOSTED BY: HARRIS HILL L/D R/C**

co-sponsored by:

**The National Soaring Museum
The Harris Hill Soaring Corp.
Chemung County, NY
Eastern Soaring League**

**Four days of soaring at the
cradle of soaring in America**

Taking scale into the new century, we promise another friendly, well attended aerotow for the summer of the year 2000. As last year, we will be given exclusive use of the Harris Hill Soaring Corporation's airfield on Wednesday through Friday, 7-9th. Weds. will be open flying (aerotow or slope) for early arrivals. Thursday will be the start of the official event with radio impound. The field will be shared with full scale sailplanes on Saturday. Factory and international demo flying are scheduled for Saturday afternoon. Sunday is a travel day, and no flying is scheduled.

This year we expect to see some excellent pilots from Europe attending, including 1999 Akro Cup winners. National and international vendors will be showing their wares. The emphasis will be on fun and aerotowing, as well as some fantastic slope soaring if conditions dictate. Tow planes and experienced pilots will be there to tow you to altitude. We will be blocking out channels 17-25-26-29-57 for tug use this year. Bring a scale sailplane with nose release and join us at historic Harris Hill. On Friday evening there will be a Banquet at the Harris Hill Youth Camp adjacent to the flying field. Guest speakers to be announced. More exciting plans are in the works; keep an eye out for further developments as they become available. Current AMA or MAAC membership is required. There will be a \$25.00 pilot registration fee (\$20.00 in advance, check payable to HH L/D by April 15th). Bring the family and enjoy a few extra days in the NY State wine country, or visit the National Warplane Museum, or the Glenn Curtiss Museum.

For details & information (including shipping your sailplane to Elmira) contact:

John Derstine 570-596-4392

e-mail: johnders@postoffice.ptd.net

RD#3 Box 336, Gillett PA 16925

Online Registration & Updates

<http://www.Geocities.com/~scalesoar>



ZIVA

Baltimore Area Soaring Society presents the annual... **EAST COAST HAND LAUNCH CLASSIC** **May 6-7, 2000**

(Pre-registration required by April 30)



*A full weekend of R/C hand-launch
competition sanctioned by the AMA and
Eastern Soaring League (ESL)
12 rounds flown in 1999 by 44 contestants.*



For more information, tasks and registration:

www.soarmd.org

John Appling 410/374-2463 -or- JAppling@qis.net

R/C Soaring Digest is a generous sponsor of ECHLC 2000

SCHEDULE OF SPECIAL EVENTS

May 5-7
Texas National Tournament
Jay Schultz, jkschul@juno.com
Henry Bostick, (972) 279-8337

May 6-7
MVSA Gateway Soaring Open 2000
Mark Nankivil, (314) 781-9175
Nankmc@QuixNet.net
Alden Shipp, (217) 223-3052
alden@adams.net

May 6-7
International Slope Race
Gavin Botha, (408) 270-1471
gbotha@arc.nasa.gov

May 6-7
East Coast HL Classic
John Appling, (410) 374-2463
jAppling@qis.net

May 19-21
Midwest Slope Challenge
Loren Blinde, (402) 467-4765
mwsc@alltel.net, www.alltel.net/~mwsc

May 20-21
Los Banos Scale 2000
Bruce DeVisser, (408) 286-7396
ohimktg@aol.com

June 7-10
Elmira Scale Aerotow 2000
John Derstine, (570) 596-4392
johnders@postoffice.ptd.net
http://www.Geocities.com/~scalesoar

June 10
Cross Country Challenge 2000
Merrill Brady, mmglidert@keyway.net
Gary Fogel, gliderrc@aol.com

June 9-11
Montague Cross Country Challenge
3rd Annual, Practice June 9th
DG Airparts, Inc., dgair@cdsnet.net
(541) 899-8215

June 23-25
MSSC 2000
Ed Wilson, (502) 239-3150
ewilson1@bellsouth.net

Dallas, TX

O'Fallon, MO

Davenport, CA

Frederick, MD

Lake Wilson, KS

Los Banos, CA

Elmira, NY

Lancaster, CA

Montague, CA

Louisville, KY

June 24-25

Spring Fling 2000
Dudley Dufort, (916) 448-1266
www.svss.org

Sacramento, CA

July 1-2

CRRC 3rd Annual RES - 2m & UNL
Info. & Map: <http://www.charlesriverrc.org>
Dick Williamson, (781) 981-7857
Williamson@ll.mit.edu
Pete Young, (617) 484-0640
pwyoung@ix.netcom.com

Sudbury, MA

July 29-30

GNATS Aerotow 2000
Phil Landray, (905) 468-3923
linden@niagara.com
Gerry Knight, (905) 934-7451
Lou Kleiman, (905) 688-4092
Mistral@niagara.com

Ontario, Canada

August 3-6

International Electric Flight Festival
Ron Scharck, (858) 454-4900
Scharck@aol.com

San Diego, CA

August 6-12

F5 World Championships
Ron Scharck, (858) 454-4900
Scharck@aol.com

San Diego, CA

August 12-13

CRRC Soar-In Contest
Anker Berg-Sonne, (978) 897-1750
anker@ultranet.com
John Nilsson, (978) 368-7136
nilssonj@rd.simplenet.com
Info. & map: <http://www.charlesriverrc.org/>

Sudbury, MA

August 26-27

Washington Scale Aerotow Fun Fly
Gene Cope, (509) 457-9017, gcope@ixpnet.com
Frank Smith, (509) 924-8440

Yakima, WA

September 2-4

Soar Utah 2000
Scott Marshall, (435) 843-9478
marshall@trilobyte.net
<http://www.silentflyer.org>

Salt Lake City, UT

September 29 - October 1

Oc-Tow-Berfest 2000
Peter George, (314) 664-6613
twometer@worldnet.att.net

St. Louis, MO

For detailed information on events
outside of the U.S.A., please view
www.sailplanes.com event schedule.

Please send in your scheduled
events as they become available!

5TH ANNUAL

G.N.A.T.S. AEROTOW 2000

"Come fly with us in Canada's
beautiful Niagara Wine Country!"

July 29-30, 2000

To be held in Central Niagara Peninsula,
Ontario, Canada
(Approx. 30 Miles West of Buffalo/Ft. Erie)

Co-sponsor: Canadian Model Aerotow Society
Emphasis will be on fun and aerotowing.
Tow planes and experienced pilots will be
available to tow you to altitude. Bring your 3
meter (118") or larger sailplanes, fitted w/
ailerons and tow release, and join the fast
growing aerotow movement. Scale
Motorgliders will be welcome at this event
as will non-scale large sailplanes fitted with
tow releases.

Pilots' choice awards include Vintage &
Modern sailplanes, and tugs. Proof of 2000
MAAC or AMA membership is required,
along with gold sticker radios. Meals and
accommodation are available nearby.
Registration fee: \$12 (\$10 US).

For information package & map contact:

Phil Landray, (905) 468-3923
Linden@niagara.com
Gerry Knight, (905) 934-7451
Lou Kleiman, (905) 688-4092
Mistral@niagara.com

R/C SOARING DIGEST

Radio controlled

THE JOURNAL FOR R/C SOARING ENTHUSIASTS

A MONTHLY LOOK INTO THE WORLD OF SAILPLANE ENTHUSIASTS EVERYWHERE

R/C Soaring Digest (RCSD) is a reader-written monthly publication for the
R/C sailplane enthusiast. Published since 1984, *RCSD* is dedicated to the
sharing of technical and educational information related to R/C soaring.

RCSD encourages new ideas, thereby creating a forum where modelers can
exchange concepts and share findings, from theory to practical application.
Article topics include design and construction of RC sailplanes, kit reviews,
airfoil data, sources of hard to find items, and discussions of various flying
techniques, to name just a few. Photos and illustrations are always in
abundance.

There are *RCSD* subscribers worldwide.

R/C Soaring Digest Subscription Form

USA: \$30 First Class
(TX res., please add \$1.52 tax.)
Canada & Mexico: \$30 Air
Europe/U.K.: \$45 Air
Asia/Africa/Pacific/Middle East: \$52 Air
Check or Money Order, only, please. U.S. funds.

Name _____

Address _____



R/C Soaring Digest
P.O. Box 2108
Wylie, TX 75098-2108 U.S.A.
Voice (972) 442-3910
FAX (972) 442-5258

e-mail: RCSDigest@aol.com

<http://www.halcyon.com/bsquared/RCSD.html>

Spring Fling 2000



Sacramento - California

**JUNE
24 & 25**

Two-day Thermal Duration Contest

7 ROUNDS OF THERMAL DURATION COMPETITION, NIGHT Flying, ZAGI-type Racing, TWIN STAR racing, You Brung-it we Race-it Racing, Lunchtime HLG CONTEST, Open Flying, DEMOS, BBQ, RAFFLE, VENDOR, Fly on 22 ACRES of clear flat land! S&E Modeler Sponsored PILOT'S CHOICE Awards and SAILPLANE DASH, FREE on-site camping the week before - sorry no RV hook-ups, OPEN practice the week before, Fun, FUN, MORE FUN! Easy airport access from Sacramento!

Four Classes:

Open, 2-meter, 3-function, Gray Cup
Entry fees: \$30 for one class,
\$40 for two classes

Contact:

Dudley Dufort (916) 537-1266
C.D. Carl Vega (916) 927-0449
Sign up online at: www.svss.org



Classified Advertising Policy

Classified ads are free of charge to subscribers provided the ad is personal in nature and does not refer to a business enterprise. Classified ads that refer to a business enterprise are charged \$5.00 per month and are limited to a maximum of 40 words. The deadline for receiving advertising material is the 15th day of the month. (Example: If you wish to place an ad in the March issue, it must be received by February 15.) RCSD has neither the facilities or the staff to investigate advertising claims. However, please notify RCSD if any misrepresentation occurs. Market Place Listings are \$5 a month. Personal ads are run for one month and are then deleted automatically. However, if you have items that might be hard to sell, you may run the ad for two months consecutively.

For Sale - Business

PC-Soar Version 3.7 Sailplane Performance Evaluation Program with Airfoil and Sailplane Library expanded to 60 models including Chrysalis, Anthem, Genesis, Peregrine, Probe, Thermal Eagle, and Spectrum. Airfoil library includes 322 polars with 56 UIUC polars. PC-Soar with Libraries of Sailplanes and Airfoil Polars plus a new Excel utility for working with multi taper wing areas and aerodynamic centers. Reduced cost: \$50 + \$3 P&H. PC-Soar library and software Upgrade to Ver. 3.7: \$10 + \$3 P&H. LJM Associates, 1300 Bay Ridge Rd., Appleton, WI 54915; ph: (920) 731-4848 after 5:30 p.m. weekdays or on weekends. E-mail: lmurray@athenet.net. PC-Soar Web Page: <http://www.athenet.net/~atkrone/pcsoar.htm>.

PARACHUTES: \$10. Dale King, 1111 Highridge Drive, Wylie, TX 75098; (972) 475-8093.

DesignAire: EASY TO USE AIRCRAFT DESIGN SOFTWARE (PC). 3-D sketch, performance, Wt/Bal, inertias, color graphs, panel analysis, static stability, airfoils, envelope, FAR 23A loads and envelope. Runs "airfoil ii". \$119. JammaAero POBox 236, Horntown VA 23395, www.jammaero.com.

For Sale - Personal

1/4 Roedel Super Cub (towplane), 2.687 meter span, wing profile Clark Y mod. (suitable motors are 160 T, 300 T, OS BGX-1, Brison 3.2 or similar), NIB... \$385.00. Contact Robin Lehman, 63 E. 82nd St., New York, NY 10028; (212) 879-1634.

Hobby Shops that Carry RCSD

Gunnings Hobbies 538 San Anselmo Ave. San Anselmo, CA 94960 (415) 454-3087	Hobby Town U.S.A. 8060 S. 84th St. La Vista, NE 68128 (402) 597-1888
Gyro Hobbies 23052 Lake Forrest Dr. Unit C2 Laguna Hills, CA (714) 583-1775	Hobby Warehouse 4105 South Street Lakewood, CA 90712 (562) 531-8383
Hobbies "N Stuff" 9577-L Osuna Rd. NE Albuquerque, NM 87111 (505) 293-1217	King R/C Five Forks Village King, NC 27021
	Tim's Bike & Hobby 2507 Broadway Everett, WA 98201 (206) 259-0912

Closet Scale Stuff At Sailplanes Unlimited, Ltd.

1/3 Pribek ASW 27 - 5 meter span (196"), wing profile HQ 2.5/12, ca. 20 lbs.
1/4.2 FiberClassics Nimbus 4 - 6.28 meter span (246"), wing profile E 68-66, ca. 18 lbs.
1/3.6 Roedelmodell DG 800 - 4.15 meter span (163"), wing profile E 207, ca. 11 lbs.
1/3.75 Roedelmodell Fox MDM-1 - 3.8 meter span (149"), wing profile RG 12, ca. 15 lbs.
1/2.77 Pribek ASW 19 - 5.4 meter span (212"), wing profile Ritz 3 mod., ca. 20 lbs.
Please call for additional info: (212) 879-1634.



CUSTOM DESIGNED, FIBERGLASS FUSELAGES FOR THE SCRATCH BUILDER

VIKING MODELS, U.S.A.

Serving Scratch Builders
Since 1979

2 Broadmoor Way
Wylie, TX 75098-7803 U.S.A.
(972) 442-3910
RCSDigest@aol.com
9:00 A.M. - 5:00 P.M. CST



STILETTO RG-15

Design Suggestions

Fuselage designed to take a heat shrink battery pack in the nose, with a standard size receiver, on/off switch, and 3 standard size servos in tandem. Fuselage designed by Bernard Henwood. Recommended for thermal or slope, intermediate to expert.

S&H via U.P.S. - Continental U.S.A.
(Texas residents add 7.25% state sales tax.)

Check or money order only, U.S. funds, please. C.O.D. \$10.00 additional. Prices subject to change without notice.

Dear Scratch Builder,

Many of you have asked for fuselages that we have not been in a position to provide, as most of you know, until now. But, we're back, at least for a limited time.

The thermal/slope, epoxy fiberglass fuselages shown below, are the first of our Viking line, and include suggested specifications (wing span/airfoil/radio channels). We **will not** carry an inventory, but rather custom make each fuselage as the orders are received. We want to do things right, so delivery time varies, and can take up to a month or longer, depending on what you want.

Jer

Thermal or Slope

Epoxy Fiberglass Fuselages	Price	S&H
Aeolus III (60"/NACA 63A010/3)		
43" fuse, plans	\$75.00	\$15.00
Condor 3m (bolt-on wing mount/up to 10" chord)		
52 1/4" fuse, nose cone	\$90.00	\$15.00
Contestant (148"/E205/3-4/10.5" chord)		
60" fuse, canopy, tray	\$90.00	\$15.00
Elf 2m (bolt-on wing mount/up to 10" chord)		
44 3/8" fuse, nose cone	\$80.00	\$15.00
Oden (100-130"/S3021/As Req./10.25" chord)		
51" fuse, canopy	\$85.00	\$15.00
Raven 3m (119"/Mod. E193/As Req./10.75" chord)		
51" fuse, plans	\$90.00	\$15.00
Stiletto II (100-136"/Any/As Req./10" max. chord/bolt-on wing)		
49" fuse	\$85.00	\$15.00
Stiletto RG-15 (100-136"/RG-15/As Req./plug-in wing)		
49" fuse	\$85.00	\$15.00
Stiletto S-3021 (100-136"/S-3021/As Req./9.5" Chord/plug-in wing)		
49" fuse	\$85.00	\$15.00
Stiletto S-7037 (100-136"/S-7037/As Req./9.5" Chord/plug-in wing)		
49" fuse	\$85.00	\$15.00
Stiletto HQ 25/9 (100-114"/HQ25/9/As Req./10" root cord/plug-in wing)		
49" fuse	\$85.00	\$15.00
Zen (100"/None/Var.)		
51" fuse, hatch	\$85.00	\$15.00

All fuselages are Kevlar™ reinforced.

R/C Soaring Resources

These contacts have volunteered to answer questions on soaring sites or contests in their area.

Contacts & Soaring Groups - U.S.A.

Alabama - North Alabama Silent Flyers (NASF), Ron Swinehart, (256) 722-4311, <ron.swinehart@imco.com>, or Rob Glover at AMA3655@aol.com, http://sh1.ro.com/~samfara/
Alabama - Central Alabama Soaring Society, Ron Richardson (Tres.), 141 Broadmoor Ln., Alabaster, AL 35007, <ron_mail@bellsouth.net>.
Alabama - Southern Alabama & NW Florida Aerotow, Asher Carmichael, (334) 626-9141, or Rusty Rood, (904) 432-3743.
Arizona - Aerotowing, slopesites in AZ (rugged), Arizona Flying Eagles R/C Demo Show Team, Dave Wenzlick, (602) 345-9232, <azdw@uswest.net>, or visit CASL at <http://www.public.asu.edu/~vansanfo/casl>.
Arizona - Central Arizona Soaring League, Iain Clithero, (602) 839-1733.
Arizona - Southern Arizona Glider & Electric (Tucson area), Philip Brister (contact), (520) 394-2121, pbrister@juno.com. SAGE welcomes all level of flyers!
Arkansas - Northwest Arkansas Soaring Society, Tom Tapp (President), RT 2 Box 306, Huntsville, AR 72740; (501) 665-2201, eve.
California - DUST, Buzz Waltz, 68-320 Concepcion, Cathedral City, CA 92234, (760) 327-1775, <buzzwaltz@excelsioronline.com>.
California - High Desert Dust Devils, Stan Sadoff, 14483 Camrose Ct., Victorville, CA 92392; (760) 245-6630, <Soareyes@aol.com>.
California - Inland Soaring Society, Robert Cavazos, 12901 Forman Ave., Moreno Valley, CA 92553, RCAV@aol.com.
California - Northern California Soaring League, Mike Clancy, 2018 El Dorado Ct., Novato, CA 94947; (415) 897-2917.
California - Sacramento Valley Soaring Society, Dudley Dufort, 225 30th St., Suite 301, Sacramento, CA 95816, (916) 448-1266, <www.svss.org>.
California - Soaring Union of Los Angeles, John Bruce, 908 W 245th St., Harbor City, CA 90710, (310) 534-0948, <rcflyinman@aol.com>.
California - South Bay Soaring Society, Mike Gervais, P.O. Box 2012, Sunnyvale, CA 94087; (408) 683-4140 (H), (650) 354-5469 (W).
California - Southern Calif. Electric Flyers, John Raley (President), 1375 Logan Ave., Costa Mesa, CA 92626; (714) 641-1776 (D), (714) 962-4961 (E), e-mail: E-Flyers@ic.netcom.com.
California - Torrey Pines Gulls, Ron Scharch, 7319 Olivetas Ave., La Jolla, CA 92037; (619) 454-4900.
Colorado - Rocky Mountain Soaring Assn., Phil Weigle, 1290 Salem St., Aurora, CO 80011; (303) 341-9256 eve.
Eastern Soaring League (VA, MD, DE, PA, NJ, NY, CT, RI, MA), Tom Keisling (Pres./Editor), (814) 255-7418, kiesling@etcc.com; Ben Lawless (Sec./Tres.), Lawless@ang.atnll; Anker Berg-Sonne (Sorekeeper), (508) 897-1750, anker@ultranet.com; Josh Glaab (Contest Coordinator), (757) 850-3971, jlglaab@pinn.net; <http://www.ecclipse.net/~mikel/esl/esl.htm>.
Florida - Florida Soaring Society, Mark Atzel (President), 1810 SW Terrace, Ft. Lauderdale, FL 33312, (954) 792-4918.
Florida (Central) - Orlando Buzzards Soaring Society (<www.spses-usa.com/~ingo/OrlandoBuzzards>), Jerre K. Ferguson (Pres.), 4511 Pageant Way, Orlando, FL 32808, (407) 295-0956, <jerre@bellsouth.net>.
Georgia - North Atlanta Soaring Association, Tim Foster, (770) 446-5938 or Tom Long, (770) 449-1968 (anytime).
Hawaii - Maui Island Slope Soaring Operation (MISO), Duane A. K. Asami, 262 Kamila St., Kula, HI 96790, pgr. (888) 932-6247, <dasaam@mauigateway.com>.
Illinois (Chicago Area) - Silent Order of Aeromodeling by Radio, Jim McIntyre, 23546 W. Fern St., Plainfield, IL 60544 2324; (815) 436-2744, Bill Christian, 1604 N. Chestnut Ave., Arlington Heights, IL 60004; (847) 259-4617.
Illinois (Northwest) - Valley Hawks R/C Soaring Club, Jeff Kennedy (President), 414 Webster St., Algonquin, IL 60102, (708) 658-0755, eve, or msg.
Indiana (NE Indiana and NW Ohio) - League Of Flight by Thermal (LOFT), Ft. Wayne, Marc Gellart, (419) 229-3384, <isoar2@wcoil.com>, <www.rc-aero.com/LOFT>.
Indiana - Bob Steele, 10173 St. Joe Rd., Fort Wayne, IN 46835, (219) 485-1145.
Iowa - Eastern Iowa Soaring Society (IA, IL, IN, KS, NE, WI), Ed Harris (editor), 2000 NW 84th Ave., Ankeny, IA 50021; (515) 965-5942, <harris.edwin@mcleodusa.net>, <http://eiss.cnde.iastate.edu>.
Kansas - Kansas Soaring Society, Pat McCleave (Contact), 11621 Nantucket, Wichita, KS 67212; (316) 721-5647.
Kansas - Aerotowing, Jim Frickey, (913) 585-3714.
Kentucky - Bluegrass Soaring Society, Frank Foster (President), 4939 Hartland Pkwy., Lexington, KY 40515; (606) 273-1817.
Kentucky - Louisville Area Soaring Society, Ed Wilson (Contact), 5308 Sprucewood Dr., Louisville, KY 40291; (502) 239-3150 (eve), e-mail <edwilson1@bellsouth.net>.
Louisiana - Capitol of Louisiana Soaring Society (CLASS), Leonard Guthrie (contact), 12464 Fair Hope Way, Baton Rouge, LA 70816, (225) 275-2122, flynguls@aol.com.
Maine - DownEast Soaring Club (New England area), <Jamesiii@blazenetme.net>.
Maryland - Baltimore Area Soaring Society, Erich Schlitzkus (President), 52 North Main St., Stewartstown, PA 17363; (717) 993-3950.
Maryland & Northern Virginia - Capital Area Soaring Association (MD, DC, & Northern VA), Chris Bovais, 12504 Circle Drive, Rockville, MD 20850; (703) 643-5513.
Massachusetts - Charles River Radio Controllers, Dick Williamson (past president), 21 Pendleton Road, Sudbury, MA 01776; (781) 981-7857 (W), <williamson@lil.mit.edu>, <http://www.charlesrivercc.org>.
Michigan - Greater Detroit Soaring & Hiking Society, Greg Nilsen (Sec.), 260 Rosario Ln., White Lake, MI 48386-3464; (248) 698-9714, GNilson624@aol.com.
Michigan - Great Lakes 1.5m R/C Soaring League & "Wings" Flight Achievement Program & Instruction, Ray Hayes, 58030 Cyrenus Lane, Washington, MI 48094; (810) 781-7018.
Minnesota - Minnesota R/C Soaring Society, Tom Rent (Contact), 17540 Kodiak Ave., Lakeville, MN 55044; (612) 435-2792.
Missouri - Independence Soaring Club (Kansas City area, Western Missouri), Edwin Ley (Contact), 12904 E. 36 Terrace, Independence, MO 64055, (816) 833-1553, eve.
Missouri - Mississippi Valley Soaring Assoc. (St. Louis area), Peter George, 2127 Arsenal St., St. Louis, MO 63118; (314) 664-6613, Mark Nankivil, nankm@quixnet.net, (314) 781-9175.
Nebraska - B.F.P.L. Slopers, Steve Loudon (contact), RR2 Box 149 El, Lexington, NE 68850, (308) 324-3451/5139.
Nebraska - Lincoln Area Soaring Society (Wilson Slope Races), Jim Baker, 920 Eldon Dr., Lincoln, NE 68510, (402) 483-7596, jcbaker@nebraska.com, <http://www.geocities.com/CapeCanaveral/Hangar/1671/lass-2.html>.
Nebraska - SWIFT, Christopher Knowles (Contact), 12821 Jackson St., Omaha, NE 68154-2934, (402) 330-5335.
Nebraska - Ken Bergstrom, R.R. #1, Box 69 B, Merna, NE 68856; (308) 643-2524, <abergst@neb-sandhills.net>.
Nevada - Las Vegas Soaring Club, Ray Dinoble, 10812 Hollow Creek Lane, Las Vegas, NV 89144, (702) 254-7911, <cdinoble@juno.com>.
Nevada - Sierra Silent Soarers (Reno/Sparks/Carson City/Minden area), Chris Adams, (775) 345-1660, chris@scrollsander.com, <http://www.scrollsander.com/SierraSilentSoarers.htm>.
New Jersey - Vintage Sailplane R/C Association, Richard G. Tanis (President/Founder), 391 Central Ave., Hawthorne, NJ 07506; (201) 427-4773.
New Mexico - Albuquerque Soaring Association (all soaring & electric), Jim Simpson (contact), 604 San Juan de Rio, Rio Rancho, NM 87124; (505) 891-1336, <jimbonee@aol.com>, <http://www.abqsoaring.com>.
New York - aerotowing Rochester area, Jim Blum and Robin Lehman, (716) 335-6515.
New York - Elmira - Harris Hill L/D R/C, aerotowing & slope, John Derstine, (717) 596-2392, e-mail johnders@postoffice.ptd.net.
New York - aerotowing Long Island Area, Robin Lehman, (212) 744-0405.
New York - (Buffalo/Niagara Falls area) - Clarence Sailplane Society: <www.paradox.net/homepages/ntimm/ess.html> or Lyn Perry, President (716) 655-0775, perry@ecc.edu; Jim Roller, Competition Coordinator (716) 937-6427; Rol98@aol.com).
New York - Long Island Silent Flyers, Stillwell Nature Preserve, Syosset, NY, Ze'ev Alabaster (President), (718) 224-0585, or Peter DeStefano (VP), (516) 586-1731.
New York - Syracuse area, Central NY Sailplane Group, Dave Zintek, Minoa, NY, (315) 656-7103, e-mail Zintek@aol.com.
North Carolina - Aerotowing, Wayne Parrish, (919) 362-7150.
Northwest Soaring Society (Oregon, Washington, Idaho, Montana, Alaska, British Columbia, Alberta), Sandie Pugh (Editor - NWSS Eagle), 1119 SW 333rd St., Federal Way, WA 98023, e-mail: parrot2luv@aol.com, (253) 874-2429 (H), (206) 655-1167 (W).
Ohio - Cincinnati Soaring Society, Ed Franz, 7362 Ironwood Way, Burlington, KY 41005; (606) 586-0177, <edfranz@fuse.net>.
Ohio - Dayton Area Thermal Soarers (D.A.R.T.S.), Walt Schmoll, 3513 Pobst Dr., Kettering, OH 45420, (513) 299-1758.
Ohio - Mid Ohio Soaring Society (MOSS), Hugh Rogers, 888 Kennet Ct., Columbus, OH 43220; (614) 451-5189, e-mail <tomnagel@iwaynet.net>.
Ohio, Kentucky & Indiana - Ohio Valley Soaring Series, Marc Gellart, (419) 229-3384, <isoar2@wcoil.com>, <www.dma.org/DARTS/ovss/ovss.html>.
Oklahoma - Central Oklahoma Soaring, George Voss, (405) 692-1122.
Oklahoma - Tulsa R/C Soaring Club (TULSOAR), <http://www.mccserv.com/tulsoar>.
Oregon - Bay Area R/C Fliers, Mike Shaw, <grizzly2@gte.net>, (541) 269-2423.
Oregon - Portland Area Soaring Society (PASS), Pat Chewning (Secretary), 16766 NW Yorktown Dr., Beaverton, OR 97006, (503) 645-0323, e-mail: patch@sequent.com, www.europa.com/~patch/
Oregon - Salem Soaring Society, Al Szymanski, CD, (503) 585-0461, <http://home.att.net/~asz/sas>.
Oregon - Southern Oregon Soaring Society, Jerry Miller, 3431 S. Pacific Hwy. TRLR 64, Medford, OR 97501, e-mail Milljer@aol.com, pb/fax (541) 535-4410.
Tennessee - Memphis Area Soaring Society, Bob Sowder, 1610 Saddle Glen Cove, Cordova, TN 38018, (901) 751-7252, FAX (901) 758-1842.
Tennessee - Tullahoma (South Central), Coffee Airfoilers, Brian Smith, 317 Crestwood Dr., Tullahoma, TN 37388, (931) 393-4876, <bismith@midtnet.net>.
Tennessee - Soaring Union of Nashville, Terry Silberman, PO Box 17946, Nashville, TN 37217-0946, (615) 399-0846.
Texas - aerotowing, Dallas area, Andrew Jamieson, 6931 Desco Dr., Dallas, TX 75225, (214) 369-6118, AJamieson@Sleepmed.com, Larry Sengbush, (972) 291-4840.
Utah - Intermountain Silent Flyers, Tom Hoopes, (801) 571-3702 (eve), "Come Fly With Us!"
Vermont - Steve Savoie, 926 Gage St., Bennington, VT 05201, (802) 442-6959.
Virginia - Blue Ridge Area Soaring Society (Central Virginia - Waynesboro), Tom Broeski, (540) 943-3356, <tjb@rica.net>.
Virginia - Tidewater Model Soaring Society, Herk Stokely, (757) 428-8064, herkstok@aol.com.
Virginia - Appalachian Soaring Association, Bristol VA & TN area, Daniel E. Dudgeon, Apt A, 721 Meadowview Rd., Bristol, TN 37620; (423) 844-0518: voice mail (423) 914-4290, <ddijun2@aol.com>.
West Virginia & Pennsylvania - Tri-State Soaring, Chip Vignolini, 2784 Mill St., Alliquippa, PA 15001; (724) 857-0186, Voice mail (412) 560-8922, <cydne30a@prodigy.com>.
Washington - Seattle Area Soaring Society, Waid Reynolds (Editor), 12448 83rd Avenue South, Seattle, WA 98178; (206) 772-0291.
Wisconsin - Valley Aero Modelers, Lee Murray, 1300 Bay Ridge Rd., Appleton, WI 54915; (920) 731-4848, <lmurray@athenet.net>.

T.W.I.T.T.

(The Wing Is The Thing)

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. Full information package including one back issue of newsletter is \$2.50 US (\$3.00 foreign). Subscription rates are \$20.00 (US) or \$25.00 (Foreign) per year for 12 issues.

T.W.I.T.T., P.O. Box 20430
El Cajon, CA 92021

Outside U.S.A.

Australia - Southern Soaring League, Inc., Mike O'Reilly, Model Flight, 42 Maple Ave., Keswick SA 5035, Australia. Phones: ISD+(08) 8 293-3674, ISD+(08) 8 297-7349, ISD+(018) 8 082-156 (Mobile). FAX: ISD+(08) 8 371-0659.

Canada - Calgary R/C Soaring Society (Alberta), thermal duration & slope soaring, Chris Gregg (Pres.), (403) 226-1019, cgregg@cadvision.com; Eric Weder (Sec.), (403) 289-8844, eweder@telusplanet.net.

Canada - Montreal Area - C2VM Glider Club, Jacques Blain (President), days (514) 443-5335, eve. (514) 652-6167.

Canada - Greater Niagara Area Thermal Soarers (GNATS), Flat Field Soaring & Aerotowing, Gerry Knight, (905) 934-7451 or Don Smith, (905) 934-3815.

Canada - MAAC Men Gliding Club, Jim Holland, 168 Verona Dr., Winnipeg, Manitoba, Canada R2P 2R8, (204) 697-1297.

Canada - Southern Ontario Glider Group, "Wings" Programme, dedicated instructors, Fred Freeman, (905) 627-9090, or Bill Woodward, (516) 653-4251.

England (CIAM Flyer), Jack Sile (Editor), 21 Bures Close, Stowmarket, Suffolk, IP14 2PL, England; Tele. # 0449-675190.

England (southwest) - Sean Walbank, Woolcombe Hays, Melbury Bub, Dorchester, Dorset, DT20NJ, phone 01935-83316.

Hong Kong - Robert Yan, 90 Robinson Road, 4th Floor, Hong Kong, (852) 25228083, fax (852) 28450497, yanr@asiaonline.net.

Japan - Dr. Paul "Sky Pilot" Clark, 2 - 35 Suikoen Cho, Hirakata Shi 573, Osaka Fu, Japan; IAC+(81) 720-41-2934, <pclark@osk33web.ne.jp>
http://www3.osk33web.ne.jp/~pclark/skypilot/

Scotland - Ron Russell, 25 Napier Place, South Parks, Glenrothes, Fife, Scotland KY6 1DX, ph. 01592 753689.

RCSD Index/Database

Available from: <http://www.athenet.net/~atkrn95/pcsoar.htm>. Or, send 3.5" high density disks & SASE with stamps for 2 oz. Lee Murray, 1300 Bay Ridge Rd., Appleton, WI 54915; (920) 731-4848 after 5:30 pm weekdays or on weekends, <lmurray@athenet.net>.

Reference Material

Summary of Low-Speed Airfoil Data - Volume 3 is really two volumes in one book. Michael Selig and his students couldn't complete the book on series 3 before series 4 was well along, so decided to combine the two series in a single volume of 444 pages. This issue contains much that is new and interesting. The wind tunnel has been improved significantly and pitching moment measurement was added to its capability. 37 airfoils were tested. Many had multiple tests with flaps or turbulence of various configurations. All now have the tested pitching moment data included. Vol 3 is available for \$35. Shipping in the USA add \$6 for the postage and packaging costs. The international postal surcharge is \$8 for surface mail to anywhere, air mail to Europe \$20, Asia/Africa \$25, and the Pacific Rim \$27. Volumes 1 (1995) and 2 (1996) are also available, as are computer disks containing the tabulated data from each test series. For more information contact: SoarTech, Herk Stokely, 1504 N. Horseshoe Circle, Virginia Beach, VA 23451 U.S.A., phone (757) 428-8064, e-mail <herkstok@aol.com>.

"Ultimate Scale Soaring" video taken at the 1998 Northeast Aerotowing Fly-in, New York, U.S.A. - international flyers & interviews. From Germany: The Akro Cup and The Scale Seglerschlepp. Check or money order, \$24.95 plus \$3.20 S&H (U.S.), payable to John Derstine, RD 3# Box 336, Gillett, PA 16925; (570) 596-4392, <johnders@postoffice.ptd.net>.
S&H foreign: \$6 Canada/Mexico, \$7 Europe, \$8 Asia/Africa, \$8.50 Pacific Rim. VHS format, NTSC standard. PAL format \$40 + applicable shipping.

Books by Martin Simons: "World's Vintage Sailplanes, 1908-45", "Slingsby Sailplanes", "German Air Attache", "Sailplanes by Schweizer". Send inquiries to: Raul Blacksten, P.O. Box 307, Maywood, CA 90270, <raulb@earthlink.net>. To view summary of book info: http://home.earthlink.net/~raulb

Seminars & Workshops

Free instruction for beginners on construction & flight techniques, week-ends (excl. contest days), "Al" Angelo, South Bay Soaring Society (San Jose area), (415) 321-8583.

BBS/Internet

Internet soaring mailing listserve linking hundreds of soaring pilots worldwide. Send msg. containing the word "subscribe" to soaring-request@airage.com. The "digestified" version that combines all msgs. each day into one msg. is recommended for dial-up users on the Internet, AOL, CIS, etc. Subscribe using soaring-digest-request@airage.com. Post msgs. to soaring@airage.com. For more info., contact Michael Lachowski at mikel@airage.com.



Sailplane Homebuilders Association (SHA)

A Division of the Soaring Society of America

The purpose of the Sailplane Homebuilders Association is to stimulate interest in full-size sailplane design and construction by homebuilders. To establish classes, standards, categories, where applicable. To disseminate information relating to construction techniques, materials, theory and related topics. To give recognition for noteworthy designs and accomplishments.

SHA publishes the bi-monthly *Sailplane Builder* newsletter. Membership cost: \$15 U.S. Student (3rd Class Mail), \$21 U.S. Regular Membership (3rd Class Mail), \$30 U.S. Regular Membership (1st Class Mail), \$29 for All Other Countries (Surface Mail).

Sailplane Homebuilders Association
Dan Armstrong, Sec./Treas.
21100 Angel Street
Tehachapi, CA 93561 U.S.A.



The League of Silent Flight (LSF) is an international fraternity of RC Soaring pilots who have earned the right to become members by achieving specific goals in soaring flight. There are no dues. Once you qualify for membership you are in for life.

The LSF program consists of five "Achievement Levels". These levels contain specific soaring tasks to be completed prior to advancement to the next level.

Send for your aspirant form, today:

League of Silent Flight

c/o AMA

P.O. Box 3028

Muncie, IN 47302-1028 U.S.A.



The Vintage Sailplane Association

Soaring from the past into the future! The VSA is dedicated to the preservation and flying of vintage and classic sailplanes. Members include modelers, historians, collectors, soaring veterans, and enthusiasts from around the world. Vintage sailplane meets are held each year. The VSA publishes the quarterly BUNGEE CORD newsletter. Sample issues are \$2.00. Membership is \$15 per year. For more information, write to the:

Vintage Sailplane Association
13312 Scotsmore Way
Herndon, VA 22071 USA



The Eastern Soaring League (ESL) is a confederation of Soaring Clubs, spread across the Mid-Atlantic and New England areas, committed to high-quality R/C Soaring competition.

AMA Sanctioned soaring competitions provide the basis for ESL contests. Further guidelines are continuously developed and applied in a drive to achieve the highest quality competitions possible.

Typical ESL competition weekends feature 7, or more, rounds per day with separate contests on Saturday and Sunday. Year-end champions are crowned in a two-class pilot skill structure providing competition opportunities for a large spectrum of pilots. Additionally, the ESL offers a Rookie Of The Year program for introduction of new flyers to the joys of R/C Soaring competition.

Continuing with the 20+ year tradition of extremely enjoyable flying, the 1999 season will include 14 weekend competitions in HLG, 2-M, F3J, F3B, and Unlimited soaring events. Come on out and try the ESL, make some new friends and enjoy camaraderie that can only be found amongst R/C Soaring enthusiasts!

ESL Web Site: http://www.eclipse.net/~mikel/esl.htm

ESL President (99-00): Tom Kiesling (814) 255-7418 or kiesling@ctc.com

DAVE'S AIRCRAFT WORKS

The Gunfighter's Choice

NEW! D.A.W. KILLER FOAMIE WARBLDS!



Foam51D

Span: 48"
Length: 35"
Area: 453"
31 - 33 oz.
S3016
2 - 4 ch.



foamie109

THE ULTIMATE SLOPE COMBAT MACHINES!

You can have it all... Looks, durability AND performance; all in one airframe! Designed from the ground up with full-contact combat in mind, you will find these simple to construct slope killers the most satisfying warbirds you've ever owned. Wings and fuselage are constructed of the latest technology, combat proven EPP super-foam with Coroplast tail group. Designed to be covered with iron-on film coverings! Kits include airframe components, all wood materials, basic hardware and illustrated instruction manual. \$59.95 ea. + \$5.00 shipping in cont. U.S. (CA res. add 7.75% tax).

ALSO AVAILABLE:

We continue to offer our original wood kits! These are also suitable for Speed 400 electric conversion.

P51D- 34 3/4" W.S.
Ta152- 34 3/4" W.S.
P40- 31 1/2" W.S.
Hurricane- 31 1/2" W.S.
Me109- 30 1/2" W.S.
Ki61- 36" W.S.



Complete kits \$35.95 + 7.00 s/h in cont. U.S. (CA res. add 7.75% tax). Send \$1.00 for complete catalog. See our reviews in July '96 Model Builder and QFI 21!

DAVE'S AIRCRAFT WORKS

34455 Camino El Molino, Capistrano Beach, CA 92624
(949) 248-2773 or E-mail to: daw1@access1.net
<http://www.davesaircraftworks.com>



ZIKA

Advertising Note

Please note that the cut-off date for classified & display ads is the 15th of the month.

Advertiser Index

- 15 Aerospace Composite Products
- 21 Anderson, Chuck
- 7 B-Streamlines
- 13 Buzz Waltz R/C Designs
- 30 Cavazos Sailplane Design
- 23 Composite Structures Technology
- 30 Dave's Aircraft Works
- 29 Eastern Soaring League (ESL)
- 10 Hobby Club
- 24 International Scale Soaring Assoc.
- 29 League of Silent Flight
- 13, 30 MAD Aircraft Design
- 17 Major Hobby
- 21 Maple Leaf Design
- 3 MM Glider Tech
- 26 R/C Soaring Digest
- 23 RnR Products
- 17 RPV Industries
- 29 Sailplane Homebuilders Association
- 31 Sailplanes Unlimited, Ltd.
- 30 Sanders, Eric (CompuFoil)
- 15 Slegers International
- 28 T.W.I.T.T.
- 4, 15 Viking Models, U.S.A.
- 27 Viking Models, U.S.A.
- 29 Vintage Sailplane Association
- 25 East Coast HL Classic
- 25 Elmira 2000 - New York
- 26 GNATS Aerotow 2000 - Canada
- 20 Los Banos - California
- 15 Montague Cross Country Challenge
- 3 Oc-Tow-Berfest 2000 - Missouri
- 11 Soar Utah 2000 - Utah
- 27 Spring Fling 2000 - California

CSD Cavazos Sailplane Design

12001 Foreman Ave., Monterey Valley, CA 95033

email: cavazos@compuserve.com

SWITCHBLADE wins 1st again!

The SWITCHBLADE S400RACE was specifically designed for racing. It is fast and very quick. The kit features a light weight epoxy glass fuse, new rails 99 composite wings, complete with all hardware, CAD plans and instructions.



SWITCHBLADE S400RACE
38" Race 99 A.S.A. Network
31" Plus 96 A.S.A. Network
17" Plus 97 A.S.A. Network

Kit Price
\$109.00

Shipping & Handling
\$6.00
California Sales
Tax 7.75%

(909)
485-0674

Please be sure to tell our
advertisers you found them
through RCSD!

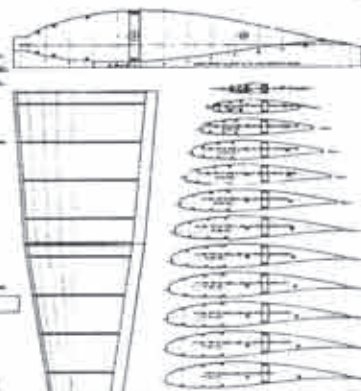
CompuFoil 98 for Windows

Multi-panel auto rib generation, full planform support, D-Tubes, T.E. stock, L.E. round stock, trailing edge building tabs, greatly enhanced spar options, more modification tools, etc. Price: \$35-\$115 depending on modular purchase options. Registered original CompuFoil for Windows users upgrade for \$35. Incremental updates always free. Download the trial version, free utilities, or foam cutting tips from www.compufoil.com or email eric@compufoil.com

Eric Sanders
7682 Winfield Dr.
Brighton, MI 48116



Phone/fax: 810-225-1165 (8pm-12pm EST)
Email: eric@compufoil.com



*NOTE!-NEW ADDRESS * NOTE!-NEW ADDRESS * NOTE!-NEW ADDRESS*

Stop drawing and Start Building!

Highlander EPP

**\$74.99 plus
\$7.00 shipping**

CA residents add \$5.81 (7.75% tax)

Wing Span: 78"
Wing Area: 590 sq. in.
Airfoil: 507037
Weight: 34-39 oz.
Length: 42 in.
Radio: 2 Channel
Hardware Included

Hardware Included

Its all EPP construction and proven basswood spar setup make this plane virtually indestructible. This is the ideal setup for a trainer sailplane as well as satisfying even the most seasoned pilot.

MAD Aircraft Design

15268 Rolling Ridge Drive
Chino Hills, California
91709 USA

(909) 606-0363



<http://www.madaircraft.com> email: madair@madaircraft.com

SAILPLANES UNLIMITED, LTD.

IN STOCK

Krause

1/4s Discus	HQ2.5/12	158" (4m)
1/4 Salto	HQ3/14	179" (4.53m)

Roedelmodell

1/4s ASK 21	E393	165" (4.2m)
1/4s Ka6E	E392	165" (4.2m)
1/4s Fox	RG12	149" (3.77m)

PriBeck

1/4 ASW27	HQ2.5/12	196" (5m)
1/2s ASK18	E203-201-193	209" (5.33m)
1/4s Ka6E	E207-205-205	196" (5m)
1/2s ASW19	Ritz3 mod.	212" (5.4m)

Schueler & Fleckstein

1/4 all glass ASW24	E203	196" (5m)
---------------------	------	-----------

Bruckmann

1/4 Salto	Ritz 2	176-203" (4.5-5.2m)
1/4s ASK 18	E 203	165" (4.2m)
1/4s FOX	E 374 SD 6060-6062	183" (4.66m)

Czech these out!

All completely finished with retracts installed:

1/4 all glass Ventus 2C	HQ 3/15, 13, 12, 10, 8	237" (6m)
1/4.75 all glass ASW 27	HQ 3/12	158" (4m)

And more

TOWPLANES in stock

Frisch: 1/4 Wilga 109" (2.78m)

Bruckmann: 1/4 Piper Pawnee

Roedelmodell: 1/4 Jodel Robin 86" (2.18m)

SPECIAL ORDER

PriBek

1/4 ASW24	E203-201-193	196" (5m)
1/4 ASW27	HQ2.5/15	294" (7.5m)
1/4 FOX	E374	183" (4.66m)

Bruckmann

1/2s Fox		222" (5.65m)
----------	--	--------------

Frisch

1/4 Wilga		147" (3.73m)
-----------	--	--------------

Schueler & Fleckstein

1/4 all glass Fox	RG12	183" (4.66m)
1/4 all glass ASH 26	HQ3/14-10	235" (6m)
1/2s all glass ASW15B	HQ3/14	235" (6m)

very realistic **PILOTS** from 1/4 to 1/2s

Wilga



1/4 Piper Pawnee

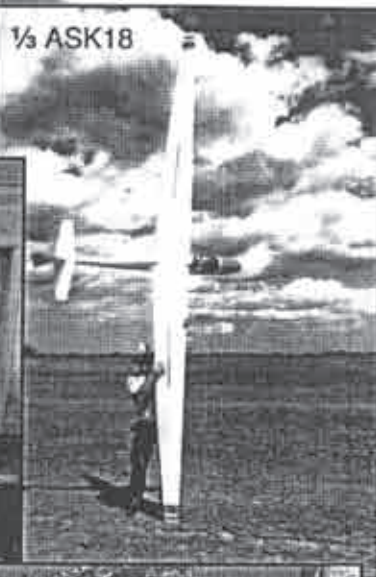
1/4 & 1/2s
Ka6E



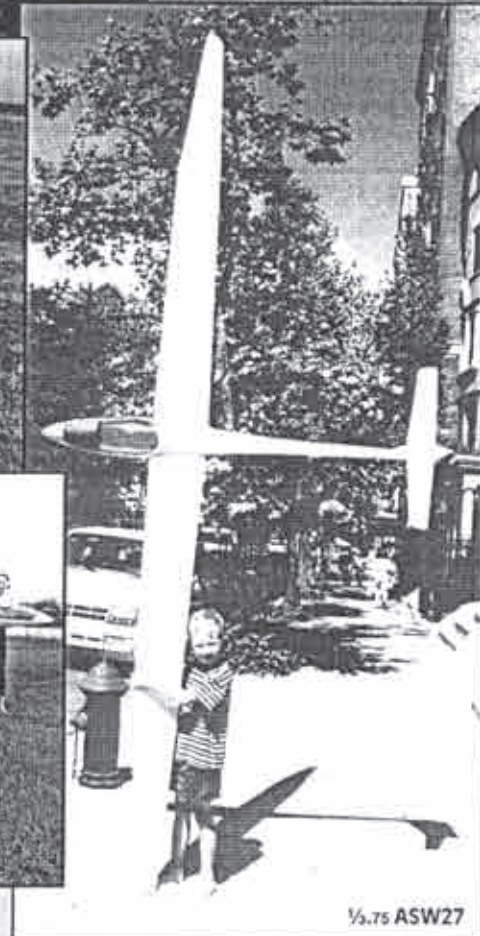
1/4s Ventus



1/4s ASK18



1/4s ASK21



1/4.75 ASW27

RPV INDUSTRIES EPP U-2

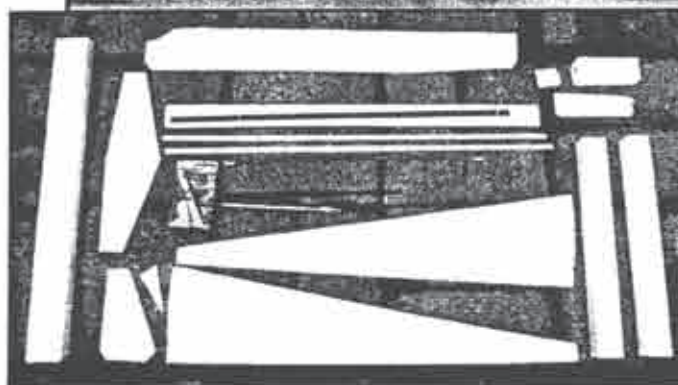
Reviewed by Richard Loud
Ballston Spa, New York
(Review included in this issue.)

"Can't you just hear it!!! I think this is one of the most scale-like views of the U-2 as it takes off on another mission."

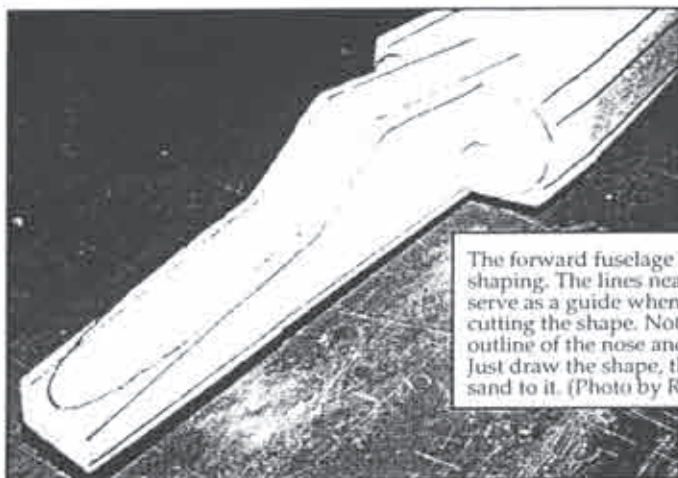
...Rich Loud
(Photo by Dave Garwood.)



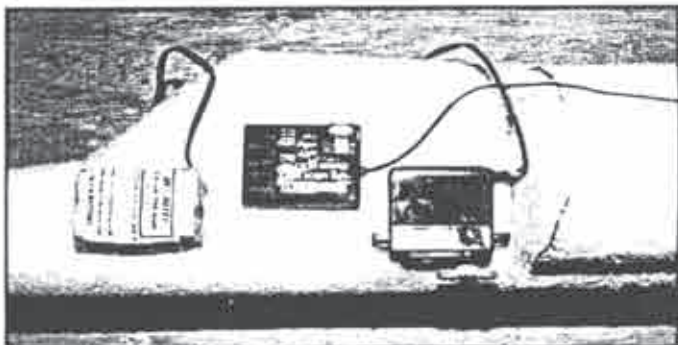
All taped up and ready to cover. It helps to have previous foamie building experience when taping the fuselage, as the instructions are somewhat vague in this area although they are very clear on the procedure for taping the wings. (Photo by Rich Loud.)



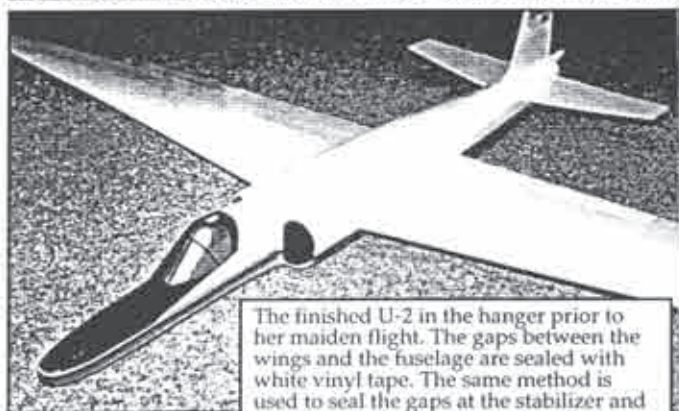
U-2 kit contents are just a few blocks of EPP, EPP wings, Coroplast tail feathers, carbon fiber spars, balsa and some hardware. (Photo by Dave Garwood.)



The forward fuselage prior to shaping. The lines near the edges serve as a guide when rough cutting the shape. Note the outline of the nose and intakes. Just draw the shape, then cut and sand to it. (Photo by Rich Loud.)



Radio gear layout on the side of the shaped fuselage per the diagram in the instructions. You may find it beneficial to install the radio prior to shaping so you won't have to "take the knife" to your masterpiece. (Photo by Rich Loud.)



The finished U-2 in the hanger prior to her maiden flight. The gaps between the wings and the fuselage are sealed with white vinyl tape. The same method is used to seal the gaps at the stabilizer and fin. (Photo by Rich Loud.)



On the flight line awaiting initial flight tests. With all that white, it's a good thing we waited for a spring thaw to test it. One week earlier and this spot would have been covered in a foot of snow. (Rich Loud photo.)