R/C

SOARING DIGEST

A JOURNAL FOR R/C SOARING ENTHUSIASTS

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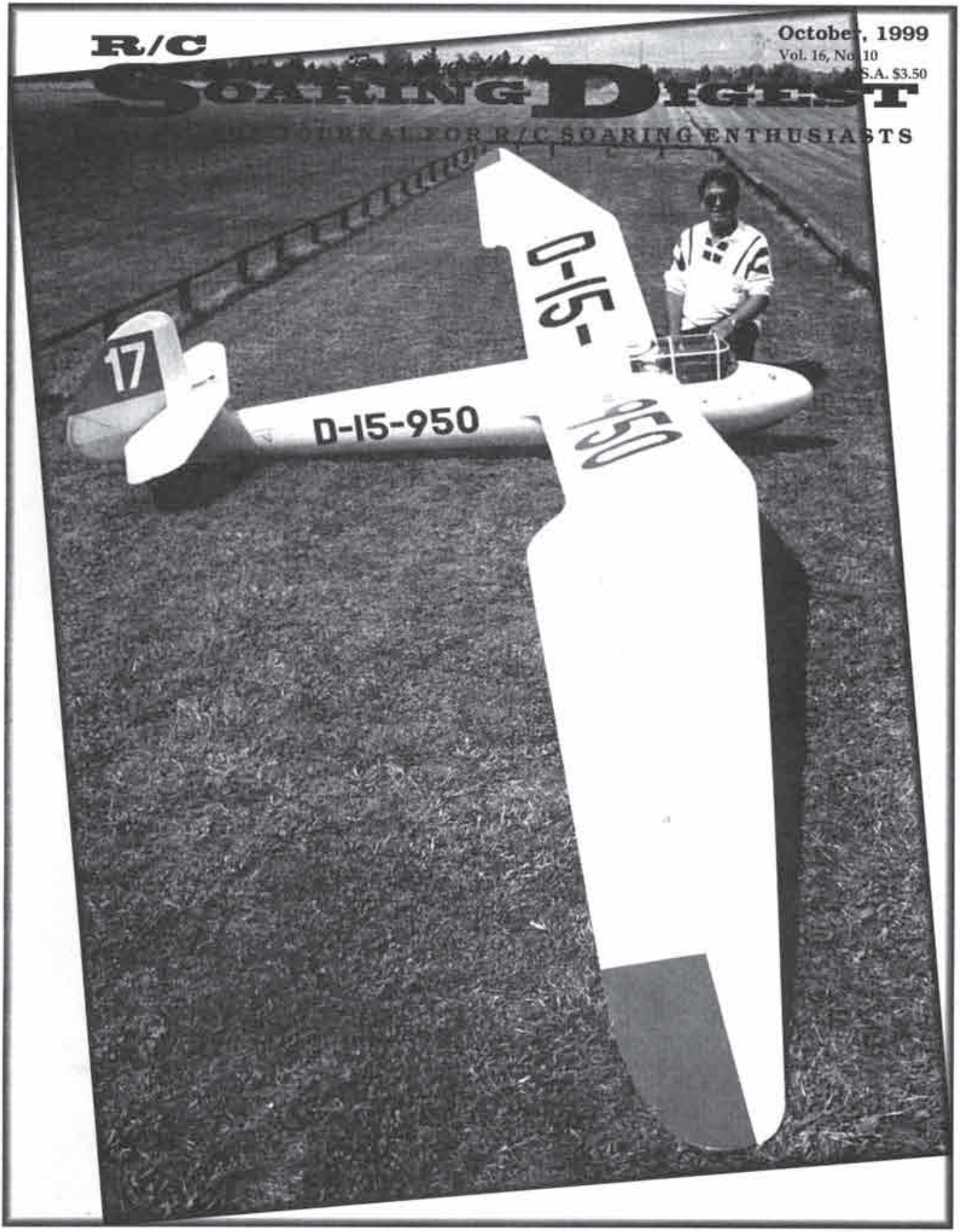

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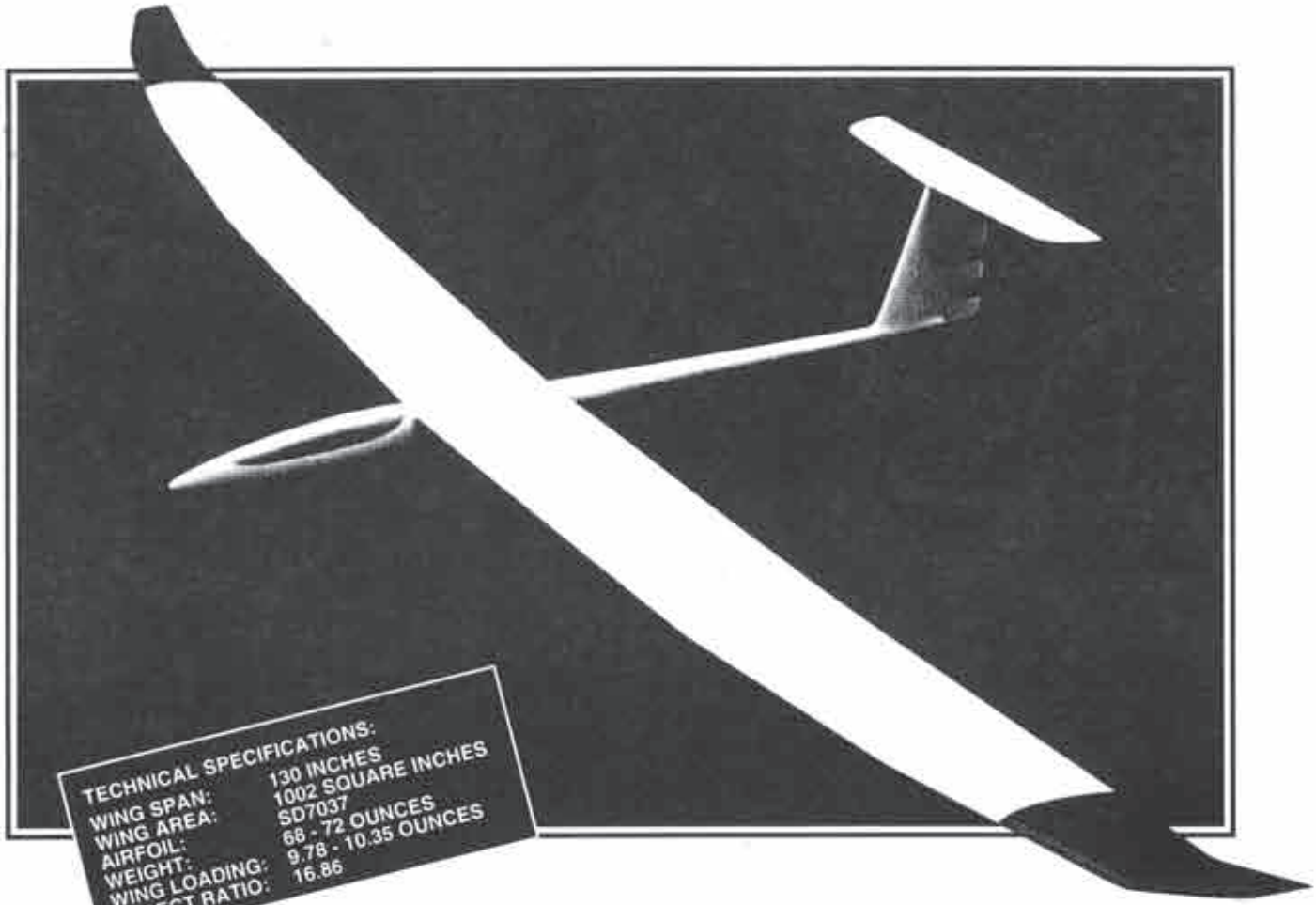

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AN IMPRESSIVE, MAGESTIC SCALE MODEL

Arnold Hoffmann's museum scale 1:2.2 Minimoa as seen at Rödermark, August, 1999. A precise duplication of the full size Minimoa, it flies identical, as well! Arnold is the 5 time winner of the German Masters for Sailplanes.

Photography by Robin Lehman, New York.

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

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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: rcsdigest@aol.com
http://www.halcyon.com/bsquared/RCSD.html

Feature Columnists
Bill & Bunny Kuhlman (B²), Robin Lehman, Lee Murray, Tom Nagel, Mark Nankivil, Dave Register, Dave Sanders, Steve Savoie, Jerry Slates, Gordy Stahl

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

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Bookshelf Listings - A listing of recently published books of interest to aeromodelers.
Complete RCSD Index, 1984-1998

The Soaring Site

Year 2000 Events

We've received several announcements for upcoming events in the year 2000. One year 2000 event, the Texas National Tournament (TNT), has been moved up in the year, and is scheduled to be held May 5 - May 7th at the Dallas R/C field in Dallas, Texas.

Preliminary dates for the Midwest Slope Challenge have been established: May 19-21. Correction! The notice says: Midwest Slope Challenge of the Millennium! Loren Blinde is the Contest Director.

Elmira Scale Aerotow 2000 will be held at Harris Hill on June 7-10th. In this issue, John Derstine reports on the latest news leading up to this major event.

Additional contact information is included in the 'Schedule of Special Events'.

If any of you have an event you'd like to see added to the schedule, please drop us a note. That's all it takes to get added to the schedule.

Resources

The resource section of *RCSD* changes almost every month. And, we've found that many of you use it frequently. We try to keep it up to date as best we can, but there are likely some contact addresses or telephone numbers that may need to be changed. For those of you listed, or for those of you familiar with your state/area, would you please take a minute or so and review the contact information? It would be most appreciated! And, thanks also to those of you that keep an eagle eye on it every month and already send us changes as they occur!

Happy Flying!
Judy & Jerry Slates

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

Announcement

Elmira Millennium Aerotow Festival 2000

From John Derstine

Elmira 2000 will be held on our traditional dates (the second week in June), Wednesday through Saturday, the 7th through the 10th. Optional flying is also available 'til noon on Sunday.

We have arranged, for the first time, to co-ordinate German DMFV events so as not to conflict with Elmira within two weeks, either side. This will allow some of the top German pilots to attend Elmira, with sailplanes. Expect Stephan Volker, Thomas Gleisner (1998 Akro cup winners), Thomas Schmidtt, Theo Arnold, Alex Frisch, Ralf Scheifele, and others, as well as a representation from the IGG. We also expect a Brazilian scale aerobatic sailplane team to attend, as well as a larger group from Chile, and flyers from the UK.

This will be the Elmira event not to miss. If you have not yet come to see what Harris Hill has to offer the R/C sailplane pilot or full scale enthusiast, come visit in 2000 to see the best collection of scale R/C pilots and planes from around the world!

Also of interest...

IVSM 2000

The National Soaring Museum (NSM) is hosting, as many of you know, the IVSM 2000 (International Vintage Sailplane Meet - full scale), July 1-11. We will be performing informal scale model aerotow demonstrations one or two days during the meet. We would invite anyone with a vintage scale sailplane to bring it along if they plan on attending. This will NOT be an aerotow event, and we will fit in between the full scale activities at the invitation of the NSM. Our club field will be available for open flying of power, electrics, and aerotowing.

John Derstine
(717) 596-2392
E-mail; johnders@ptd.net
Scale Soaring: http://www.Geocities.com/~scalesoar

■

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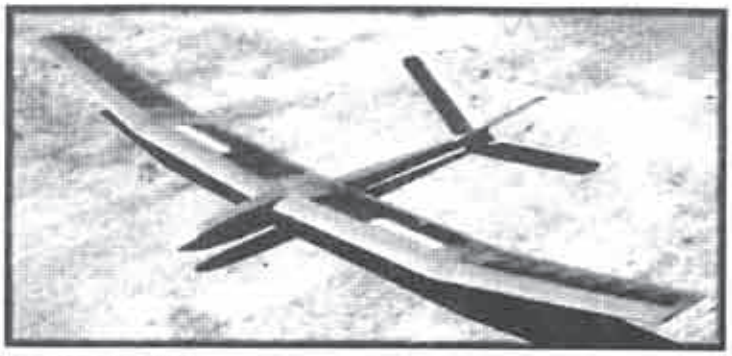


Finished model, ready to fly. Gross weight: 46 oz.

Low Tech Design & Construction Rudder, Elevator, Spoiler Model RES - Part VII

The Final Chapter

Success didn't come easy. There were a few minor complications. But, the Flattopper has finally taken to the air on its first successful flight.

However, let's go back in time to the first day that I took Flattopper out for its first test flight...

Getting Ready for the Test Flight

The radio was installed, along with battery pack, servos and V-tail mixer. A half ounce of lead was added to the nose to balance the plane at 35% of wing chord.

Reaching the flying field in short order, Flattopper was ready for its first hand toss. Holding the plane over my head, at a slight nose down attitude, I took 3 steps and gave Flattopper a good toss.

Ooops... Flattopper went straight up about 25 feet and stalled. Somehow, fate intervened, and there was, luckily, no damage.

Quick Fix

When constructing Flattopper, I built in 2° of angle of incidence. Thinking that this might be too high, I had added a small shim under the trailing edge of the wing, in order to decrease the angle of incidence; another 1/2 ounce of lead was added to the nose.

The second hand toss was noticeably better, but still not acceptable to me. So, an additional 2 oz. of lead was added to the nose. Then, using full down trim, Flattopper got its first, good, flat glide.

Checking Out the Controls

The elevator or pitch control was very sensitive; rudder or yaw control was a bit slow, but manageable. I considered putting the model up on a high start, but thought better of it. I realized, by adding 2 oz. to the nose, that the c.g. had moved forward; thus, the towhook was now behind or aft of the c.g. so, playing it safe, I chose to return home and make the necessary adjustments rather than risk the model.

Checking the Angle of Incidence

Whoops!! Somewhere along the line (after the drawings were drawn and the patterns constructed, parts were cut out and glued together) the angle of incidence wound up at 2.5°! And, that's a bit much!

I considered cutting a little out of the wing saddle, but then the hatch wouldn't fit, as it comes back over the wing. I also considered cutting the V-tail off, correcting that angle there, which would also allow me to improve the rudder or yaw control.

I opted to cut off the V-tail, very carefully; then, I cut the V-tail in half, and changed the angle from 110° to 90°. (See figure 1.) The V-tail was reinstalled onto the fuselage; the angle of incidence came in at 1.5°. Flattopper was rebalanced to 35% of the wing chord.

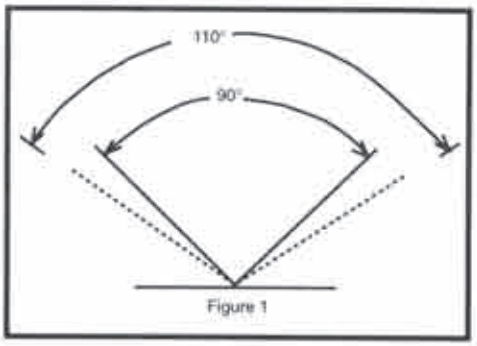


Figure 1

Test Flight - Take 2

Holding Flattopper over my head, again in a slight nose down attitude, I gave it a good toss, and out she went, straight and true for about 50 yards. While the elevator or pitch control was still very sensitive, rudder or yaw control was much improved, although it could be better.

For the past 20 years, or so, I've been flying 6 servo models, with heavier wing loading. And, here I am today, learning how to fly a newly designed light weight model. Maybe I'm expecting too much from Flattoper, too soon?

Conclusion

Have I designed the ultimate model? Nope, I don't think so. Have I designed a good model? Yup, I think so. While it's not perfect to my way of thinking, with a wing loading of only 7.5 oz. per sq. ft., it flies well in zero to light winds. In moderate to heavy winds, it needs ballast.

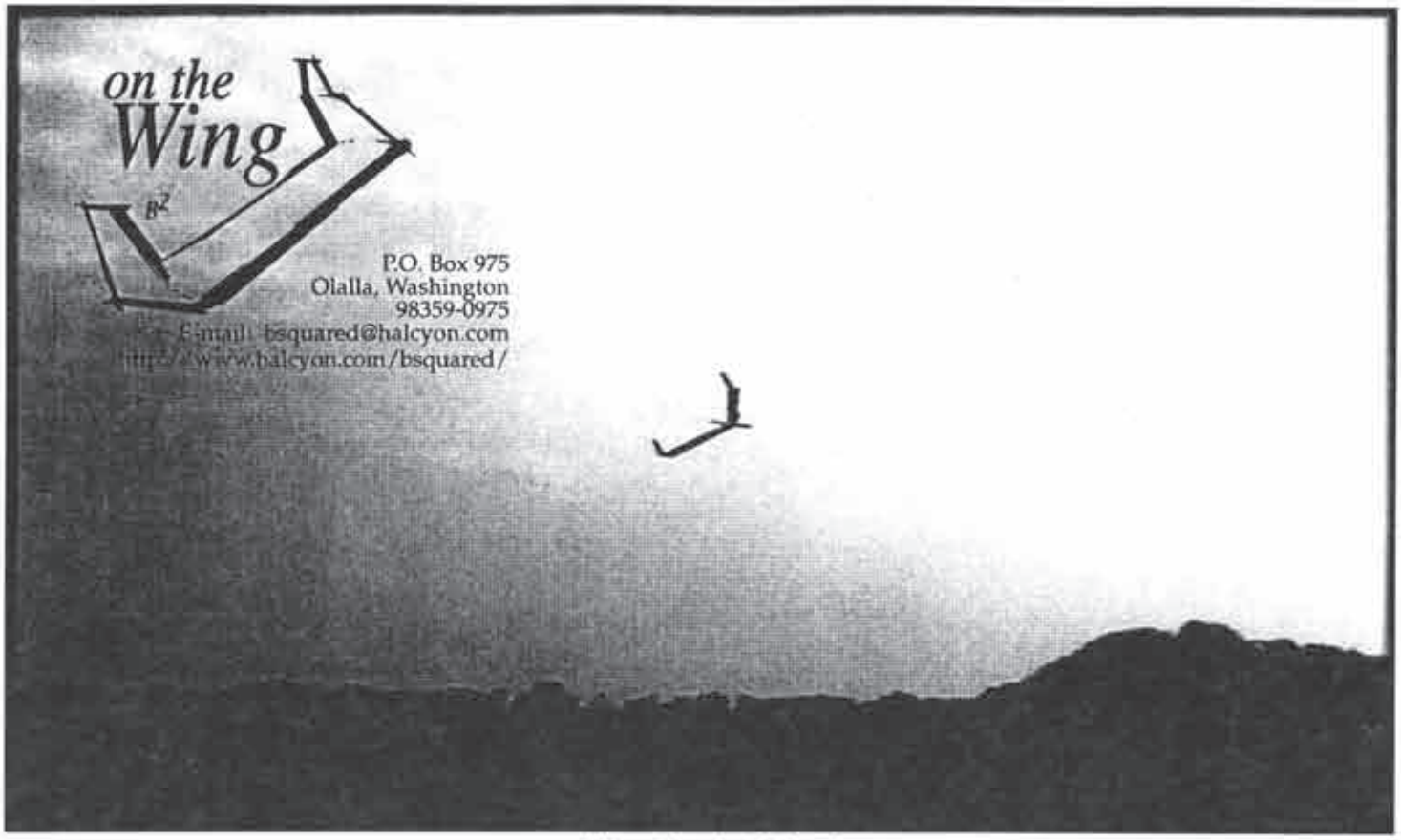
What would I change to improve on the design?

1) Wing dihedral could handle another one to two degrees. This should improve rudder or yaw control.
2) Two inches could be added to the tail moment, which should dampen the elevator or pitch control a bit, thereby making the model more stable.

Yes, I'll likely build another, but not right away. With a bit more flying time under my belt, I'll be better able to determine just exactly what needs to be done next.

Until then! Keep your wing tips up!

■



Glyn Fonteneau & Dave Camp's CO8 2M

We have been corresponding with Glyn Fonteneau via e-mail for some time. Although having a long term interest in flying wings, he started his excursion into tailless sailplanes only recently. Glyn built and flew a copy of Herk Stokely's RC-HLG (*RCSD* March 1997), while his friend Dave Camp decided on a RC-HLG version of Hans-Jürgen Unverferth's CO7 (*RCSD* September and October 1997). Both models were a success, and the experiences acted as an impetus for both to build something with greater performance potential.

Andy MacDonald's web site <http://www.ozemail.com.au/~flyingwing/>, for those who have yet to visit it, is a comprehensive collection of information concerning RC tailless soarers, including both planks and swept wing planforms. Andy's focus is on contemporary designs and construction methods, so swept wing planforms very much take center stage. The information for Hans-Jürgen Unverferth's CO series has come directly from Hans-Jürgen himself, and makes for exciting reading. Hans-Jürgen indicates that with the advent of CO8 (*RCSD* May and June of 1998, and April 1999), performance of swept wing planforms has now met, and in some cases surpassed, that of conventional tailed sailplanes. Glyn and Dave decided to build a version of the CO8 design.

Determined to construct low cost models, and motivated by a rather unique club contest format involving evening flying of two meter 'ships, they decided on that span. The resulting models use all of the other parameters of the CO8, including the wing chord. An advantage of this taking this route is that wing templates for a "normal" size CO8 are already made. Glyn provided an overview of the resulting two meter planform in a recent e-mail, and we've included it here.

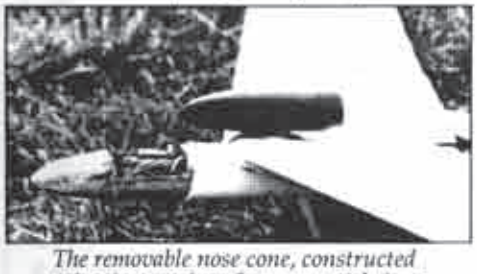
As you can see from the drawing, each wing is made of three, same size pieces. The airfoil (Reinhard Seilemann's RS004a) remains constant across the span, but the wing twist is stepped at each panel break. The blue foam wing uses a full depth 1/32" plywood spar, capped with 1.125" wide uni-directional carbon from Aerospace Composites (14210 Doolittle Drive, San Leandro, CA 94577. Order Desk: (800) 811-2009, Technical Assistance: (510) 352-2022. FAX: (510) 352-2021. E-mail: Info@acp-composites.com). The wings are vacuum bagged with epoxy and fiberglass laid out at a 45 degree angle to the leading and trailing edges. The mylars were pre-painted, yielding unique color schemes and ideas for future models. Volz Wing-Star servos drive the elevons, JR 331s drive the flaps. The winglets sport the same RS004a section (*RCSD* May 1998) as the wings and are vacuum bagged foam, epoxy and fiberglass.

The fuselage is made using the lost foam method. Slip off nose cones, constructed with the help of an *RCSD* article (March 1998), are a part of both models. While the fuselage is a bit longer than necessary, it is quite attractive and aerodynamically clean.

Dave Camp ready to launch his CO8 2M. Several items to note in this picture: the antenna tube sticking out the rear of the fuselage, the weight at the aft end of the fuselage, and the single tow hook. Also note that the model is launched straight ahead.

Dave's CO8 2M on the ground. Too bad this can't be printed in color!

Glyn and his CO8 2M. The model breaks down into three main parts for easy transportation.



The removable nose cone, constructed using instructions from an article in a previous issue of RCSD.

The receiver aerial runs straight out the rear of the fuselage through a small diameter plastic tube.

The Panknin twist spreadsheet, available through <http://www.halcyon.com/bsquared/Panknin.html>, served to locate the CG. For safety, the CG was placed an inch ahead of the determined point during initial test flying. The completed aircraft with forward CG weighed about 32 ounces.

Significant up trim was necessary during first hand launches, as expected from having the CG located forward of the computed location, but the glide angle was exceptional. Flight testing almost immediately proceeded to high-start launches using a single tow hook. The model went up the line dead straight and released without difficulty. During further flying sessions, weight was added to the rear of the fuselage to bring the CG back toward the location predicted by the spreadsheet. Measured duration steadily increased, from 3.5 to 5 minutes. This performance improvement paralleled the addition of 4.5 ounces of lead to the aft end of the fuselage. Small flap deflections were tried in a successful effort to improve launch height. With flaps slightly deflected, these models will thermal hands off - certainly an exciting discovery.

The most impressive displays of the performance of these models came after they were trimmed properly. Here's some excerpts from what Glyn had to say about their flying experiences:

"(We) both went out late in the afternoon, wind now 5 m.p.h. or less. Several 3.5 meter F3J type gliders were slowly cruising the air and staying up very well. We were surprised that our models would stay up so well considering the speed they have to fly. Even with thermal flap set they were traveling faster than the F3J machines. Glyn had a 12 minute flight and Dave a 20 minute flight. We think this shook up the other fliers because Dave only came down to explore the aerobatics capabilities. Climbing inverted turns were possible in the weak lift. Coupled aileron/flap improves the roll rate, with very little flap required (2 mm down used)."

"Last weekend Dave and I entered a slope slalom event with the CO8 2M. Wind speed varied between 12 and 30 mph, but mostly between 20 and 30. The idea was to launch and fly round a very tight course in the least time. We were up against F3B and F3J machines, many ballasted up. We both flew the wings with no provision for ballasting (at 2 lb. AUW) and I came first in class (just wings) and 5th overall. We think it shook up some of the competitors, particularly as neither of us had flown the wings on the slope before. We came away very happy."

Dave and Glyn are obviously quite pleased with their CO8 2M design. There has been only one instance of "propelloring" on tow, that due to too steep a launch with flaps too far deflected. Large flap deflections coupled with down elevator are required to slow for spot landings. (Practice, practice, practice.) This model does not suit the "float around the field looking for lift" method. Rather, the CO8 2M seems to desire to go out and cover ground in an active search for lift. Glyn says it will be interesting to see how the CO8 2M works in the evening against the "Gentle Ladies" entered in their club contest.

With the success of the CO8 2M firmly established, Glyn and Dave are now contemplating a CO8 of 3.3 to 3.5 meter span, perhaps with a bit more chord. The pair would also like to experiment with potential fences, as this may help obtain even higher launch altitudes. There's also a desire to incorporate a "six flap" control system. Additionally, Glyn is drawing up plans for a 1/4 scale SZD 20 "Wampir," a Polish tailless design which has been on his "to do" list for more than ten years, and Dave is considering a 1/4 scale SB 13 "Arcus." Glyn and Dave have promised to keep readers of "On the 'Wing..." updated on their various projects. They are currently fashioning a web page detailing the CO8 2M.

If you have a tailless project which you feel may be of interest to *RCSD* readers, please let us know. We're always on the lookout for material for future columns. Contact us at P.O. Box 975, Olalla WA 98359-0975, or at <bsquared@halcyon.com>.

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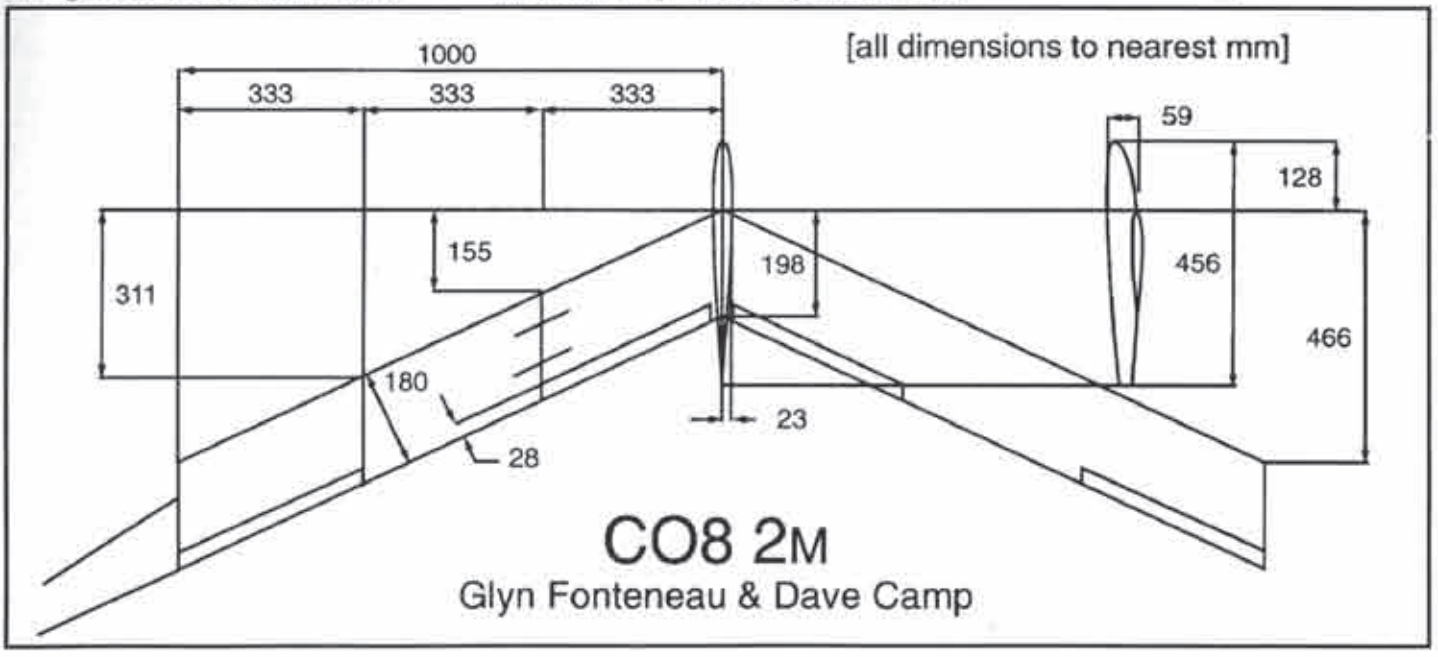


TECH TOPICS

Dave Register
Bartlesville, Oklahoma
RegDave@aol.com

RDS Installation

A while back, Harley Michaelis wrote a 'Tech Topics' column here in *RCSD* describing the Rotary Drive System (RDS). At that time it was referred to as RADS (Rotary Aileron Drive System). The concept has been expanded to include flaps, so the more general term, RDS, is appropriate.

Quite a lot of refinement of this system has occurred since the original column. Harley has found a manufacturer who now molds a really neat engineering version of this system. There is a web site where you can pick up a bunch of detailed information (http://www.bmi.net/propt/rds/). Most recently (September *Model Aviation* magazine), a description of the system and some excellent installation comments were published by Mike Garton.

For those of you who may be contemplating an RDS installation, the easiest way to try it out is to modify the aileron installation on an existing ship. This is about as fool-proof a job as you can get and is less intimidating than conversion of the flap system (which requires re-orientation of the servo well). So if you've been curious about how to do this, let's walk through the conversion I recently carried out on my Laser 3MC. Along the way, I'd like to point out a few little tricks I've learned that haven't been mentioned in the other literature.

First thing to do is take a look at the drawing of the RDS setup for aileron control. The coupler is a clever design with a molded adapter for the spline which fits into a cylindrical molding to capture the torque rod. The torque rod is locked in place by a set screw. The torque rod goes into a 'pocket' in the aileron. The bend in the torque rod at the aileron hinge converts the rotary servo motion into an up and down motion of the control surface. As noted in Mike's article, an important point in eliminating 'slop' in this assembly is having a tight fit for the torque rod in the pocket. I've also found it's important to accurately drill out the coupler for the torque rod and anchor it at the wing exit. This minimizes forces on the servo which would tend to move it around in the well (more on this later). See Figure 1 for an outline view of the general mechanical concept. Figure 2 is an assembly picture of the RDS equipment for the Laser 3MC.

If you're happy with the existing control throws on your ship, a key element is reproducing your control surface movement. So the first step is measuring the amount of up and down aileron travel you've programmed into your system. Measure that at a well defined position on the TE of the aileron. The amount of throw at the tip is a good place to start. You'll want to reproduce this closely with your RDS installation to minimize re-programming. The RDS adjustment that you'll want to mess with to get close is the angle in the torque rod.

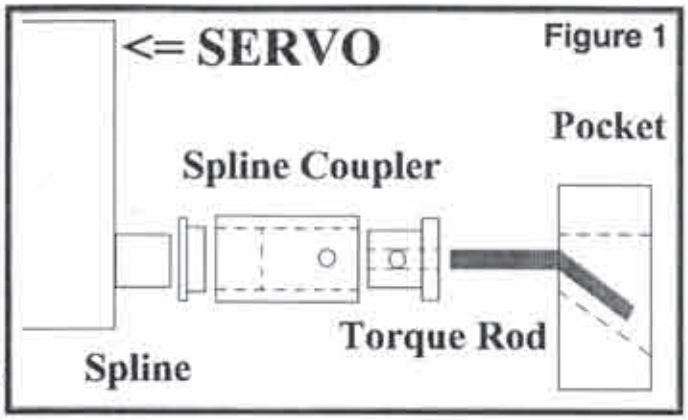


Figure 1

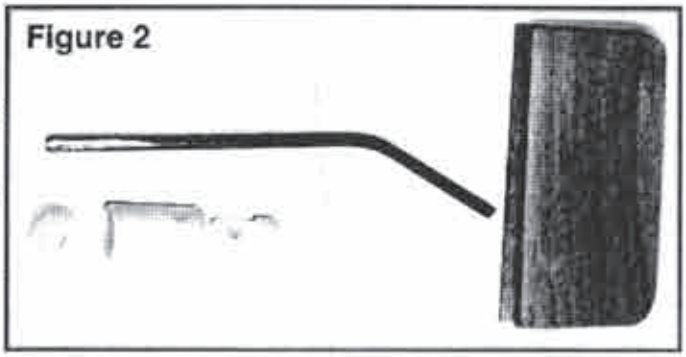


Figure 2

Having recorded your aileron travels, let's get to work on the installation. First thing is to peel off the retaining tape you've got over the aileron servos. Remove the linkage and take a look at your aileron servo setup. I hope you didn't glue yours in, as it will be a bit of a mess getting it back out. (I use double sided tape to hold it in the well, and reflective tape is placed over the entire assembly.)

On the Laser 3MC, the output spline gear points towards the wingtip. For the RDS installation, all you do is flip the servo over on a diagonal so that the output spline is now pointing at the TE on the side of the servo well closest to the wing root. Figure 3 shows a drawing of the respective orientations.

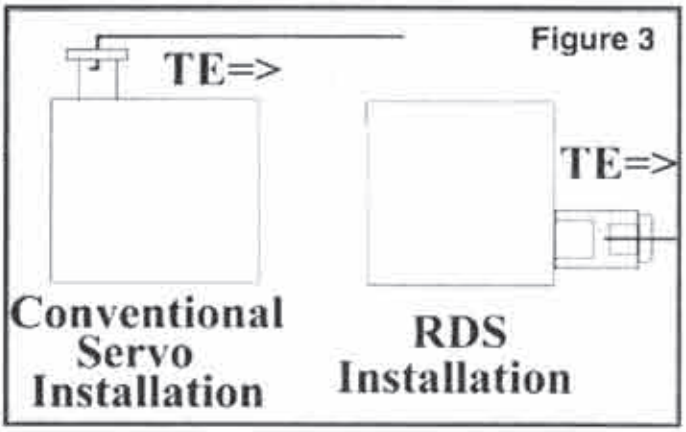


Figure 3

Now here's where you have to do a little work. Your servo well will have to be modified to accept the servo in the new orientation. But before you start carving, mount the RDS coupler on the servo; but don't mount the insert that captures the torque rod. Put a piece of 2" wide masking tape over the wing well and trace the servo outline (including the output coupler) for the new orientation. You can use an Exacto knife or a Dremer router to remove the material inside the traced lines to fit the servo and assembly. In the conversions I've done thus far, the new orientation will require extending the length of the well (LE to TE direction) as well as making a small rectangular cut-out past the spline location to access the set screw. The excess width (root to tip direction) will be filled with scrap balsa once the alignment is complete.

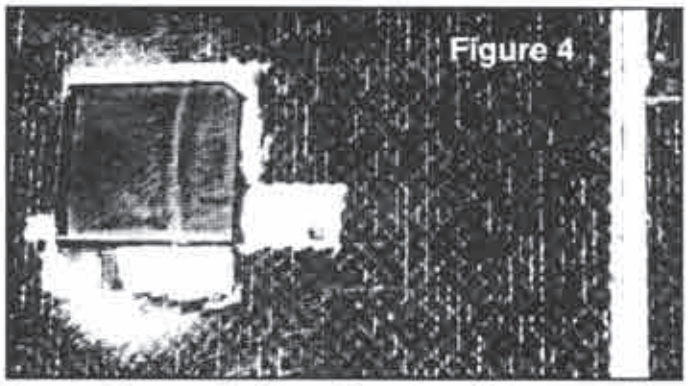
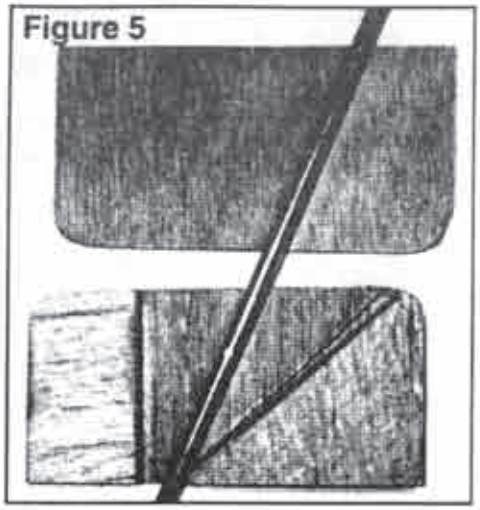
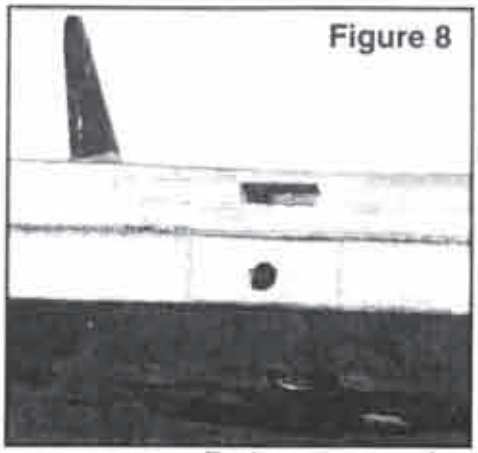


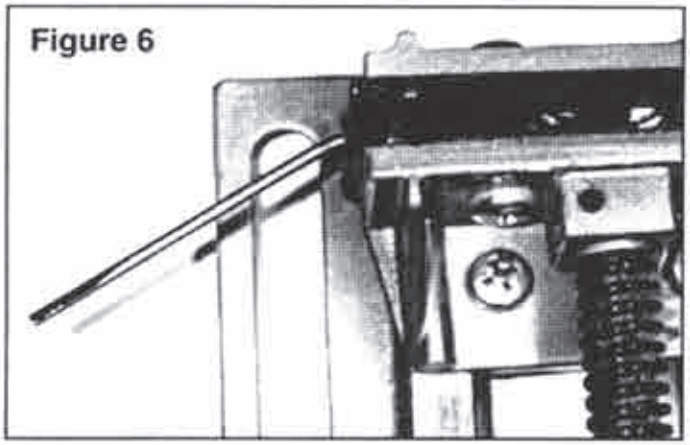
Figure 4

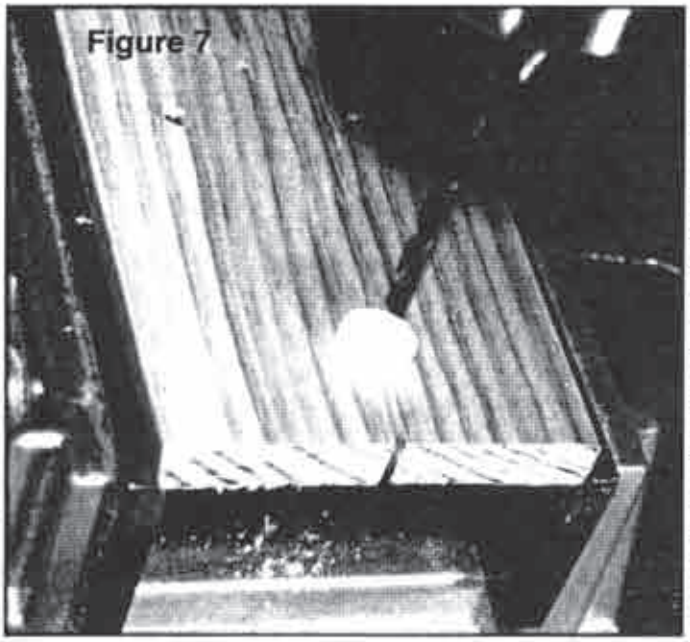
See Figure 4 for a view of the servo (with scrap balsa packing) in the modified well.

With the servo well re-routed to fit the new servo orientation, add the torque rod coupler to the assembly and use an Exacto knife to carve out enough foam under the skin for the entire assembly to fit in the well. With the servo in place and pointing properly towards the TE, draw a line along the spline and coupler axis from the servo









output to the TE. This line represents the location for the torque rod in the wing.

I typically use 3/32" music wire or clevis shanks for the torque rod. So a 1/8" or slightly larger channel from the TE to the servo is about right. Start at the TE at a location ~ 1/4" down from the skin (on the side for the tape hinge!) and run the drill bit into the core by hand until it comes out in the servo well at the coupler location. Don't worry too much about exact alignment. You can egg this out if needed by running the drill bit back and forth a few times. Basic objective here is to get the exit hole at the TE aligned with the center of the torque rod coupler. If the hole is a bit oversized, we'll fix that in a few minutes.

Next step is to make the 'pocket' and mount it in the aileron. Harley and others recommend counter top sheet samples which are available in most hardware stores. I've been using 1/32" ply and have had good success with this material. My figuring is that the pocket is going to be embedded in a slug of epoxy, so the ultimate strength of the pocket skins isn't too critical. For the spacers, I've been using 3/32" balsa and have made one side tapered to give as much surface area contact as possible for the pocket assembly. The spacers are CA'ed to the bottom skin. The torque rod is then placed in the opening and the assembly lightly sanded to be sure the rod rolls with the sanding block. If you take off too much of the spacer, then follow Mike's instructions for mixing up some epoxy with micro-balloons. If you get it just right, you can CA the top in place and keep going. The point is to have a snug fit with no up and down wobbling of the rod. But not so tight that you get binding of the rod in the pocket. An example of the pocket construction for the Laser 3MC is shown in Figure 5.

Next trick is to line up the pocket with the exit hole in the TE. I leave the skin intact and remove the foam underneath with a small Exacto saw available from Micro-Mark. A very sharp #11 blade will work reasonably well also. You want to get the hole in the pocket and the hole in the TE reasonably well aligned. Once you've got that set, and the foam dug out to the proper depth for your pocket, cover the rear opening in the pocket with a small strip of masking tape and then epoxy it in place. The tape is to keep the epoxy from getting into the pocket. I usually mix the epoxy with microballoons as a filler and to help with sanding down the excess goop after it's set.

Now let's tackle the torque rod. As mentioned, this is typically 3/32" in my installations. There are three important aspects to the torque rod: 1) a sharp bend at the wing exit, 2) proper length to the spline coupler, and 3) maximum depth in the pocket.

Depth in the pocket is to get as much leverage as possible and to minimize play in the surface ('slop'). Take the straight torque rod and put it directly into the pocket until it contacts the inside surface. Back off just a titch and that's where you want to make your bend. The bend needs to be made with a steel jawed vise. I've found that lightly tapping near the edge of the vise jaws with a metal hammer will work nicely. You want to tap on the coupler end of the rod so as not to mar the surface of the rod in the pocket. A picture of a proper bending setup is shown in figure 6. (Note the flat that's been ground into the torque rod here and in Figure 2!)

In the original documentation for the RDS, an angle of 45 degrees is normally specified. In the several aileron installations I've done thus far, 45 degrees is a bit too much. I've found 30 is about right. The way to set this angle is to try 30 degrees and then see if the aileron throw is the same as in your original setup. If it's not enough, increase the angle up to a max of about 45 degrees. If it's too much travel, reduce the angle somewhat. You could sit down and calculate all this, I suppose, but trial and error seems to work pretty well.

Two more (important!) items, and then we're done. Notice that we haven't drilled out the torque rod coupler to fit the torque rod yet? You can do that at anytime but when you do, here's a hint. **DON'T TRY AND DRILL IT OUT BY HAND!** If you do, I'll guarantee it will be slightly off axis, which will try to force the servo to move around in the well. Take just a second to do this right and it will come out really slick.

Try this - take a piece of 1/4" scrap pine (trellis stock or the like). Using a drill press, drill a 7/64" hole near one end of the pine piece. Now cut a slot in the wood from that end into the hole. This will make a very snug fit for the torque rod coupler (~ 1/4" OD). Push the coupler into the hole and

mount the pine block level in a vise. Now drill out the 3/32" hole in the coupler. See figure 7 for an example of this assembly.

Since the coupler is plastic (looks like a nylon of some sort), go slowly since you'll melt and push some of the material out of the way rather than drill a clean hole. After making the initial pass, let the part cool for a few minutes and then re-drill. Alternatively, put the whole thing in the fridge for ~ 30 minutes before drilling to make it a bit stiffer. The 3/32" rod will be a tight fit, but after sliding it in and out a few times it will loosen up nicely. Do NOT make the hole oversize or you'll lose alignment! If it's a little tight at first, use the handiest moisture source available to loosen it up some (i.e. - Spit on it!).

With the torque rod bent and the coupler drilled, put everything together (don't tape in the servo yet!) and cut the torque rod to final length. This should be such that the bend in the rod is just outside the TE of the wing. Be sure and round off both ends of the rod. Now, go over to your sanding disk and grind a small flat on the coupler end of the torque rod. This will assure good retention of the torque rod by the set screw as well as assuring reproducible alignment if you take it apart in the future.

One last item and we're done. Remember that we made a slightly oversized hole in the wing for the torque rod? Now we're going to fix that a bit. Take some scrap 1/32" or 1/16" ply (about 1" long by 3/8" wide - or somewhat wider than the width of your TE is at the exit hole). Drill a 7/64" hole in the ply at a location that will line up with the hole in the aileron pocket. When you assemble the torque rod and aileron, set the ply piece so that the hinge line is flush at the neutral position. Epoxy the ply piece in place on the TE at this location. Then trim off the excess material to bring it flush with the upper and lower surfaces.

This block will allow free rotation of the torque rod and minimizes side forces on the tape hinge (and the servo). Figure 8 shows the pocket and block assembly properly aligned on the wing of the Laser 3MC.

That's about it. Drop the servo in with double sided tape. Insert the torque rod through the TE into the coupler. Lock it in place with the set screw. Slide the aileron in place over the torque rod and tape on the hinge. Stuff the excess space around the servo with scrap balsa and then cover the whole pocket with reflective tape as you'd do in a standard setup. Big difference is that nothing is hanging down under the wing. (Oh yes, don't forget to lop off the old aileron horn - I save this until last just in case I chicken out at the end!)

Elapsed time from start to finish (both wings) was about 3 hours. But some of that was to stop and take a few pictures along the way. So you should be able to do this conversion in an evening. Hope this works out for you. If you do the experiment and have any questions, please check out the web site, Mike's article in *Model Aviation* or drop me an e-mail. Done properly, this is a very simple installation and is very reliable and tight. ■

Mike Bamberg flew 40.6 miles
on 6/13/99. Try that some time!

Real pilots go places!!

Montague Cross Country Challenge - June 2000

Know Your Metals

by Roy Vaillancourt

This article is intended to help distribute some information about some of the metals most commonly used by the average modeler. Understanding the classification and associated properties of various metals will help you choose the right material for the job and maybe even help you learn how to work metals more easily. Please keep in mind that the following series is not all-inclusive and that it is presented merely as a broad information base to enhance the average modeler's knowledge of the various metals we routinely use.

Being the most commonly used metal, I'll start with Aluminum.

Aluminum:

One of earth's most abundant metallic elements, Aluminum is one of the most versatile engineering and construction materials readily available to modelers today. It is produced in a wide range of alloys to satisfy many requirements. These include high strength, light weight, good corrosion and tarnish resistance, good electrical and thermal conductivity and, as an added bonus, an attractive silvery luster. Pure Aluminum melts at 1220 degrees F. Most of Aluminum's alloys can be easily fabricated, machined and joined. Aluminum can be supplied in wrought (such as plate, bar or rod), cast, or forged conditions. It is non-toxic and can accept many kinds of surface finishes from anodizing (a chemical etching process) to painting. Although there are many alloys, for most modeling applications we generally use three types of Aluminum: 2024 -T4, 5052 -H32 and 6061 -T6.

2024 -T4

A well known Aluminum - Copper alloy that has been solution heat-treated and then naturally aged to a substantially stable condition. Available in many forms such as sheet, strip, plate, block, rod and tube. It is very machinable. Considered very rigid. Mechanical properties include high strength and excellent fatigue resistance to tensile or compressive loads. Although it is very resistant to bending loads, this very property makes it NOT very good for forming by bending. Most common uses are pistons and connecting rods in engines, pivot blocks, scissors or air cylinders on retracts. DO NOT use 2024 for bending brackets of any type. This material fractures readily at the bend line and is also very susceptible to cracking at stress concentration points under vibration. NOT GOOD for engine mounts.

5052 - H32

An Aluminum - Manganese alloy that is strain hardened and stabilized. It has moderate to high strength properties. It is NOT heat-treatable. Good welding and brazing characteristics with a high resistance to corrosion. Most common in sheet metal form. Generally not available in thickness over 3/16. Excellent for bending up brackets, etc. When bending, keep the internal bend radius at least equal to 1.5 times the material thickness.

6061 - T6

This Aluminum - Silicon - Magnesium alloy has been solution heat treated and artificially aged. Machines very well (the best of all Aluminum). Has excellent brazing and welding qualities. Very high resistance to stress cracking. Good formability by bending or pressure forming. Medium strength with high corrosion resistance. Used in many heavy-duty structures. Good for making engine mounts and landing gear components.

For machining Aluminum, the best cutting agent/lubricant is Kerosene. Should you not have any Kerosene around, the next best cutting aid would be a light machine oil such as Marvel Mystery Oil. Failing that, good old candle wax also works great.

One thing to remember when finishing Aluminum is that, for the common man, getting paint to stick to it is very tough. Not because we can't paint right. It's because our finishing method does not agree with what Aluminum wants to see. Aluminum naturally forms a thin surface layer of oxidation. (This is that black stuff you get on your hands when handling untreated Aluminum.) This layer forms rapidly on fresh cut material and prevents the rest of the material underneath from oxidizing or corroding. Even if the part looks shinny, this layer may have already formed. This is why Aluminum is considered very corrosion resistant. However, this very same layer is what makes it very hard for paint to stick. Well some of you may say, "I'll out smart this material and use some epoxy paint." Truth is, no matter what paint you use, if the surface isn't prepared right the paint will peal right off.

The best way to prepare Aluminum is to dip the part in a chromic acid etching bath just prior to priming. This bath removes all oxidation and applies a thin protective top layer that adheres to the Aluminum and accepts any paints very well. Painting should begin as soon as possible after the part is dried off, but it is possible to wait up to 24 hours without too much harm. Once the primer is on, all other painting can proceed at a normal rate. Well most of us don't have a chromic acid bath at home, so how do we handle this problem? The best way is to sand the entire part with 320 or 400 wet - dry sandpaper used wet. Dry the part off by use of a heat gun or forced air. Wash right away with Acetone or thinners compatible with the paint you will be using. Again dry off and commence applying primer. Once the primer is on you can relax. If you had to stop anywhere in the process before you got primer on the part, you'll have to start all over with the sand paper, etc. The point here being that you have to get primer on an oxidation free surface. ■

About the Author

Roy Vaillancourt is the president of Vailly Aviation. His specialty is giant scale warbirds. Vailly Aviation has been serving the giant scale enthusiast since 1986. Roy is an active scale contestant and has competed regularly at **TOP GUN** and **The Scale Masters Championships** for the past 10 years. He has written numerous articles for many of the major magazines dealing with all aspects of scale modeling. Roy and his wife Nancy operate Vailly Aviation out of their home as a part time venture to help contribute to the scale modeling community. In "real life" Roy's full time day job is as a senior design specialist for Lockheed Martin. He is a degreed mechanical engineer (2 degrees) with over 30 years experience in the design and manufacturing fields.

HAVE SAILPLANE, WILL TRAVEL!

The pilots in the photographs are Jim Carlton (with green baseball cap on backwards) flying a 2M Monarch, and Junior Ryan Baldi flying a Foaminator.

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

This column is dedicated to soaring vacations. This month, Jim Carlton takes us to Lake Erie, near Cleveland, Ohio.

"Rockin' on the Erie Shores"

By Jim Carlton

Coastal slope soaring brings to mind venues such as Torrey Pines out west and Cape Cod to the east. Paul Naton in his "Endless Lift" videos highlights many other locations coastal and inland where slope addicts can satisfy their needs to "wiggle the sticks", but how about our "North Coast"? Yes, fellow slopers, outstanding flying can be found on the southern shores of our Great Lake Erie, near the metropolis of Cleveland, Ohio, at the northern border of our country. Cleveland, you say? Yes, Cleveland, the comeback city of the decade! Here is just a little about my hometown; then let's get to the slope!

Much maligned and the brunt of many jokes in the mid 70's, Cleveland has experienced a true renaissance period. With mass exodus of people to the suburbs in the 70's, the city realizedthat, in order to keep the population, many changes needed to be made. Effort was put into rebuilding much of the infrastructure, as well as revitalization of much of the abandoned or under utilized industrial sectors. Achievements such as renewal of the Flats entertainment district, birth of the Gateway Project with Gund Arena and Jacobs Field, homes of the Cavs and Indians pro sports teams, opening of the Rock and Roll Hall of Fame, The Great Lakes Science Center and the new Cleveland Browns Stadium, as well as strong support for the many established cultural and civic organizations such as the Cleveland Orchestra and Playhouse Square, illustrate our success in creating a truly "world class" city. Enough, you say? I'm starting to sound like a travel guide? I digress.

Also incorporated in this growth was the acquisition of the Cleveland Lakefront Parks by the State of Ohio. Under state management, Edgewater Park and Perkins Beach, where we fly, have been kept open as public recreational areas. Most of the Cleveland shoreline, like most of the southern part of Lake Erie, abuts private land and thus is not accessible to the public. State control has left this area with a spectacular view of the downtown Cleveland skyline available to the public.

Perkins Beach is located on the west side of the Lakefront State Park, west of Edgewater Beach, which is west of downtown Cleveland. Perkins Beach is a slight misnomer, because you can't really swim or sunbathe; the area is a rocky wall, next to the lake, that progresses up the slope to a walking trail and then to a grassy slope of about 35 feet. Total rise from the water surface to the top of the slope is about 50 feet, which doesn't sound like much;

with nothing out front but water as far as you can see, the lift can be incredible.

The area on the face and at the top of the slope is about a football field in length with a paved walking/bike trail at top running parallel to the slope. Behind this stands a row of trees, which can cause some problems for those who venture a little too far back from the face of the slope. Past this tree line you could fly over the trees and land in an open field near the parking lot if a pilot is hesitant about landings on the

slope. Yes, rotors are abundant over the tree line but manageable.

North to northeast winds are ideal for this location. Winds as low as 5 mph are usable and, when the lake kicks up, 25-30 mph is not uncommon, "rockin' on the Erie shores". The autumn season promotes many days of north, northwesterly wind that can be very flyable. Late October into November the waters are still warm enough to keep the winds from being too blistering cold. Ideal summer conditions have the lake acting as a giant A\C unit making for very pleasant conditions on a hot summer day; with our south, southwest prevailing winds, evening onshore winds are more common. An effective band of lift stretches your eyesight in either direction, east or west, and many flights have been taken hundreds of feet out over the water. Altitudes can be gained where caution has to be used so as not to get into airspace with "full scale" aircraft arriving at Burke Lakefront. Ask local flyer Dana Flemming about his adventure years ago with this subject. You won't believe who was on THAT plane. Although the airport is many miles away, you can see the runway lights from the slope.

This is an excellent venue for the National Airshow that is held around Labor Day each year with many high speed passes from the Blue Angels just a few hundred feet overhead. Obviously, not the time to be flying the slope with our aircraft due to the traffic and the crowds of people. Holidays can also bring out many admirers of the lakefront.

Remember, this is a public park and we do have permission to use the facility by the park rangers, but you may have to answer the usual questions from curious onlookers. ("How much does it cost? Where's the motor? How far will it go?" Etc, etc.). Be prepared when the winds are strong to have a lot of company from the abundant flocks of gulls, hawks and occasional Peregrine Falcon also wanting to share your airspace. I can't count how many times I have heard a pilot yell, "Which one is me?" Also, please respect our natural resources and try not to provoke the native wildlife. (The birds, not the people!) The rangers will warn you if caught attacking the avian population with your aircraft.

Fly what you've got! Anything from Scale 3M down to my Red Herring can fly well here. Common to find Gentle Ladies and Wanderers as well as Foaminators, Foamerons, Boomerangs, Samurais and my recent favorite 2M Monarch. They all work well when the winds are up. Bring ballast. I haven't put one in the drink, yet, but I have put them on the rocks along the shore. Trees are favorite landing sites for those unwilling to turn into the slope on landing approaches. Take a couple of practice approaches and you'll get the hang of it. I have found flaps help greatly to make a hover landing, and catch at the top, a real crowd pleaser. Easy on airframes, too. Avoid the large steel sculptures under the trees. They are not very forgiving; just ask my Samurai. The most fun I've had lately is tossing my 5 oz. Red Herring into 15-20 mph winds and having a ball. I am really surprised at how well it penetrates and how agile it is on the slope.

Now for the details

You can reach Edgewater State Park off of the Memorial Shoreway, Rte 20. From the south take I-71 to the Innerbelt and take I-90 west towards Lakewood. Follow the Shoreway past the first Edgewater Park entrance and exit the freeway at Edgewater Rd. First stop sign you come to will be Access Rd/West Blvd.; turn right into the park. Follow the road to the right; go up the hill and park in either of the next parking lots on the right or left. The slope is easily visible and a short walk from the cars. Follow the park rules posted, as in any state park. Arriving from the west of Cleveland follow I-90 to I-71 north which turns into the Innerbelt and follow the previous directions, or take Rte 6\20 to West Blvd. Turn left or north and follow it to the park entrance. From the east, I-90 or Rte 2 also lead to the Shoreway and follow it west past downtown Cleveland till you see the park signs.

Great slope sites also draw great pilots, and Edgewater State Park and Perkins Beach are no exceptions. Recently, one of our favorite flyers hooked his last thermal and specked out. Joe Scarpelli was one of those great pilots who made flying the slope look so easy. Joe could be found at the slope year round. His aircraft weren't always the prettiest to look at (What well used sloper, is?), but fly he could! Always pushing the envelope with both aircraft and flying skills, Joe was fun to watch. Even as his eyes grew weaker and his reflexes slowed, he would still fly circles around most. The occasional tree, dorked landing or failed battery didn't dampen Joe's enthusiasm for flying. Just about any time you would call, he would meet you on the slope. Joe's outward appearance or gruff demeanor didn't reflect the really nice guy inside. He was always willing to give a hand and was always ready to give you his opinion (about anything!). Even though in reasonably good health at age 69, Joe succumbed to a heart attack. He will be fondly remembered and greatly missed.

Contact any of the Buckeye Soaring Society members for additional information. Give me a call if you need advice on accommodations in the area or if you want to check on conditions. E-mail me at jimn8uay@stratos.net or by landline at 440-845-9552 (home) and 440-543-5392 (work). I usually am available one day out of the week, or evenings on the weekends. Currently, I am preparing to attempt an LSF four hour flight for level IV and hope to get an attempt or two in before the weather deteriorates. Anyone in the area wanting to witness or attempt LSF work is gladly welcome. Passing through the area, give us a call. If the winds are up, let's do it!

Contacts:

Jim Carlton, jimn8uay@stratos.net
440-845-9552

Dana Flemming, dlflem@aol.com
440-248-1268

Brett Baldi, Bbaldi@now-online.com
440-333-6495

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Thanks, Jim!

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

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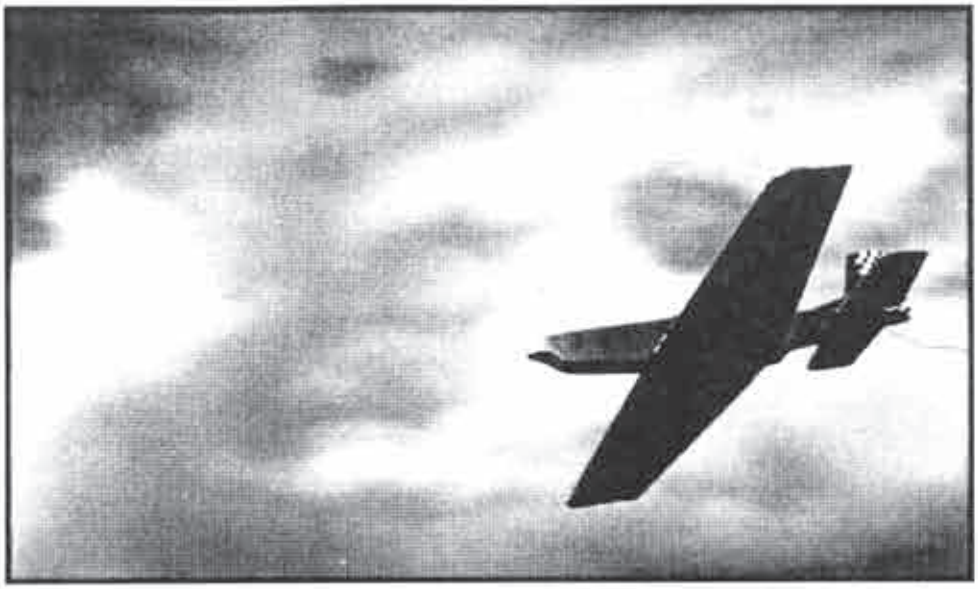
■

"SHORT CUTS"

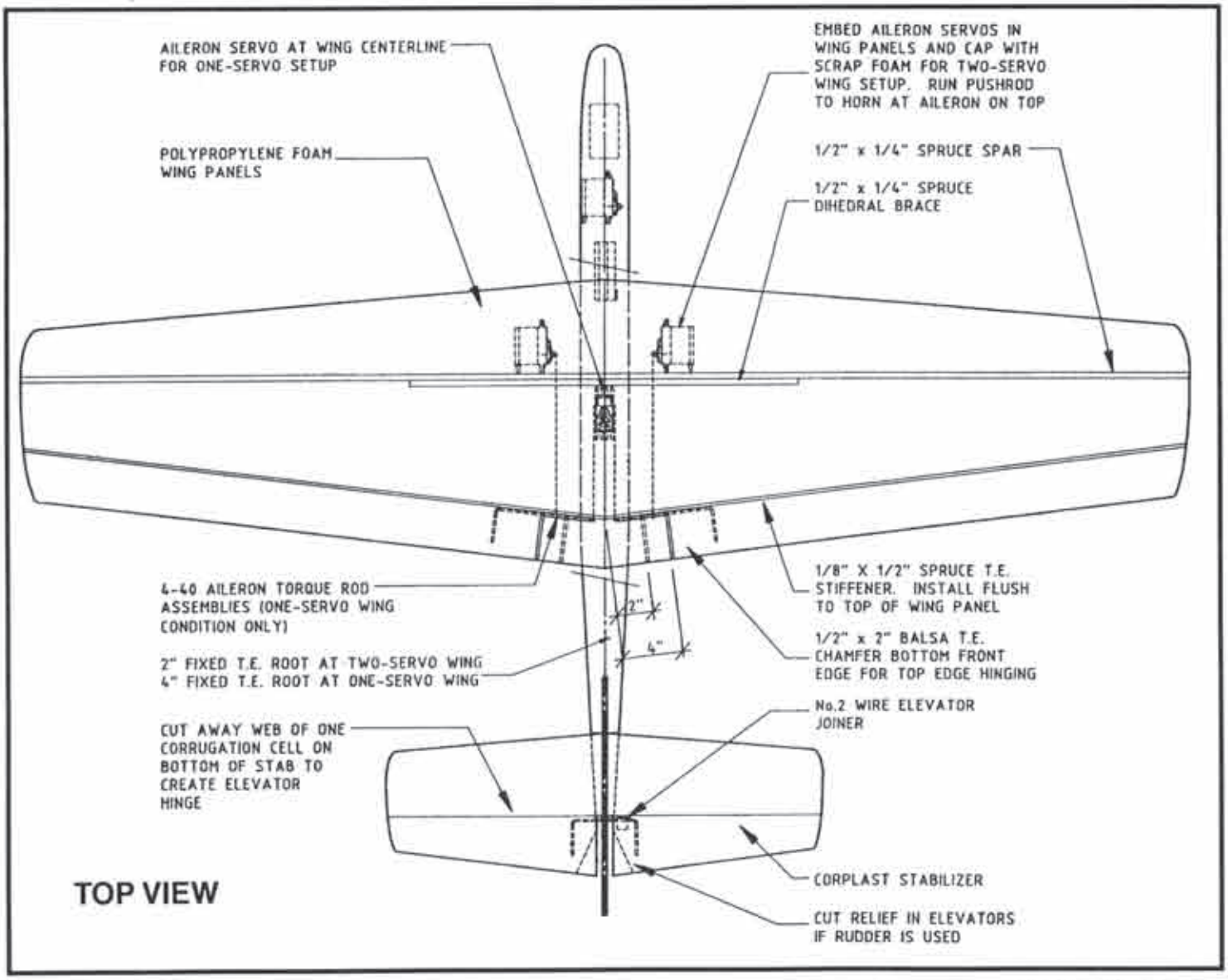
Steve Savoie
926 Gage St., Bennington, Vermont 05201
(802) 442-6959



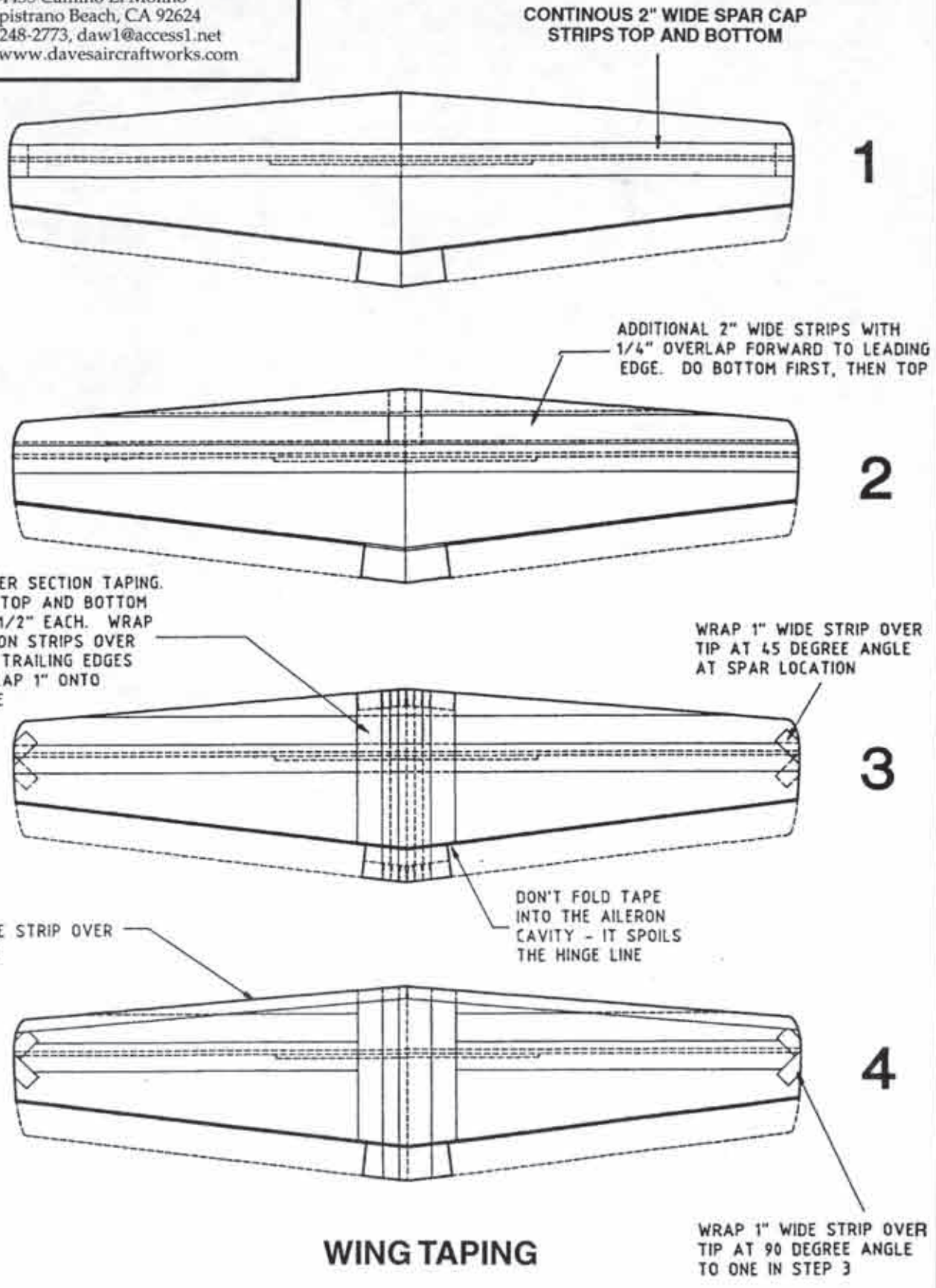
KIT REVIEW
DAVE'S AIRCRAFT WORKS
FOAM P-51 COMBAT SLOPE GLIDER

Well, I finally did it, joined the crowd, and picked up my first combat foamy. The combat craze was a little slow to pick up here in the East, but after I flew Dave Garwood's P-51 DAW Mustang I knew that I just had to have one. What I like about the plane is its looks, smooth but crisp flying characteristics and, most importantly, its survivability.

For those not in the know, foamies are made almost entirely out of EPP (expanded polypropylene foam) and are locally reinforced with basswood spars, cloroplast tail feathers, and balsa aileron stock. The foam's survivability is enhanced by selectively wrapping it with nylon filament, reinforced strapping tape. One



Dave's Aircraft Works
34455 Camino El Molino
Capistrano Beach, CA 92624
(949) 248-2773, daw1@access1.net
http://www.davesaircraftworks.com



WING TAPING

would think that this mix of components give a pretty ugly appearance when covered with Ultra-Cote; not true.

When the kit arrived, I began reading Dave's instruction manual to get a better feel for the construction methods, do's and don't. The manual was very detailed, listing all that was included in the kit (and it all was), and listing all the extra stuff need to assemble the kit like glues, covering, epoxy, tape, etc. Dave lists two rolls of film, but you could get by with one if you lay things out well and spray paint the tail instead of covering it.

With all the supplies purchased, I decided to build the plane cheap and simple, 1 servo for elevator and another for the ailerons. Dave's instructions detail other variants such as 1 servo per aileron for camber control, as well as a rudder servo. I decided to use cheap, standard Tower servos and an 800mAh battery pack because I hate recharging at the field. I followed the directions and construction methods exactly. Dave has manufactured over 6000 foamy kits, so I figured he's got the process pinned. I started off by bonding the basswood spars and sub-trailing edges into the foam with Household Goop, as Dave recommends.

Next was the cut out in the foam fuselage for the battery, elevator servo, and receiver. (At this point, I did note a minor error in the directions, which Dave has already corrected.) I cut into the foam fuselage from the sides; they should have been cut in from the top of the fuse for more strength. This area gets later wrapped with strapping tape, so I really don't know how much I reduced the strength of the fuse. Unlike conventional kits, once the electronics are in, they are capped over with extra foam, wrapped in strapping tape, and covered. The only way to get them out is to cut them out, so make sure your travel distance is correct on the servo arms , everything is connected up tight, and checked out, including switches.

Dave recommends a small soldering iron to melt out channels for servo and battery leads to connect up. The leading edges of the foam cores and the fuselage require light sanding to get them to proper shape and appearance. EPP sands nicely with 100 grit paper. I bonded the two wing halves together and installed the torque rod assembly (included in the kit) into the wing. The next stop was the tail. The cloroplast stabs had the lower skin surface cut and beveled in order to produce a live upper skin hinge; the two separate elevators were connected together with a simple U clip.

At this point, I had three separate components: wing, tail group and fuselage. The next step was to prepare the foam for taping. A funny thing about EPP foam is that nothing likes to stick to it except epoxy and goop. So before the strapping tape is applied to the foam it has to be first sprayed with 3M-77 and allowed to tack up. This works great. Dave's instructions are great, with very detailed directions and illustrations on how to wrap, overlap, and reinforce both the fuselage and wings with the tape. I had never covered over strapping tape before, so I called Dave to see if the strapping tape should also be sprayed over with 3M-77. He said that most folks are scuffing up the tape with 220 grit, but that I could also shoot the tape areas with 3M-77. Being me, I opted for the 77, which also made covering a snap.

Off course, prior to all this wrapping and spraying, I had already installed the elevator push rod (not included) and embedded the antenna into the fuse. The wing was covered with silver Ultracote; then, I cut the recess for the aileron servo, bonding it in place with the Goop. I did opt at this point to vary a bit from the kit. Dave supplies the linkage, torque rods, and nylon clevis for the servo and linkage hook ups. I decided to use heavy duty metal clevises for the aileron linkage and the elevator servo connection. I didn't want to dig away at the finished plane to replace a nylon clevis deep inside the fuselage.

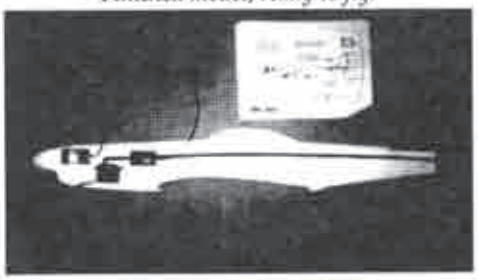
I did however use the nylon clevis at the elevator control horn at the tail, which is easily accessible should it need replacement. I do prefer nylon clevis on most of my slope planes, because they usually serve as a weak link and blow out before I strip out a servo. The tail group was next, assembled and bonded with Goop into a slot in the back of the fuselage. The next day, the aileron servo was hooked up and checked out for proper operation and adjustment. It's got to be done now, because the next step is to bond the wing to the fuselage with Goop, a kind of semi-permanent arrangement.

The finishing touches were to cover and hinge up the ailerons, apply accent trim and balance off the plane. Dave recommends placing the CG 1/4" in front of the spars, which measures out to 3-3/4" back from the leading edge. I called Dave to discuss the CG placement and, to my surprise, he says most folks (including himself) prefer a slightly forward CG, because it adds to stability and improves recover after a mid-air hit.

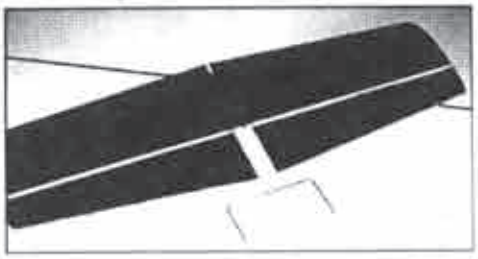
The big day came and the plane's first flights were during a warm up for a slope race held at Claremont, New Hampshire; the CD was Dave Garwood. I did have a bit too much elevator authority, and I did notice (so did Dave) that the little plane was tip stalling a lot. I then flew Dave's plane (another DAW P-51) and noticed a remarkable difference. There was a warning in the directions; I must have tweaked a bit of wash-in into the tips when I was applying the tape, never checking it prior to the first flight. I did continue to fly the remainder of the day. I just had to keep the speed up and be a tad bit more gentle on the turns.

I called Dave Sanders and he said the cores are cut to produce between 1.5 and 2 degrees of washout, or 1/4" lift at the trailing edge of the wing tip. I measured

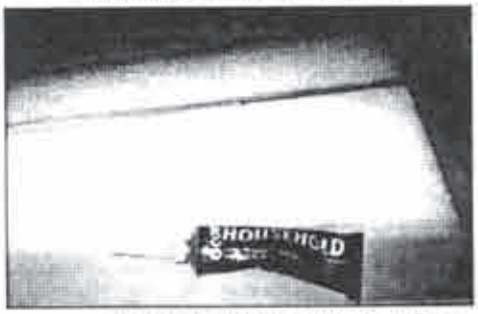
Finished model, ready to fly.



Components installed in fuselage.



Coroplast tail feathers with U clip.



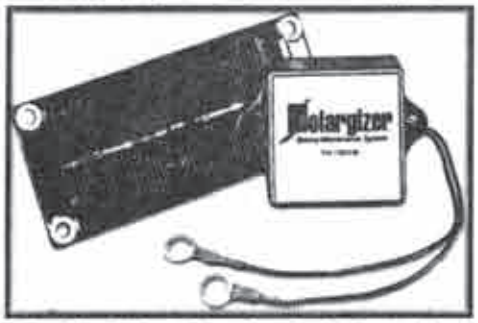
Basswood spar installed using Goop.

mine and found .5 degree of wash-in. Ooops. This was corrected using the old heat gun and twisting the wing. Dave calls this tuning the wing, which can also be done to re-align the fuse and tail group as time and mid-airs go on.

To summarize it all, I found this a nice little plane, low cost ($59.95), you can use standard radio equipment with a cheap radio, and it flies very well. I also like its extremely damage resistant construction, and pretty darn good looks for a foam aircraft; I'm not known for putting a lot of finish time into a plane. The plane sports a S3016 airfoil, has a 48" wingspan, and loads up to about 10 oz/sq. ft., so it does need a bit of wind; but, you can really milk every ounce of lift out of your local slope when the wind begins to drop, without fearing a repair job. I'm very pleased with time and methods, as well as the end product. Nice job, Dave!

■

GORDY'S TRAVELS



Visiting Those Lonely Winch Batteries Is Battery 'Cholesterol' Ruining Yours?

By Gordy Stahl
Louisville, Kentucky
GordySoar@aol.com

If you read my Optima Battery article (*RCSD*, January 1999) you know that I have been researching winch batteries. The Optima is an amazing design that avoids the problem of 'sulfation' (lead acid battery 'Cholesterol' buildup that happens when LE batteries are unused for extended periods of time).

Reading about that build up got me thinking about my own physical condition; frankly, I was getting fat. Discussions with modelers during my travels about the problem of winch batteries losing their oomph, and my weight, lead to me finding two interesting things which seems to have solved both problems.

I found a brochure at a local Battery Plus that talked about a device manufactured by PulseTech: a solar powered device that electronically sends out extremely low amperage pulses of current at the rate of 20,000ppm. When I left the store I just happened to have National Public Radio on and caught an interview with people who had gone on a Dr. Atkin's Diet. It seems that all of the thoughts about low fat diets are virtually marketing techniques to sell food and that the real way to lose weight and keep it off while getting way healthier was to eat just the opposite and a LOT.

So, I contacted PulseTech to order one of their Solargizers and stopped at a book store to get the Atkins book.

PulseTech's system works very much like the popular Sirius Charger we already use for our Ni-Cads. Both use this pulsing concept to keep the insides of the cells free of sulfation (lead acid cells) or dendrites (Ni-cads). Both produce virtually magical results.

While the PulseTech Solargizer is not a charger, it is used during charging with your automotive charger and when by itself; but it is best used in combination when your winch is in storage and on a 1 amp or so trickle charger. The PulseTech rep made it clear just how important it is to LA's to keep them on a 'float' charger while they are stored.

The Solargizer comes complete with a self-powering solar panel, and has a power jack in it so that a small wall plug-in type power supply can be used in cases where your batteries do not have access to light. Using it couldn't be simpler; just clip on the leads and leave it.

One of the really neat features is its ability to restore and old battery's effectiveness and, in fact, improves the input/output efficiency of a new battery. The Solargizer works with ALL lead acid batteries. Yep, that means gel cells, sealed, marine, and deep-cycle... All. If it says Lead Acid, it works. I tried it on every LE that I have and found that it did indeed restore full power to some very old gel cells that I was using to power a fast field charger. Slowly but surely the over all charged voltage was declining and their working capacity was to the point of tossing them. I had previously tried sparking them with really high current shots. Deep discharging and recharging... And some other equally dumb things were tried, in an effort to avoid having to buy new ones. I hadn't gotten around to tossing them, so they made the perfect test dummies.

I mentioned that it does its job with extremely low current, so if you were to touch its alligator clips together in the dark, chances are you won't see a spark. I want to repeat that **the Solargizer has nothing to do with charging**, but it will allow your batteries to receive a more complete charge from your charger.

What happens to our LA's is, from the day they are made, a natural chemical process causes a sort of 'plaque' or, as I stated before, "cholesterol" begins to collect on the surface of the battery's lead plates. This sulfation blocks the reaction between the lead plates and the acid in the cells. The pulsing of the Solargizer sort of keeps the system agitated.

One condition that exists in cells that have lost their power and that the Solargizer can not fix is damaged plates, as in dropped. A similar condition can exist in Ni-cads for instance, usually caused from over-heated cells. The Cadmium matrix cracks making it effectively into a 'smaller' cell.

A battery whose internals are not uniform is impossible to see when purchased, but become evident very quickly with age; these will never be as 'good' as one where everything is uniform. I mention this since I found that one of two 'identical' cells was stronger than the other, in one case, and never achieved the charged voltage of the other.

LEAD ACID BATTERY (WINCH) INFORMATION SITES OF INTEREST

"Try these web sites for more information about the batteries we use for our winches."

Optima Sprial-wound Batteries
http://www.interstatebatteryofdet.com/Optima2.html
http://www.optimabatteries.com/product/marine/body.htm

Technical Specs
http://www.acdelco.com/parts/1505.htm

Deep Cycle Battery FAQ
http://nyquist.ee.ualberta.ca/~schmaus/dcbat.html

Glossary
http://www.interstatebatteryofdet.com/glossary.html

Is this on the up an up? Well, PulseTech units are used in the military, by utility companies, hospitals, security systems and, well, wherever lead acid batteries are used in critical applications of long term dormancy.

The cost is under $100, they're available from your local battery supplier, and are usually 'in-stock' at Battery Plus stores. You can go to the PulseTech web site to view their FAQ (frequently asked questions) page and to see their other products, as well as view a listing of testimonials from various application users (www.Pulsetech.com). You can even call them at 1-800-580-7554.

What about my weight? Well I lost 50 lb. in about 90 days! If you saw me last year, you probably won't recognize me now. If you see a guy walk onto your flying site with sailplanes, and he looks a lot like James Bond, it's probably me.

Keeping the pulse on our hobby is a lot of fun for me, and I hope that through my 'travels' that it's fun and informative for you. But right now, I am in sailplane withdrawal so my next trip will be to with Alberto of Hobby Club and his beautiful glass fuse, built up with transparent blue covering, new, electric powered sailplane: the 100" Ellipsoid ARF. If you just can't wait to see it, take a trip of your own to www.HobbyClub.com. See you next trip!

■

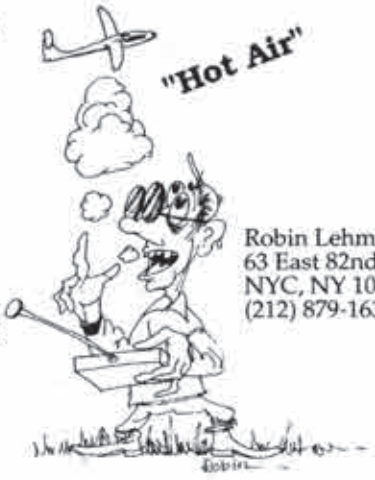
The whole town turned out for the 1999 Rödermark giant scale sailplane fly-in (in Germany) and no wonder: Almost a hundred scale sailplanes were flown. The weather was perfect and many flights lasted well over an hour. As it turned out, this was the largest sailplane get together in Germany of the year and it was magnificent. You could just about find any sailplane you wanted to see (from Foxes and Swifts to some unique scratch-built vintage masterpieces) and many you've never before seen! Seven scale towplanes shared duty getting these wonderful scale models aloft. It was beautiful! (See page 26 for another absolutely beautiful sailplane!!)

Awe and Wonder

My second visit to Germany really blew me away! This summer, Pete George and I visited the Rödermark fun fly Seglerschlepp (near Frankfurt). We then went on to visit the Wasserküppe and the Akro-Cup the weekend after (at Bad Neustadt two hours from Frankfurt). All I can say is that the second time around I'm left with awe and wonder!

Awe

During the two day Fun Fly Seglerschlepp event in Rödermark hosted by Flugmodellsportclub Rödermark and arranged by Frank Oeste and Jürgen Keck, we saw well over a hundred gliders. What was most impressive about these sailplanes, ranging in size from very small (1:12) on up to almost half sized, is that ALL were superbly built and finished.



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

This enormous 1:2.2 Minimoa is perhaps the nicest flying sailplane I've ever seen. It's an early bird, as you all know and consequently, the real thing flies very slowly and gracefully. The model, being relatively light (19 Kilos) and with a span of seven meters, it's a real floater. This masterpiece was built by Arnold Hofmann, five-time winner of the German Masters for Sailplanes. This is a slightly smaller replica of the real thing! You might see this model at Elmira 2000 or at the IVSM meet at Harris Hill next year.

Roughly 90% of them flew with completely finished cockpits and most of these had (Axel) pilots. Of the hundred or so sailplanes there, not a single one was of shoddy workmanship! Quite a few of these were what we would call "Museum Scale". These were really miniature replicas of the real thing (simulated welded steel framework, completely realistic cockpits, canopy latches, etc.). Many were really very beautiful works of art!

As you might expect, all the (R/C) pilots we saw flying there were excellent, and some were undoubtedly amongst the best in Germany!

Also of interest was the fact that all but one of the towplanes were scale. Sharing the towing duties throughout the two days were: three 1:3 Wilgas, one 1:4 Wilga, two 1:4 Swiss Trainers, one 1:3 Piper Pawnee, two 1:4 sized Pilatus Porters, and one non-scale Schlepper.

As if all this weren't enough, Mother Nature thoroughly cooperated and brought us two absolutely stunningly beautiful blue sky days, filled with gorgeous cream puff clouds! To top it off it was neither too hot nor too cold, and a very light breeze blew right down the runway all day long! I cannot imagine two more perfect days! It was WONDERFUL!

Wonder

After a trip to the Wasserküppe (more on that some other time), we drove to Bad Neustadt where the 1999 Akro-Cup was to be held.

The 1999-2000 Akro-Cup diagram (*RCSD* Aug. 1999) has been reproduced in *RCSD* a couple of times, and is somewhat familiar to many of you. Seeing the diagram is one thing. Understanding it is another; but flying it and watching the expert pilots perform it is quite a different matter!

What I personally missed in studying the Akro-Cup diagram is that all of the circles (loops, etc.) should be flown the same diameter; all of the figures need to be properly "placed" right in the middle, or on the right or on the left of the judges. In order to get a high score, you must not only fly each maneuver perfectly, but as well you need also to plan well ahead so you can "place" each maneuver exactly where it needs to be flown so that the next maneuver can be flown and "placed properly", as well. If you look at the aerobatic routine with this added knowledge, the information contained in few squiggled lines and circles becomes all the more important.

Some of the sailplane pilots wanted to start so high that the 1/3 Wilga pilots had a hard time seeing their huge towplanes! Most interesting of all (to me) was the fact the tow pilots themselves felt that most gliders were starting too high. I sat with the tow pilots and heard the discussions on this subject. These guys seemed to be leaning towards an altitude limit (of 2,000 feet or less).

Now back to the wonder – It was truly awe inspiring to watch the Akro-Cup pilots compete and put their various scale sailplanes through the paces! It was quite something to watch almost flawless stunt routines, almost flawless landings, in all types of good and poor visibility! The very best pilots seemed not to be bothered by conditions in any way shape or form!

Over the 3-day Akro-Cup event (from Friday through Sunday), 29 pilots had 3 flights each, and on a couple of occasions in very poor visibility! These eagle-eyed expert pilots were fazed by nothing, and competed head to head with a variety of aerobatic birds.

The sailplanes of choice were the Fox, Swift, and then a whole slew of other designs: the Lunak, Lo100, Mü28, Kobuz and Foka. Most of the aerobatic sailplanes were on the larger size: 1:3 up to the giant 1:2 Fox and the 1:2.2 very graceful and elegant Swift (there were two of these). The smallest were 1:5 sized aerobatic ships.

A humbling experience

I used to think that I could fly pretty well until Gerhard Bruckmann very kindly lent us his 1:3 sized Lunak to fly in the competition. While it's true that I hadn't flown this airplane much prior to the competition, we did have a couple of practice flights the day before and I had a heck of a time getting used to this excellent aerobatic sailplane! As it turned out I finished towards the bottom of the heap; Pete George did much better and finished more towards the middle. This experience gave me an even greater appreciation of just how good these pilots are. Pete and I are greatly indebted to Gerhard Bruckmann for the loan of his airplane, and for letting us have a first-hand taste of what it's like to compete in this marvelous event.

It's pretty obvious that if you are going to fly this very demanding aerobatic routine, you need to practice, *practice*, PRACTICE! You also need to practice with an aerobatic sailplane you're used to. That being said, the skill level of the top pilots was truly awesome!

Opportunity

Having made many new German friends over the summer, it became quite clear that there's plenty of scale sailplane flying every weekend all over Germany. Whether on a slope or being airtowed up, the pilots are out there flying just as much as they can. Somewhere in Germany on almost every weekend is a scale Fun fly or scale competition. Fun flies take place everywhere, and are attended by everyone in the vicinity. Many also travel to attend these events.

The Rödermark fun fly for example has become a well-known event for the larger and the best scale sailplanes in Germany, so guys come from all over the country as well as Switzerland and Austria to attend this fantastic meeting. Other events are smaller, but the point is, there are many opportunities to airtow large scale birds every weekend. Folks like Alex Frisch and others are there to airtow 3 or 4 weekends a month during the entire summer! Are they ever good at it! Plenty of practice makes perfection!

There's also plenty of opportunity for those interested in scale competition to get together four or five times a season as well.

All of this flying over the summer encourages a very high skill level in both piloting and model building! The results of this enthusiasm are stunning!

Proximity

Since Germany is much smaller than America (a bit larger than New England), one can easily drive from one end to the other in a day. What struck me in particular, on this last trip, was that so many highly skilled scale model builders and R/C pilots live within but a short distance of one another. There also seems to be many, many R/C flying fields scattered nearby. Driving 10 or 15 kilometers to get to the flying field seems to be the norm in this particular area (near Frankfurt at least). Each one of these many model airplane fields has a group of 3 or 4 sailplane pilots who fly on a regular basis. More importantly, many of these guys live so close to each other that they can easily get together and airtow each other. I don't mean to imply that all these guys fly aerobatics, but they all have the opportunity of getting together and flying on a regular basis whenever they want.

The good news is that more and more of us are getting together and airtowing on a regular basis. There also seems to be a growing interest in scale sailplanes and towplanes. The one goes hand in hand with the other, and if all goes well, in time we'll be able to travel all over the USA and meet like-minded folks who enjoy the thrills of airtowing large sailplanes. Won't that be fun!!!!! Good flying and happy landings to all of you!

New and Wonderful

Gerhard Bruckmann is planning to make a 1:2.25 giant Salto with a span of 6.10 meters (for aerobatics) and a 6.8 meter span (for soaring). This will be a most spectacular bird indeed! Anyone interested? ■

WING PROFILES FOR SCALE SAILPLANES

By Martin Simons
Stepney, South Australia

Where's the difficulty?

One of the problems for the builder of a scale sailplane is the choice of wing profile.

Yet in a way, there should be no problem. A strict scale model should be nothing less than an exact, though smaller, copy of the original, including the wing profiles. For many reasons we cannot usually imitate the internal structure perfectly, but we ought if possible to keep to the external forms and appearance. Finding out details of the prototype wing requires a little library work but is usually easy. The profiles on a full sized sailplane almost always change in some systematic way from wing root to tip, which complicates things. It is rarely sufficient to know the root airfoil only. This will almost always change to something else further out along the span and there will usually be some wing twist or 'washout' built in. With diligent research the model builder can find out all these details.

The designer of the aircraft had good reasons for choosing the profiles and for the model builder to change them might seem rather presumptuous. Do we always know better than the original designer?

Modern kit models

Even so, a quick survey shows that it is very unusual for a scale sailplane to have the wing profiles of the prototype. Of about thirty commercially available kits I have been able to check quickly (in recent advertisements or from personal knowledge), none have the wing profiles of the prototype. These kits are supposed to represent modern plastic sailplanes.

Sections used include Quabecks, Epplers, Girsbergers and the occasional Ritz. None of these profiles has ever been used on any full scale sailplane.[1] The reasons why these airfoils are chosen by the kit producers is not always clear. Why don't they use the same sections as the prototypes?

There is a widespread suspicion that full scale sailplane sections will not behave well at model sizes and airspeeds. Suspicion, or maybe even superstition, is probably the right word. It is possible, but not sure, that some of the profiles used on the full scale aircraft are utterly useless at model sizes and speeds. (More is said of this below.) Of course no one wants to put a lot of work into a big model which turns out to fly badly. When there is genuine doubt it is understandable that many will fall back on a wing section that is known to give a reasonably good result. If this entails a sacrifice of scale appearance, most seem prepared to put up with this.

The kit producers might be basing their choices of profiles on scientific data which is not available to the rest of us. Someone at Graupner or Multiplex or Bruckmann or PriBeck or Frisch or any of the other commercial producers might have done a whole lot of tests in wind tunnels or in actual flight. It may be that each kit is put into production only after it has been proved that the full scale airfoils do not work.

I am, however, very doubtful if this extensive testing has ever been done. If it has, let's hear about it! The approach probably used is the other way round. It is known that various profiles do work on models. These are chosen for the kits because a lot of money is being invested and failures are rightly feared. To prove that some full scale profiles do not work, would be expensive and difficult. I do not think it has been done.

The kit models fly well, they look something like the full scale aircraft, and that probably satisfies most of those who buy them. That people should buy is what chiefly concerns the company accountants. We don't have to leave the matter there, however.

Scale effect

The 'scale effect' in aerodynamics is well known. Small wings at low airspeeds never work as efficiently as larger ones moving fast. Expressed in terms of the famous Reynolds number, while full scale sailplane wings operate at Re numbers upwards of 400,000 to 4,000,000, the radio controlled scale model sailplane is usually in the 100,000 (wing tips at the stall) to 500,000 (wing roots in fast flight) range. This makes a difference in terms of the maximum attainable lift coefficient and the ratio of lift to drag at all airspeeds. If the prototypes have best glide ratios between twenty and sixty to one, scale models are likely to achieve only about half these figures. Again, we have no reliable measurements, so there is an element of uncertainty about this.

This, however, does not mean that the scale modeller should automatically change the profile. The specially designed model sections do not behave so very differently. Scale effects are apparent with all of them and there has been regrettably little progress in overcoming this despite a great deal of research in the last few decades. The results published from Princeton and the University of Illinois show that none of the popular sections designed for models perform very brilliantly below Re numbers of 100,000. We are up against a natural phenomenon here and, if it is any consolation, it is much worse for butterflies.

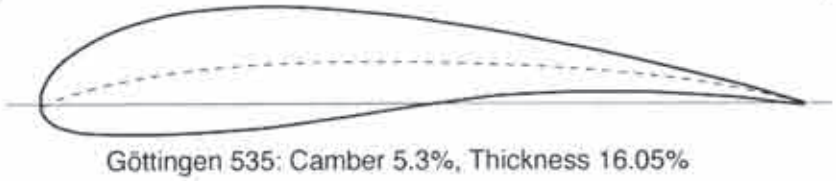
Thickness and camber are the most important features of any wing profile. The modeller should always consider these first. The main advantage gained by using some of the popular modern sections, Girsberger, Quabeck, SD, etc., is simply that they are thin and only slightly cambered. For certain competition purposes this is what is required but with scale sailplanes we are not expecting to win speed tasks or race around pylons. If that is what we want to do, let us build models specially for this kind of thing. But a scale model should be a scale model!

There is very little evidence in any case that the full scale sections so often rejected are always bad for models. In many cases, laying a tracing of one section over another, it becomes hard to see that some popular model profiles are any different from the equivalent full scale ones, providing the thickness and camber are about the same.

We should remember also the inevitable slight inaccuracies that creep in to our models when building. The modern computed sections will not work in the way they are intended, if they are not accurately built. The older profiles are less critical in this respect and may actually be superior even when their surfaces are slightly wavy with humps and hollows.

Old timers

With models of older types of sailplane which usually have to be built from scratch, use of the original wing profile is not uncommon. Two sets of plans I have

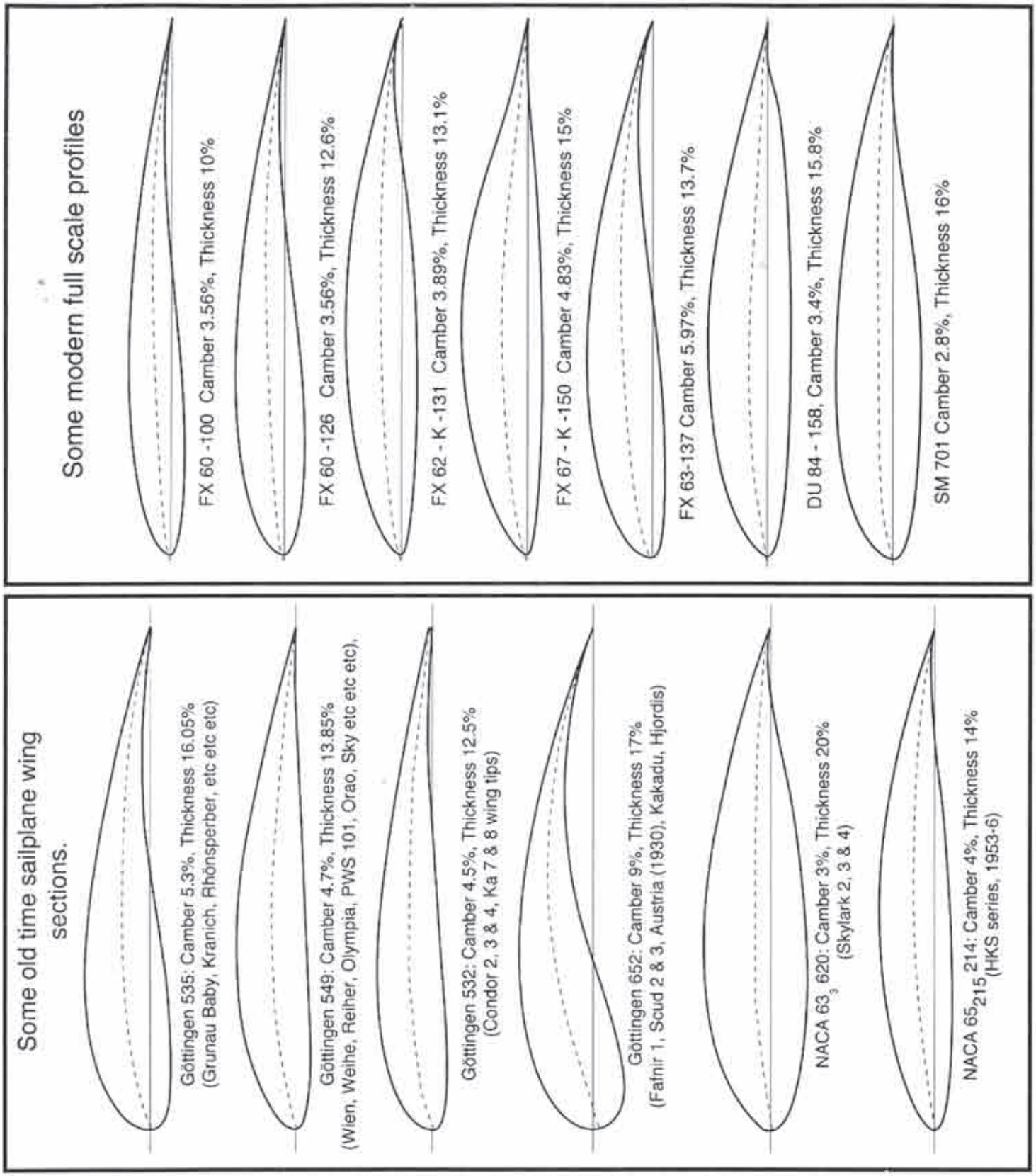


Göttingen 535: Camber 5.3%, Thickness 16.05%

HQ 3.5/12 Camber 3.5%, Thickness 12%

A radical change

The Slingsby T - 21 wing had the Göttingen 535 section over the inner panels. To change to the HQ 3.5/12 makes a very obvious difference to the scale appearance and to the character of flight.



myself published, the Kirby Kite and the PWS 101, and the Slingsby Prefect by Keith Humber, are correct and the same applies to George Buzuleac's Grunau 4 [2]. These are 'vintage' sailplanes with 'vintage' sections. I expect I have missed some others.

An example of the other kind of thing is the recently published scale plan by Chris Williams for the Slingsby T - 21 Sedbergh, the famous British 'side by side', open cockpit trainer. Chris used a Quabeck HQ 3.5/12 profile. This has 3.5% camber and is 12% thick. The model evidently flies very well and looks good generally, but the change is very obvious to anyone who has actually seen a T - 21. Part of the character is lost. Is the change justified? In this case there is some direct experience to guide us.

My friend Ian Moreland has a very fine model of the T - 21. He used the original Göttingen 535, tapering over the outer panels of the wing to a thin symmetrical tip with washout. It looks perfect. The G 535 is 5.3% cambered and 16% thick. Granted, Ian's model, with its light structure and vast wing area, flies slowly and does not do very well when trying to make headway

against a stiff breeze. If trimmed for more speed, it comes down rather quickly. But this is not entirely the fault of the wing profile.

The T - 21 itself was never a fast sailplane. It was a gentle, slow, training and passenger-carrying club two seater. With low wing loading, huge open cockpit, struts, exposed skid and wheel, and the G 535 wing, its best glide was claimed to be 21:1 which was probably a considerable over estimate. It was an excellent soarer in light winds and thermals. It floated dreamily around the sky. Ian's model looks and flies just like the full scale T - 21. If the wind blows too hard, put it away.

The point is, this ancient Göttingen 535 section does not do anything very terrible at model sizes and speeds. Models using it do not fall out of the sky, spin uncontrollably or refuse to take off at all. They just fly slowly. This is a slow flying section.

Full sized aircraft which used Gö 535, as well as the T - 21, include the Grunau Baby 1, 2 and 3 (not the Grunau 4), Rhönbussard, Rhönsperber and Sperber Junior, the Kranich 1 and 2, Bowlus Baby Albatross, Geoff Richardson's Australian Golden Eagle, the Hungarian M-22, British Scott Viking, and many, many others. In all cases, the sections changed outboard. The wing tips were much thinner and less cambered, with pronounced washout. Lightly built models of these with the true sections will not blaze round the sky with smoke trailing behind them, but as sailplanes they will fly quite nicely... and slowly.

Another profile that was widely employed on full scale sailplanes from about 1930 until the fifties, was the Göttingen 549. The fashion was set by the beautiful 'Wien' sailplane designed by Lippisch and flown with outstanding success by Robert Kronfeld about 1929 - 32. G 549 was used over the next twenty years by famous designers such as Hans Jacobs for his Weihe, Reiher, Olympia and Kranich 3, by Bowlus for the Super Albatross, Slingsby for the Gull 4 and its larger development, the Sky, the Russian designer Groshev for the GN-7, by Schneider for the Grunau 4, and so on.

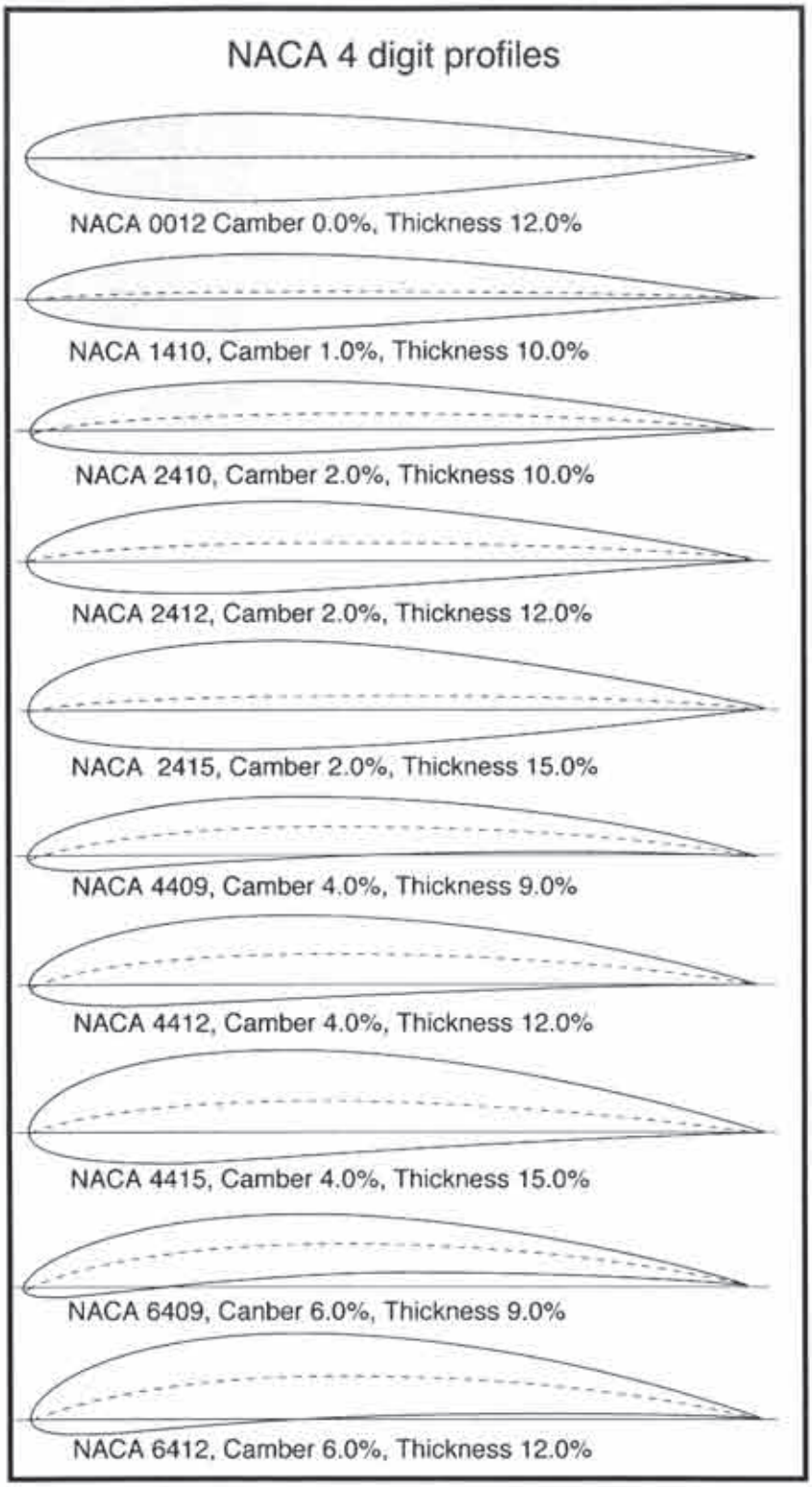
Wind tunnel studies in Germany, at the time when the Reiher was being designed, showed it was a very good section but it has never been tested, so far as I know, in a modern low turbulence, low speed wind tunnel. Practical experience shows that it is at least as good for models as other sections of similar thickness and camber. The 549 has 4.7% camber, a little less than the 535, and it is thinner, 13.8%. Thickness, or rather, thinness, has much to do with this whole matter.

My own quarter scale PWS 101, still flying after nearly ten years, uses this section. The model does not lack performance. My Helios also uses this section, to scale, over the inner third of the wing, tapering in thickness thereafter, as with the original aircraft. Noel Roediger's Orao is another example. There is nothing wrong with the way these behave in flight. Why change the sections?

The Göttingen 532 is thinner and less cambered again, and it is used on my correct scale model Condor 3. (Full scale, it appears also at the tips of the full scale Ka 7 and Ka 8.)

Unless the old time prototype has something very extraordinary in the way of a wing profile there is no real reason to believe that the original sections will be unsatisfactory for a large and reasonably heavy model.

I would class the very thick, strongly cambered Göttingen 652 as extraordinary. It was used on such types as the Fafnir 1, The British Scud 1 & 2, Hjordis and the Kupper Ku 4 Kakadu. Despite its extreme shape it was used on light, free-flight models many years ago, an example being Ron Warring's 82 inch span 'Zeus', plans of which were published in 1942. The 'Zeus', with an aspect ratio over 21, very high for those days, did fly



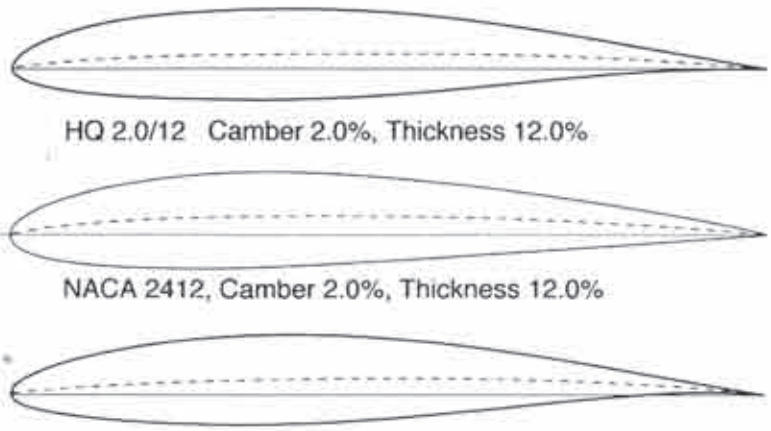
even with a light wing loading, but it was not a successful contest sailplane. I would like to see some tests of this profile in a modern low speed wind tunnel, if only to convince myself that it would not do particularly well.

The full sized sailplanes using these old profiles were slow by modern standards. If required to fly fast the glide angle suffered a good deal. They lacked what we call 'penetration'. Models of them will be the same. That is part of the scale idea: the model should behave in the air like the full scale aircraft. If you want a fast model, choose a fast prototype.

Modern sailplanes

Coming to modern sailplanes and sections, we hesitate again but the hesitation is based on ignorance rather than reliable knowledge.

In full scale sailplane design the trend to 'laminar flow' profiles began in the early



HQ 2.0/12 Camber 2.0%, Thickness 12.0%

NACA 2412, Camber 2.0%, Thickness 12.0%

NACA 63-412 Camber 2.2%, Thickness 12.0%

A revealing comparison

The Quabeck HQ 2.0/12 is a section specially designed for use on models.

NACA 2412 and 63 - 412 are full scale profiles dating back to 1930 and 1939 respectively.

Below, computer plots of these have been superimposed. Is your workshop technique good enough to differentiate?

Do you suppose that if you use one or other of the full scale profiles, your model will fall out of the sky?

Will you be able to detect any difference in performance?

NACA 2412 (broken line) superimposed on HQ 2.0/12

NACA 63 - 412 (broken line) superimposed on HQ 2.0/12

NACA 63 - 412 (broken line) superimposed on NACA 2412

nineteen fifties. Early 'laminar' wooden sailplanes such as the Slingsby Skylark series used wing root profiles that were 20% thick, 18% in the case of the Ka 6. The great thickness of these wings is the reason I tend to worry about them for models, but the worry is that I do not know how they would behave, if we copied them faithfully.

No one, as far as I can discover, has ever tested a NACA 63 3 620 Skylark profile in a model-sized wind tunnel. I would like to know what happens. I do not know of anyone who has built a true scale Skylark wing and flown it. Is anyone in a position to tell us about it?

Till we have such reports, we are guessing. It is true that at Re numbers below 150,000, very thick profiles often exhibit serious flow separation. But except perhaps at the extreme wing tips of a large scale radio controlled sailplane (where the prototype wings are usually thinner anyway), we do not usually operate at these low numbers. If we are building to 'peanut' sizes we have many other problems, but for radio controlled sailplanes of one fifth scale and larger, this particular difficulty does not seem to arise.

In any case, when we come to plastic sailplanes and even some of the later wooden ones, it is very probable that the full scale section would behave perfectly well on a large model.

The wing will still be subject to scale effects. We shall not get a glide ratio of 60:1 from an exact scale ASW 22 or Nimbus 4. But that is not the fault of the wing section, it is because we shall be operating at generally lower Reynolds numbers than the full sized aircraft and any profile at all will be less efficient.

Why would you not build a model of the impressive V tailed HKS 1 sailplane, with its proper NACA 65 215 214 section? This was a world record breaking aircraft of 1954 origin. The section is cambered 4% and is only 14% thick. Lots of models have flown happily with sections of this thickness. I guess (again) the profile would work very well on a model with a suitably high wing loading.

I have some reservations about the Wortmann FX 67 series, which were used on such types as the Glasflügel Kestrel, Nimbus 2 and Slingsby Vega. These sections, running from 17% thick down to 15%, were designed for a long extension of the laminar boundary layer and specific use with camber flaps. The contours of the upper surfaces suggest there might, on a faithful scale model, be some flow separation at low speeds. I do not know this, I only suspect it might be so. I doubt if anyone has ever tried them on a model. (Please let me know if someone has!).

More recently, such types as the SB 9 & 10, ASW 12, ASW 15, ASW 17, ASW 19, ASW 20, ASW 24, Discus, etc., have used thinner profiles, often between 13 and 14%, and there is no reason to think that these will not be satisfactory for models. (See footnote 1 about the HQ sections of the ASW 22 & ASH 25.) No one would want to build models of these sailplanes as light weights with balsa ribs and tissue paper covering, but with modern techniques and wing loadings around the 4 to 5 kg per square metre (13 to 16 ounces per square foot) or more, they should be satisfactory, as far as anyone knows. Such wing loadings are perfectly acceptable for large models, indeed I have seen model sailplanes with higher wing loadings flying very well and soaring easily in light lift.

A popular profile for wing tips on full scale aircraft was the Wortmann FX 60 - 126, 12.6% thick, and this has been used with success on models. Even more popular has been the FX 60 - 100, which is the 126 thinned down to 10%.

I myself once built a large model sailplane with the man-powered aircraft profile, FX 65-3-137 (13.7% thick, 6% camber). It flew well, but, with so much camber, quite slowly. What else was to be expected? The point is that some full scale Wortmann sections do quite well on model sailplanes and most of the others will probably be the same.

More recently still, sections have appeared, mostly from Delft University, which are intended for use with turbulators under the trailing edges, or tiny pneumatic blow holes along the flap hinge lines (ASW 27, Ventus 2, etc.). I suspect we would not gain anything by trying to imitate the turbulators in these locations. The separation bubbles on our wings will certainly be in different places. But the basic sections themselves do not look especially difficult for us.

Compromises

At the end of all this, if you still feel you must change the section, there are various tricks and dodges that will minimize the visual effects.

It is at the wing root, adjoining the fuselage, where any alteration to the section will be most obvious. It is standard practice with full scale sailplanes, as already mentioned, to taper the wing section progressively from the root, where a certain thickness is needed for heavy spars, to thinner profiles outboard. More often than not, the tip section is totally different. The change may begin about half way along the semi span, or at the aileron root, extending from there progressively outwards. It would, therefore, be very reasonable to retain the exact section at the root but to start tapering it immediately to a thinner profile. Probably no one will notice.

Alternatively, if the prototype has a thick wing the section may be thinned down everywhere while retaining as far as possible the same general character. George Buzuleac, for his ES 60 Boomerang[3], did not trust the 18.4% thick original root profile so used a thinner section from the same Wortmann family. It takes someone with calipers to detect the difference. If this is done, probably the scale percentage camber should be preserved, only the thickness might need to be reduced. Most computer plotting programs allow sections to be modified in thickness while retaining the camber.

Still chicken?

If none of the above is sufficiently convincing, the scale modeller may still feel it necessary to make a radical change of wing section. In this case, what's wrong with the Clark Y? This, first published in 1922, when tested in the wind tunnels at Stuttgart and Princeton, showed up very well against the best of the newly designed model profiles, given roughly comparable thickness and camber. As the Princeton researchers stated ten years ago, Clark Y is the most popular section ever for both full-scale and model aircraft. With only 11.72% thickness and 3.55% camber, it remains hard to surpass for model sailplanes. Probably the most important thing in its favour is that it is quite thin. No one will use it for an F3B model or pylon racer, but that is another subject entirely.

If the Clark Y won't do then why not use one of the NACA 4 digit sections which were all, in a sense, based on the Clark Y but with varying thicknesses and camber (like the 2412). These are conservative (not to say stodgy) old sections. They are not fashionable but they are safe. We know they work quite well at model sizes.

The 4 digit sections were used on some full scale sailplanes - the Slingsby Gulls 1, 2 and 3 (not the 4, see above), the Schweizer TG - 2 and TG - 3, the Italian Pelicano, the American LK 10, and the astonishing, high aspect ratio Darmstadt D - 30 which, in 1937 had the best glide ratio of any sailplane, 37.6:1. The wing tips of the D - 30 had a chord of 240 mm (9.5 inches), less than many model wings and not flown much faster. The NACA sections worked well on the D - 30. Why not on a model?

Perhaps what we should do is to build a few test wings with full scale profiles, fit them to a standard fuselage, ballast them to a reasonable wing loading, fly them and see what happens.

Volunteers, anyone?

[1] Note that there are two entirely differentsets of HQ profiles. The Brunswick Akaflieg students, Horstmann and Quast, designed a series of HQ profiles for full scale. They were used for some modern full sized sailplanes, such as the ASW 22 & ASH 25. There is no resemblance between these and the Helmut Quabeck HQ sections for models.

[2] Plans for my two models and the Prefect are available from English magazines. The Grunau 4 comes from the Australian magazine, *Airflow*.

[3] Plans available from *'Airborne'* magazine as above.

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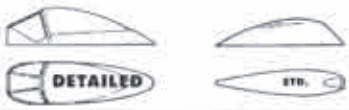

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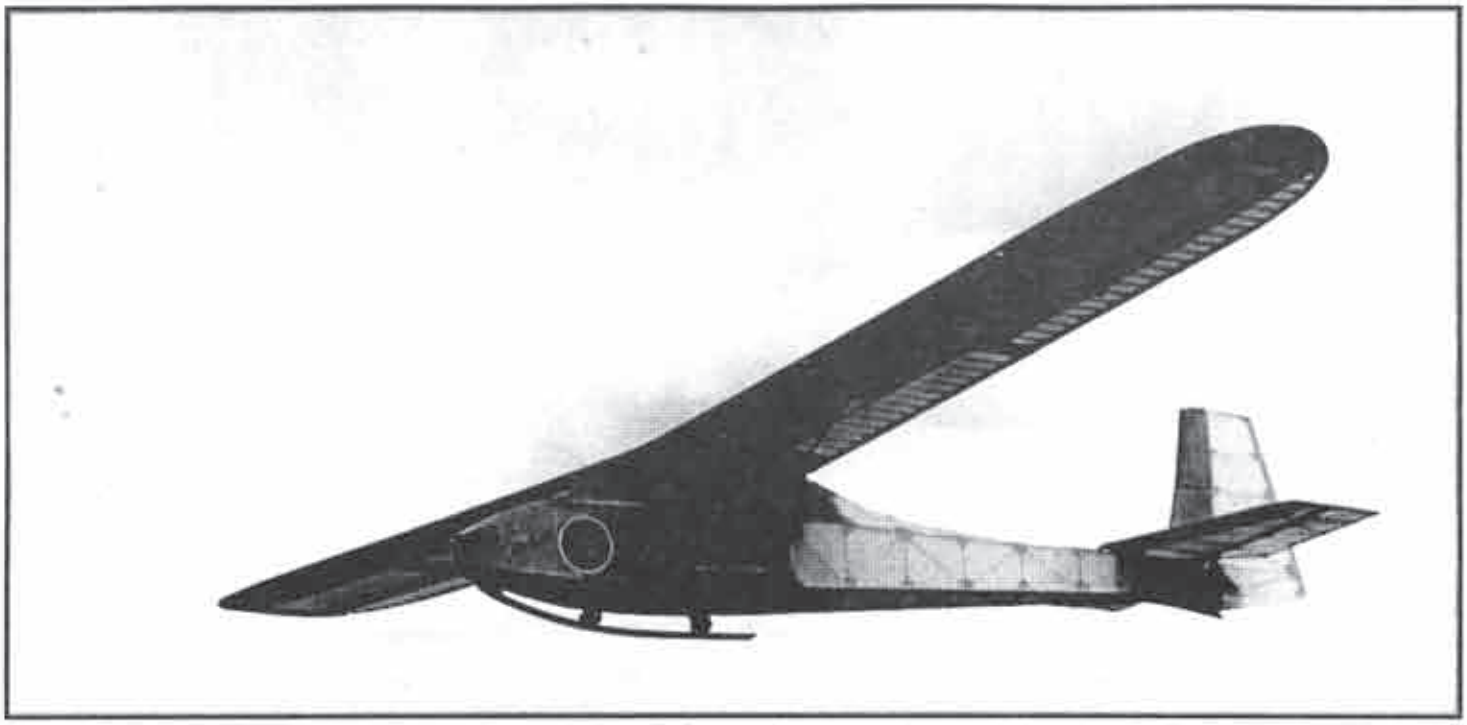
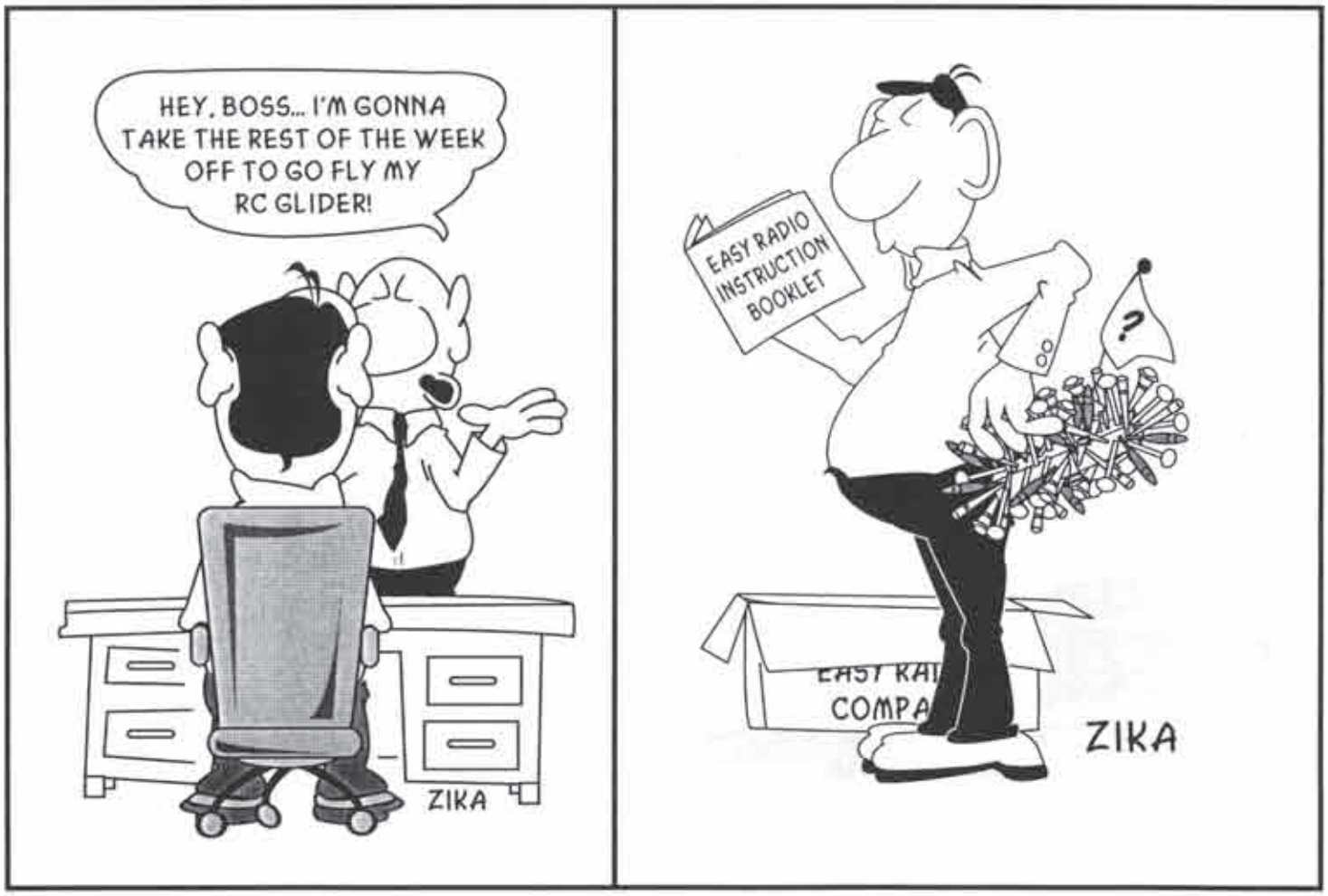


Of particular note at the 1999 Rödermark fly-in in Germany was Jurgen Alex's 1:4.5 Malhufio. This model weighs in at 14 kilos and is a real floater! With the sun shining through the fabric on the wings, the ribbing can plainly be seen, which makes it a wonderful looking bird in a deep blue sky with sun! It's a duplicate of the real thing; Jurgen has the unique distinction of having built and flown the original in 1922, so he really knows how the scale model should look!

Photography by Robin Lehman.



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Kansas - Kansas Soaring Society, Pat McCleave (Contact), 11621 Nantucket, Wichita, KS 67212; (316) 721-5647.

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Louisiana - Capitol of Louisiana Soaring Society (CLASS), Leonard Guthrie (contact), 12464 Fair Hope Way, Baton Rouge, LA 70816, (225) 275-2122, flynguts@aol.com.

Maine - DownEast Soaring Club (New England area), <Jamesiii@blazenetme.net>.

Maryland - Baltimore Area Soaring Society, Erich Schlitzkus (President), 52 North Main St., Stewartstown, PA 17363; (717) 993-3950.

Maryland & Northern Virginia - Capital Area Soaring Association (MD, DC, & Northern VA), Chris Bovais, 12504 Circle Drive, Rockville, MD 20850; (703) 643-5513.

Massachusetts - Charles River Radio Controllers, Dick Williamson (past president), 21 Pendleton Road, Sudbury, MA 01776; (781) 981-7857 (W), <williamson@ll.mit.edu>, <http://www.charlesriverrc.org>.

Michigan - Greater Detroit Soaring & Hiking Society, Greg Nilsen (Sec.), 260 Rosario Ln., White Lake, MI 48386-3464; (248) 698-9714, GNilsen624@aol.com.

Michigan - Great Lakes 1.5m R/C Soaring League & "Wings" Flight Achievement Program & Instruction. Ray Hayes, 58030 Cyrenus Lane, Washington, MI 48094; (810) 781-7018.

Minnesota - Minnesota R/C Soaring Society, Tom Rent (Contact), 17540 Kodiak Ave., Lakeville, MN 55044; (612) 435-2792.

Missouri - Independence Soaring Club (Kansas City area, Western Missouri), Edwin Ley (Contact), 12904 E 36 Terrace, Independence, MO 64055, (816) 833-1553, eve.

Missouri - Mississippi Valley Soaring Assoc. (St. Louis area), Peter George, 2127 Arsenal St., St. Louis, MO 63118; (314) 664-6613. Mark Nankivil, nankmc@quixnet.net, (314) 781-9175.

Nebraska - B.F.P.L. Slopers, Steve Loudon (contact), RR2 Box 149 E1, Lexington, NE 68850, (308) 324-3451/5139.

Nebraska - Lincoln Area Soaring Society (Wilson Slope Races), Jim Baker, 920 Eldon Dr., Lincoln, NE 68510, (402) 483-7596, jcbaker@inebraska.com, <http://www.geocities.com/CapeCanaveral/Hangar/1671/lass-2.html>.

Nebraska - SWIFT, Christopher Knowles (Contact), 12821 Jackson St., Omaha, NE 68154-2934, (402) 330-5335.

Nebraska - Ken Bergstrom, R.R. #1, Box 69 B, Merna, NE 68856; (308) 643-2524, <abergst@neb-sandhills.net>.

Nevada - Las Vegas Soaring Club, Ray Dinoble, 10812 Hollow Creek Lane, Las Vegas, NV 89144, (702) 254-7911, <dinobler@juno.com>>.

Nevada - Sierra Silent Soarers (Reno/Sparks/Carson City/Minden area), Chris Adams, (775) 345-1660, chris@scrollsander.com, <http://www.scrollsander.com/SierraSilentSoarers.htm>.

New Jersey - Vintage Sailplane R/C Association, Richard G. Tanis (President/Founder), 391 Central Ave., Hawthorne, NJ 07506; (201) 427-4773.

New Mexico - Albuquerque Soaring Association (all soaring & electrics), Jim Simpson (contact), 604 San Juan de Rio, Rio Rancho, NM 87124; (505) 891-1336, <jimbonee@aol.com>, <http://www.abqsoaring.com>.

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Texas - aerotowing, Dallas area, Andrew Jamieson, 9426 Hillview, Dallas, TX 75231, (214) 349-9346, e-mail ajsleep@aol.com. Larry Sengbush, (972) 291-4840.

Utah - Intermountain Silent Flyers, Tom Hoopes, (801) 571-3702 (eve). "Come Fly With Us!"

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Virginia - Appalachian Soaring Association, Virginia's Southwest (Bristol area), Greg Finney, 106 Oakcrest Circle #5, Bristol, VA 24201; (540) 645-5772, e-mail <gfinney@naxs.com>.

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

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

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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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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

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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 desiminate 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).

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Vintage Sailplane Association
13312 Scotsmore Way
Herndon, VA 22071 USA

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

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

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

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

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The Condor is designed by Mark Allen, who is considered one of the best model sailplane designers in the United States, if not the world. Mark has taken all of his previous experience in competition thermal duration flying, plus all the knowledge he has gained from his earlier contest and sport designs, to design the Condor. Mark Allen's previous planes, to name only a few, are: Falcon 880 and 800, Falcon 600, Swift, Thermal Eagle, Vulcan, Night Hawk, Sky Hawk, Electric Hawk, Falcon 550E, Rocket, Pocket Rocket and, of course, the molded, world championship F3B Eagle. By taking the best of these designs and the new construction techniques available today, Mark has come up with, what we feel, is the absolute best open-class sailplane available.

The wings are made in America by Ron Vann, owner of Spectrum Enterprises. Ron is also an avid competition flier, and is considered to be one of the best wing manufacturers in the industry. Taking his years of experience in manufacturing wings, Ron has produced wings and stabs for the Condor that we feel are world class. Starting with the spar that Mark Allen designed, Ron uses only the best and most accurately cut foam cores available. He then uses hand-picked obechi from Kennedy Composites, which is applied with West Systems epoxy.

CONDOR

Tomorrow's Sailplane, Technology Today

This is after he has first reinforced the wing with carbon fiber and fiberglass. The servo wells are routed out, as are the flaps and ailerons. What this means for the sailplane enthusiast is a minimum amount of work before getting the sailplane into the air. The wing is light but strong enough to take "pedal to the metal" launches. Also available as an option is Ron's unique internal capped hingeline. This means even less work for the modeler.

The fuselage is made by Steve Hug, owner of the Fuse Works. Steve is another master at what he does. Fuse Works makes what we consider to be the best fuselage in the business. Steve uses only the best fiberglass and Kevlar™ available. All fuselages are manufactured using the West Systems epoxy. Steve's fuselages have the least amount of pinholes, if any, that we have seen. In fact, the fuselage is so pretty that many people do not paint it. The fuselage is extremely light, and yet strong enough for very aggressive flying and landing. For those with very little building time, and those who don't like to paint, there is an optional pre-painted, in the mold, fuselage which includes a unique carbon fiber canopy.

All kitting is done at Slegers International's new and larger manufacturing facilities. We have spared no time or expense with supplying the modeler with the best materials available. The kit contains pre-sheeted wings and stabs by Ron Vann, fiberglass and Kevlar™ reinforced fuselage by Steve Hug, 3/8" diameter titanium wing rod from Kennedy Composites, optional 3/8" diameter steel wing rod by Squires Model Products, control horns and tow hook by Ziegelmeyer Enterprises, pushrods by Sullivan, or optional one piece steel rods. All wood is custom cut. Specially cut basswood of 60" is supplied to eliminate splices in leading edge, flaps and aileron capping. All balsa is hand picked, light to medium, to ensure light weight wing tips, stab tips, and rudder. Aircraft ply is used for the pre-fit servo tray and towhook block. A comprehensive instruction manual is included.

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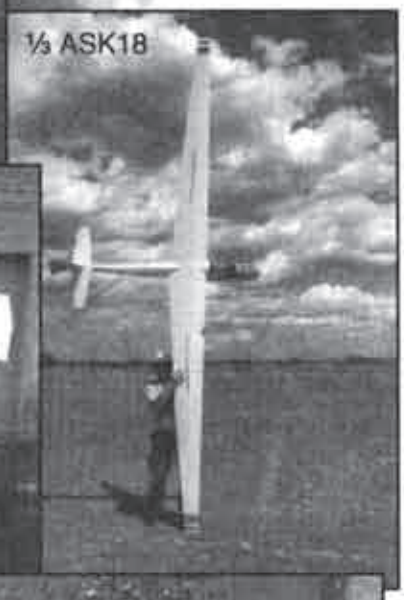

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