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# **R/C** **SOARING DIGEST**

*Radio controlled*

**THE JOURNAL FOR R/C SOARING ENTHUSIASTS**



# R/C SOARING DIGEST

Radio controlled

THE JOURNAL FOR R/C SOARING ENTHUSIASTS

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BEAUTY IN FLIGHT

Rich Loud's DAW 2-meter Schweizer 1-26 photographed over Wilson Lake in Russell County, Kansas during the Midwest Slope Challenge in May 2000. Rich's flight report of the Schweizer 1-26 is featured 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.

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### 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: rcsdiges@aol.com

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

### Feature Columnists

Scott Gradwell, Bill & Bunny Kuhlman (B<sup>2</sup>),  
Lee Murray, Tom Nagel,  
Mark Nankivil, Dave Register,  
Steve Savoie, Jerry Slates, Gordy Stahl

### Artwork

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

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**"Getting Started in RC Soaring"** ..... Getting started guide - Adobe Acrobat PDF format  
**Links to Organizations, Special Interest Groups & Clubs**

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

..... "Trimming Your Sailplane for Optimum Performance" by Brian Agnew  
..... "Flies Faster" by Dr. Michael Selig  
..... "The Square-Cube Law and Scaling for RC Sailplanes" by Dr. Michael Selig  
..... "Modifying & Building the MB Raven (Parts 1-4)" by Bill & Bunny Kuhlman

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

**Complete RCSD Index, 1984-1999**

## The Soaring Site

### The "Four T's"

Last month, we discussed the "Three T's": Theory, Technology, and Techniques. We now stand corrected, and will address the "Four T's". Can any of you guess what the fourth one is? Our appology to Tom Nagel, for not thinking of it ourselves, who says, "How about "4 T's" - theory, technology, technique and travel? I have actually run across two different people now who not only read the —um— stuff I write, but were traveling with a folder of back issues of HSWT."

*Thanks, Tom! Consider it a done deal!*

Tom also said, "I haven't absorbed all the ideas for changes yet. One that I know I like is the idea of limiting the number of times a year that the R/C Soaring Resource pages are sent out. It has always seemed to me like publishing the phone book on a monthly basis. Once or twice a year is plenty."

Glad you agree, Tom. This month, we've started a sidebar showing monthly changes and/or additions, only, that will be added to the .pdf file and the hard copy which will be distributed periodically.

### Looking for a Source

Steve Savoie wants to know if any of you have a source for a hot glue gun and a soldering gun that are either 12V

or gas/butane powered. If you are aware of a source, please drop us an e-mail or note. We would appreciate it!

### 'Tis the Season

We wish all of you the best of times during this holiday season. Drive safely, fly safely, have a most enjoyable Merry Christmas, and a Happy New Year!

**Happy Flying!**  
**Judy Slates**

### R/C SOARING RESOURCES

*(The following changes were submitted this month, and will be added to the R/C Soaring Resource listing: on-line .pdf file, and periodic hard copy distribution.)*

Alabama - Southern Alabama & NW Florida Aerotow, Asher Carmichael, (334) 626-9141, or Rusty Rood, (850) 432-3743.

Virginia - Appalachian Soaring Association, Bristol VA & TN area, Douglas Terry, (423) 878-4644, <TDouglas295@netscape.net>.

### PENSACOLA 2001 !!! Scale / Aerotow Extravaganza !

February 9th, 10th & 11th, 2001,  
Pace Field, Pensacola, Florida  
Rain Date: February 16th, 17th & 18th, 2001

ASHER CARMICHAEL (334) 626-9141  
(after 7PM CST) Carmic985@aol.com  
RUSTY ROOD (850) 432-3743

Be sure to confirm weather and event status on the Wednesday or Thursday before scheduled dates.



### CUSTOM DESIGNED, FIBERGLASS FUSELAGES FOR THE SCRATCH BUILDER

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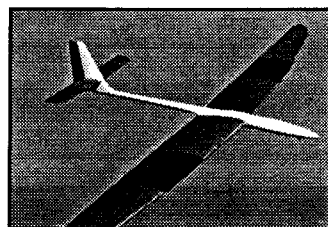
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RCSDigest@aol.com  
9:00 A.M. - 5:00 P.M. CST

#### 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*



#### 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.

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

### 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
StilettoS-3021 (100-136"/S-3021/AsReq./9.5" Chord/plug-in wing)		
49" fuse	\$85.00	\$15.00
StilettoS-7037 (100-136"/S-7037/AsReq./9.5" Chord/plug-in wing)		
49" fuse	\$85.00	\$15.00
Stiletto HQ 2.5/9 (100-114"/HQ2.5/9/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.**



### 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



## Jer's Workbench

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

### Annual Clean Up...

For most of us, winter has arrived. It's cold, wet, and just plain miserable. With the holidays upon us, as well, this combination sure cuts into our flying time.

I find it's a good time to take advantage of the circumstances, stay inside where it's warmer, and work on cleaning up some of the projects that I've been putting off for the last few months.

I don't always put things away like I should, sometimes because things have to be moved in order to move other things. And, when I don't return a handy tool back into its proper location such as a toolbox, drawer, or shelf I lose a lot of time trying to remember when I used it last. So, this time of year is dedicated to the annual cleaning of the shop, with special attention paid to models that need a bit of tender loving care, too.

I usually start this project with a long walk around the shop, noting obvious tools lying about that can be easily be returned to where they belong. During the second walk around the shop, with a waste basket and/or garbage bag, I collect such things as scraps of unusable wood, glued-up or bent T-pins, and dried up bottles of glue. Of course, when I uncover useable scraps of wood, those are relegated to the old scrape box, while miscellaneous nuts, screws, and washers are collected and deposited into a small jar. Who knows? I might need one of them another day!

It's at this point, workbench cleared, that I grab the broom or shop vac, and commence sweeping the floor and any other surface that can be easily reached. I'm always pleased with myself that it looks so much better and I can devote my time to tuning up my models.

### Tuning Up Models

First thing to do in the tune up process is to remove the flight battery pack

from the fuselage. With an electronic battery management system, it is simple to plug in the flight battery/transmitter battery pack, set aside, and let the electronic battery management system do its thing. If you don't have an electronic battery management system, use the regular battery charger to charge the flight battery pack and transmitter battery pack. And, using a yellow sticky, mark down the date & time, and set aside. We'll discuss the batteries later.

Check the fuselage next, dumping out any dust or dirt, carefully inspecting the nose and around the wing's root for cracks; continue the inspection over the rest of the fuselage, checking tailboom and seams, as well. The servos and servo tray should be firmly mounted and not loose to the touch.

Play in the rudder can be caused by the hinge, a worn control horn, or push-rod flex. If not repaired, the play can cause trouble such as high speed flutter, and detach during a long dive. If play is identified in the stabilizer, the control horn and push-rod should be checked for flex.

Another important area to check is the tube that the stabilizer pivot rod goes through. This pivot point can wear out over time, especially if the model is 2 or 3 years old and has a lot of flying time in under its hatch. Not easily fixed, one indication of a problem is when it is difficult to trim the model level, compensating by frequently adjusting up and down trim. (This type of situation could also be indicative of a warped stabilizer.)

The last items to inspect are the ailerons and flaps, checking them out in much the same manner as was done with the rudder.

### Back to the Batteries

For those of you with an electronic battery management system, you probably know the status of your batteries at any given point in time. So, enuf said! For those of you that don't have this system, however, the batteries have to be charged.

The voltage on the battery packs can be read using a volt meter; the readings should be recorded, noting date and time. I recommend that this step be done every day for a week. If the

voltage drops, the batteries likely need to be replaced. For those of you that don't have a volt meter, I recommend that you either get one, or borrow one from a friend.

### Dressed to Fly?

After the model has been inspected carefully, that's about the time to step back and give her an approving eye, only to discover skinned shins, scrapes and unsightly blemishes that need a bit of touch up.

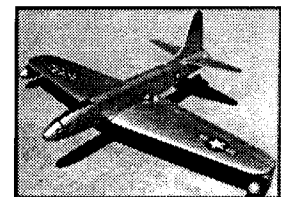
For areas that are covered with iron-on film, a quick touch up with a hot iron should tighten up the skinned surfaces. A light application of wax and polish, or a touch of paint when applicable should complete the job. When waxing and polishing, any rough spots that need refinishing will be apparent, and the model should experience less drag and fly better.

Cleaning up the shop usually makes the other half or significant other very happy. But, more importantly, an inventory list can be prepared during cleaning, providing a good excuse to visit the local hobby shop. Some of the items can be also added to a Christmas list, for those having trouble figuring out what to buy for you.

Here's wishing all of you a very Merry Christmas and a Happy Holiday Season! ■

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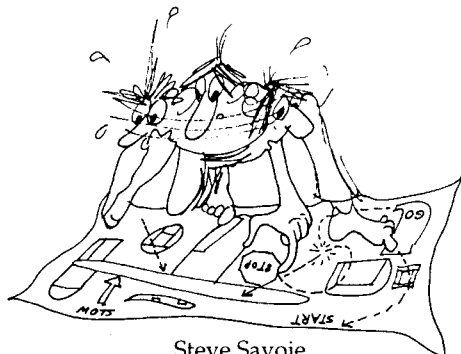


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## "SHORT CUTS"



Steve Savoie  
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### WINTER STORAGE TIPS

**O**K, it's that time of year again: time to start building. But before you do, there are a few maintenance issues that have to be dealt with before that new kit can be started. So, let's begin with the heart of the RC system: the transmitter.

We often forget about the transmitters. We just charge them up, select the right model and fly; then, start all over again another day. The transmitter needs more though; what about the batteries and the dirt and grime inside? So, the first thing to do is remove the battery pack, inspect the wiring and connectors, clean them with tuner cleaner, and check for frays in both insulation and battery wrapping.

Plug the batteries into the charge and shake the heck out of the connector. Does the charge light flicker? You have a big problem if it does; the lead or connector should be replaced.

I recommend doing the same to all the transmitter batteries and to set up a regular schedule to run them through a Digipace or other battery conditioner. The next thing to do is to get a can of 'Canned Air', take the back off the transmitter and blow all the slope crud out. Try to systematically work the dirt out by holding the transmitter upside down - focus around the trims and gimbal areas, including the potentiometers. I wipe down the transmitter case with armorall cleaner. Many folks lubricate the antenna segments with a clear silicone spray lubricant and exercise the segments. If you have an older transmitter with screwdriver slotted potentiometers and snap switches for servo reversing, go ahead and exercise them all, but make sure they go back into the proper

position and tag the transmitter saying the same, just in case.

Receiver batteries should be given the same care as that noted for the transmitter except they get more abuse, landing shock, water immersion, wire wear from swapping to other planes, and heat from field charging. You should also check the installation date on the batteries, I pitch mine after 3-4 years depending on use. Pay extra attention to the battery covering, especially if nose weight has been rubbing against cell links; this could be disastrous if it shorts in flight or storage. And since we are in the nose of the plane, why not check the nose weight. Has it shifted? What about the CG? Is it still where it should be? Go ahead and remark the spot.

Let's work back to the tow hook. Does it rotate a bit. Is it loose? If so, fix it. A broken tow hook 20 feet up can easily cost a plane. Most wing hold downs are pretty tough and don't require much maintenance, but give the fuselage a good look for cracks, especially those visible from the inside.

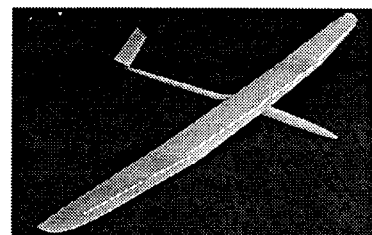
Have you looked at the wing joiners lately? Steel and aluminum are pretty much low maintenance, and I just wipe them with WD-40 to keep the surface clean. Beware of carbon fiber wing rods, as they are subject to compressive cracking, more from hard landing and zoom launch spring back, so check for cracks real closely using a magnifying glass. Any sign of cracking is reason enough to replace it. And what about the wings? Check the wing tubes for rotation and fix it, if necessary.

The wings themselves normally take some work every year, at least mine do. I wipe them down clean, listen to the servo gears, and check the leads for wear and tear, especially near the connectors. Give them a good shake while exercising them under power. Give the center section a close look for damage that may have gone unseen, looking especially close at stress joints such as servo pockets, joiner tube ends, and center joints on 1 and 3 piece wings. I will often check the hinges or hinge tape for premature failure and replace it before it fails in flight under flutter. Almost every year I witness aileron hinge tape failure, especially during the winter slope months.

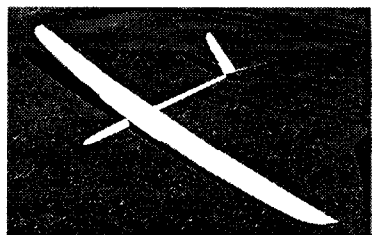
Don't forget to look at gap seal tape.

Failure in the field is not a killer, but a real pain in the butt. I'll also check clevises and, if they are nylon (slopers), I replace them annually. I also check out the steel ones. Twisted ailerons annoy everyone and a good way to prevent it is to use small padded pinch clips to hold them aligned in the neutral position to the tips and root. On my few polydihedral floaters still in service, I make sure all rubber bands from the previous year are tossed so I have no temptation to use degraded rubber.

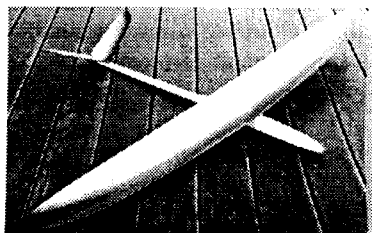
The rudder and stab/elevator are next. Once again, I inspect the hinges and rework any that are degrading. I also turn the plane on, exercise the elevator and put resistance load against the servo to test the linkage, push-rods and control horns. ■



Hera - Artemis F3J from: \$659.00  
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Nemesis slope racer from: \$299.00  
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## The Blackbird 2M Project, Part 2

As we mentioned in Part 1, we've decided to use Barnaby Wainfan's BW 05 02 09 section on this rendition of Dave Jones' Blackbird 2M. This is the same airfoil which we used on our modified *Model Builder* Raven project last year.

The BW 05 02 09 first came to our attention through the Raven S, another Dave Jones design. It was noted on the plans as an alternative to the CJ-25209 section used on the prototype. Rib templates for both the CJ-25209 and BW 05 02 09 airfoils were provided on the full size plans. Not having coordinates for the BW 05 02 09, we contacted Barnaby Wainfan. Barnaby reported that he did not have coordinates for the section in his files.

We have several plotting programs on our Macintosh computers. One of these, Foil 1.2, has the capability of deriving coordinates from scanned images. The plywood wing end cap was scanned at 300 dpi, and the resulting black and white TIFF image was then modified to remove any extraneous dots and lines. The clean image was imported into Foil 1.2 and the coordinates derived using the software code.

With the coordinate table in hand, we opened up Dave Johnson's MacFoil

and had our printer plot out the airfoil using the end cap chord. Using a light table, we gradually adjusted the coordinates until the plotted section exactly matched that shown on the plans. The resulting coordinate table, as presented here, was forwarded to Barnaby to add to his archives.

While writing this article, we were visited by Andy and Alison MacDonald. Andy runs a web site devoted to flying wings <<http://www.ozemail.com.au/~flyingwing>>, and he and Alison have spent the last three months away from their native Australia to travel around the United States. Andy had his laptop and a copy of Eric Sanders' CompuFoil. CompuFoil quickly provided the BW 05 02 09 pitching moment (+0.018) and zero lift angle (-0.15°).

As this section was designed for non-swept, i.e. "plank," wings, the zero lift angle is not of immense importance. The pitching moment, on the other hand, provides the information required to determine the amount of pitch stability. Most of the later CJ sections had pitching moments around 0.03 to 0.04, so the BW 05 02 09 is a bit less stable but still within the acceptable range. The last airfoil Dave Jones produced was the CJ-21509 (1.5% camber, 9.5% thickness). It had a pitching moment of 0.0145 and a zero lift angle of -0.1196°. In looking at airfoils designed for planks, the general trend is toward lower positive pitching moment values. Less reflex equates to lower drag, a more rearward CG range, and better performance.

The one disadvantage of the BW 05 02 09, when compared to Dave Jones' CJ series, is its lack of a flat spot on the lower surface. The CJ-3309 lower surface is flat from about 2.5% chord back to 75% chord; the CJ-25209

lower surface is flat from 25% chord to 75% chord. This flat spot allows easy construction, with a minimum number of jigs, etc., on just about any flat surface. Since the Blackbird 2M wing uses a D-tube leading edge and relatively open bay construction aft of the main spar, the BW 05 02 09 forces the builder to use jig blocks or some other method of maintaining alignment.

MacFoil, once a few distances and/or percentages are noted in various parameter "fill-ins," easily plots full size templates with sheeting and spar locations drawn in. Rib patterns can be easily cut from sheet aluminum flashing material using scissors. The important item here, however, is the ease with which templates for contoured jig blocks can be cut out by using the sheeting contour and section base lines.

During construction, all of the lower surface sheeting is assembled over the plans, followed by the main spar. The ribs are then glued to the lower portion of the D-tube and the cap strips with medium CA glue and a metal ruler.

**CURTISS P-40 WARHAWK**

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

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

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**STREAMLINES**

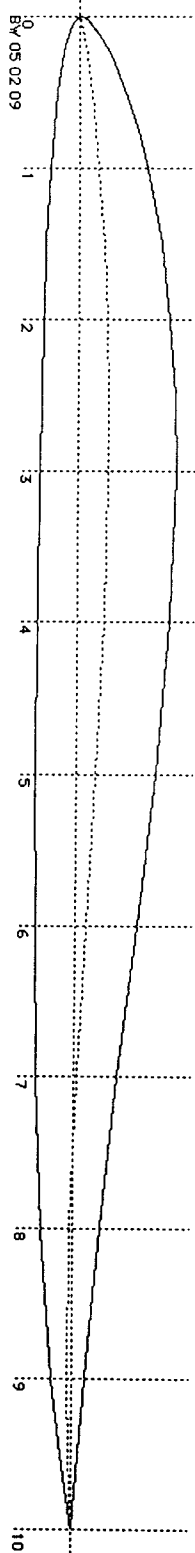
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### BW 05 02 09.coord

1.00000	0.00000
0.95000	0.0045
0.90000	0.00813
0.80000	0.01833
0.70000	0.02937
0.60000	0.04157
0.50000	0.05337
0.40000	0.06236
0.30000	0.0665
0.25000	0.065
0.20000	0.061
0.15000	0.0555
0.10000	0.0460
0.07500	0.0395
0.05000	0.0315
0.02500	0.02125
0.01250	0.01425
0.00750	0.01035
0.00375	0.0065
0.00200	0.0045
0.00100	0.00285
0.00010	0.00155
0.00000	0.00000
0.00010	-0.00050
0.00100	-0.0015
0.00200	-0.0025
0.00375	-0.00375
0.00750	-0.0055
0.01250	-0.00725
0.02500	-0.0105
0.05000	-0.0145
0.07500	-0.01725
0.10000	-0.01945
0.15000	-0.02231
0.20000	-0.02350
0.25000	-0.02477
0.30000	-0.02547
0.40000	-0.02655
0.50000	-0.02755
0.60000	-0.02699
0.70000	-0.02576
0.80000	-0.02184
0.90000	-0.014
0.95000	-0.00777
1.00000	0.00000



### BW 050 02 09

Parameter	Value
thickness	9.2%
camber	2.05%
pitching moment, $C_m$	0.018
zero lift angle, $\alpha_{L=0}$	-0.15°

The metal ruler is slid under the cap strip and used to apply upward pressure to the cap strip and rib assembly while the glue cures. Once the glue has set, the rear contour blocks are slid between the cap strips and the building surface; the front contour blocks are slid between the D-tube and the building surface. Nearly all of the remaining wing construction can then be completed with the blocks in place.

We'll explain these procedures in more detail in the next installment in this series, Part 3, which will cover the construction process. We'll include photos, drawings, methods, tips and techniques. Stay tuned!

Comments, questions, and suggestions for future columns may be sent to us at either P.O. Box 975, Olalla WA 98359-0975, or <bsquared@halcyon.com>.

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## HAVE SAILPLANE, WILL TRAVEL!



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

### Bluegrass Soaring & Horse Events: A Cultural Study

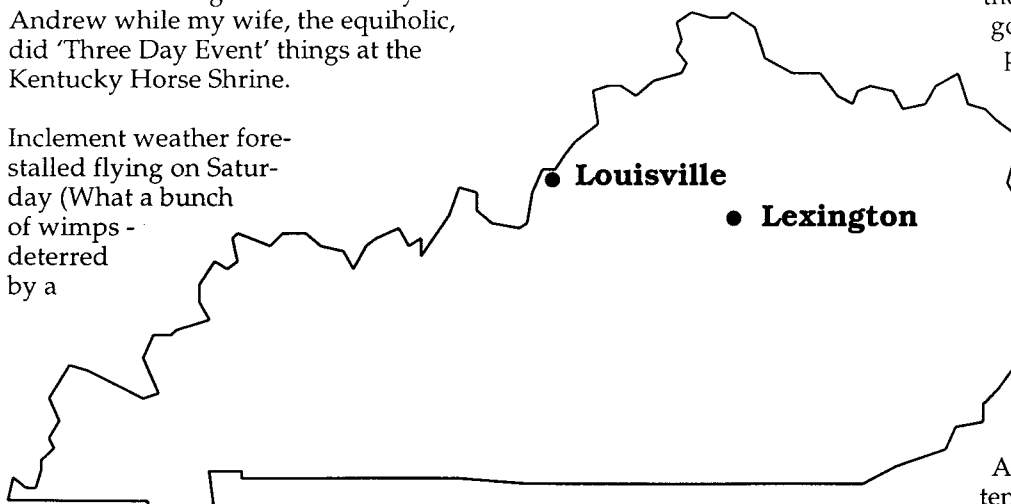
While back, I had the opportunity to visit Lexington, Kentucky, where the Bluegrass Soaring Society was kind enough to provide an afternoon of refuge for me and my son Andrew while my wife, the equiholic, did 'Three Day Event' things at the Kentucky Horse Shrine.

Inclement weather forestalled flying on Saturday (What a bunch of wimps - deterred by a

If any of you are married to an equiholic and find yourselves shanghaied to the Lexington area, be sure to give these guys a call. Flying sure beats the Kentucky Horse Park self guided walking tour of historic manure piles.

The weekend gave me the opportunity to observe a major horse event at unnecessary length, and I noted a number of similarities to RC plane meets - and a number of crucial differences.

The horse competitors cluster up in little club or team groups, just like the flyers at a contest. Vendors come in to provide food and sell merchandise. However, the horse vendors include folks trying to sell wood shavings and sawdust, stuff that we normally try to get rid of. The combined spirits of competition and camaraderie are similar, with the riders paying obsessive attention to schedules, rules and techniques, helping each other out as



mere 'severe' thunderstorm warning and torrential rains!) As a result, I wound up having to face the worst of my fears. Not only did I have to go watch my wife ride horses, I had to sit in the rain watching my wife ride horses. She finished the cross country course and galloped off to a nice, dry barn, leaving Andrew and me with the choice of either standing under a tree in a thunderstorm or running across an open field with aluminum lawn chairs over our heads in a thunderstorm.

Sunday and sailplanes were a real relief after that experience.

needed, and then going out to compete head to head. I think the horse people have a slight edge when it comes to the size of vehicles parked around the field.

The horse people all dress in bizarre costumes for their events, which has some parallels to the standard sailplane meet costume: light blue LSF T-shirt, sunglasses, shorts, tennis shoes and the pilot's choice of hat. The equiholics costumes are, on the other hand, derived from the historic garb of British aristocracy and are therefore heavy, itchy and inappropriate for the weather and/or the activity. The ladies

This column is dedicated to soaring vacations. 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](mailto:tomnagel@iwaynet.net) for gentle editing and suggestions.

Tom

wear white pants and fancy blouses under wool jackets as they sit astride a horse whose favorite thing is to go roll in shit; and then they ride around the course in the hot sun jumping over things until the horse throws them off into the mud.

There are a few major differences that I noticed between horse events and sailplane competitions. For one thing, most of the horse people are of the female persuasion, whereas most of the sailplane folk are men. I see no good reasons for this, except that perhaps men have better sense or less money.

Also, sailplane competitions generally do not have open sewers full of manure and horse urine flowing through them, or festering piles of composting stall waste scattered about. In fact, the only thing that stinks at the competitions I have attended are my landing skills.

And finally, sailplane competitions tend to have a lot fewer people walking around on crutches. This despite the fact that we fliers have a chance of stepping in groundhog holes almost equal to that of your average hayburner. I think if Christopher Reeve had flown RC sailplanes he'd be a lot happier guy today.

In closing, I'd like to say that the Kentucky Horse Park is really a pretty classy place, well landscaped, with good roads and parking, a wide variety of fine fields and great restroom facilities. Now, if they would just get those damned horses out of the way, they'd have a really first-class facility.



## CROSS COUNTRY SOARING



Scott Gradwell  
Medford, Oregon  
rcpilot@cdsnet.net

### Fly Further & Stay Up Longer

This year is going by unbelievably fast. None of my projects ever seem to get done by the deadline I set. Maybe I could just double the time that I think things are going to take, but I will still probably be behind schedule.

I have been working on the upcoming Montague Cross Country Challenge; I think this will be the most exciting one yet. There won't be gimme laps this year. The task you choose to fly will take some thought.

I received an e-mail from Greg Springate with some photos of his new cross country machine. It looks impressive and I cannot wait to see it fly. Even though it is a 3 function machine, I am sure it will be very competitive in the Open class.

One of the techniques used in full size soaring that can translate into R/C cross country is choosing your speed

to fly. In full size soaring, you can be more precise since you have an actual airspeed indicator and variometer. But the concept can be used in R/C soaring, also. Basically, if you are cruising between turnpoints, you speed up in lift and slow down in sink. The stronger the lift, the slower you go; the stronger the sink, the more you speed up. Rarely will you stay at a steady speed; you are always flying through the air speeding up or slowing down. You should start with an approximate best L/D speed for the sailplane, which I have heard is around 30 mph for a SB-X/C. Since we don't have an onboard airspeed indicator, we can use the car MPH gauge. We can ask the driver to keep a constant speed of 30 mph and work on keeping our sailplane in the same position relative to the car. This is a lot of fun if the speed limit is 45 mph; people will be passing you wondering what in the heck those jokers are doing.

When the variometer indicates sink, we will ask the driver to speed up to 35 mph, or maybe even 40 mph if the sink is really bad. Then, if we keep the sailplane in the same position relative to the car, we will know the approximate speed of the sailplane.

The opposite holds true for lift. If we are already high and don't feel like stopping to thermal, we can still take advantage of the lift by slowing down and staying in it for as long as possible.

The stronger the lift, the slower we go.

Now all this assumes the winds aloft are calm. If possible, you should get a current winds aloft forecast. Then you can make adjustments to your ground speed which, if you keep the sailplane in the same position, will adjust your flying speed. The copilot should be comparing the forecast with actual conditions when the vehicle is stopped, either at turnpoints or thermals. If you are going into a headwind the rule of thumb is to add half the wind component to your best L/D speed - a tailwind, subtract half the wind component from your best L/D speed. Without having onboard instrumentation this is not an exact science, but the general principles are the same, and I am sure it will help you fly farther and stay up longer.

Also, could someone e-mail me Tom Hoopes e-mail address? Several people are interested in his Total Energy conversion and I need to find out if he is able to do it anymore. ■



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by Joe En-Huei  
West Windsor, New Jersey

## EMS 1/3.5 Minimoa

### Introduction

I never thought that I would ever own any large size vintage scale sailplanes because they were rare and time consuming to build. I was skeptical whether scale vintage sailplanes would fly well because some say there is a strong tendency of sideslip in circles for sailplanes with gull-wing design. Besides, I am a big fan for contemporary scale sailplanes, especially the superships.

Until about two years ago, when I came across a beautiful EMS 1/3.5 Minimoa flown by Herr Ralf Scheifele during the Elmira Meet. I was impressed and amazed by the gracefulness of the slow flying Minimoa. I thought it was a personal ship, but after chatting with Ralf, I was very happy to learn that the plane was available as an ARF.

Shortly after the Elmira Meet, Sailplanes Unlimited imported two EMS Minimoes. The one that I picked up was completed finished. The wings and tail feathers were already covered with buff color fabric, nicely done by my good friend John Derstine.

### Minimoa Kit

The EMS 1/3.5 Minimoa has a wing-span of 191 inches (4.85 meters) and it is quite big with 2,450 square inches of wing area. The chord at wing root is 14.5 inches. However, the fuselage is quite short at 68 inches (not including the rudder). The ailerons, split elevators and rudder are built-up and they are huge. The wings and tailplane are of sheeted foam. The spaces between



wing "ribs" were routed out to simulate the structure of vintage design. The gull wings are extremely strong with composite reinforcement.

The fuselage is gel-coated fiberglass and is a beautiful piece of art from Rosenthal. The kit has a very high level of craftsmanship. The wing blades and tailplane receptacles, main wheel and tow release were already in place. The Graupner spoilers (activated on top and bottom of wings) were already installed and the cutouts for ailerons, spoilers and split elevator servos were complete. Servo boxes were also included in the kit.

The EMS Minimoa wings have a relatively thick Eppler series profile. The "dihedral" angle at the root of wing is about 7 degrees and the

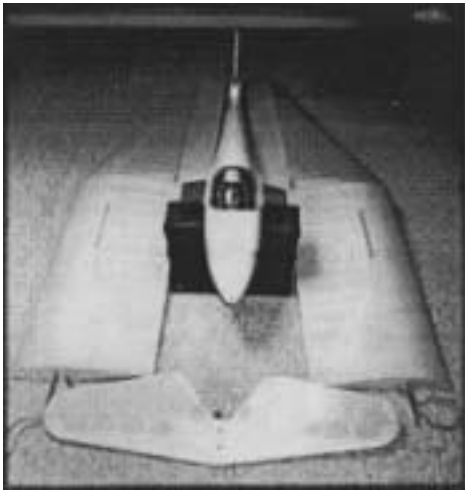
"anhedral" angle at the break of gull wing is about 2 degrees measured at rest. The "chord skip" design – widening of the chord at the outer panel of wings – perhaps would reduce tipstall potential in circling.

### Assembly

Besides using pivot hinges to connect the control surfaces to the wings and tailplane, the only thing to complete is to install the servos in the wings for ailerons and spoilers and elevator servos in the tailplane. Servos for rudder and tow release are located in the space just behind the pilot. Various size servos are listed below:

Ailerons	two HS-605s Metal Gear
Spoilers	two HS-422Bs
Split Elevators	two HS-225s Metal Gear

**R/C Soaring Digest**



Rudder one HS-700BB  
Tow Release one HS-422B

The radio system is a JR 10 channel and the receiver battery has 1,400 mah capacity. I programmed 65 percent of aileron differential. A very realistic pilot "Axel" (available from Sailplanes Unlimited) and minor cockpit details enhance the scale appearance. The takeoff weight is about 20 pounds including about 5 pounds of ballast in the nose. The CG is at 6.5 inches behind the LE at wing root. The 2-D wing loading is about 19 oz/sf (3-D wing loading 1.2 oz/cf) and is quite light for its size.

### Test Flight at a Flat Field

The test flight was conducted at Northeast Philly R/C field on a fair weather day in late September of 1999. My good friend Mike Popescu had a big Stinger with a G-62 motor for towing duty. The Minimoa was fine on tow but oscillated up and down slightly. Upon release at about 500 ft. AGL, it became unstable and appeared to be tail-heavy. Quickly, I dialed in down trim on the elevator, and luckily the plane was saved. I found the ballast in the nose (secured by Velcro and rubber band) had shifted in flight. I glued the ballast in place to play it safe.

A week later, I flew the Minimoa again. The Minimoa followed Mike's big Stinger with ease to about 1,000 ft. AGL on a fair weather day with light breeze. Upon release, the Minimoa flew slow and graceful and was a very gentle plane to fly. The Minimoa had a very flat glide and could detect thermals well due to its slow flying speed. The Minimoa coordinated very well in turns and circles (without

noticeable tendency to sideslip in circles). I intentionally stalled the plane and the recovery was straightforward and quick. The spoilers were very effective for bleeding off altitude safely.

Before the sun set, we made two more tows to altitude and the Minimoa stayed up very long. Minimoa's wing and tail structures were so beautiful when the sun illuminated them. It resembled a bird in flight, and perhaps that was the original intention of the designer back in the 1930's.

### Test Flight at a Slope

I also flew the Minimoa at Harris Hill, New York, during the Elmira 2000



event, where it was towed to altitude by John Derstine's Pegasus – a competent tug. The Minimoa was rock steady in gusty winds (and big slope lifts) and the flight lasted about one hour. When the sun came out and wind died down in the evening, the Minimoa was equally pleasant circling in thermals and it impressed many spectators. The Minimoa was visible even at extreme altitude due to its buff color and large size wings. Test flights proved that it is absolutely docile to fly.

### Acknowledgments

The 1/3.5 EMS Minimoa is surprisingly easy to fly. Any R/C pilot who has flown an aileroned glider can fly the EMS Minimoa. In fact, it can soar as good as large size contemporary scale gliders which I have flown. The EMS Minimoa is an ideal choice for scale sailplane enthusiasts with no time to build.

My thanks to Robin Lehman for importing the plane, Mike Popescu and John Derstine for towing duty, Dan Troxell for trimming the plane at Harris Hill and to John Derstine for organizing the Elmira Meet where we can see many beautiful scale sailplanes in action. The kit designer and builder should be credited for the wonderful 1/3.5 Minimoa – a modeler's dream indeed.



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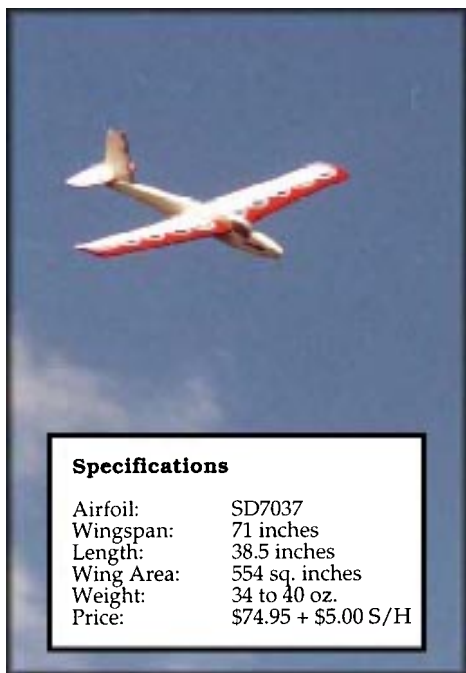
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## Dave's Aircraft Works Foamie 1-26 - 2 Meter



### Specifications

Airfoil:	SD7037
Wingspan:	71 inches
Length:	38.5 inches
Wing Area:	554 sq. inches
Weight:	34 to 40 oz.
Price:	\$74.95 + \$5.00 S/H

*When on the wing, the lines of the EPP 1-26 look very close to the real thing. Due to its size and durability, it's a natural for soaring in schoolyards and smaller fields. (Photo by Dave Garwood.)*

By Richard Loud  
Ballston Spa, New York  
(518) 884-8024  
Rnjloud@aol.com

In the August, 2000 issue of RCSD, Steve Savoie presented an excellent article on the construction of the 2 meter Schweizer 1-26 from Dave's Aircraft Works. As it turns out, Steve and I had decided to do somewhat of a tag team review of this most versatile model, so now it's my turn to provide you with a flight report.

Not to repeat any of Steve's words, let me just state that the instruction book you get with the kit is very detailed and can guide even a first time builder to successful completion. It also includes excellent tips for building and covering any EPP model.



*To get a good high-start launch, you really have to heave the 1-26. Otherwise, it may drop a wing shortly after release. (Photo by Dave Garwood.)*

*The assembled 1-26 perched atop the travelling bow case. Although the disassembled model will fit back into the original box, the bow case offers extra protection as checked baggage. (Photo by Rich Loud.)*



my way back from Kansas last May to make sure it was safely in my hands at the airport. Go ahead and doubt me, but I have witnesses!

My first flight was at Wilson Lake, Kansas in winds exceeding 45 mph. It was just a gentle hand toss and I immediately realized I needed some nose weight. I also realized that 45 mph may be a little too much wind for this model. After wrestling it to the ground, I made a small slit in the covering on the nose, dug out a little foam and inserted a 0.75 ounce weight.

The next toss, the following day when the wind was a little calmer, proved that the balance was fine and in the middle of the recommended range. I made a few passes along the slope to check the trim and sensitivity of controls. I found the initial setup to be very pitch sensitive, indicating the CG may still have been a little far aft, but I opted to reduce elevator throw rather than add more nose weight. This worked great to reduce the sensitivity. Roll and yaw controls were both fine



*Preflight checks before the maiden high start launch. Always check that the wings are properly set prior to launch as they are held in place by a friction fit and will shift on landing. (Photo by Dave Garwood.)*



*How many of you would let your four-year-old son take a nap on top of your sailplane? This is as close as I could get to the Samsonite gorilla test, but I promise, the 1-26 is in there! When completely disassembled, the 1-26 fits nicely inside a bow case and even has room to spare for other gear. (Photo by Rich Loud.)*



when set per the instructions. I mixed as much as 75% rudder throw with ailerons for those times when I'm just cruising around or thermalling.

Interestingly, while I was in somewhat of a holding pattern, waiting for Dave Garwood to come over and shoot some pictures, I had a nasty midair with another 1-26 flown by Alden Shipp. What was most memorable about the impact was that it made the loudest sound I've ever heard between two foamies. I landed almost immediately to check out the plane and straighten the wings; they are held in place with a snug friction fit so a collision can easily knock them a little cockeyed. I noticed a crease in the top of the right wing and another in the right aileron but overall they seemed pretty sturdy so I launched again. This time I waited until Dave was ready to start snapping pictures before tossing off. I went on and flew for 45 minutes, most of that time yanking and banking to get close to the camera before succumbing to better judgment and landing the plane.

Upon returning home from Kansas I found that underneath the crease, the spar was broken in two places and the subtrailing edge and aileron were also broken. Had that happened to most any other plane, I would have folded the wings for sure while banking for that "perfect shot." If that doesn't testify to the safety and durability of the 1-26, nothing will.

After repairing the damaged wing, I took the 1-26 out to our local thermal field to see how well it would ride a high start. Well, it'll ride one. I'd have to say that the 1-26 is more at home being thrown off a slope than it is under tow, but you can get decent launches with a high start. Mine has a tendency to fall off to one side or the other immediately after release, so get ready to be on the stick right away. I found that tendency went away if I launched with a shallow attitude to build up airspeed prior climbing. Of course, this is at the expense of final release altitude. The 1-26 is reportedly strong enough to handle full on winch launches, but since my wing had been compromised in Kansas, I'm sticking to the high start.

Well executed thermal turns with the 1-26 are absolutely beautiful. It holds a line through the turn that makes you think it's on rails. Because of its small

size compared to many of the thermal ships we fly today, it does seem a bit touchy with the recommended aileron throws. If you expect you'll be using the 1-26 mostly for flat land flying, it may be a good idea to use dual rates on the ailerons to avoid over controlling in a thermal.

Landings are comfortable for both slope and flat land. This is due in part to the high degree of control that is maintained even at low airspeeds. I'm sure the other reason is that, being made of EPP, there's very little fear of dorking it into the ground, or a rock, or a tree, fence, backstop... You get the point! If you plan to use a computer radio, you may want to program in spoilers for glide-path control. I haven't programmed them on mine, yet, and have had to go around several times on the slope to get it down where I wanted it.

If foamies are good for anything, they're good for practicing aerobatics and trying things you may not normally try with other, "crunchy" models. Loops are a breeze whether big, lazy and scale-like or quick and tight. All that's needed is a shallow dive to build up some airspeed and the 1-26 will pull through. My favorite loops are the big lazy ones that start out pointing away from the slope and finish with a dive in close into the slope face. When you're coming straight down trying to get as close to the ground as possible, that's when the adrenaline really starts pumping!

Rolls should be entered with relatively high airspeed to ensure you'll get all the way around and they require down elevator while inverted to keep them axial. The 1-26 is also an excellent trainer for inverted flight. True, it does need a lot of down elevator to keep the nose up but it shows no tendency to roll out. This is THE plane for practicing low level rolls parallel to the slope and half rolls into inverted passes along the slope face.

OK, here's one of my favorites: the hammerhead stall. With the 1-26 screaming along the slope, pull up into the vertical and just before it stops flying, kick in full rudder, preferably away from the slope. With a little practice, and a lot of rudder throw, you can get the 1-26 to rotate about its center of gravity so the inside wing is actually moving backwards. That's a



*Close-up of the wing-fuselage joint showing the servo leads and the steel wing rod. Carbon fiber wing rods can be used to save weight if desired. The wings are held tight purely by friction. (Photo by Rich Loud.)*



*Close-up of the removable stabilizer. A piece of quarter inch thick plywood was used for the mounting surface. It was drilled and tapped for 4-40 screws to hold the stabilizer in place. (Photo by Rich Loud.)*

really cool thing to see.

I'm sure there are a lot of maneuvers I haven't tried with the 1-26 but it's just a matter of time. If foamies are good for anything, they're good for trying new things.

If you're in the market for a model that's at home on any slope or any flying field and can even be checked as baggage, the DAW Foamie 1-26 2 meter may be just the ticket you've been looking for. Build it stock, with a one piece wing, and you'll have one of the most versatile sailplanes at your flying sites. Build it with a two piece wing and removable stabilizer and you'll have one of the most versatile sailplanes anywhere.

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# TECH TOPICS

Dave Register  
Bartlesville, Oklahoma  
regdave@aol.com

## Polars Don't Have To Be A Bear!

For several years now, I've put off writing a series of articles about polar analysis of RC sailplanes. The reasons:

- 1) Martin Simons covered the topic very well in *RCSD* as well as in his excellent text "Model Aircraft Aerodynamics",
- 2) Most folks feel it's too mathematical and technical to be generally interesting,
- 3) Even if you wanted to perform this type of analysis, the software is not readily available to users who really don't want to get into the math.

OK, so what's changed to trigger bringing this topic back?

- 1) The topic hasn't been covered in *RCSD* for several years,
- 2) The math doesn't have to be that challenging and the physical concepts are quite straightforward (See, for instance, Bill and Bunny Kuhlman's text "Understanding Polars Without Math".),
- 3) We still have a software access problem but there are a few tools out there. And I'll make my Visual Basic polar program available to anyone who wants it.
- 4) We now have reasonably complete data for a number of airfoils which can be used as part of the input to the analysis (UIUC database),
- 5) I'd like to cover some topics on planform design in the next several columns. So we need to understand the basis behind the analysis to be sure the results make sense,
- 6) If you're going to fly RC sailplanes, you really ought to understand why they work the way they do (i.e., just read this stuff and take your medicine like a man).

Before we go too far, a mathematical analysis of the potential performance of an RC sailplane is not a panacea for everything. For instance, we don't have a lot of low Reynolds number data (below ~60,000) so the analysis for small models is suspect. Also, this type of analysis does not address tailplane volumes, CG position or any type of stability criteria. It assumes that's already been settled and your sailplane is flying at near optimum conditions at each speed setting.

Next, remember that this is a model calculation. Hopefully the trends will be reliable but absolute values have to be verified by actual flying experience. A polar analysis is one of many tools available to the soaring pilot. But ultimately you have to prove it in the air.

Finally, exactly what do I mean by a polar analysis? You can find airfoil data and graphs ( $C_d$  vs  $C_l$ , etc.) that do a good job describing the airfoil's performance. But a very large part of the characteristics of the plane depend on the planform and wing loading as well. So what we'll be doing is incorporating the major effects of the entire sailplane, of which the airfoil is just one part. Maybe we should call this "holistic" sailplane analysis? Nah. Too '90s. Let's just get going.

The journey begins by looking at the basic physics of the problem. You've

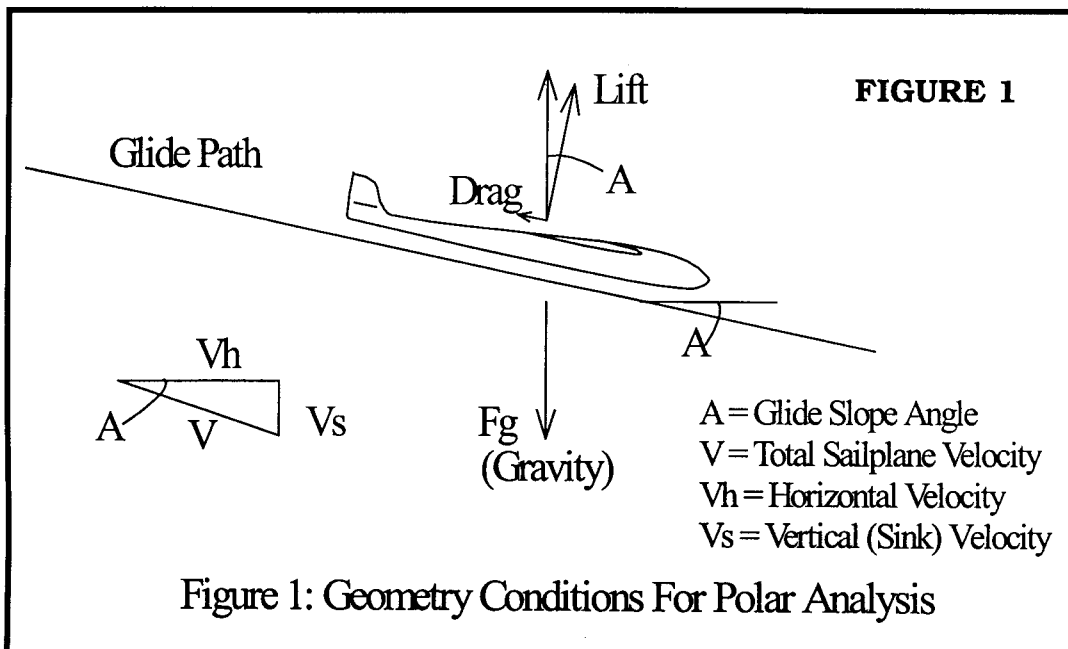
launched your ship to a reasonable altitude. It's a dead calm day with no lift or sink. You're flying "straight and level" at a constant speed. But you're slowly coming down. How come?

Very simple — gravity! There is a force trying to bring you back to terra firma and it's simply the weight of your sailplane.

Since the force is with you (and your sailplane), we know from introductory science courses that a force acting on something causes that 'something' to accelerate. Throw a rock straight up in the air and watch what happens. When it reaches its apogee and starts to return to earth, notice that it continually speeds up on the way down. That's a force at work (gravity) causing acceleration of the mass of the rock.

So, how come our ship doesn't speed up on its way down? After all, we did say it was traveling at a constant speed. For most of us, that's the way we fly. The exception being Jeff Naber's "extreme verticality" landing approach. You can check the results of that method on our TulSoar web site. Normally, however, the only way any material body can have a constant velocity in the presence of a force (such as gravity) is if an equal and opposite force balances things out.

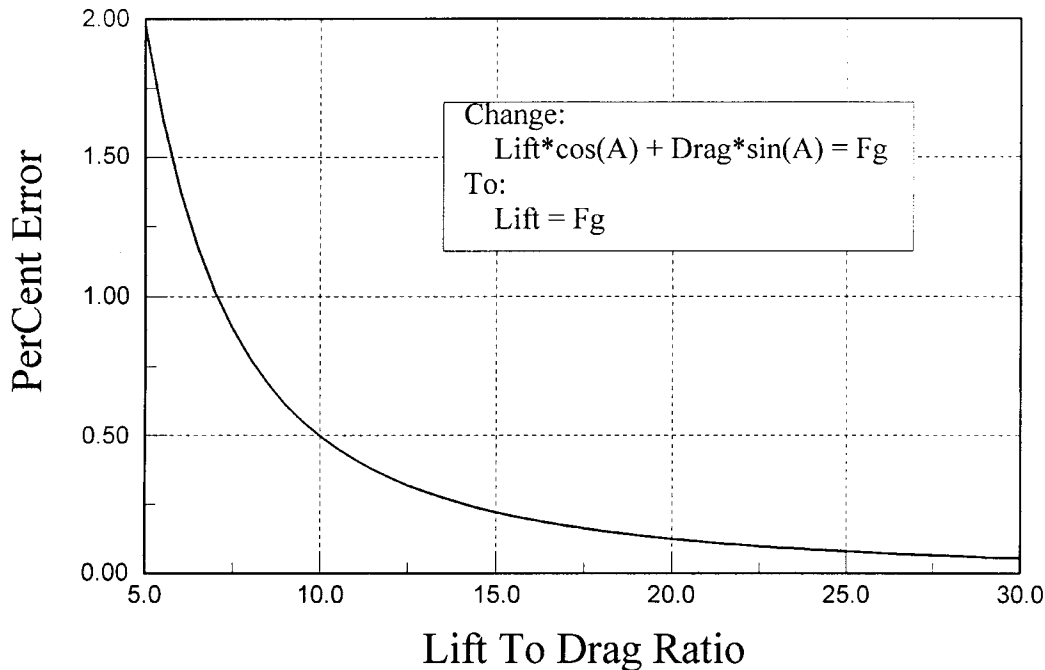
So, if gravity is pulling down, Lift must be pulling up to balance it. Close,





## Estimated Error: Simplified Lift Equation

FIGURE 2



but no cigar. Both Lift AND Drag are the opposing forces that balance gravity. Lift is by far the larger force (usually), but drag is an important component and it's these two forces acting in concert to oppose gravity that allows a simple mathematical expression for our performance analysis.

The flaw in our original statements a few paragraphs back was "straight and level" (You did catch that didn't you?). Straight — yes. Level — no.

Lift operates in a direction perpendicular to the aircraft flight path. Drag could be considered any aerodynamic force directed anti-parallel to the flight path. Since the flight path is angled slightly downwards (Experience tells us that in the absence of Lift we can't fly forever.), neither the lift nor the drag force alone opposes the gravitational force. And all of this doesn't act exactly the same under all flight conditions.

Let's say you're flying along at a constant speed. Then you dial in a little bit of camber. You now have more lift than you need for that flight speed and flight angle. So the plane slows up some to reduce lift (more on that later). This will also change Drag a bit. The combination of both of these changes leads to a complex algebraic interplay

which brings about a slightly different glide slope. If the glide slope has changed, then it means the Lift to Drag ratio has changed and so the performance at this new setting is different than it was previously.

The amazing thing is that all of these forces find a point where it all works out naturally. Nature abhors both a vacuum and a crash — despite the resulting increase in entropy. The tough part is figuring out how nature did all this without nature knowing all the mathematics.

Let's use the diagrams in Figure 1 to help sort this out. Our sailplane is proceeding along the glide path at a constant velocity,  $V$ . This velocity can be resolved into a horizontal and vertical component using the glide slope angle ( $A$ ):

$$V_h = V \cdot \cos(A)$$

$$V_s = V \cdot \sin(A)$$

Similarly, we can resolve the gravitational force along the lift and drag directions. For a constant velocity along the glide slope both of these components have to separately balance the gravity component along their respective directions.

$$F_g \cdot \cos(A) = \text{Lift}$$

$$F_g \cdot \sin(A) = \text{Drag}$$

Therefore, a rigorous definition of the Lift to Drag ratio can be defined as:

$$\text{Lift/ Drag} = F_g \cdot \cos(A) / F_g \cdot \sin(A)$$

Since we know the trigonometric functions in terms of the velocity components, we can substitute:

$$\text{Lift/ Drag} = (F_g \cdot V_h / V) / (F_g \cdot V_s / V) = V_h / V_s$$

So, with a very simple concept of the physics of flight, we've derived one of the key relationships we need.

The other appropriate equation can be derived from what we've already discussed. We know that

the sum of the lift and drag forces projected along the vertical axis has to exactly balance the gravitational force. The vertical component of the lift vector is:

$$\text{Lift} \cdot \cos(A)$$

while the vertical component of the drag vector is:

$$\text{Drag} \cdot \sin(A)$$

So we add 'em up and that has to equal the gravitational force for everything to balance out:

$$\text{Lift} \cdot \cos(A) + \text{Drag} \cdot \sin(A) = F_g$$

Where  $F_g$  is simply the total weight of the sailplane.

So, there you have it. The two basic equations we need to solve the polar problem. In the next column, we'll look at the aerodynamic elements that go into the Lift and Drag terms. For the remainder of today's column, let's see how you solve the equations we've derived.

The aerodynamic forces we're dealing with depend directly on the velocity of the aircraft. The weight of the airplane (gravity!) determines how much velocity is required to generate enough

lift to support this weight. So the first step is to find out how much lift is required and then what velocity will generate that lift. That velocity, in turn, largely determines the drag values.

The answer to the Lift question can be found in the second equation we derived:

$$\text{Lift} \cdot \cos(A) + \text{Drag} \cdot \sin(A) = F_g$$

At this point, the only thing we know here is the gravitational term,  $F_g$ , which is simply the weight of the airplane. All the other terms (Lift, Drag, A) are what we're trying to solve. One way to do this is a process called iteration — guess the solution, plug it into the equations and see how close you came. Correct the guess a bit and try again. After a few attempts you'll zero in on the correct answer. This is hard for people to do, but very easy for a computer program. If you've ever used the "Solver" macro in Excel, this is exactly what it does.

But there's an easier way that's almost as accurate and certainly good enough for our purposes. Let's take another look at the values of the terms in the equations:

$$\text{Lift} \cdot \cos(A) + \text{Drag} \cdot \sin(A) = F_g$$

$$V_s/V_h = \tan(A)$$

Let's assume we have a Lift/Drag = 20 (perhaps a tad optimistic). Then:

$$V_s/V_h = 1/20, \text{ and}$$

$$A \sim 2.9 \text{ degrees.}$$

Using the sin and cos values for this angle, our equation becomes:

$$0.9988 \cdot \text{Lift} + 0.0499 \cdot \text{Lift}/20 = F_g, \text{ or}$$

$$1.0012 \cdot \text{Lift} = F_g$$

So if we simply ignore the drag and trig functions and use the approximation:

$$\text{Lift} = F_g$$

we'll only be off by about 0.1% in this case. Not too bad!

Let's take what we hope might be a worst case of Lift/Drag = 8, Then

$$V_s/V_h = 0.125, \text{ and}$$

$$A \sim 7.1 \text{ degrees}$$

and our equation becomes:

$$0.9922 \cdot \text{Lift} + 0.1240 \cdot \text{Lift}/8 = F_g, \text{ or}$$

$$1.0078 \cdot \text{Lift} = F_g$$

Still only off by less than 1%. This tells us that we can effectively ignore the drag term in the equation and simply state that:

$$\text{Lift} = F_g \text{ (weight of the sailplane)}$$

Under any conditions, the error in this assumption does not appear to be greater than 1% at any reasonable Lift/Drag ratio. This is a tremendous simplification for our solution and, as we've illustrated, introduces an indistinguishable error into the calculation. A general evaluation of the % error across a wide range of Lift/Drag ratios is shown in Figure 2.

So here's the deal:

- 1) We'll figure out the Lift we'll need (and the resulting velocity and lift coefficient -  $C_l$ ) from the equation:

$$\text{Lift} = F_g \text{ (weight of the sailplane)}$$

- 2) We'll use this velocity, and the wing planform parameters to determine the average Reynolds number for the wing. The UIUC database will then give us the corresponding drag coefficient for that  $C_l$  and Reynolds number.

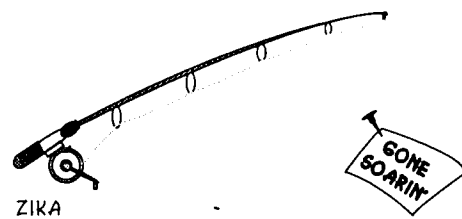
- 3) From this information we can calculate the induced and parasitic drag of the wing. We'll have to make an estimate for the parasitic drag for the fuselage and tailplane but that should be a relatively minor (but important) Drag contribution. With both Lift and Drag now known, we know the Lift/Drag ratio and consequently the  $V_h/V_s$  ratio. Since we know

the total velocity (V) from step 1, we can determine the absolute values of  $V_h$  and  $V_s$  and plot the resulting data to get our polar.

With this process automated in a small computer program, it becomes relatively easy to compare airfoils, planforms and wing loadings to see how they affect the overall performance of the design (similar to what we did last month when we analyzed ballast).

Will this method be absolutely correct? Probably not. Will the trends and even some of the details be usefully predictive? Definitely. The real power of this approach is the ability to try out a number of different design concepts with a few milliseconds of PC processor time before sitting down to invest maybe 50 hours of building time to try out just one of them. The closer you can get to the right one by modeling the model, the more fruitful and enjoyable the building and flying will be later on.

Next time let's take a look at the aerodynamic terms and the assumptions needed to make this whole thing work for us. There WILL be a quiz. A passing grade is required before you can go flying next Spring!



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# THE ELECTRIC CONNECTION

## Gift Giving Ideas for Christmas & the Coming Year

by Mark Nankivil  
7411 Canterbury Ave.  
St. Louis, Missouri 63143  
(314) 781-9175  
nankivil@flashcom.net

*Looking for sailplane, gift giving ideas for either Christmas or the coming year? Well, here are a few ideas that might fit the bill.*

### Electrics

Cavazos Sailplane Designs has a new 10 cell F5B model that will be available shortly called the Axis. I have felt the "need for speed" this year and this model looks to be one that can fill it. Check CSD's models out at their web site <<http://members.aol.com/rcav/index.htm>>.

Aveox has a sharp all molded electric called the Sirius. Specs on this model are: hollow molded balsa/fiberglass laminate wing, gelcoated Kevlar™ fuselage, split vertical fin for easy servo installation. 1.7M wingspan (67"), 930 mm long (36.6"), 28.3 square decimeter surface area (440 square inches), MH30 airfoil. Check Aveox out at <<http://www.aveox.com/hobby.htm>>.

On the sport side of things, the RBC Paddle is a cute Speed 400 model that would be a fun one to put in the air at the flying field. The Paddle has a unique look to it with twin tailbooms and a teardrop shaped fuselage pod. Check it out at the Specialized Model Supply web site at <<http://rc-aero.com/biz/smsupply/>>.

### Sailplanes

Scale sailplanes have me totally jazzed. As I write this, it is just a week after the very successful Oc-tow-berfest aerotow event here in the St. Louis area. There is total beauty in a large - 14' span and more - scale sailplane flying over. I particularly want to do a model of the Ka6CR or Ka6E as I have always enjoyed the shape of this beautiful sailplane. Rosenthal of Germany has a couple of kits and fuselages available and the 5 meter



model of the Ka6E is quite impressive. But their 6.5 meter Ka6CR is incredible! With CNC cut ribs and wood parts, and a monstrous fiberglass fuselage, this is one model that will test the towplane's pulling power! Check them out at <[http://www.rosenthal-flugmodelle.de/en/index\\_e.htm](http://www.rosenthal-flugmodelle.de/en/index_e.htm)>.

Robin Lehman has a 1/3rd scale, 5 meter span Pribeck Ka6E listed in his ads that looks great, too. Check out Robin's wonderful goodies at <[www.sailplanes.com](http://www.sailplanes.com)>.

I plan on a few trips to Wilson Lake this coming year and, to fulfill that need for speed on the slope, the BD-5J sloper from Brian Laird at Slope Scale Models looks to fill the need. You've seen Dave Garwood's excellent renditions of their models in RCSD and other model magazines, and the BD-5J looks to be in the same class. Check it out at <[http://ourworld.compuserve.com/homepages/slope\\_scale/](http://ourworld.compuserve.com/homepages/slope_scale/)>.

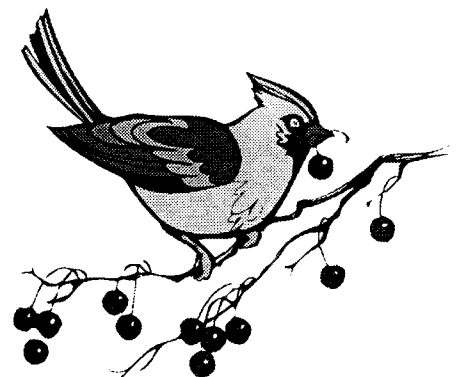
### Miscellaneous

I like to read and maintain my own archive of sorts and there are two Martin Simons' books that would be great wintertime reads. The first one on my list is "Slingsby Sailplanes" and the other is the upcoming book titled "Sailplanes, Volume 1, 1920-45". (Raul Blacksten is selling it. Inquiries: <[raulb@earthlink.net](mailto:raulb@earthlink.net)>.)

Tools! A gift certificate to the local Home Depot or Lowe's would be put to good use for sure! The MicroMark catalog also has a number of tools listed that would be useful in the workshop.

All in all, the base of our Christmas tree will need to be quite large to fit all of this under the boughs. Most of all though, I want to wish everyone out there a most glorious holiday season and may your building and flying in 2001 be enjoyable, plentiful and challenging!

Good Health & Good Lift in 2001!



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# TWEAKING THE MAJESTIC

By Bob Johnson  
Fond du Lac, Wisconsin

I enjoy building model airplanes; they're a kind of three-dimensional jigsaw puzzle. When a friend of mine purchased a Majestic kit and I had the opportunity to examine it, the design and the quality of the material impressed me and the desire quickly grew to assemble another jigsaw puzzle. A quick check of the Laser Arts web site was provided me with their address and shipping costs, and my check was in the mail. A week later, the kit arrived.

I found the fit of the laser cut pieces to be exceptionally good. Especially impressive was the fit of the plywood fuselage pieces. The instruction book was well written and well illustrated. Anyone having previously built a model from a kit should have no trouble assembling a Majestic. I would not recommend the Majestic to a person who has no prior building experience.

I have this 'thing' about looking for ways in which the design/construction of a model can be improved. Careful examination of the Majestic plans and instructions revealed several enhancements that could be made:

1. The trailing edge of the wing was rather blunt and I prefer a nice sharp trailing edge. CompuFoil® was used to generate a root rib pattern that was compared to the airfoil shown on the plans. This revealed that the blunting of the trailing edge resulted in a shortening of the wing chord by one-half inch.
2. An addendum to the instructions suggested that a sub fin be added to the bottom of the tail boom at the rear to counteract a small Dutch roll tendency. I felt that a sub fin could easily become a shed part on landing with the resultant zero landing points, so I decided to increase the length of the v-tail surfaces rather than adding the sub fin.
3. The ends of the wings were three layers of balsa, which were rounded off after being glued to the wing. I felt that lengthening the tips and tapering them more

gradually would be an improvement.

With these revisions in mind, construction of the kit began. During the construction process several other modifications were made; these will be described below.

A sharp trailing edge and increasing of the wing chord to that of a true SD 7038 airfoil were accomplished by laminating 1/64-inch plywood to 1-inch wide, 3/16-inch thick balsa. Laminating resin was used for the adhesive and vacuum bagging was employed to assure a good bond between the plywood and balsa. After each wing panel was built, one-half inch was removed from the trailing edge and the balsa/plywood trailing edge was butt-glued in place. The trailing edge was then shaped to the correct profile.

The SD 7038 is an undercambered airfoil. To insure maintaining the correct profile when attaching the trailing edge, CompuFoil® was employed to generate templates that were utilized to assist in attaching the trailing edge at the correct angle. When attaching the trailing edge to the wing, I tried a little 'trick': The SD 7035, SD 7036, SD 7037, and SD 7038 airfoils constitute a 'family' that are all the same thickness but differ in the degree of undercamber, increasing in amount as you progress from the SD 7035 to the SD 7038. I read somewhere that tip stall characteristics would be improved if the tip of the wing had more undercamber than the root. When the trailing edges were glued in place, I

attempted to create the profile of the SD 7035 at the root and progress to that of the SD 7038 at the tip. Thus, the undercamber at the wing tip was increased with respect to that at the root. I recognize that it is impossible to reproduce an airfoil with 100% accuracy, especially in a built-up wing, but feel that along with the addition of aerodynamically cleaner wing tips that the tip stall characteristics have been enhanced.

As suggested in the addendum to the plans, carbon fiber was laminated to the spars on the inner section of the wing. 0.014 carbon fiber was laminated to the top spar and 0.007 carbon fiber to the bottom spar. Laminating resin was used as the adhesive and the spars were vacuum-bagged until the resin cured.

The sheer webs in the kit were replaced with 3/16 balsa sheer webs on the inner panel only. This increases the gluing area, which should result in a stronger wing. The instructions suggest using an aliphatic glue rather than super glue for most of the construction. I used Super Phatic® glue, which is available from Hobby Lobby®. Wherever this glue was employed, the joint was double-glued.

The length of the spoilers was increased by one wing bay to six bays in length compared to the five bay spoiler length of the kit. 1/64 plywood was laminated to the bottom of each spoiler. This increases the stiffness of the spoiler blade without a significant increase in weight. Laminating resin was used as adhesive and the spoilers



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were vacuum bagged until the resin cured.

A piece of 0.003 Mylar was glued to the top of each spoiler. The Mylar extends past the edge of the spoiler on both sides and the rear by about 1/8 inch. This insures a good seal between the spoiler blade and the wing when the spoiler is in the closed position. A removable hatch, held in place with wood screws, was constructed and the spoiler servo was adhered to this hatch with double-stick tape.

Both the fixed and movable part of the tail surfaces were increased in length by two inches, thus adding more area to counteract the Dutch roll tendency alluded to in the addendum sheet. Gluing balsa to the end of each part and then sanding it to shape accomplished the increase in length.

The cable pushrods included in the kit were replaced with carbon fiber pushrods purchased from Composite Structures Technology®. To reduce the friction between the pushrods and their housing, Son-of-a-Gun®, a protectant lotion marketed by STP® for use on leather, vinyl, and rubber in automobiles was applied to the pushrod. Son-of-a-Gun® contains silicon that serves to lubricate the pushrods and permit them to slide with less friction inside their housing.

I wanted to fiberglass the fuselage and knowing that fiberglass cloth will not readily go around a sharp 90-degree corner, rounding of the fuselage corners was necessary. Basswood triangle stock was glued to the inside corners of the fuselage thus allowing the rounding of the outside corners

without reducing the strength of the structure. The fuselage construction is quite strong and fiberglassing is probably not necessary but I it's just something I wanted to do. I used 2-ounce fiberglass cloth and EZ-Lam® resin from Aerospace Composite Products®. The fiberglass was primed and painted with K&B Superpoxy®.

The wings are held to the fuselage by a spring or rubber bands that attach to hooks on the two wing halves and run through the fuselage. To facilitate the attachment/removal of the wings, a hatch was added to the top of fuselage. This hatch also facilitates the insertion of the tow hook and the Y-harness for the spoiler servos though these should be one-time operations.

Every sailplane I have built has come out tail heavy requiring that weight be added to the nose to achieve proper CG location. Assuming this would be the case with the Majestic, I calculated the horizontal and vertical tail volumes and determined that the tail boom could be slightly shorter. Consequently, the front end of the tail boom was shortened by one inch before gluing in place.

Also, in an attempt to decrease the anticipated nose weight, the steel rod, which the tail surfaces slide onto, was replaced with a titanium rod. The Majestic uses two rods to mount the tail surfaces, the second of which is aluminum. When I attempted to bend the aluminum rod included in the kit to the proper angle, it was too brittle and broke. Consequently, titanium was also substituted for the aluminum rod though I did not really desire to do that, as that would increase the weight



at the rear of the fuselage.

The plans/instructions call for hinging the movable portion of the tail surfaces with tape. The tape is adhered to the covering, which in turn is adhered to the tail structure. If the covering loosened, the movable portion of the tail surface might not function properly with a resultant diminishing/loss of control. Consequently, the tail surfaces were hinged with live hinges and the gap was sealed with transparent tape.

Hitech® HS225MG servo's were used to move the tail surfaces and Hitech® HS55 servo's were used to drive the spoilers. A Hitech® Slimline receiver fit nicely into the fuselage.

The wings and tail surfaces were covered with transparent red and yellow Monocote®.

I found the Majestic an enjoyable kit to build and a good performing aircraft. I feel that it is competitive with the other RES kits currently available and highly recommend it to anyone who has had previous building experience.

If you have questions, feel free to contact me.

Bob Johnson  
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# THE MULTIPLEX COCKPIT 7 CHANNEL TRANSMITTER

By Barry Fulcher  
Broomfield, Colorado

Looking at the Cockpit radio transmitter for the first time, I am reminded of my first look at a Jaguar sports car. The clean, simple design is a great example of form and function coming together. This concept is carried throughout the radio's total internal design and use. For instance, picking up the Cockpit is a pleasure. Everyone that I have handed it to has said it is light and very comfortable to hold. Controls are made more easily worked due to the well designed case. Switches are few, but all you need to control your selected functions. This 7 channel transmitter will do almost as much as the 4 pound, 8 channel porcupine I have been using. I need a neck strap to carry the Japanese porcupine. The Cockpit, on the other hand, can be held effortlessly for long periods with just my hands.

Part of the light weight is due to the batteries used by the Cockpit. Or, should I say, the lack of them, because the unit comes with only six 600MAH



batteries, and not the usual eight. Yet, the range of time is not shortened. In fact, the operating time after a few charges can be up to three and a half hours.

The innovative features continue with nine model memories, dual rates for elevator, rudder, and ailerons, as well as thirteen mixers that have variable inputs and direction. Like I said, the list goes on.

The Cockpit gives you travel adjustments on all channels. Plus, there are eight mode settings, which allow a pilot to assign the sticks to suit personal needs.

Maybe you want the battery alarm to go off sooner? Or, perhaps go to the last possible safe moment? *You* simply set it to the setting that suits your situation, and not the guys in the factory that may not ever fly an RC aircraft.

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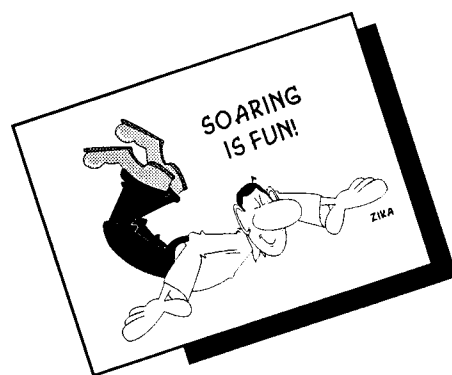
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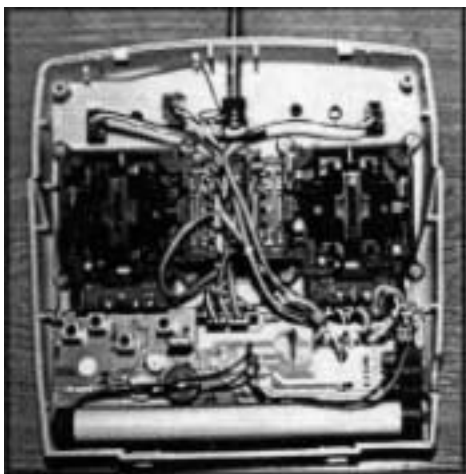
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Did I mention that the channels are changed by sliding to locks on the back of the case, and merely plugging in an inexpensive crystal? No expensive module like most six channel transmitters that can't mix a true flaperon or spoilerons with slider precision, as the Multiplex can.

Since the Cockpit uses outputs one and five for aileron control, it does mixes that only eight channel transmitters can accomplish with an eight channel receiver. For me, this meant that I could use my old six channel receivers from a long dead system, for up-to-date control of high tech aircraft (i.e., separate aileron control in full house craft).

Of course, exponential is part of the list of features of the system. If you're not convinced yet, that this is the greatest transmitter since the introduction of the first computer RC system, read this carefully. This is the easiest radio that I, and my friend (with 20 years of RC experience), have programmed. If you can imagine never reading the instructions, and still being able to program a computer radio, the Cockpit is the RC transmitter for you.

Programming is performed by the turning and depressing of one knob. For instance, let's say you have built a new sailplane and are now ready to do the radio gear set-up. With plane and transmitter on, start your stopwatch. First, turn the 3D program switch to the left until Menu appears in the large display window. Push the same switch down and you're in the program mode.

Now, turn the switch to the right, until you read servo in the window. Push the switch down again, and you're

ready to adjust the servos. At this point, the servo can be centered and the end points set. All it takes is a twist of the knob in either direction and centering is done. Hold the control stick that you have chosen to talk to the servo all the way to one side and turn the magic knob to the desired travel.

Time! It takes longer to say what to do than it does to do it. The whole system works that quick and easy. As a matter of fact, I have been doing a lot of my fine tuning while flying.

Dual rates no longer are trial and error setting. I set the system to that function prior to launch and then, when at a safe altitude, flip the switch for rates and just turn the knob while in the air. Changes are small and precise. The same ease is experienced for exponential, aileron differential, elevator compensation for throttle, flaps, and spoiler. No more guess work to get that perfect trim for your style of flying.

Other great innovations include the user's ability to change the switch location and function. All switches are plugged into a circuit board. Just put them in the spot you want.

This also brings up another innovation Multiplex has come up with. If, for instance, you are going to fly only tail feathered floaters and don't need switches for mixers, one can buy the basic Cockpit with minimum of function switches. You still get all the functions; you just can't turn them on and off. You can have dual rates, for instance, on all the time or off all the time. Switches can be purchased later from Multiplex as your needs change. Add the ability to up and download your set-ups on the family PC. Plus, actually program it there, allowing for


unlimited model memory.

In conclusion, I can only say that the bar has been lifted in the RC transmitter technology realm. With all the functions, light weight, comfortable grip, and long operating time, the cockpit will be very difficult to match. As far as I am concerned, my 8 channel, 4 pound porcupine transmitter has had its day on the slope. I have used the Cockpit on all types of planes and have had only good things to say about it.

So, what will it cost you to get one of your own? Multiplex tells me that the basic min. switched model can be had for \$233.00. The full switched unit is just \$275.00, which I think is a real steal.

To find your nearest dealer or to check out other great RC products from Multiplex:

Critter Bits &  
Multiplex USA  
14751 Calvert Street  
Van Nuys, CA 91411  
[www.multiplexrc.com](http://www.multiplexrc.com)  
(800) 375-1312

<p><b>Xenath 112" LMR</b> Class A and B Sailplane.</p>  <p>Wingspan: 112 in. Wing Area: 905 sq/in Wing loading: 12 to 13 oz/ft Flying weight: 73 to 78 oz. Airfoil: SD7037 Radio: Computer, 6 mic. servos. Power: .05 Geared. \$549.00 Retail. Plus Shipping</p>	<p>CSD is offering all new design for Class A &amp; B Sailplane. The Xenath (Named after the MCA/Universal television series "Xena: Warrior Princess") was designed with an emphasis on soaring first. The Xenath fly's like an open class contest ship. The Xenath is an all Vacuumed bagged 2lb Blue foam wing with carbon reinforcement. Other pictures of the Xenath can be found in DEC 99 page 58 in Model Aviation, Ron Scharck is holding the Xenath and page 90 of S&amp;E Modeler Jan 2000 issue. Also, if you would like to "see" the Xenath check out the new video "Electric Airshow."</p> <p><b>CSD</b> Cavaco Sailplane Design</p> <p>Phone: (909) 485-0674 <a href="http://members.aol.com/rcav">Http://members.aol.com/rcav</a> e-mail: <a href="mailto:rcav@aol.com">rcav@aol.com</a></p>
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## 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 Quabeck 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.

Chuck Anderson, P. O. Box 305, Tullahoma, TN, 37388 Phone 931-455-6430

# Gift Giving Ideas for Christmas & the Coming Year

By Jerry Slates  
Wylie, Texas

Looking for sailplane, gift giving ideas for either Christmas or the coming year? Well, here are a few ideas that might fit the bill.

I like to begin my Christmas lists with stocking stuffers, little things that make life easier that I often forget to add to everyday shopping lists. Most sell for a couple of dollars, and nothing is over \$10. While a good sized hobby shop will usually carry most items, a visit to the local home builder supply stores' tool departments is certainly warranted.

Clamps are a necessity, at least for me, and come in various flavors, such as C-clamps and spring clamps. Available in various sizes, a pair of 3 inch clamps will usually fit our hobby needs.

When it comes to holding very small parts together, a surgical homostat comes in very handy. Also available in many sizes, I would suggest that a 5 or 6 inch size will usually be quite adequate.

For those of us with large hands and big fingers, tweezers come in very handy. A pair of these is always within easy reach in the top of my tool box.

And, what's a tool box without a handy file or 2? I usually keep three on hand: a small flat file, a 3 cornered file, and a round or rat-tailed file. And, of course, when purchasing files, be sure to obtain a handful of handles so they're easier to use.



And, when one runs out of stocking stuffers to add to the wish list, we move into the 'big' stuff. For example, there's a 1/4th inch Dual-Torque, 12 volt drill that I've been drooling over for awhile. It only weighs 10 ounces, as compared to most 2-1/2 pounds, 1/4th inch electric drills. Because of the weight, it should be easy to control when working on small models. The cost is \$54.95, plus it requires a 12 volt power supply which costs \$39.95.

The 1/4 inch Dual-Torque, 12 volt drill can be found in the Micro-Mark small tool catalog. In fact, most of the tools mentioned here can be found there, as well.

Micro-Mark  
340 Snyder Ave.  
Berkeley Heights, NJ 07922-1595  
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Standard Type	\$4.00 - \$12.00
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www.public.asu.edu/~vansanfo/casl

February 9-11, 2001

Pensacola 2001 Pensacola, FL  
Asher Carmichael, (334) 626-9141  
Carmic985@aol.com  
Rusty Rood, (850) 432-374

June 9-10, 2001

Montague XC Challenge Montague, CA  
Dean/Scott/Randy, (541) 899-8215 Days  
Dean Gradwell, (541) 899-7034 eve.  
dgair@cdsnet.net

July 21-22, 2001

Gerry Knight Memorial Ontario, Canada  
Scale Aerotow Rally Y2001  
Phil Landray, (905) 468-3923,  
linden@niagara.com  
Don Smith, (905) 934-7415,  
donsmith@mergetel.com  
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### 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/month and are limited to a maximum of 40 words. RCSD has neither the facilities or the staff to investigate advertising claims. However, please notify RCSD if any misrepresentation occurs. Personal ads are run for one month and are then deleted automatically. If you have items that might be hard to sell, you may run the ad for 2-3 months.

### For Sale - Business

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**PARACHUTES: \$15** (includes S&H U.S.A.) Send check or money order to Dale King, 1111 Highridge Drive, Wylie, TX 75098; (972) 475-8093.

**FENDERS!** Cover your aileron and flap pushrods with a set of fenders, to help protect bottom of wings & control horns. Price (check or money order): \$5.95 (set of 4) + \$3.50 S&H USA. (Texas residents add 7.250% sales tax.) Viking Models, U.S.A., 2 Broadmoor Way, Wylie, TX 75098; (972) 442-3910.

### DesignAirc: EASY TO USE AIRCRAFT

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**SAILPLANE PLANS:** Copies of ORIGINAL, SOAR BIRDY & BIG BIRDY plans as originally kitted by Bridi Hobby. \$12.00 per set, shipping included. BUZZ WALTZ, 68-320 Concepcion Rd., Cathedral City, CA 92234, 760-327-1775 or e-mail, [cbuzzwaltzrc@excelonline.com](mailto:cbuzzwaltzrc@excelonline.com).

### For Sale - Personal

Brand new, in the box, Mark Levoe Super V 2M... \$475.00 + freight. Brand new, in the box, Airtronics Sagitta 900 balsa wood kit... \$100.00 + freight. Keith Maurer, (619) 461-3819, California.

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

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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  
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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.

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### 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 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

1709 Baron Court  
Daytona, FL 32124 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/esl.htm>

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

## A FESTIVE OCCASION

**Photography by Dave Garwood, Scotia, New York.**

Dave Sanders, DAW, flies a Durable Aircraft Models P-51 Mustang PSS model during the Southern California PSS Festival at Cajon Summit in May 2000. The event is held annually by the Inland Slope Rebels from Riverside, California.

