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R/C Radio controlled SOARING DIGEST

THE JOURNAL FOR R/C SOARING ENTHUSIASTS

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ABOUT *RCSD*

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

Eastern Soaring League (ESL)

This month, we took a quick trip via the internet to the east coast in order to check out the web site for the Eastern Soaring League. The site design has changed significantly from the last visit. The home page opened up quickly with 6 card file type categories: Introduction, Calendar, Standings, Newsletters, Resources, and Officers.

For those of you interested in the ESL contest schedule, where to go, and who to contact, you can access the "Links to Organizations, Special Interest Groups, and Clubs" from the *RCSD* Main Web Page (http://www.b2streamlines.com/RCSD.html), and select the link to the ESL web site. While some of the contest dates and/or contact information will likely change during the year, for those of you without on-line access, what follows are the introduction and calendar pages as they are, today.

ESL Introduction

"The Eastern Soaring League is a Radio Control Soaring contest league organized by soaring clubs spanning the Eastern Seaboard from Virginia to Massachusetts. The season runs from April to October and concludes with an End-of-Season contest organized by the ESL board.

"Membership in the ESL is free and automatic when you enter an ESL-sanctioned contest. Members are organized in Sportsman and Expert classes.

"At the end of the contest season awards are given to the top ten performers in Sportsman and Expert classes and to the individual whose performance has improved the most since the previous season.

"ESL contests, while competitive and including some of the best pilots in the country, are characterized by good sportsmanship and a spirit of inclusion and coaching. If you are an R/C soaring pilot of any skill level, and you have the opportunity to attend an ESL contest, we encourage you to to enter and enjoy two days of competitive soaring fun."

ESL 2003 Contest Schedule (Date, Contest, Location, Contact)

May 3-4, BASS HLG
Baltimore, MD Area
John Appling
jappling@qis.net
410-374-2463

May 17-18, SKSS 1
Newark, Delaware
Bob Muma
rmuma@comcast.net
(610) 363-1631

May 31-June 1, LASS
Lancaster, PA
John Murr
jmurr@sagerswisher.com
(717) 394-3399

June 14-15, BRASS
Waynesboro, VA
Tom Broeski
(540) 943-3356
tjb@adesigner.com
CD: Doug Barry

June 21-22, BARCS HL (not ESL)

June 27-28, LISF 1
Syossett, Long Island
John Hauff
tankman58@aol.com
(718) 767-1369

July 12-13, DBSF
Reading, PA
Dale Hart
dalehart@enter.net
(610) 821-0977

July 19-26, AMA/LSF NATS

Weasel & miniWeasel

Alyssa, age seven and a pilot in her own right, holds the completed Weasel and miniWeasel, from Richter R/C Aircraft Design, for the camera.

Coverage of the designs, by Bill & Bunny Kuhlman, is included in this issue.

Back Cover

2001 HLG Champ

Bruce Davidson DS'ing a new Carbon 3-meter Pike at the Frankfort, Kentucky slope site. According to Gordy Stahl who submitted the photography, "The wind was about 17 mph, and he's doing near 100 mph!"

Aug 2-3, SKSS 2
Newark, Delaware
Bill Groft
bill@eft-inc.com
(610) 255-4844

Aug 9-10, CRRC Soar-In
Sudbury, MA
Anker Berg-Sonne
Anker@rcn.com
(978) 897-1750

Aug 16-17, South Jersey (not ESL)
John Jenks
jwjenks@netzero.net

Aug 23-24, BASS Open
Baltimore, MD Area
John Appling
jappling@qis.net
410-374-2463

Sept 6-7, CASA Open
Warrenton, VA
Skip Schow
raschow@aol.com
(301) 916-9574

Sept 13-14, South Jersey HL (not ESL)
Evans Mill Pond, Marlton, NJ
John Jenks
jwjenks@netzero.net

Sept 20-21, LISF 2
Syossett, Long Island
John Hauff
tankman58@aol.com
(718) 767-1369

Sept 27-28, CASA HL (not ESL)

Oct 4-5, ESL End of Season
Reading, PA
Tom Kiesling
kiesling@ctc.com
(814) 255-7418

Oct 10
Down East Soaring Society HLG XC (not ESL), Wilson, NC
Contact: Oleg Golovidov
oleg.golovidov@engineous.com
CD: Dick Proseus
s3m2h4wl@coastalnet.com

Oct 11-12
Down East Soaring Society HLG Thermal Contest (not ESL), Wilson, NC
Contact: Oleg Golovidov
oleg.golovidov@engineous.com
CD: Dick Proseus
s3m2h4wl@coastalnet.com

Happy Flying!
Judy Slates

SCHEDULE OF SPECIAL EVENTS

March 15-16, 2003
The Classic Mid-Winter Southern California
Torrey Pines Vintage Sailplane Regatta
http://www.agcsc.org

May 15-18, 2003
Midwest Slope Challenge Wilson Lake, KS
www.alltel.net/~mwsc

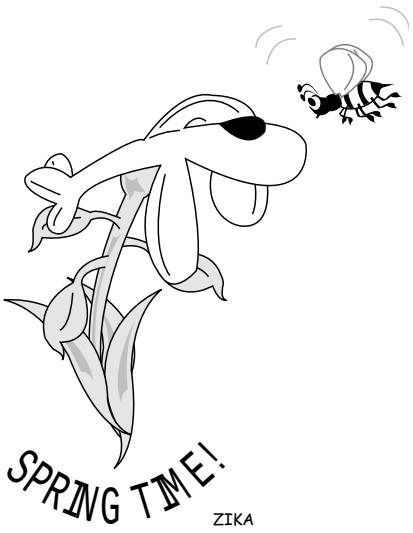
May 24-25, 2003
So. California PSS Festival Cajon Summit, CA
Brian Laird, Slope_Scale@compuserve.com
<ourworld.compuserve.com/homepages/slope_scale>

July 19-26, 2003
AMA/LSF NATS Muncie, IN

October 10-11, 2003
Texas National Tournament (TNT) Dallas, TX
www.SLNT.org

November 29-30, 2003
Tangerine Soaring Championships Orlando, FL
www.orlandobuzzards.org

Please send in your scheduled 2003 events as they become available!



Announcement

Midwest Slope Challenge 2003

Greetings,

Registration opens Friday, Feb. 14 for the 10th annual Midwest Slope Challenge.

Event dates are May 15-18 and details can be found at:
www.alltel.net/~mwsc

We've added a "What's New" section to the web page, so you can tell at a glance what has been updated and when.

You'll note that it's now a four day event. We've sanctioned Thursday to make it an "official" fun flying day. No, you don't have to show up a day earlier; it's just a day of open flying with designated time slots for breakable (non-EPP) planes. Based on popular sentiment expressed last year, we now have two foamie combat classes: flying wings and conventional planes. And the "Pole of Doom" seems to have survived a winter in the garage, so the Warbird race is back.

The Lucas Inn will once again serve as our race HQ and check-in location, but it's no longer in the motel business. So if you were accustomed to staying there, you'd best be looking elsewhere. Lodging suggestions are on the web page.

Other than that, it's business as usual: combat, racing, fun flying and Dave Urban's prime rib. We seem to have gotten some really nice publicity from last year, so beat the rush and get your entries and frequencies reserved soon...

Hope to see you there,
Loren
mwsc@alltel.net

THE SKEG FROM HELL

There's been a lot of chatter about skegs lately. Many fliers either love or hate them, depending upon their flying preference.

Lets take the hate side first. Folks in this group include hardcore slope flyers who think skegs or anything connected to them, including thermal planes, are elitist creations by geeks who don't know how hellacool it is to sit in the wind and watch your plane go back and forth. Other potential anti-skegers are Sunday fliers who never want their planes to come down; therefore, obviating the need for landing aids. Yet another group is the Continent of Europe, which tends to admire the form and sophistication of their plane's graceful lines and feel that a skeg is like a mustache on the Mona Lisa. Scale landing fans are the last major group of skeg-haters, seeing them as unnatural because real sailplanes don't have them.

On the skeg-lover side are many of the devotees of the all-American classic thermal/duration contest. Yet even within this group are those who feel "energy management" skills should be such that landings (even downwind) require nothing but fine honing through practice. Other dissenters are those who see skegs as physically dangerous on a par with B.B.guns and running with scissors. This last group is right in my estimation, especially when the skeg is made of metal and/or sharpened and flown unsafely.

What's left?

I submit that flyers that love the thrill of thermal/duration contests find it easy to embrace the value of a skeg …or anything else that will ensure greater landing accuracy. It's pretty simple, a skeg acts as a pivot point, slamming the skid's teeth at the front of the ship into the ground, providing friction for stopping, protecting flaps from trauma and keeping the plane in a negative angle of attack, preventing a wing tip from lifting, spinning the plane and flipping it over. What could be better insurance when ground or weather conditions take the edge off your energy-management? You say they're downright ugly? Well, maybe so …but no more ugly than say, a skate on a shoe or a glove on a hand. A thermal/duration sailplane is, after all, a seriously specialized piece of equipment. Looking like a full-scale sailplane is not a requirement. It could and should look like whatever it takes to do the best job within the rules of competition. And it should be tough and repairable enough for the rigors of contest performance. If you don't agree with that, you shouldn't compete. You'll be disappointed, and your baby will be like an egg in a ballgame.

When I say, "do the best job" I include the concept of practical safety. Mistakes happen. Things go wrong and common sense tells us that metal or metal-like skegs and skids can cause more serious injury than those made of softer material. Think smart, and while you're at it check out *Superskeg.com* for the most complete selection of commercial skegs and teeth I've ever seen.

Phil Bauer /Fremont, CA /philkaybauer@aol.com

TECH TOPICS

Dave Register
Bartlesville, Oklahoma
regdave@aol.com

Table 1: Fitted Values for Lift-Roll Input

	Root	Break	Tip	
Chord	8.8	6.6	1.9	Ellipse
Span		20.5	9.25	
Chord	8.5	6.7	2.1	Ellipse
Span		20.6	9.15	With Twist
Chord	8.36	6.9	2.7	Ellipse With
Span		19.1	10.65	Twist and Re

Geometry of the Wing

Over the past couple of columns we've looked at planform optimization for hand launch gliders with a particular emphasis on discus launch (DLG). Before leaving this topic, there is one other planform related issue we need to discuss. That's the specific geometry of the wing.

Although this seems a simple subject, it can be rather complex. To keep it to manageable terms, we'll restrict ourselves to a Schuemann-Ellipse wing outline.

By Schuemann-Ellipse we mean the outline suggested in Wil Schuemann's article in *Soaring* magazine. This article can be reviewed at the Scrollsander web site and is a very useful reference for anyone looking at design issues. Schuemann's suggested planform most closely resembles a quarter ellipse for each wing with the trailing edge bisecting the long axis of the ellipse.

In general, an elliptical lift distribution along the wing is considered to be optimum for both induced drag and stall control. The key here is that we're talking about an ideal elliptical lift distribution, which is not necessarily the same thing as an elliptical geometry distribution.

At the Reynolds numbers (Re) where full size aircraft operate (> a few million), the lift distribution is reasonably well estimated by the geometry distribution of the wing. But at the scale we use in R/C, and in particular for DLG, the situation is not as simple.

Consider the data of Figure 1 in which we've plotted X-Foil results for the lift coefficient of the AG12 airfoil vs. Angle of Attack (AoA) for a number of different Re values. Add in the observation that the polar analyses we've done in the past few months indicates that minimum sink for this airfoil will occur at an angle of attack between 6 and 8 degrees.

Figure 1: AG12 Cl Vs. AoA - Reynolds Number Response

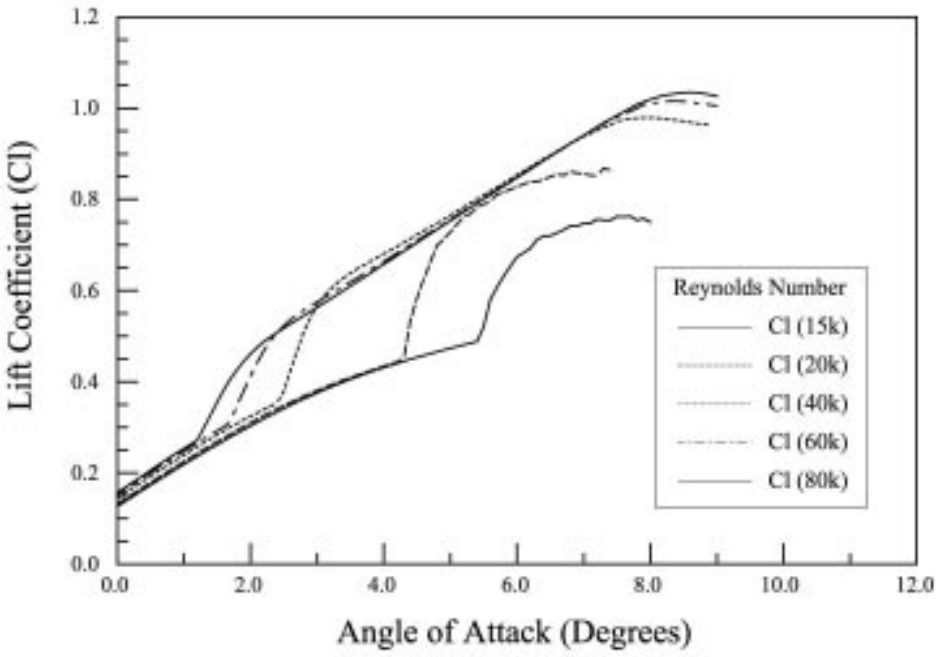


Figure 2: Cl vs Re At A Fixed AoA (AG12 - XFoil)

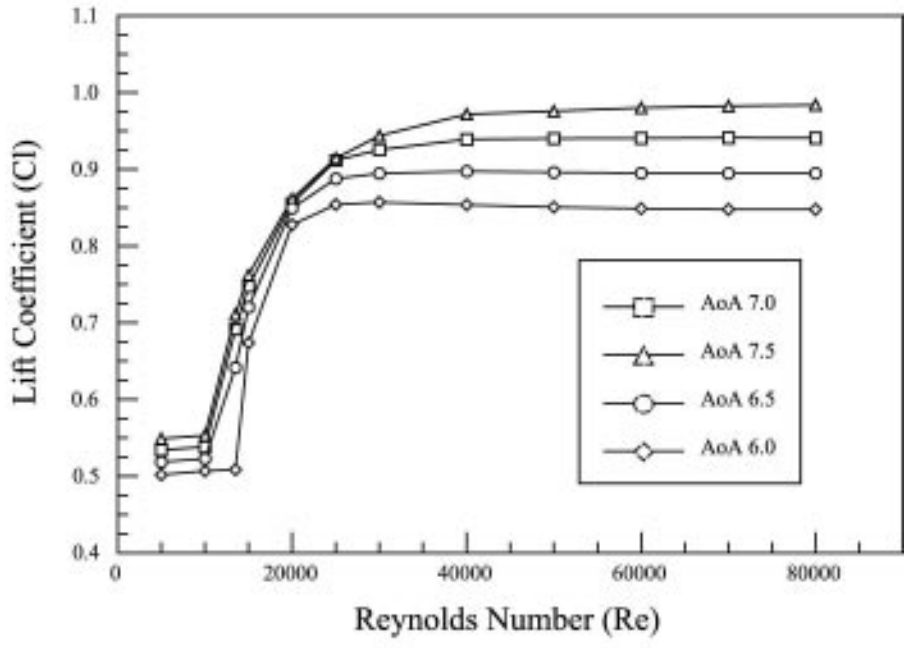


Figure 3: Cl vs. Re at 7.5 AoA for AG12 (Fit)

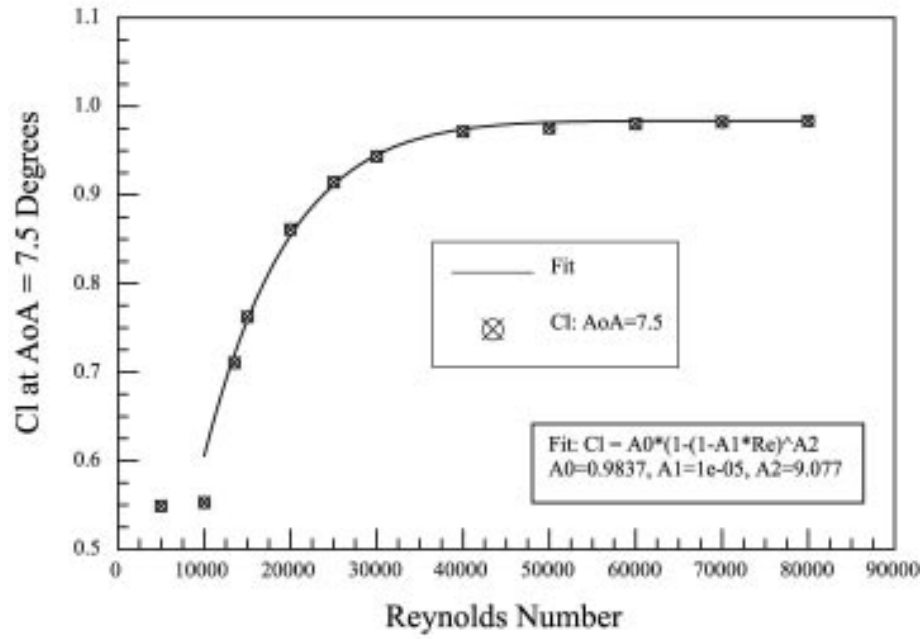
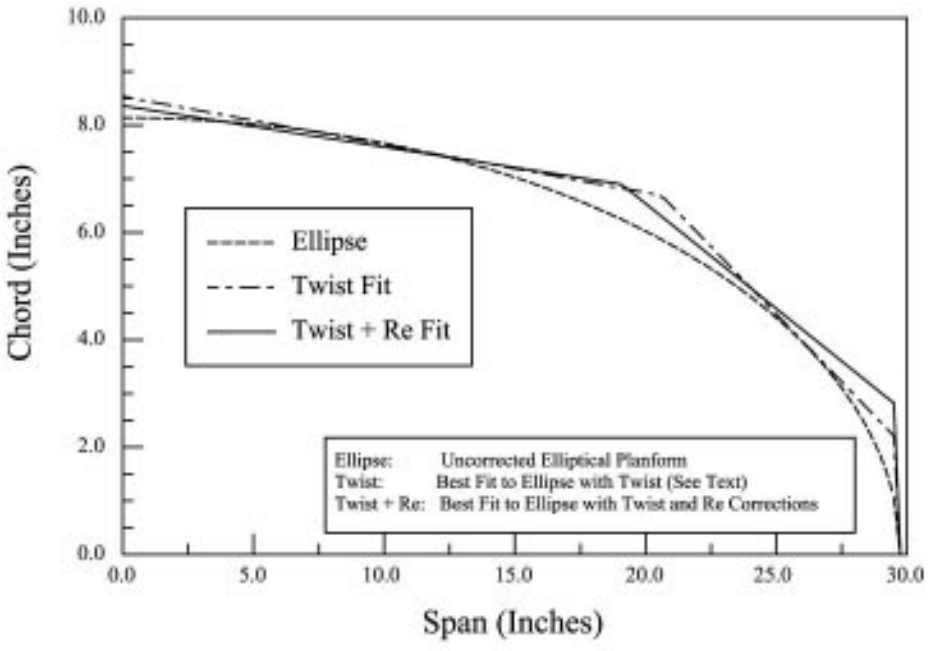


Figure 4: Planform Corrections (Best Fit to Double Taper)



Under these conditions the velocity of our aircraft is ~ 16 ft/sec. If we've designed an 8.25" root chord and a 1.75" tip chord, the respective Re will be ~ 70,000 and ~15,000 respectively.

Looking at Figure 1, note that the Cl response for Re < 20,000 starts going to pieces pretty quickly (XFoil Results). If these chords represent our best fit to an elliptical geometry, then the total lift at the tip needs to be evaluated very carefully.

Another observation to note is that the onset of stall is a degree or so lower for the lower Re. This fact, coupled with the lower than optimum lift capability at the tip, will almost guarantee tip stall problems if the wing is not designed carefully.

How do you fix this problem? Probably the only correct way is to go build a bunch of wings and pick out the one that works best. Since we're into modeling our models here, I'll outline a technique I've used to get a good starting point for the problem. There are much more theoretical ways to approach these issues but the general considerations which follow have worked well for me.

First of all, one way to address the lower stall angle at the wing tip is to use some washout. A degree is about right for small wings. At larger chords (open class ships), very little, if any, washout is really needed.

Another way to compensate for a low Cl at low Re is to increase the local chord. Since the lift distribution is determined by the product of the local Cl and the local chord, when Cl drops, increase the chord to compensate.

This gets into an iterative problem because increasing the chord increase the local Re which increases the local Cl which means you don't need to use as much chord as you first thought which reduces the local Cl a bit which...

Let's not get too hung up on this. I prefer to take only the first iteration which will provide some excess load capacity at the tip. If we're making an error here, it's on the safe side and, as we'll see, the correction is not too large for most practical dimensions.

I'm also going to limit this discussion to the things I can do in my shop. I can only cut simple, straight tapered cores. Those beautifully contoured wing planforms that come from the CAD-CAM machines are out of my league. For DLG, a double taper wing is about as complicated as I'll go. For 2M I'll do a triple taper while for open class a quad taper is more appealing.

I developed an Excel spreadsheet a few years ago to do this analysis. For most purposes, the Lift-Roll spreadsheet is equally handy. However, the Solver macro in Excel can seek the proper solution, which you have to manually determine in Lift-Roll.

As an example, in Table 1 I've listed several double taper fits for wings with an aspect ratio (AR) of 9 using my spreadsheet and the Solver macro. The first of these (Ellipse) is a best fit to a

simple elliptical geometry. Plug these values into Lift-Roll and you'll find it's as close an approximation to the elliptical distribution as you're going to get.

I've also included in Table 1 the optimized result for a double taper wing with 1 degree of washout (twist). The AR is again 9. This planform contains 0.5 degrees of twist in the main panel and 0.5 degrees of twist in the tip. Again, plugging it into Lift-Roll will produce an optimized distribution for this planform configuration.

What we have not yet done is include the compensation for the low tip Re. This compensation has to include both the drop off in the local slope of the lift vs angle of attack (AoA) curve and the plateau effect at around 7 to 9 degrees due to the onset of stall. For open class ships, these effects are minimal. For DLG, they can be significant.

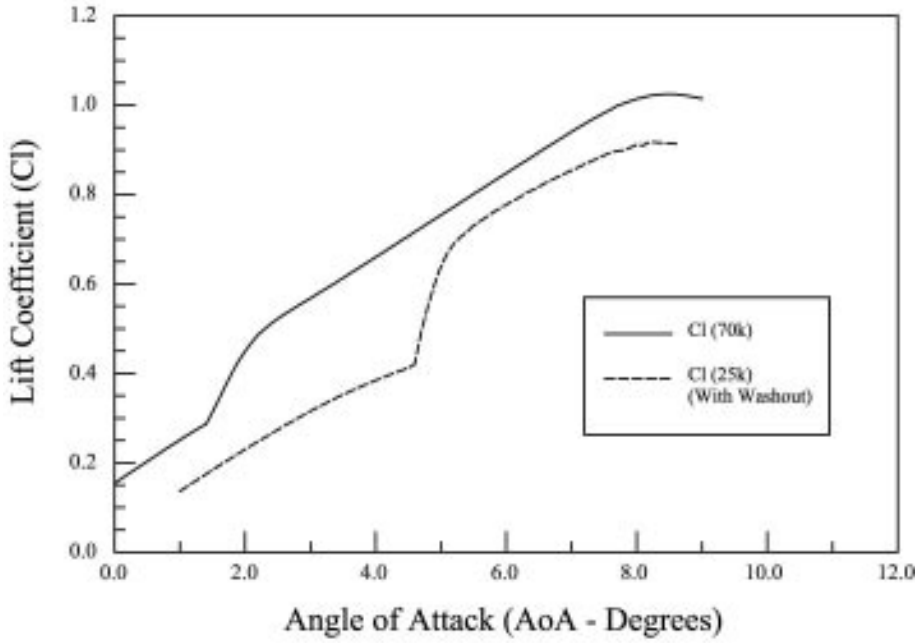
For this part of the analysis, it's convenient to develop a better picture of the Cl response vs Re for a fixed AoA. As previously noted, the standard Cl vs AoA has been shown in Figure 1 for a number of Re values. In Figure 2, we've re-plotted that data as Cl vs Re at a fixed AoA.

In order to apply this result to our planform model, it's useful to have a closed form expression for this data to plug into our spreadsheet model. A simple formula that provides a good emulation of these data at 7.5 degrees AoA is shown in Figure 3. I chose 7.5 degrees since it's close to the AoA for minimum sink and also represents a value which begins to catch the affects of stall onset. Proper compensation here should be useful for minimizing the tendency to tip stall.

If we apply our Cl(Re) model for AoA = 7.5 degrees to our double taper planform with twist, we get the values shown as the final entry in Table 1. A summary of the original elliptical planform, elliptical planform with twist, and the final planform with twist and Re correction is shown in Figure 4.

If you plug the results of the last calculation into Lift-Roll, you'll find that it appears to overestimate the lift in the tip section and underestimate it in the main. As noted, this is because Lift-Roll does not include Re corrections. However, the method we've used (first iteration only) will provide a slight lift excess in the tip even when Re correction is applied.

Figure 5: Root and Tip Cl for Optimized Planform
Tip Curve Shifted for -1 Degree Washout



This is actually the safer direction for a design since you WANT the stall to initiate at the root and proceed to the tip. That's a much better condition and should lead to a straight-ahead stall. If the planform were biased towards a tip stall, the imperfections that are always present in our building methods will assure that one tip will let go before the other. This leads to an ugly spiral stall tendency. If that happens too close to the ground, the results can be unfortunate.

One more comment on twist (or washout). The specific value used will depend on the nature of the wing and airfoil (dihedral, polyhedral, blending of the airfoil, etc.). For the present case, Cl vs Re for the root and tip sections (with twist) are plotted in Figure 5. Note that the washout used has placed the stall AoA at about the same point for both the root and the tip. Compare that to the original (untwisted) result in Figure 1. Without twist, it is very likely that the tip section will stall before the root even with the wider chord developed to correct for Re response.

Another way to achieve this same objective would be to use a different tip airfoil - perhaps one that generated higher lift, or more effectively handled the transition bubble so flow attachment could be better maintained near the stall AoA. Using the Ag12-Ag13-Ag14 sequence might be a useful way to produce this result. The specific Re and twist compensation rules would be a little different than we've developed here.

The basic point of all this is that the design of the planform must include some consideration for the stall potential of the wing and the actual lift distribution desired at or near minimum sink. That's a complex but tractable problem. The best results are found by starting with a good estimate and then refining it with real flying experience. ■

"The Golden Age of Model Aviation" by Alvin Sugar

It's a unique approach to flying model aircraft - as determined by a successful applications engineer. All effort is biased upon smaller fields, and a needed change in goals to fly them. The book proves that there is a difference in machine configuration when one is histart launching to 1/3 the altitude of our current designs, and that when doing so without alterations, one becomes handicapped. 'Antique' balsa and film sailplanes become lighter with modern radios installed, and correcting their polyhedral and tailsurface size for the resulting lower center speed, permits them work lift effortlessly. Larger models work better than small, when airspeed is the same. Lift reductions work well when in 'tune' to needed mass inertia. New hi tech designs for low launching (as an operational center) opens the door to a multitude of new soaring approaches. Soaring my way is treated like music, where everything becomes a ratio: to altitude launched, and related airspeed of model. The math, charts and graphs are simple to comprehend. The bottom line is that construction material and perfection is not prime; having fun is!

Price: $14.95 per 3.5" Floppy disk (to be opened by MS Word or Works)
Checks to: GG Sugar Co.; Order to: Al Sugar, PO Box 113315, Carrollton TX
[alvinsugar@juno.com] Postage/handling free in USA

Alyssa, age seven and a pilot in her own right, braves the rain (hence the flash-lit rain drop) and holds the completed Weasel and miniWeasel for the camera.

"The *Weasel* is extremely aerobatic in the hands of an accomplished pilot, but has enough stability for the beginner. Its small size, light weight, and durability make it a perfect contender for light combat on the slope. The *Weasel* is agile and recovers quickly from maneuvers at low altitudes. This little glider is an absolute joy to hand catch, thanks to its light weight and low stall speed. All this amounts to an aircraft that is pure fun to fly."

The *Weasel* has a wing span of 36 inches and requires a radio with elevon mixing and dual rates, two micro servos, a mini receiver, and an appropriate NiCd battery pack. The recommended flight pack includes two HS-81 servos, a Hitec 555 receiver, and a 4.8V 270 mAh battery pack. We used HS-80 servos, which fit perfectly in the pre-cut cavities, an FMA M5 receiver and a JR 250 mAh flat battery pack.

P.O. Box 975
Olalla, Washington
98359-0975
bsquared@appleisp.net
http://www.b2streamlines.com

Richter R/C Aircraft Design
Weasel* and *miniWeasel

Our most recent kit review was written about Trick R/C's original Zagi, published in the January 1997 issue of *RCSD*. Yes, the original Zagi — the one made almost entirely of styrofoam. A number of advancements in construction technology have come on the scene since then, but we haven't had the inclination or the opportunity to construct a tailless glider made of EPP (expanded polypropylene). All of that changed when we heard about Michael Richter's *Weasel* and *miniWeasel*.

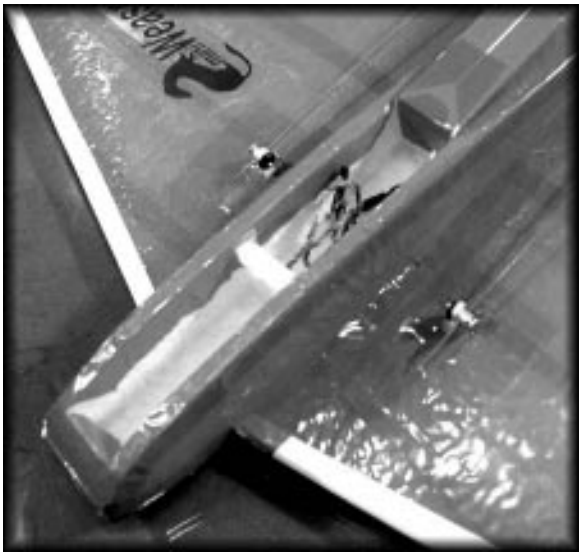
The *Weasel* and *miniWeasel* arrived in separate boxes. Both were extremely well packaged and survived postal delivery in absolutely pristine condition. Michael has managed to nestle the wing cores, fuselage, elevons, hardware package and packing tape in standard boxes in such way that things don't rattle and one part doesn't damage another.

The *Weasel*

"The *Weasel* is a small, lightweight flying wing that is extremely maneuverable, yet forgiving. Its unique shape and special blend of airfoils gives it a wide speed range and great stability. The high lift design allows it to hover in a light headwind, while the pilot maintains full control even at this low airspeed.

The completed Weasel and miniWeasel on the glass building surface. The fuselage pods do not extend much beyond the apex of the wings: 2-1/4" and 1-1/2", respectively.

This photo provides a good view of the fin and control surface geometry. These are very compact aircraft.



The underside of the miniWeasel. All of the hardware for the control linkages is included in the kit.

Kit Contents

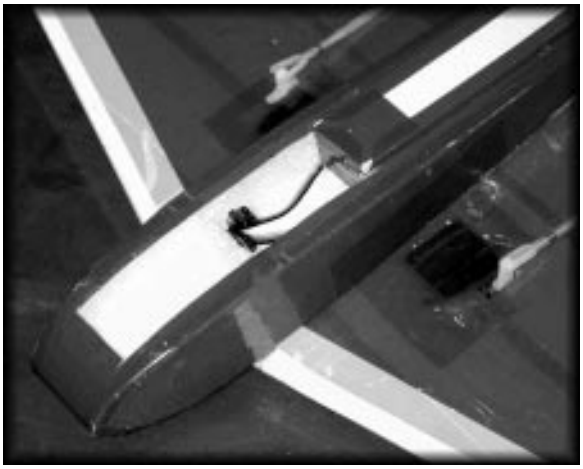
EPP foam wing with pre-cut cavities for servos
EPP foam nose pod with pre-cut cavities for battery pack and receiver
Coroplast™ fin
balsa elevons
spruce spars
plywood wing joiner
Coroplast battery and receiver cover
plastic tubes for pushrod system
Du-bro control horns
Du-bro clevises
roll of colored tape for covering
construction manual

The *miniWeasel*

"The *miniWeasel* is a miniaturized version of the original *Weasel* slope glider, as the name implies. Its smaller size and light weight make it extremely maneuverable. We think that this glider is a blast to fly in small places, close to the ground. Its low wing loading allows it to fly in thermal conditions and its special blend of airfoils makes it fast for its size. (If you really want to keep the weight down for thermal flying we recommend that you not cover the elevons and fin with tape; however cover them if you plan to fly mostly on the slope, as this will make them more durable.) This airplane really comes alive on the slope in 5 to 15 m.p.h. winds. You will have hours of fun flying this little glider, literally in your face — we have actually done touch-and-goes off of their own heads! Rolls, loops, inverted flying, the *miniWeasel* does them all.

"You may think that this small glider would be difficult to fly, but it is actually not. It takes a little time to get used to the increased sensitivity of the controls, but it shares the same hands-off stability of its larger brother, making it relatively easy to fly.

"Discus launching (also known as side-arm-launching) with this glider is great; simply grab a wing tip at the



The belly of the Weasel, showing the empty battery pack and receiver cavities.

spar with three fingers and fling it into the wind. You will be amazed at the altitude you can get from such a launch. This type of launch enables you to fly on flat fields, where thermal updrafts are the main source of lift. You can fly this glider practically anywhere. Take *miniWeasel* along with you on a hike, a road trip, to the local slope, to a nearby school yard, or simply give it a fling in your own backyard. Get a couple of them together on the slope and prepare for insane *miniWeasel* combat! This glider has been known to make people's heads spin."

The suggested radio gear for the 24 inch span *miniWeasel* includes a transmitter with elevon mixing and dual rates, two sub-micro servos, a sub-micro receiver, and a 50 to 150 mAh NiCd battery pack. The airframe is set up to take two Cirrus CS-10bb Molecular servos, Cirrus MRX-4 sub-micro receiver, and a Wattage 4.8V 150 mAh NiCd battery. We found MPI MX-30 micro-servos to be the exact size for the pre-cut servo wells. A standard Batteries America 150 mAh (N) battery pack fit with plenty of room to spare, but we had some problems fitting the M5 receiver in this model. We'll take a look at this difficulty in greater detail in a moment.

Kit Contents

EPP foam wing set with pre-cut cavities for servos
EPP foam nose pod with pre-cut cavities for battery pack and receiver
Zepron fin and elevons
basswood spars
3/16" x 3/8" balsa wing joiner
3/32" sq. x 5" long basswood fin reinforcement
Coroplast battery and receiver cover
music wire pushrod material
Du-bro Micro control horns
plywood control horn mounting plates
Du-bro Mini EZ connectors
Du-bro micro EZ links
roll of colored tape for covering
construction manual

The Weasel and miniWeasel boxes, pretty much as they arrived. Some of the items have been moved so they're more easily seen, but you should get an idea of the great packaging job Michael does.

Construction hints and tips

Construction manuals for both aircraft are available on-line on the Richter R/C Aircraft Design web site <www.flyweasel.com>. They're at <http://www.flyweasel.com/

instruction_files/
weaselinstructions_1.pdf> 610K, and
<http://www.flyweasel.com/
instruction_files/
miniweasel_instructions.pdf> 1.2 MB.
While you're there, make sure you download all of the cool *Weasel* and *miniWeasel* movies.

A few suggestions which may help during construction of the *Weasel*, in order roughly parallel to the construction manual:

• Drip small quantities of epoxy into the spar slots, then use a 1/8th inch dowel, held at 45 degrees along the length of the slot, to spread the epoxy in the slot. Run the dowel back and forth in the slot in a dragging motion. This wipes epoxy downward into the slot while covering the sides and bottom, and tends to put a bead in the lower corners of the slot.

• Rather than covering the plywood joiner with epoxy, and having epoxy stick to your gloves and make a general mess, bend the wing over the edge of the building table to open the slot in the foam. Drop some epoxy in the slot, them take a wooden coffee stir stick, again held at 45 degrees to the length of the slot, to spread the epoxy across the vertical sides of the slot. The plywood joiner can then be easily inserted.

• We applied a single coat of dope on the elevons, lightly sanded the surfaces with fine sand paper, then used the included packing tape to make the hinges, as outlined in the instructions. Looks good and works as it should. Not sure if we saved any weight, but it did give us the opportunity to exercise our olfactory nerves.

• The directions explain how to spray on the 3M 77 adhesive and wait before applying the tape covering. We waited overnight and applied the top covering, but ended up tearing it all off because it just would not stick for more than a few minutes before coming loose. Fortunately, taking it off was easy. We applied a very light coat of 3M 77 adhesive over what was already there, then covered, and everything is fine.

• We build on glass (an old sliding glass door) and used a smaller piece of glass to fully support the wing at the proper angle (one inch at the wing tip) while placing the dihedral brace. After covering was completed, however, the dihedral was down to a fraction of an inch. In retrospect, we may have put a small amount of tension on the tape while covering the lower surface. Michael said some people are building the *Weasel* with no dihedral at all, with no adverse effects, but we were more careful when covering the *miniWeasel*, and the dihedral turned out exactly as specified.

• The instructions mention that lightly sanding the covering material on the fuselage should be done before applying the double-sided fabric tape. The same should be done to the lower surface of the wing where that same tape is expected to stick. The double-sided tape supplied in the kit sticks wonderfully well — enough that we did not bother to use the crisscross tape over the fuselage and leading edge.

• We used a very light coating of Household Goop to glue the fin into position rather than using the taping method. This technique was picked up while our granddaughter Alyssa was building her MAD *Highlander*.

Other than some of the tricks we used previously on the *Weasel*, we did make a few changes to the *miniWeasel* construction process.

• We didn't add the strapping tape to the wing tip, as we have no plans to discus launch.

• The fuselage is supposed to be attached to the wing by means of the tape covering material. We used Goop instead. After the exposed portion of the bottom wing surface was covered, a length of tape was folded along its length and applied to the fuselage so that the folded part would attach to the lower surface of the wing. The credit card idea, as described in the instructions, works like a charm!

• We did not use the full tape width to attach the basswood strip to the bottom of the fin, but rather cut the tape in half along its length and used only one half. Goop was used again to mount the fin in the fuselage slot.

A couple of suggestions which apply to both the *Weasel* and the *miniWeasel*,

Another of Michael Richter's designs. We're still trying to talk him into kitting this 'wing! It just looks soooo cool.

as well as other foam-based aircraft:

• 3M 77 and packing tape do not really make the ideal covering material. One trick we use to smooth things out is to set our Goldberg covering iron to "2" and use the low heat to get the tape to stick. Your thermostat setting may vary. This tightens tape which is slightly slack and works especially well in areas where the tape seems to resist sticking.

• The trick with Goop is to use very thin coats — just enough to wet the porous surface. When used in this way the Goop vehicle, toluene, evaporates so fast that the initial bond is very much like working with contact cement. EPP foam lets enough evaporation to take place that the joint is nearly fully cured in a half hour or so.

After we had the *Weasel* covered, Michael wrote and made the following suggestion,

> "I forgot to mention a trick that I recently learned regarding taping the wings. The problem with taped wings is that the edges always tend to pull away when a little dirt gets under the tape. This makes for some really unsightly wing tips. Instead of using Goop to seal the tape edges, as some people do, go to a home improvement or craft store and look for stretchable plastic tape — 3M makes it in 3/4" rolls in a variety of colors. This is great because you can match the tape with your color scheme. I think it is called 3M Plastic Tape. This tape has NO filaments in it and has the stretchiness of heavy

duty black electrical tape (you could use black electrical tape if your plane is black). Simply take this tape and stretch a single piece along the leading edge and around the wing tip. It will conform beautifully to the compound curve and will seal all the small packing tape seams. It is quick, clean, and simple."

This works! And if the tape deteriorates beyond usefulness, it's a simple matter to pull it off and apply a fresh strip.

Between both aircraft, the only problem we had is with the receiver installation in the *miniWeasel*. The M5 would be a nice fit with a bit of room to spare if only it had end plugs. The servo plugs stick up because of the vertical plug orientation, and the associated wiring bends the Coroplast hatch below the bottom of the fuselage about 1/8th inch. We thought about modifying the servo plugs so they don't stick up so far, or waiting for an end plug M5 to be released. (We hear FMA is considering putting out an end plug version.) In the end, we simply took out our Dremel tool and routed out the bottom of the receiver cavity until we were slightly into the wing. Now everything fits and the Coroplast cover is flush with the fuselage foam.

Construction time for the *Weasel* is projected to be five to ten hours. Despite the noted changes in the building process and the usual unexpected minor snags, our time was just over seven hours. The *miniWeasel* builds faster. Actual construction time for it was exactly as estimated — five hours.

The balance point for the *Weasel* is directly on the wing joiner. Elevator function is set up for 3/16th to 3/8th inch up and down, aileron function for 1/2 inch to 3/4 inch up and down. We adjusted the servo travel at the transmitter so that all control throws were in the middle of the suggested ranges. Our *Weasel* weighs 310.5 gm, 11 ounces, ready to fly. About a half ounce of nose weight was needed to get the CG right. This is closer to the minimum weight than the maximum, and we're pleased with the way things turned out. It looks and flies great!

The CG location for the *miniWeasel* is 4-15/16 inch forward of the hinge line. The instructions state that the location is critical on an airplane this small, so we quickly manufactured a balance stand. The recommended deflections are 3/16 inch up and down for elevator and 5/8 inch up and down for aileron. Our *miniWeasel* came in at 127 gm, 4.5 ounces, ready to fly. An ounce of lead was needed in the nose to achieve the correct CG location. This is the maximum suggested overall flying weight, so we're glad we didn't add the cross of fiber tape on the wing tip! The *miniWeasel* flies extremely well, a bit faster than expected, and is very responsive.

Test flying both models was incredibly easy and went extremely well. We could not have been more pleased with initial flights. The CG locations and control throws provided in the instruction manuals are right on! Amazing. This is the first time in our experience that the provided set-up instructions have actually been accurate!

Weather here in the Pacific Northwest is in one of its weird states again this year. It's windy when it's raining and calm when it's not, so slope flying to any great extent has so far not been possible, but hand launches over flat ground have demonstrated a lot of potential, and it looks like the fun to price ratio is going to be extremely high.

Our thanks to Michael Richter for supplying the kits for these reviews and for being incredibly responsive to our suggestions and feedback. We're still trying to talk him into kitting some of his other designs, like the very cool swept forward 'wing pictured here!

Suggestions for future columns can be addressed to us at either P.O. Box 975, Olalla WA 98359-0975, or <bsquared@appleisp.net>.

Sources:

Richter R/C Aircraft Design
Michael Richter
1250 Northridge Rd
Santa Barbara CA 93105
Phone/FAX: (805) 687-4435
Web site: <http://www.flyweasel.com>
E-mail: mrichter@flyweasel.com

Prices:
Weasel $50 plus packing and postage
miniWeasel $35 plus packing and postage
Orders may be placed on the flyweasel.com web site.

FMA Direct
5716-A Industry Lane
Frederick MD 21704
Sales: (800) 343-2934
Support: (301) 668-7615
FAX: 301) 668-7619
<http://fmadirect.com>

Batteries America, 2211-D Parview Road, Middleton WI 53562
Orders: (800) 308-4805, Inquiries: (608) 831-3443, FAX: (608) 831-1082
Web site: <http://www.batteriesamerica.com>
E-mail: ehyost@midplains.net

■

GORDY'S TRAVELS

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"Goop-hyde Your Foamies to a High Shine!"

On one of my recent trips, I woke one night late in my motel room and screamed out into the darkness, "I'm going to build my EPP Moths!" *...Then went back to sleep.*

So inspired, I went to work at researching the construction information and the web site for North Country Flying Machines on the Moth.

http://www.northcountyflyingmachines.com

In case you didn't read the review in *RCSD*, May 2002 issue, the Moth is a 48" EPP tailless Foamie that has proven to be a rocket Dynamic Soaring (DS) machine that flies in the lightest slope lift, often working the wispiest thermals to the sky. It has such an incredible speed range that it has distinguished itself as a most amazing Foamie. The Moth is not a cranked-plank Zagi-esque combat ship; instead it has more fighter jet lines, with a straight leading edge and tapered trailing edge, a fuselage and prominent vertical stabilizer. If you haven't been to the web site to see photos and DS video of this little ship, you are really missing out.

Enough of that! Mostly what I found in my construction research was some well proven innovations. The number one trick was the use of thinned Marine Goop. (Marine Goop is in a purple tube and claims greater UV resistance than the other Goop products. It is available at all Home Depot stores.)

The Goop is thinned with Toluene, a stinky solvent found also at HD, but in the paint department. Getting the Goop to accept thinning takes some stirring, mashing and more stirring. You will swear that it's not going to happen, but stir on young soldier, as it does work!

Anyway, NCFM suggests coating the EPP fuselage with Goop to create a tough skin or hyde to protect the foam and as part of the finishing process.

I decided to give it a shot and learned a few things in the process not mentioned on the web site tips. First thing was amazement! The Goop cures to an incredibly clear and ultra glossy finish... And it goes right over EPP that has been painted with enamel - paints like Krylon! I then found that you could actually create an EPP Foamie fuselage that looked like molded glass ... Only shinier!

Here's the step by step:

Final shape the foam fuse with screen type sanding paper, usually used for drywall finishing. 80 grit is good for this.

Next wipe on some light spackle to fill all the dents in the foam. Then sand with a light touch so as not to compress the surface while sanding. If you want you can do this a few times to really fill in the foam.

Next mix up some thinned Goop to a consistency of runny pudding. Stir the heck out of it to make sure it's not lumpy. You will stir it to almost a foamy consistency. Then using a 1" brush, paint a good coat onto the fuse. You'll want to let it dry at least 24 hours, then sand it with the screen lightly and then coat it again with the same consistency.

This time when it dries, use some 220 sandpaper to get it fairly smooth. At

this point you can decide if another coat is desired or, if it is fairly smooth, you are ready for paint.

Keep in mind that Goop-hyde is going to be seriously clear, so any painting you do will show through. This is just like the clear protective coat on your car!

You can paint canopy lines, letters, numbers, etc., and it will seem like it's on the outside but won't rub off. Any enamel, like Krylon and paint pens, is fine.

Let it all dry over night and then get ready for some more Goop coats. This time thin the Goop to the consistency of thin paint and coat the whole fuse again. You want to be sure to coat the entire fuse, inside wing holes, RX compartments - everywhere, in order to avoid creating weak spots.

Don't be afraid to sand and recoat, as it will end up clear. Also if you need to add some paint over the Goop coats, not a problem!!!

What is a problem is the smell! The Goop coat STINKS, especially if it's cold outside. You can heat cure the solvents in the curing fuse with a heat gun or just let it sit for a few weeks. When I did mine it was less than 20 degrees in the garage. It was great from the stand point that the Goop didn't harden and ball up when I wanted to re-stroke some spots with the brush.

By the way, if you soak some paper towels with the Toluene, you can wash the Goop out of the brush for reuse. Don't throw the unused Goop mix out!!! If you have a wood top that you would like 'sealed', pour the rest on it and just sort of brush it or wipe it on!

Your fuse will stink for quite awhile if it's cold, as in weeks. So plan on storing it outside for awhile or the wife will get nuts on you!

Most Foamie kits recommend packing tape for strengthening the EPP fuselage. I believe that you could first fill with the spackle, coat with your Goop-hyde mix, sand, 3m spray glue, do the packing tape thing, then Goop-hyde right over the tape before painting and finish-Gooping.

This process has some other interesting possibilities! For instance, for providing a protective 'skin' on the bottom noses of glass fuselages, to keep them from getting scratched up on gritty landings!

This process isn't rocket science... So, there isn't a lot to ask about it. My advice is mix some up in a plastic cup, using something blunt like a popsicle stick, and paint some EPP.

If it is hot out, the solvents will dry quickly and your Goop-hyde mix will start getting sticky and messy quick. I don't know if you can store thinned Goop in a glass, sealed jar, but you could try it!

Don't even bother considering weight! The benefits far outweigh any weight added to the airframe. Functional weight is a good thing!

Did I mention that you will not believe how shiny your Foamie will be!!!! So shiny that you can't look at it in the sun... Not kidding.

Give the Goop thing a try if you are building a PSS sloper or a Moth. You will notice that I refer to it as Goop-hyde, which means that it creates a durable skin that will help the EPP resist tears on impact and compression, too. So coating the leading edges and tips of Foamie wings is a really good idea.

3m spray glue is still needed for Ultra-Coat or taping over the Goop-Hyde and EPP foam, so nothing new there!

I'll be checking your Foamies for Goop-hyde when my travels bring me to your slope, so don't brush me off... Instead, brush some 'Goop-hyde' on!

See you on the road! ■

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Installing A Power Duck Antenna In The Futaba 9CHF Transmitter

By Dave Register
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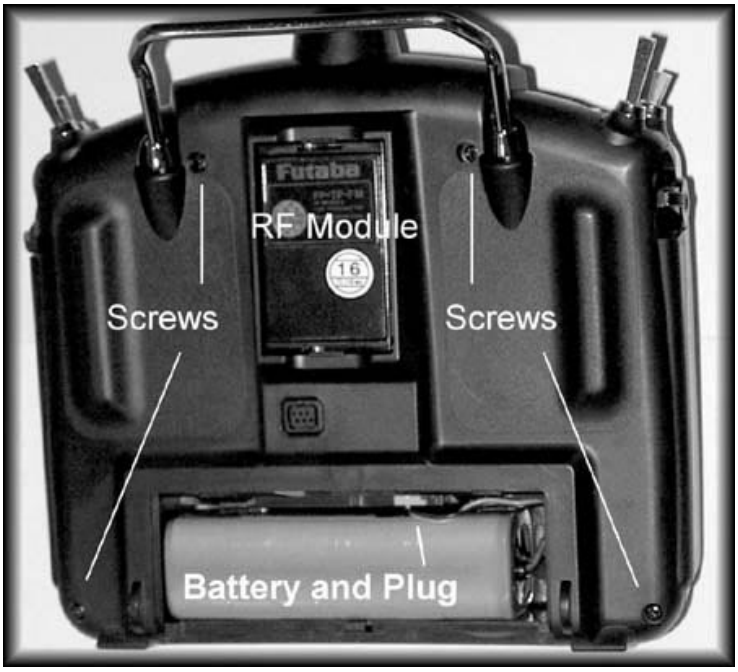

Figure 1

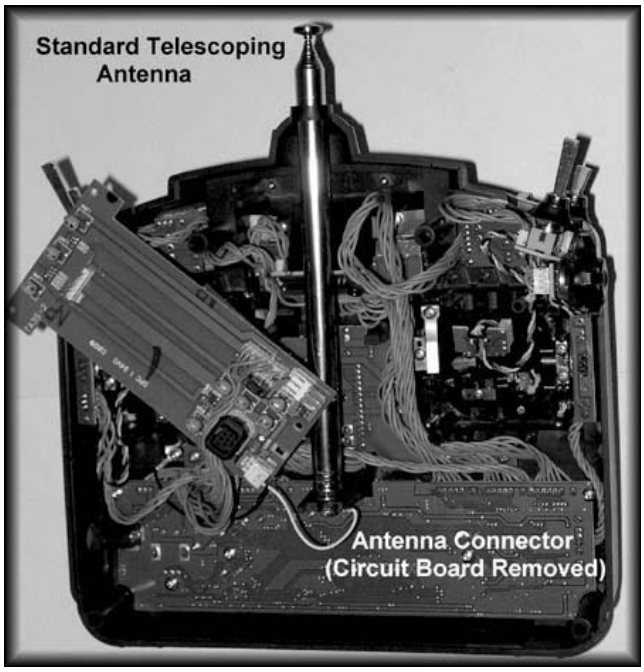

Figure 2

For years I've used a Power Duck (aka Rubber Ducky) antenna on my Futaba 7UGFS. After mangling the original antenna into the ground a bunch of times, something had to give.

After converting my Fut 7 some five years ago, I've never had a hit or loss of signal. I've flown open ships to the limits of my eyesight (actually, beyond just a bit - but I had a great spotter that time!). Since flying DLG I just don't see how you can launch well with that long telescoping antenna whipping around all the time.

When I recently went to a 9C, the old telescoping antenna caused all the same problems. A quick call to George Voss (Soaring Specialties: http://www.soaringspecialties.com/) and a hot pink Power Duck was on the way.

Installation of this antenna is very simple and requires maybe three minutes of work on the Futaba 9CHF. One must note the disclaimers:

1) This voids the warranty on your Transmitter, and
2) Since this is not an OEM antenna, it is not AMA legal and can be subject to disqualification at AMA sanctioned meets.

That said, I've never had a problem so far at contests or with range and operation. Once you've popped out your Tx batteries, it's hard to do damage to your Tx while installing the mounting post.

If you're thinking of doing this conversion, but might be intimidated by the thought of getting into the innards of your Tx, here's some notes and pictures of what to do.

Figure 1:

1) Remove the frequency module (just pops out by squeezing the end tabs).
2) Remove the battery (remove the battery cover, pull out the pack and unplug).
3) Undo the four screws on the back panel and lift off the panel. There are no wires or attachments to the back panel.

Figure 2:

4) Lift of the board that accepts the frequency module. It has no retaining screws or clamps, it just lifts off and can be set to one side due to the ample wiring harness.
5) Unscrew the antenna from the base bolt and remove it.

Figure 3:

6) Screw in the top fitting (BNC type) with the washer on the inside. The hole for the antenna has a slight inward lip on it on the outer surface so the BNC connector will move around a bit at first.
7) Tighten up the retaining bolt on the antenna connector. About 1/6 turn past hand tight is about right. The BNC mount for the antenna no longer rocks in the seat now.

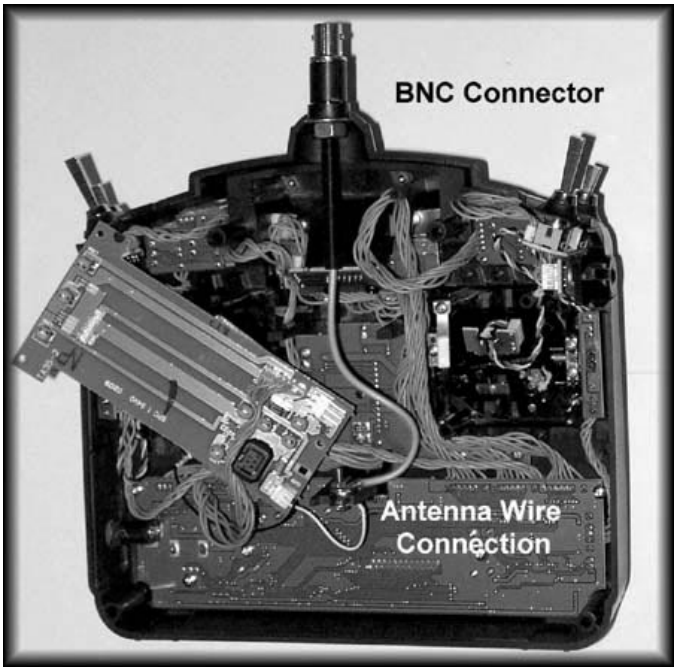

Figure 3

Figure 4

8) Undo the nut on the antenna wire connecting bolt and put the wire from the BNC connector on the inside of the screw. Replace the nut and tighten it up. At this point, the original white wire should be in its original position while the orange wire from the BNC mount is on the opposite side of the slotted plastic retaining tab.

9) Put the board (from step 4) back in place. Make sure the little alignment blocks are in their proper positions in the board. Put the cover back on and tighten down the 4 screws. Reinsert the battery and plug.

10) Plug the RF module back into the rear of the case. Be a little careful doing this as the pins are very long and easy to misalign. If there's ANY resistance then the pins aren't aligned. Back up, check the pin spacing and straightness and try again.

Figure 4:

That's it. Maybe took all of three minutes. Your Power Duck is up and running. Range check as recommended with all of your planes. (Anyone out there know what BNC stands for? Nuclear physicists need not reply.)

■


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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 turbulation 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>.

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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.

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:

web site: www.soaringissa.org

Books by Martin Simons: "World's Vintage Sailplanes, 1908-45", "Slingsby Sailplanes", "German Air Attaché", "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

T.W.I.T.T.

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A Division of the Soaring Society of America

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Dan Armstrong, Sec./Treas.
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Vintage Sailplane Association
1709 Baron Court
Daytona, FL 32124 USA

ESL

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ESL Web Site: http://www.e-s-l.org