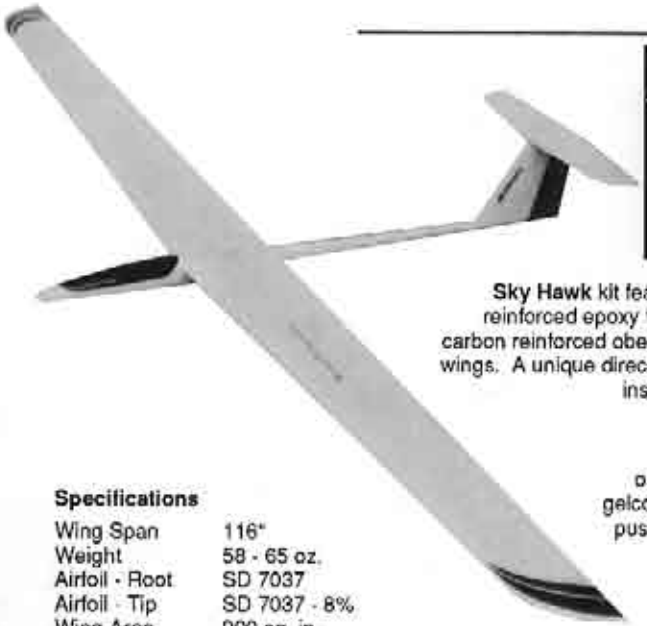

Introducing a new blend of technology in one neat package!

Sky Hawk kit features a kevlar - carbon reinforced epoxy fiberglass fuselage with carbon reinforced obechi - foam, pre-sheeted wings. A unique direct drive elevator servo is installed in the vertical fin.

Also available is an optional high gloss white gelcoat fuselage and rudder pushrod tube pre-installed.

Specifications

Wing Span	116"
Weight	58 - 65 oz.
Airfoil - Root	SD 7037
Airfoil - Tip	SD 7037 - 8%
Wing Area	900 sq. in.
Wing Loading	9.5 - 10.5 oz./sq. ft.
Aspect Ratio	15:1

Sky Hawk Attributes

- ✓ High aspect ratio wing
- ✓ "Swift" wing tip technology
- ✓ Thin airfoils at the wing tip
- ✓ Large control surfaces
- ✓ Large tail surfaces
- ✓ Long tail moment
- ✓ Exceptional performance
- ✓ Sleek lines and good looks
- ✓ Easy to handle
- ✓ Lots of room for radio gear

SKY HAWK

"I listened to what the sailplane community wanted in a sailplane, analyzed what I felt were the best of all the technologies available today, and merged them into a single package. I simply call it, Sky Hawk."

... Mark Allen, designer of the Falcon and Eagle series of sailplanes

Sky Hawk is packaged by Slegers International and flown by Brian Agnew.

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R/C Soaring DIGEST

August, 1994
Vol. 11, No. 8

U.S.A. $2.50

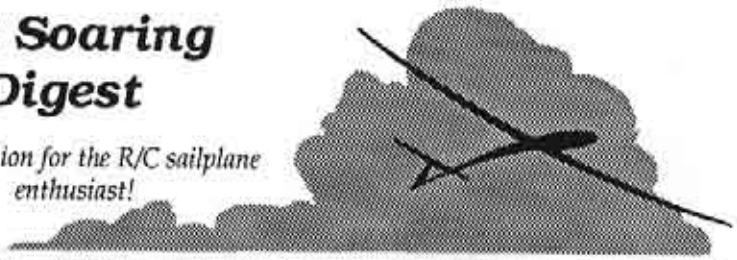
SKY HAWK

Mark Allen (not in photo) is putting his SKY HAWK through its paces for Wayne Tallant of Tallant Productions in Northern California.

Photo by Nick Sklavos.
See "About the Cover" on page 1.

R/C Soaring Digest

A publication for the R/C sailplane enthusiast!



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The Soaring Site

About the Cover

Wayne Tallant of Tallant Productions in Sebastopol, California, is shown video taping Mark Allen's new plane, Sky Hawk. Mark Allen is the pilot, and the photo was taken in the Rohnert Park area in Northern California by Nick Sklavos, an engineer at Tallant Productions. Wayne says that he plans to produce a series of video tapes dealing with the many aspects of R/C soaring. His press release is included in the "New Products" section of this issue and his first video, "The 1994 ISR", is available, now. While we have not yet seen Wayne's work, we look forward to seeing it because of the memories it should stir, having lived in Rohnert Park and Santa Rosa, and having visited such places as Davenport, where the International Slope Race video was filmed. Thanks for sharing the photo, Wayne!

LSF NATS

LSF President, Mike Stump, says, "Things are progressing with the LSF NATS very well with 112 entries as of June 22. We look forward to another great week. The USF3B team selection finals will be hosted by the Weak Signals of Toledo over Labor Day weekend. Myself and Jack VanHee of the Weak Signals are the Contest Directors."

A Question from New York

Anthony Mondesire of Bronx, New York would like to hear from others regarding their thoughts on "flat tips" vs. "turned up tips". He asks, "What are the pros and cons?"

A Beginner's Guide

Our Martin Simons has written another new book called "Gliding with Radio Control". It is a beginner's guide to building and flying model sailplanes. The book was written to help a complete beginner avoid frustrating errors. Mar-

tin has packed into 110 pages the answers to many of the questions asked by beginners and experts alike.

The book is divided into 18 chapters and includes four appendices: a check list, sailplane publications, sailplane magazines, and a glossary. Martin explains such things as how to get help, and the costs of purchasing radio equipment and the first glider. His well illustrated diagrams clearly show different launching techniques, the glider structure and layout, and how to build the model. There is detailed instruction on how to fit the radio into the model and how to balance it. There are also in-depth explanations on learning to fly and land which includes exercises for the beginner.

Is there much on theory or numbers? No. There is very little theory, and the material is indeed new and original and has not appeared anywhere else, before. The book is published by and available from B^2 Streamlines, P.O. Box 976, Olalla, WA 98359. The cost is US$18.00 which includes packaging and postage in the United States. For airmail to Europe, please add US$10.00; for Asia and Pacific Rim please add US$15.00.

Bill and Bunny Kuhlman, B^2 (2 means squared), have been sharing their findings, experiences and ideas, through the pages of *RCSD*, with all of us for a long time, having started in 1988. They both work full time and, as you know, write the monthly column on tailless aircraft, "On the 'Wing", which is well researched and well thought out; they also build, fly, and experiment with tailless craft, and answer correspondence from other modelers. Yet, they still find the time to do all the work involved with publishing, coordinating, and/or writing specialty books for a very select group of modelers, meaning us. We know it is not an easy task, and want to take a moment to say, "Thanks, B^2."

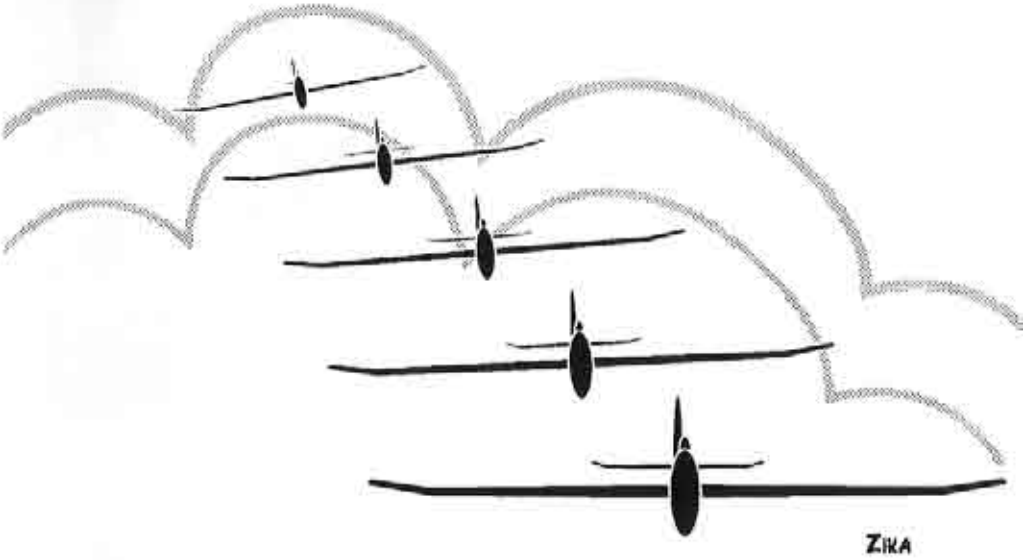
Who's missing this month?

If you sent in some material recently and it was not on computer disk, it may be a while before it can be typed and included, as an allergy is raising havoc with the eyes. As the old saying goes, "Never dull!" And, indeed, there is always something going on with *RCSD*.

With this issue, the column, "Ridge Writer", is going to take a rest. Mike Bamberg is extremely busy with his flight instructor work and won't be able to continue to write the column every other month. Wil Byers will be taking a well deserved rest; and Marc Dufresne has found himself extremely busy with his work over in France. We appreciate the writings each have shared through the pages of *RCSD*. Thanks, guys! (Gordon Jones' column is not included in this issue as he is on vacation this month.)

Contemplating Changes

What is *RCSD*? Some folks say it is a book, others a newsletter; we are also often referred to as a magazine. The reason we simply say it is a publication is because a magazine has second class status and is usually a full-size glossy/color publication, while a true newsletter, in the strictest sense, has no advertising.



We have been contemplating making some changes, particularly as it relates to advertising and new products. We are interested in, and want, your input. If you feel strongly about anything in *RCSD*, one way or another, please take the time to jot down your thoughts and send them in to us. We want to know what you like and dislike.

One example, that at least some of you don't like, is the subscription cost of *RCSD*, and it was suggested recently that we get rid of the gloss paper. The gloss paper is not that expensive compared with the total cost to print *RCSD* each month. And one really good reason to keep it is that it slides into envelopes much easier than most papers. This means we get fewer paper cuts and require less bandages every month. So, there is less time and pain involved in stuffing envelopes. If we do change the printing process, we may contemplate going back to non-coated paper, however.

Because of the offset printing process we currently use, every month a few of you call to let us know that you have received a badly bound copy where there are too many pages, not enough pages, or blank pages, which are usually in multiples of 16. We apologize and, yes, we do indeed try to catch badly bound copies, but they are very difficult sometimes to detect. The copies are bound by the printer much like paper dolls are cut. If you get a bad copy, please don't hesitate to let us know.

We are on a waiting list for a new Apple printer, as the "engine" appears to have died in the old one. (We have borrowed Gordon's for awhile. Thanks, Gordon!) With the new one, we expect the quality of the print should improve and plan to see what we can do with such things as changing some of the photos to graphic images. So, if you begin to see some changes that you like or don't like, once again, please let us know.

Happy Flying!
Jerry & Judy Slates

Bob Sowder (L) presents 1994 Mid-South Grand Champion, Rich Tiltman, with award and tee shirt from Zoomit Creations.

Dave Campbell from Memphis flew in 25 + mph winds on Sunday to take 1st place in Sportsman class. Dave was one of the contest workers who really helped out on the flight line.

From one C.D. to another, Sunday's contest director, Ron Swinehart, presents C.D., Mike Kelly, with 5th place plaque for Sunday's contest.

Ever present, and always fun, score keeper, Dana Kelly (L), looks over the final results.

California Takes Mid-South Championship for Second Year!

...Reported by Bob Sowder, Mike Kelly, Tom Ernst, Mark Thomas.

June 23 through June 26 marked the running of the 3rd Annual Mid-South Soaring Championships and several "firsts" for what has now become a "mature" event. The contest was expanded this year from 2 days in previous years, to 4 days. This was done to accommodate the addition of Cross Country and Hand-Launch Glider.

What really sets this event apart is the *RCSD* Exhibition & Trade Show tent put on by Jerry and Judy Slates. Jerry always brings a wealth of knowledge, new products, and product information from sailplane related businesses from across the country. For the third consecutive year, Jerry and Judy assembled a fantastic display of products and brochures on 10 large tables under the 20' X 20' *RCSD* tent.

Another first for the MSSC this year was "Modeler's Mall." Table space was reserved for other sailplane related businesses or organizations to promote their

Mark Levoe (R), manufacturer of the Super-V, accepts first place from C.D., Ron Swinehart, for Sunday's Thermal Duration Event.

RnR's Rich Tiltman wins 3rd place Thermal Duration on Sunday.

Over 80 people gathered Saturday evening to feast on some famous Memphis BBQ.

X-COUNTRY!

Pat Flinn (center) and his first place winning Cross Country team. Event Director, Tom Ernst, pictured at the right.

products and services. Representation at Modeler's Mall included Tim Renauld from Airtronics, Bob Sealy Fiberglass, Chuck Anderson Airfoils, and Holmes Model Aviation. LSF President, Mike Stump set up a display tent promoting, what else - LSF. RnR Products was there with a complete line of their sailplanes which included an all new molded 2-Meter Evolution. David Layne displayed several of his Saturn line of sailplanes, and Tom Jones of Zoomit Creations had a beautiful variety of Tee shirts including the extremely poplar 1994 Mid-South Championships Tee shirt.

(R - L) Cross Country Event Director, Tom Ernst, awards 2nd place Cross Country team of Lars Erricson, Rich Spicer, and Ron Swinehart.

The contest began on Thursday with two back-to-back days of cross country flying. Event Director, Tom Ernst picks up the story:

"The Mid-South Soaring Championships first venture into Cross Country was greeted with 12 pre-registered entries. Eleven of the entries, their 3 to 4 team members, and numerous spectators assembled at our X-C site in Walls, MS on the morning of Thursday, June 23rd. In most cross country events this is considered an excellent turnout, especially for a first year venture. While numerous attempts over several hours were made to enter and fly the course, these attempts were hampered by "iffy" lift conditions and winds up to 15 mph.

After several attempts, Pat Flinn of Michigan, was able to cover 9.2 miles of the 25.5 mile course. All but one team entered the course, but none equalled the distance of Pat and his team.

On Friday, approximately half of the participants returned for cross country. The remaining teams and crew members elected to compete in Hand Launch Glider at our main soaring site in Brunswick, TN. Again on Friday, wind and poor lift plagued the teams. Rich Spicer and the RnR team did manage to cover 9 miles of the course and logged the second longest flight of the two day event.

HAND-LAUNCH!

Mark Thomas (L) awards plaque to 2nd place HLG winner, Mark Hoffman from Texas.

HLG winner, Alan Schwerin (L), received congrats from Event Director, Mark Thomas.

Ole CORNFED, Fred Rettig, is motion in grace launching his HLG at MSSC.

Junior class HLG winners Chuck Thomas is pictured with his dad, Mark, on left. Chuck won first place. 2nd place winner was Michael Wilson from Kentucky.

Let me thank Rob Glover and Ron Swinehart of Huntsville, Alabama, and Pat Flinn for the use of their launch equipment and overall help. I must commend Clak Emery for his contributions on Thursday, and I applaud Phil Cosby for spending two long days with few creature comforts to help run the contest.

I am interested in repeating this event when the MSSC returns to Memphis in 1996. During this time, we plan to survey additional roads that hopefully will provide somewhat better lift opportunities. My thanks to everyone

THERMAL DURATION!

First place Expert for Saturday's Thermal Duration was Fred Weaver. California took 3 of the top 4 slots in Expert Class on Saturday.

who came out to fly, crew, and be a part of the Mid-South Soaring Championships Cross Country Contest."

Friday was an extremely busy and exciting day as cross country continued in Walls, MS, and 24 hand-launch contestants were competing in somewhat breezy conditions at the MASS soaring site in Brunswick, TN. Event Director, Mark Thomas gives us the rundown on hand-launch:

"The Third Annual Mid-South Soaring Championships had for the first time, among other things, a hand-launch glider event. We had 24 total contestants with two of those in the Junior Class. The day started out rather windy on the tail end

Ben Cleveland (R), 1st place Sportsman winner on Saturday.

Lee Farris (R), Junior winner in Saturday's and Sunday's Thermal Duration event.

Scott Hunt (R), 1st place Novice winner on Saturday and Sunday.

LSF President, Mike Stump (R), wins Synergy '91 from Rich Spicer (L) and RnR, during MSSC raffle.

RAFFLE!

Sam Woodard (R) of Kentucky is the happy winner of Saturn kit from David Layne (L) of Layne/Urwyler.

Ed Wilson (R) is presented the Avion HLG fuselage from Wright Manufacturing by Bob Sowder (L).

(Below) Chuck Anderson (L) awards Jeff McComb (R) with Chuck's software program.

of a thunderstorm from the previous night, but winds calmed as the day progressed.

The pilots meeting was held at 11:00 AM as advertised and flying started immediately afterwards. The tasks were as follows: Round 1- Three 2 minute flights, Round 2- Five 2 minute flights, Round 3- One 5 minute flight, Round 4- Three 3 minute flights, and Round 5- One 10 minute flight. All rounds had

Jerry Slates of Viking Models, U.S.A. (R) presents Don Harris with a fiberglass Condor 3.0 fuselage. Don was one of the first LSF V's east of the Mississippi River.

Ben Cleveland (R) is pictured with Don Vickers. Ben was the winner of the Feather Cut which was donated by Tekoa. Both of these gentlemen hail from Tennessee.

Team JR member Mike Stump (center) presents Nelson Itterly with MAX 4 radio donated by JR Horizon. Mike Kelly (L) hosted the popular MSSC raffle.

Mark Levoe (R) of Levoe Design presents 2m Super-V to Ray Alonzo of Florida.

Ron Allen (L) was the winner of the Spectrum donated by Slegers International. Pictured with Ron is Tim Renaud from Airtronics.

Chuck Anderson (L) was the winner of one of two Airtronics Infinity radios donated by Tim Renaud of Airtronics.

unlimited throws and 10 minutes to complete the tasks. This format must have been acceptable, as I did not receive any complaints what-so-ever.

With four flight groups per round, a maximum of 10 minutes "down time" between flight groups was allowed to keep the contest moving. With just a few exceptions, the next group was ready to go in 5 - 7 minutes. This kept the contest moving and everyone really appreciated that!

There were several different model designs present and I don't think there was a single dominate design. With the wind blowing towards the woods, most flyers tried sloping the trees if the couldn't catch a thermal in the well kept, large sodded field. Unfortunately, the trees did grab a few models, but I believe most were retrieved.

Scoring for all rounds was man-on-man within flight groups. Since each round had different flyers in each flight group, score keepers Kay Thomas and Mike Stump stayed extremely busy. Mark Barbee sat out in the hot sun timing the heats and operated the air horn signaling the beginning and ending of each round. Roger Yoakum and Max Hurst ran the transmitter impound. No contest can become a reality without competent help and we had some tremendous support

Raffle Donors and Winners!

Donor	Raffle Item	Winners
Airtronics	Infinity 600 Radio	Chuck Anderson, TN
Airtronics	Infinity 600 Radio	Bill Jenkins, TN
Chuck Anderson	Compufoil	Jeff McComb, KY
C.R. Aircraft Models	Climax HL	Allen Schwerin, LA
JR Horizon	JR Max 4 Radio	Nelson Itterly, MO
JR Horizon	Servos	Mike Kelly, TN
Layne/Urwyler	Saturn 2.9	am Woodard, KY
Layne/Urwyler	Saturn 2.0	Allan Schwerin, LA
Levoe Design	2-M Super V	Ray Alonzo, FL
Viking Models	Condor 3.0 Fuselage	Don Harris, OH
RnR Products	Synergy 91	Mike Stump, MI
Slegers Int'l	Saturn HL	Mike Wilson, KY
Slegers Int'l	UNL Spectrum	Ron Allen, KY
Tekoa	Feather Cut	Ben Cleveland, TN
Wright Mfg.	Avion Fuselage	Ed Wilson, KY

thanks to these fine people.

During the pilots meeting, it was brought to my attention that Charlie Richardson of C.R. Aircraft Models had donated a pre-sheeting Climax kit, and it was decided the kit would go to the first place open winner. Alan Schwerin took home a fine kit. Thank you, Mr. Richardson!

The awards were presented Saturday evening after the first day of unlimited class thermal duration. For a complete run-down, see the contest results elsewhere in this column. On behalf of the Mid-South Soaring Championships, it was a pleasure hosting this event, and we look forward to seeing everyone next year in Huntsville."

Following the hand-launch glider event Friday afternoon, launch equipment was set up for sport flying. Most everyone put up several practice flights in preparation for Saturday's thermal duration contest. Sport flying continued in earnest until 7 PM.

Saturday morning dawned a perfect "10"... light SW winds and plenty of sunshine. Over 100 contestants had pre-registered with 96 pilots, representing 17 states, on hand for the pilots meeting conducted by Mike Kelly.

Following the meeting, the first round began at 10 AM sharp. Saturday's task consisted of one 4 minute flight, two 6 minute flights, two 8 minute flights, and an L-6 (runway) landing. Pilots could fly these rounds in any order, as each round was scored to a 900 point chart, plus a maximum of 100 points for landing.

The sailplane class was unlimited, broken down into 4 contestant classes: Expert, Sportsman, Novice, and Junior. Contestant classes are based on LSF achievement combined with previous contest wins. We feel strongly that this encourages participation among less seasoned contest flyers and allows a greater number of rounds to be flown.

Four winches equipped with high speed retrievers, plus one back-up winch and retriever, were set up to handle 18 flight groups of 4 to 6 flyers. Each of the 4 primary winches had a 200 amp/hr battery connected in parallel, and charged by a large 50 amp charger and generator. This system worked extremely well and kept all winches "hot" for the entire day.

Contest conditions were hot and humid, with light SW winds. With the abundance of moisture in the air, thermals were light, spotty, and otherwise difficult. Without question, full-house composite ships dominated. Thermal Eagles, Super V's, Synergy's, the Genesis, Saturn's, Shadow's, and Falcons were flown in numbers.

Following a very smooth contest, with only one winch line break (several retrieve line breaks), the 5th and final round on Saturday was complete by 4:30 PM. While scores were being tabulated, Mike Kelly assembled the group for what was to be the highlight of the day: The RAFFLE.

Raffle winners had the option of picking any single item on the table -first ticket drawn, first choice. For a complete run-down on donors and winners, take a look at the boxed area in the column. We sincerely appreciate the generosity and support of all the contributors, with special thanks to Jerry and Judy Slates for their continuing support of the Mid-South Soaring Championships.

As the raffle proceeded, our helpful team of score keepers posted the day's results. Beautiful marble plaques with bronze eagles were awarded to the winners in four thermal duration classes, two hand-launch classes, and cross country.

Following the awards presentation, over 80 people stayed on site for a buffet bar-b-que dinner. Folks gathered in and around their canopies to chat about the day, and to feast on some of the best bar-b-que that Memphis has to offer. Evening

Winners

Cross Country

1 - Pat Flinn, MI	9.2 miles
2 - Rich Spicer, CA	9.0 miles
3 - Jim Ferris, TX	7.9 miles
4 - Henry Bostic, TX	7.2 miles

Hand-Launch Glider

OPEN CLASS

1 - Alan Schwerin, LA
2 - Mark Hoffman, TX
3 - Don Harris, OH
4 - Tom Peadon, TX

JUNIOR/SENIOR CLASS

1 - Chuck Thomas, TN
2 - Mike Wilson, KY

Thermal Duration

RICH TILTMAN - 1994 Grand Champion

Saturday	Sunday
EXPERT CLASS	**EXPERT CLASS**
1 - Fred Weaver, CA	1 - Mark Levoe, CA
2 - Scott Meader, CA	2 - Ron Swinehart, AL
3 - Charles Baltzer, GA	3 - Rich Tiltman, CA
4 - David Layne, CA	4 - Alan Schwerin, LA
5 - Nelson Itterly, MO	5 - Mike Kelly, TN
SPORTSMAN	
1 - Ben Cleveland, TN	1 - David Campbell, TN
2 - Tom Ernst, TN	2 - Michael Hines, TN
3 - Trey Wood, AL	3 - Mark Atzel, FL
4 - David Godfrey, AL	4 - Chuck Thomas, TN
5 - Bruce Lewis, AL	5 - Max Hurst, TN
NOVICE	
1 - Scott Hunt, FL	1 - Scott Hunt, FL
2 - Jeff McComb, KY	
3 - Tom Cobb, GA	
4 - Sam Woodward, KY	
JUNIOR	
1 - Lee Farris, TX	1 - Lee Farris, TX
2 - Michael Wilson, KY	

temperatures were pleasant, and a few hardy souls with energy to spare, flew hand-launch gliders until dark.

Unfortunately, Sunday's contest was cut short due to severe thunderstorms that rolled through in the early morning. A tornado watch was posted until 11 AM. The storm caused considerable damage at the site leaving in it's path two overturned port-o-pots (causing unthinkable spillage), the 20' X 20' *RCSD* display tent and numerous canopies ripped down, and trash blown everywhere. Several aircraft were reported overturned at a nearby general aviation airport. We do want to offer our thanks to the contestants who pitched in to get the site cleaned up and flyable.

Sunday's Contest Director, Ron Swinehart, delayed the start until noon to give the sod field a chance to dry, and to allow organizers time to clean up the damage, litter, and mess caused by the storm. I spite of 25+ mph winds and a late start, 37 people stayed to fly/survive 3 very demanding rounds. Sunday's format was similar to Saturday's with one 3 minute, one 5 minute and one 7 minute flight in any order. Each flight was worth 900 points with a graduated 100 point landing tape.

And now for the results. The thermal duration events consisted of two, one-day contests with a Mid-South Grand Champion for the highest combined two-day score. This year, the Grand Champion award went to California for the second consecutive year with Rich Tiltman of RnR Products, taking top honors. On behalf of the Mid-South Soaring Championships, we say CONGRATULATIONS to Rich for a well flown contest! Please refer to the boxed area for all of the winners.

Any time a club or organization plans an event it becomes a major undertaking for the few people willing to do the work. We are fortunate in the Mid-South to have two great clubs (Memphis and Huntsville) and a number of people that work together extremely well to accomplish an undertaking such as this event.

States Represented

1) Tennessee	20
2) Alabama	15
3) Texas	11
4) California	7
5) Florida	7
6) Georgia	6
7) Missouri	6
8) Kentucky	5
9) Illinois	4
10) Ohio	4
11) Michigan	3
12) North Carolina	2
13) Virginia	2
14) Arkansas	1
15) Indiana	1
16) Maryland	1
17) Louisiana	1

No event would be possible without a flying site. In Memphis, we are blessed with a tremendous site and the continuing support of Mac McGowan of Cherry Point Sod Farm. We have been told by many of you that this is one of the best RC soaring sites around. Mac, on behalf of the 96 contestants who had the privilege of flying on your property, we all say thank you!

At the risk of leaving someone out, we want to give a heart-felt THANK YOU to everyone who was involved in making the Third Annual Mid-South Soaring Championships a tremendous success. We would also like to recognize all of the great people who came long distances to participate... for it is you that we hold this contest, and without your participation, there would be no event.

Mark your calendars and we'll see you in Huntsville for the 4th Annual MSSC on the last weekend of June '95. ■

Understanding Sailplanes

...by Martin Simons
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13 Loch Street, Stepney,
South Australia 5069

Elementary Stressing

Part 1

We should think about stressing. Large, heavy model aircraft and especially very large sailplanes sometimes exceeding 6 and 7 metres span, are common now. Even smaller models fly sometimes at very high speeds and can become dangerous if they go out of control or break up in the air.

Most failures in flight are the result of the wing failing. Other components may collapse in certain circumstances but the wing is the most likely item to give way. The stabiliser is the next most likely thing to break in the air but stabilisers are small wings. The same general principles may be applied to them too. This article shows how a simple cantilever wing (i.e. without struts) may be checked for strength in bending.

Quite apart from safety, it is apparent that while a wing must be made strong enough, there is no point in making it too strong because then it will be heavier than necessary.

The short cut

Those who wish to arrive as quickly as possible at good practical answers should begin by looking carefully at the bending moment chart in Figure 1. This shows how the very large bending forces near the root of a wing decrease rapidly toward the tip. As the chart shows, the general shape of the curve is very similar for any normal wing. A rectangular planform yields a curve as indicated by the faint broken line. An extremely tapered wing gives the broken curve slightly under the heavy line.

Those who wish to satisfy themselves that this diagram is not arbitrary will find the details of how to work it out in the later parts of this article and in Figures 4 to 8.

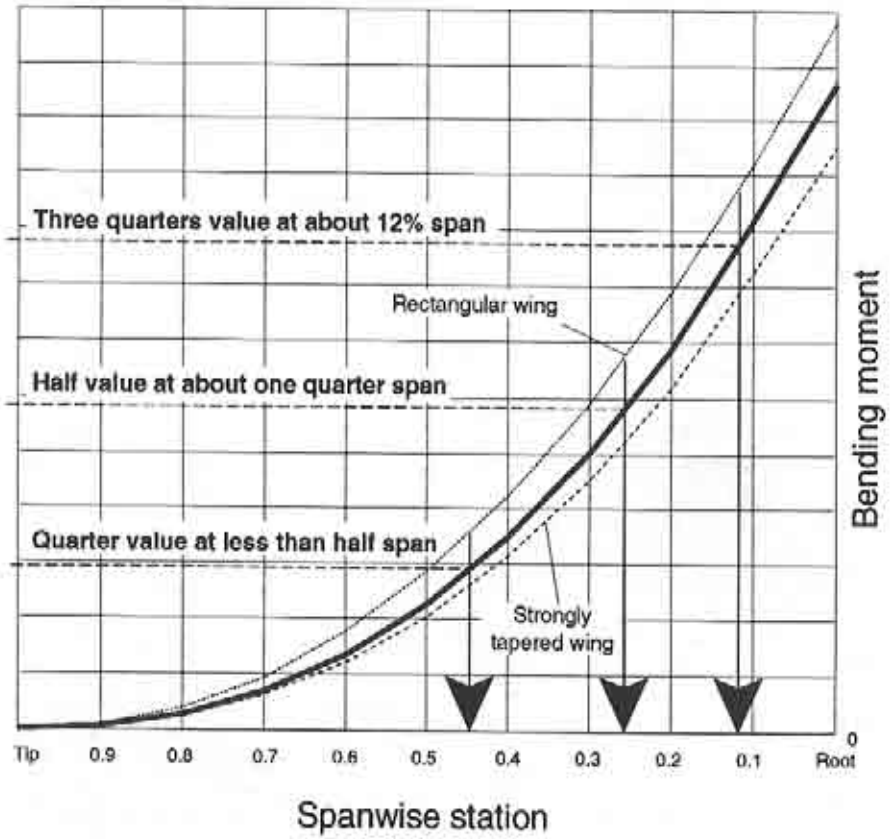
If the wing has a very unusual planform, for instance if the taper is reversed or if there are large cut outs in the centre and some large angles of sweep back or forward, some additional calculations may be necessary but even then the final results will not look very different. Struts which actively take loads do change the picture but even then the bending moment curve beyond the struts (i.e., toward the tip of the wing) will still look like this and the maximum stresses will usually be where the strut is attached to the wing. (Cosmetic struts which do not take any load on a scale model, of course do not count.)

Special attention should be given to the three large arrowheads. Whatever the bending moment at the root of the wing is, by a quarter of the way out the BM will be approximately halved. At half the span, the BM will be less than a quarter of the root value. Beyond the half way point the loads decrease to nothing at the tip. (The wing tips have to be strong enough to withstand handling and the occasional bad landing, so knowing the bending moments is not of much help here.)

There is no point at all in building the outer parts of a wing stronger in bending than the root end. Providing the root is strong enough a great deal of weight can be saved by reducing the bending strength of the outer parts.

It is also worth noting that if, as with many sailplanes, there is a substantial wing joiner such as a metal rod or strip which takes the entire bending load at the root, nothing at all is gained in strength by extending this wing joiner far into the wing itself. The wing joiners

Figure 1. A generalised bending moment diagram for simple cantilver wings.



attachments within the wing must be capable of transferring the loads but if they are so the wing joiner can be quite short. It is, however, most important that the wing at the outer end of the joiner should be capable of carrying the loads at this point, where there is a considerable concentration of stress. Most glider wings break here if they are going to break at all. They can also break by tearing away from the wing joiner as a whole. This is quite common where wings with plastic foam core and veneer or glasscloth skin, take the rod into a simple metal tube glued into the foam with no substantial support.

To work out roughly if the wing is strong enough, follow the procedure outlined in the following steps. The result is only approximate but may be taken as a reasonably good guide. Unfortunately some few calculations are inescapable but nothing more is involved than the four rules of arithmetic and the work can be done with a very simple pocket calculator. ■

Kanza

...by Mike Stump
Cadillac, Michigan

The Kanza is a fiberglass fuselage, foam core wing and stab semi-kit available from Matney's Models of Luna Pier, Michigan. I first saw the Kanza at the 1992 Toledo Model Show and obtained one at the same show in '93. Matney's Models manufactures a variety of airplanes from Quickee 500 and Quarter Midgets to scale airplanes. The Kanza can be purchased with 2 meter, standard, or unlimited wing cores. The semi-kit consists of: foam wing and stab cores, plans, and a fiberglass fuselage. Airfoils available for the wing are the S-3021 and the SD-7032.

The builder needs to provide: sheeting material for wing & stab, wing rod and receiver tube, carbon fiber & fiberglass for reinforcement in wing, spruce & ply parts for fuse, control linkage cable, balsa for rudder. The approximate cost of additional materials (excluding covering and adhesives) was $25.00.

Since no hardware or wood parts are included, this allows the builder with some experience to use the methods he is most familiar with. I originally built the Kanza as per the plans, using the control linkages shown. The plans show both the stab and the rudder to be driven by flex-cables. For the rudder I used Sullivan's new Black Nyrod and a 1/16 flex cable for the stab. The original stab linkage proved to be unsatisfactory and was changed as I will explain later.

Wing and stab construction are pretty straightforward foam / balsa combination. I used 1/16 balsa sheeting with carbon fibre tow (1" wide) above & below a balsa spar section extending out to the aileron servo bay. The builder can choose whatever joiner system he is most familiar with. I used a hardened steel rod (11/32) and brass receiver tubes in the spar. The trailing edges are reinforced with two layers of 1.5 oz cloth. The wing has plenty of area using a triple taper leading edge planform over the 98" span. The wing area on my Kanza is approximately 960 sq.". The all flying stab is a little on the small side (compared to what I usually fly) at about 8% of the wing area.

Wing construction started with measuring the completed spar width (the spars are the full length of the first panel) on the cores and cutting the spar slot out. The spars are 3/8" horizontal grain balsa with the receiver tubes (11/32 ID x 4.25" long) epoxied into slots cut at 3° for dihedral. The joiner box area is faced with 1/16 ply shear webs (6" front & 8" back). 1/16 vertical grain balsa faces the rest of the spar front and back to give an overall spar thickness of 1/2". The joiner box area is also wrapped with Dacron thread and CA for reinforcement. I used transfer tape to install the spars in the main panels.

After checking alignment for all the core panels, they were butt-glued with UFO to make complete right & left wing panels and the core beds were also taped together. 1/16 x 3 x 36" balsa sheeting was taped together with masking tape (You can glue the edges if you wish.); then cut to the general wing shape (about 1/8" oversize).

The wings and stabs were vacuum bagged using "SKIN IT" epoxy which is also available from Matney's Models. I've used it now on several sets of wings with good results. It appears to be just slightly thicker than West Systems or

EZ-Lam (This might be my cold basement, too.), but has worked equally as well. It is a 4-1 mix. It is a very easy epoxy to work having a pot life of 30 - 45 minutes. I've mixed aerosol (colloidal silica) with Skin-it and had very good results as it spreads well and very thin.

After bagging, the 3/8" leading edges and the balsa wing tips were glued to the cores with white glue. At this point the wings can be sanded paying particular attention to the LE shape and maintaining a straight and sharp TE. The wing roots were sanded to match the fuselage and the root ribs were installed. (Prior to or during this step, the wing rod receiver tube should be aligned and epoxied in the fuselage.) After the joiner tube is installed, the wing alignment pins can be installed in the wing.

I covered the wing with Monokote, using the covering as hinging for flaps and ailerons. I deviated from the plans somewhat (It's a semi-kit, right?) in making the wing's control surfaces slightly larger than shown. JR-901 servos are in the wing for flaps (with home-brew linear servo savers ala Walt Good), and JR-321 servos are installed for ailerons. Connection at the fuselage is through a 4-pin Deans connector. The flaps are set to give 90° down throw. The ailerons have differential programmed via the throw limits in my JR x-388S with 3/4" up and 1/4" down.

The Kanza fuselage appears to be molded in two halves, then assembled using seam tape. This structure weighs a little more than many one piece fuselages available but appears to be very strong. As of this writing, Kevin Matney has informed me that all Kanza fuses are now kevlar reinforced along the boom (early versions were all glass). To begin the fuselage assembly, carefully locate and mark the locations for the wing rod and alignment pins for the wing as well as the stab pivot and slot in the fin. Once sure of their position drill to proper size.

I used three foam discs spaced along the boom area to securely hold the housings for the rudder & stab controls in place. The stab pivot block, which is solid balsa is glued just below mid-fin. Two other balsa blocks hold the end of the stab drive cable in place as well as the bend in the housing at the base of the fin. The leading edge of the built up rudder was beveled to allow for a tape hinge commonly used today and the linkage to the rudder is internal. All wood parts in the fuselage are secured with thick CA. There aren't many as the wood components in the fuse include the radio tray, support rails, bulkhead for nose weight, stab blocks, fin post, and tow hook / ballast block.

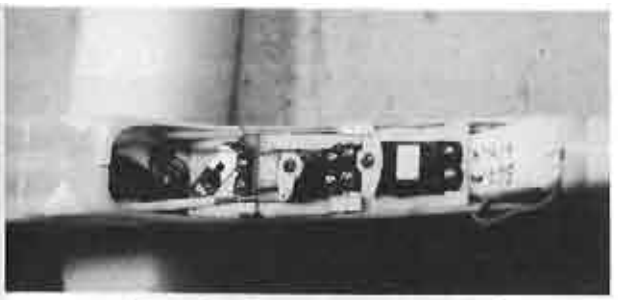
Radio installation in the fuse is also fairly straightforward. The nose section with the slide on canopy tapers from the wing LE area forward and in using standard size servos, the installation required they be installed in-line. There is sufficient room ahead of the servos for an 800 mah ni-cad pack with the RX located directly behind the servos. After balancing, the Kanza weighed 72 oz.

Once I assembled the needed components, the Kanza built as quickly as most any kit that uses foam wings. I found that, by gathering all of the needed components before starting, I never had to delay the project due to needing materials.

Before flying, the JR x-388S was programmed for full TE camber, 90° flaps for landing with Crow from the ailerons. Launch and reflex presets were also added along with aileron/rudder coupling.

The first flights with the Kanza proved two things.

#1. The fuselage is very tough. My first hand launch showed my positive stab incidence (up) to be excessive and the plane flew vertical from my hand to an altitude of maybe 15 feet. Knowing I couldn't get the nose back over, I held the stick full back and the Kanza finished a



hesitating loop as it hit the ground. Now this was very entertaining, and impressive to my friends and peers, as this was in the early morning before a contest, with a new plane, sure to be damaged by this foolish move; but the Kanza was unhurt.

#2. The stab drive system, as I installed it, was inadequate. On several occasions, including this first day of flying, I was able to induce stab flutter. I have been fortunate enough to slow the plane down enough to regain control. I found enough stress in this system that the balsa block that held the bend in the cable housing at the fin base loosened twice. That was enough!

The cable was removed, the end of the housing was cut at the fin base leaving a guide along the boom for a music wire stab drive, and a bell-crank of 1/8" ply was installed. This installation added a total of 1.4 oz. after re-balancing, but has given the Kanza solid stab control at all speeds. Through a number of flying sessions this appears to be a durable solution and the retrofit was easy.

Flying

With 960 sq. in. of wing, the Kanza has a wing loading of 10.8 oz per sq. ft. This makes for an airplane that, at over 72 ounces, can move along in most wind conditions with ease while still having the ability to slow down without falling out of the sky. Another benefit of such a large wing for a standard class airplane is docile handling. The roll rate is adequate for responding to lift, turbulence, and landing maneuvers while not being too sensitive. This makes for a smooth flying model good for a first aileron sailplane. With the CG at 38% and the tow hook mounted directly below, launches are steep and the Kanza tracks straight up the line. For launching preset, I use about 20° of flap and 10° aileron. The wing is very strong and appears as if it will stand up to most any launching style.

The version I built (std. with S-3021) handles well in the turns. There is a difference in handling with this plane using a stab that is 8% of the wing's area compared to other planes I am presently flying using stabs of about 12% is that if you tend to try to circle in a banked turn, you really needed to keep the speed above a certain minimum, or control became sluggish. I found trying to maintain a flat attitude throughout the turns that I could work smaller areas of lift more consistently.

In summary, for the person looking for an inexpensive way to step away from all wood construction, the Kanza offers a comfortable price point to experiment. Semi-kit prices are: 2 mtr. & std. $95.00; Unlim. $115.00. The Skin-It epoxy is available in a quantity sufficient for 5 or 6 complete standard class planes for $14.75. For more information about the Kanza, contact Matney's Models, 11325 Harold Dr., Luna Pier, MI 48157, or phone (313) 848-8195. ■

Jer's Workbench

Making a Plug

About a year and a half ago I did an article about mold making. To my surprise a lot of you tried the art of making your own mold. The reason I know was because of the number of telephone calls that I received. Some of you were asking for some help or a little more detailed information.

I'm about to start another mold making project, but this time it will be a fuselage for an electric sailplane. I want to walk you through this project step by step with a little more detailed information.

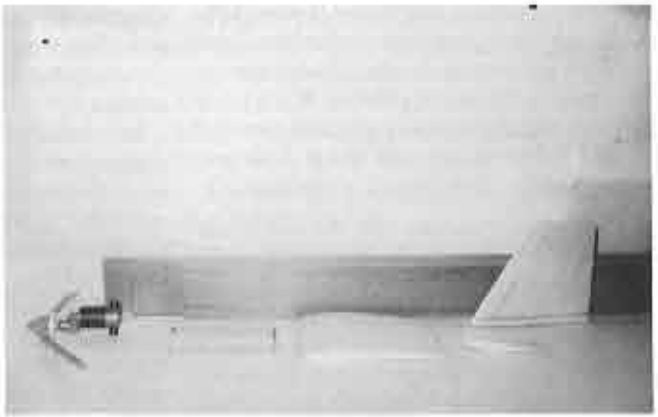
Working with Kirk Massey of New Creations R/C, he came up with the design and my part will be to try and reproduce it. As you can see in the picture, we started with a rough drawing, The drawing is a bit on the light side; don't know if the printer can reproduce it well when *RCSD* is printed, but, yes, there is a drawing in the picture. A drawing isn't required however to do a project like this, but it's best that you do one. By doing a drawing (it doesn't have to be detailed), it will help you in settling on a set of numbers to work with.

What I will be making is a fuselage, 35 inches long, with a bolt-on wing and T-tail. Inside of the fuselage will be mounted an Astro, geared FAI 05 motor, a 14 cell battery pack, and two small servos in the fin for rudder and elevator controls. The receiver will go in just behind the 14 cell battery pack, just under the trailing edge of the wing.

OK, let's put a few more items together. Again, looking at the picture, note the motor with a spinner. This will be used in shaping the nose of the fuselage. The battery pack will be used to make the correct size access hole under the wing so that the battery pack can be installed with ease. Also, there is a small wing and stabilizer section that I will use to insure a correct fit while I am carving the plug. The last item is the fin; this I will add onto the fuselage plug after the carving is completed.

The last item is the plug. What is the plug? The plug is a model of what I will be reproducing to make a mold of. What am I using to make the plug out of? Kiln-dried clear redwood. Why? Because it's easy to get at any lumber yard and it is cheap. There are other woods that I could have used, but there just aren't any exotic wood dealers here in Wylie, Texas. OK, what I got was a couple of kiln-dried clear redwood 1 X 4 X 72 inch boards. I will cut these to length and glue them together, to make a large block of wood from which to carve the plug. I would like to have gotten a large block of wood, but there wasn't any to be had, so I will use what I can get.

Next month, I will go through the steps of carving the plug. ■



Items laid out before carving the plug.

LIFT OFF!
...with Ed Slegers
Route 15
Wharton, New Jersey 07885
(201) 366-0880 - FAX (201) 366-0549
9:30 AM - 5:00 PM (Closed Sun. & Mon.)

Electric Hawk

Over three years ago, I was asked by Judy and Jerry Slates to write an article about converting sailplanes into electric powered sailplanes. Both Jerry and Judy had heard that I was very active in electric conversions. At that time, I said I would do one article. Well, one article is now over three years of monthly articles.

Many things have happened over the past three years, and most of you know that I started a sailplane and electric sailplane business. The idea three years ago, was for me to pass along to you, the reader, any knowledge that I had acquired about designs, equipment, and components for either electric or non-electric gliders. That was easy, then. But now that I am in the business, I find it more difficult to let you know what is new without getting into a "conflict of interest" situation.

I sell just about everything that is available in sailplanes. To avoid any conflict, and to let you know only about products that I do not handle, would be almost impossible. This would also defeat the purpose of my column, which is to keep you up to date on the latest in equipment. So, I will do my best to keep you informed without sounding like an advertisement.

At the recent World Soaring Jamboree, I watched the reaction of the spectators when Doug Boyd flew his ten cell rocket. Most were just amazed at the performance. By talking to some of the people there, I found out that a large percentage of sailplane pilots had no idea that an electric would perform so well. The most asked question was what plane and motor I would recommend.

To get started in electric power, assuming you have some experience flying, and that you are looking for a thermal sailplane, I would recommend the Electric Hawk. The Electric Hawk is the end result of a few years of steady improvements. It started with my electric conversion of the Falcon 600. At that time, the Falcon 600 was manufactured by the designer, Mark Allen. In talking to Mark about the conversion, it was decided to start a new plane from scratch, based on the data from the Falcon 600. Mark and I spent many hours and planes during the prototype stages in order to come up with the Falcon 550E. At that time, it was probably the best 7 cell thermal electric sailplane available, and is still one of the best. As with a lot of products that have been out for awhile, a few things showed up that could be improved on.

Mark Allen then designed the Rocket. The Rocket is a state of the art, high tech, all molded plane. With a pre-painted fuselage, all hollow wing and stab with living hinges, the plane is completely built. All that is left to the owner is to install a radio and motor package.

In an effort to come up with a less high tech and less expensive plane using some of the changes that the 550E needed, and keeping some of the high tech Rocket features, the Electric Hawk was designed.

Using the SD 7037 on the electric Hawk eliminated the ballooning effect of the E387 on the 550E. The canopy was also eliminated on the Electric Hawk. This made the nose section much stronger. It also lets the wing slide under a lip in the fuselage so that only one hold down bolt is needed in the rear of the wing, whereas the 550E uses a bolt in the front and another in the rear. This one bolt system makes changing batteries much easier. The stabs on the 550E were replaced with

a T-tail. This makes for less building, and a sturdier and much more precise set-up. To keep the cost down from the Rocket, the wing is obechi over foam, as is the stab.

With all these improvements over the 550E, and at a lower cost than the Rocket, in my opinion, this is the best 7-cell thermal electric sailplane available at this time.

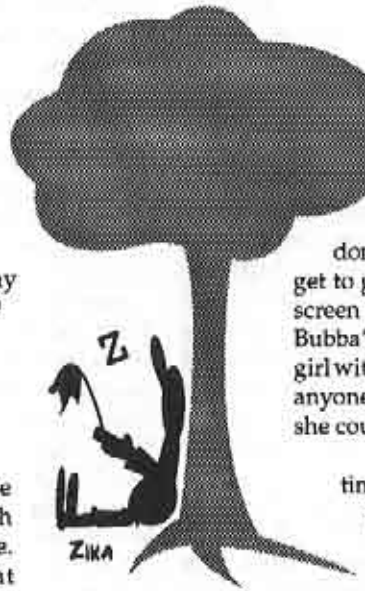
For those who want to get into electrics, and have a plane that will thermal and climb to winch height in about 30 seconds at a 45° angle, try an electric Hawk on 7 cells and an Astro FA105. I think that you will be really amazed at how well electrics can fly. If you are still not convinced, try to attend an electric contest to see for yourself before you purchase a plane.

A hint! If your plane is covered in one of those plastic coverings, and you want to get it looking really good, try waxing the wing with a good paste auto wax. You will be amazed at how well it works. Mark Allen told me about this.

Happy Flying! ■

On The Air With Cornfed

Fred Rettig
1778 S. Beltline Highway
Mobile, Alabama 36609
(205) 471-2507 (days)



"Pressure"

Boy, has it been hot here this summer! The fourth of July has come and gone. I guess the thing that comes to my mind the most about the fourth is the heat and trying to stay cool.

Bubba invited the family and I over for a barbecue. My, it sure was good. After supper, I suggested we have some watermelon. Everybody agreed. So, Bubba hollered to Wynita, his daughter, and asked if she and cousin, Sissy, would go and pick up a melon from the market. "Sure," was her reply. As they were heading towards the door, Wynita said, "Dad, how will I know if I am getting a good one or not?" Bubba looked at me, then back at Wynita, and said, "Girl, everybody knows you thump it in the middle and listen for a thud. If it has a ringing sound, don't get it. And don't forget to get a striped one!" The screen door slammed. Now, Bubba's daughter is a very big girl with fat fingers, so I knew if anyone could thump a melon, she could.

Well, not too much time had gone by when in came the girls and did they look bad. They were covered with watermelon. It was in their hair, seeds stuck to their clothes and, to top it off, they did not have a melon. Bubba climbed off his easy couch and asked, "What has happened to ya'll?"

Wynita looked down, then up at us, and just started crying. She said, "Daddy, we did what you said. We got to the market and found the striped one. I rolled them and looked them over, and found one that looked just right. I told Sissy, "This is the one. Let's go." She was quick to remind me to thump it. So, I did, but it didn't sound quite right. She said, "Try it, again." When I thumped it for the second time, the world came apart! That melon exploded like a bomb! Watermelon went flying everywhere. It was dripping from the ceiling, covered up the melon sign and, as if that weren't enough, three or four more other melon went off, too! Daddy, it was terrible! The market owner came running over, hollering and picking up pieces, saying, "You kids get out of here!" He accused us of blowing them melons up with firecrackers. We did just what you said! It is all your fault for tellin' me to thump them melons!"

Bubba and I could not help but laugh as the girls were walking off to go get cleaned up. Me and Bubba sat around all evening trying to figure out how them melons blew up like that. The only thing we could figure was that, being so hot and all, the heat had built up in them, and when Wynita thumped the melon, it was like a trigger that caused a bomb to go off.

You know, the more I think about heat and pressure, I kinda likin' it to some of you glider flyers. There you are at the contest. You get your time; then it is time to land. You get nervous. The pressure and heat gets to you, and you choke and blow the landing.

Well, fear no more! I have some suggestions that can take the pressure and heat off of your landing.

1. Make sure you have set up your plane for landing properly: spoilers, flaps and elevator. Use crow if possible. Try and bring your plane into the circle as slow as possible, using all flying surfaces to control speed and glide path.
2. Establish a set landing pattern. Use the same pattern every time. After about 500 to 1000 landings, you might want to change a few things about your pattern.
3. Make yourself set aside time just for landing practice: early morning, no lift day, or late afternoons. Forget the lift. Just practice and practice. Remember, practice makes perfect.
4. When you have turned the plane onto the final approach, make sure that you try and align the plane so that it is flying straight down the tape. Before you start practice, make sure that the line or tape (landing tape) is laid directly in alignment with the wind. Now, on the final approach, just fly the line to the spot. Oh yeah, you must have yourself in alignment with the tape. Do not stand on top of the tape. Step back about five feet or more for better judgment.

Now, I know that I've given a general overview of the landing circle, so maybe next month I'll try and get more technical.

Signing Off,
Cornfed

P.S. Say your prayers and keep the batteries charged.

ATTENTION: Chuck Wehofer of Chandler, Arizona. The wife wants to know if you want your initials knitted into your custom car door handle covers. Also, is your Rambler a two or four door car? ■

ZIKA

Dune Soaring at Kitty Hawk

...by W. Hewitt Phillips

Author's Introduction

I have been going to the Outer Banks of North Carolina for vacations for many years. I was a radio control experimenter in the days of escapements, pulse omission detectors, etc. It was natural that I should try radio control soaring on the dunes at Nags Head, North Carolina. As a result, I had a lot of fun with this sport long before it became one of the most popular branches of model aviation. This article was written in those days, about 1955, and tells about dune soaring from that viewpoint. At the end of the article, I will add a supplement on how things have changed since then.

The hobby of flying radio controlled slope soarers has a great appeal to any scientifically-minded modeler. Man has always wondered at the ability of birds to stay aloft with motionless wings. Now the secrets of this silent, soaring flight can be explored with easily constructed gliders using readily available radio control equipment.

The popularity of slope soaring in the USA has been mostly confined to the Pacific Coast, where the steady winds from the ocean sweep up steep cliffs to provide an unfailing source of upward air currents. Modelers in other parts of the country have to look a little harder for soaring sites, but suitable terrain features can be found in many areas. One such site which has many advantages and which presents a slightly greater challenge than the cliffs of the West Coast is the sandy strip of land off the coast of North Carolina known as the Outer Banks. Here, at Kitty Hawk and Nags Head, are the high sand dunes where the Wright brothers made aviation history with their early gliding experiments and successful first powered flight.

Many people know the story of how the Wright brothers happened to pick Kitty Hawk for their experiments. They wrote to the weather bureau asking for a location where steady, strong winds could be found. Not so many people, however, know why the Wrights desired these wind conditions. They were firmly convinced that a man-made glider could be made as efficient, or more efficient, than the soaring birds which they had studied so extensively. They felt, however, that the reason birds could soar, whereas man had not succeeded, was the superior skill of the birds in controlling their flight. The Wrights followed with interest the gliding experiments of Otto Lilienthal, the great German pioneer who controlled his flying machines by shifting his weight. The Wrights noted, however, that Lilienthal, though he had made over 3000 glides, had been in the air a total of less than five hours. Also, they realized that the glide should be controlled like the birds, by moving the wings and control surfaces rather than shifting the center of gravity. They reasoned that if man could stay in the air for long periods of time he could develop the skill necessary to rival the birds in their soaring ability.

The Wrights visualized that they could tether their machine like a kite, and in good steady wind conditions with a man aboard, could experiment with different controls and practice flying for long periods. In fact, they had already conducted model experiments with kites, using extra strings to operate the controls, and knew that this would allow them to study the effectiveness of may different control arrangements. They also conceived a derrick-like arrangement which would catch the machine and prevent a crash in case of an error in piloting.

The main problem was to find the steady winds and to build a glider large enough to support a man. In order to estimate the wing area necessary, they used tables of air forces given in Lilienthal's reports. These results showed that a glider of 175 square feet wing area should support a man in a wind of 15 miles per hour.

The Wright brothers soon put their ideas into practice. In 1901 they journeyed to Kitty Hawk, along with tools, wood and fabric, and constructed their first biplane glider. Kitty Hawk in those days was a remote, barren, sandy island (and still is, to a large extent, except in the tourist season). While today a long bridge connects the island with the mainland, they had to sail across in a rented schooner, and their description of a near shipwreck in this dilapidated vessel makes an amusing sidelight to their scientific notes. Before long, however, their first machine was completed. They first flew it unmanned, as a kite, the two brothers holding it down by two ropes attached at the wing tips, while it was weighted down with various amounts of anchor chain. They always experimented scientifically, measuring lift, drag, and wind velocity.

They soon found that Lilienthal's tables were in error, and that a wind of 24 miles per hour, rather than 15, was required to support a machine with a man aboard. A steady wind of this velocity is not very common, even at Kitty Hawk. Therefore, they were forced to abandon their hopes for long duration kite-type tethered flights and use some other method of testing.

At this point the value of the sand dunes became apparent. A few flights with radio controlled gliders at Kitty Hawk shows just how fortunate the Wright brothers were in picking this location. Many dunes have long, gradual slopes nearly equal to the gliding a angle of the models. No matter which way the wind blows, it is possible to head down a slope into the wind. The result is that long, steady glides can be made without ever reaching an altitude of more than ten feet. At the end of a flight, the soft sand provides a good shock absorber.

The Wright brothers soon developed a technique for testing almost as suitable as the kite system as they had originally planned. They had two men pick up the glider by the wing tips, with the pilot operating the controls in a prone position. At first only the canard elevator was used, with the assistants running down the dune and steadying the glider laterally. Later, after correct center of gravity location had been determined and experience in longitudinal control obtained, they added the lateral "wing warping" control, similar to the principle used in our present day ailerons. Then the assistants were able to release the machine and it would gradually outdistance them and glide down the dune under full control of the pilot. In hundreds of glides, with many different control systems, the Wright brothers never suffered any injury. Their safety can be attributed to low altitude, low ground speed, and soft landing afforded by the dunes.

In addition to the low, gradual slope of the dunes, which are still very useful for test flying of models, there are a small number of high sand dunes with much steeper slopes. By 1902, the Wrights had gained enough confidence to fly from one of these large dunes. The dune they used, known as Kill Devil Hill, is now unsuitable for model flying because the Wright Brothers Memorial has been built atop it, and because the dune sides have been planted with coarse grass to anchor it against the shifting winds.

A few miles further south along the Outer Banks, however, a Nags Head, are a pair of large sand dunes, one of irregular conical shape, and the other, a high ridge known as Jockey's Ridge. It was on this ridge, according to legend, that the

islanders would lead an old nag at night with a lantern tied around its neck. The seaman navigating the rough waters off the coast would hopefully think that this light was a ship safely anchored in a harbor, and would head for this beacon, only to run ashore and have their ship plundered by the "land pirates" inhabiting the coast. At present, the dunes are constantly changing shape and location as the sand drifts into ever changing forms. The conical dune is now about 120 feet high and Jockey's Ridge, about 160 feet. From the top, a beautiful view is obtained of the sand strip, about one-half mile wide, extending to the horizon in either direction, with the water of the ocean on one side and the water of Albermarle Sound on the other.

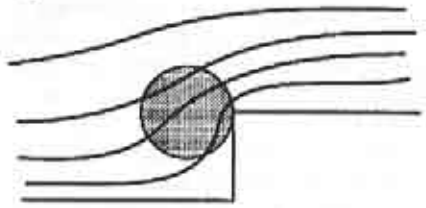
The dunes provide up currents for soaring with the wind in any direction, though the most powerful updrafts occur when the wind blows against Jockey's Ridge from either the East or the West. The radio control builder can match his skill against the seagulls as they soar over these dunes. In such contests, it is not hard to see that the gulls depend on upward air currents for soaring just as much as the models. It may be difficult for the modeler to realize that in the early days before the advent of manned flight the source of power use by these soaring birds was a subject of considerable controversy among early aeronautical experimenters and even among prominent scientists. Many felt that once the secret of the gull's soaring was learned, it would be possible for man to fly. Others, misinterpreting the laws of physics, thought that the soaring birds stayed aloft in the same way as a kite on the end of a string. Lord Rayleigh, a great British scientist, gave the correct explanation when he stated, "In order that a bird should remain continuously in flight without performing work or without loss of altitude, that is to say, in order that a bird should soar, either

(A) The wind being uniform possesses an upward velocity component, or

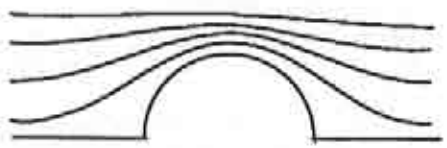
(B) The wind is not uniform."

The great British aeronautical pioneer, F.W. Lanchester, who experimented with rubber-powered models and catapult-launched gliders in 1894, further amplified these statements by noting that in the latitude of the British Isles, up currents due to thermal activity were relatively rare compared to those due to the flow of wind over cliffs and hills. He also pointed out that the existence of the Condors, the great soaring birds of Africa (and some in California which Lanchester did not know about) depended entirely on the cliffs along the seacoast, and the up currents to which they gave rise, since these great birds do not have the strength to take off from level ground.

Lanchester also made an analysis of the flow over cliffs and dunes, and in his book "Aerodonetics," published in 1908, he illustrated his results with the following sketches.



Flow over cliff



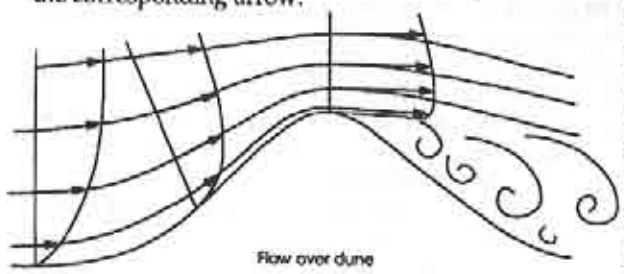
Flow over hemisphere

He estimated the useful region for soaring in front of a cliff to be confined to a circle about equal in diameter to the height of the cliff, as shown in the first sketch. The useful region in front of a hemisphere, which is more representative of the flow over a hill or dune, was not shown but it is obviously much smaller than the region in front of a cliff.

It was stated previously that dune soaring offers a greater challenge than cliff soaring. The author's experience certainly supports this statement. The region in front of a dune in which updrafts are sufficiently strong for soaring is quite limited, and considerable skill is required to keep a model in this region a sufficiently large percentage of the time to gain altitude and stay in the air for more than half a minute or so. It is usually impossible to acquire an altitude more than about 50 feet over the crest of the dune, because the up currents level out quite rapidly with increasing altitude, as shown by Lanchester's sketch.

The problem of dune soaring is further complicated by the severe variations in velocity from place to place on the dune, or as an engineer would say, "velocity gradients." Good powerful controls are required to cope with these peculiarities in the airflow. Two of the main control problems resulting from velocity gradients are described below. First, however, a brief discussion of the nature of the velocity variations is desirable.

In the sketch below, the velocity and direction of the wind at a given point are indicated by the length and direction of the corresponding arrow.

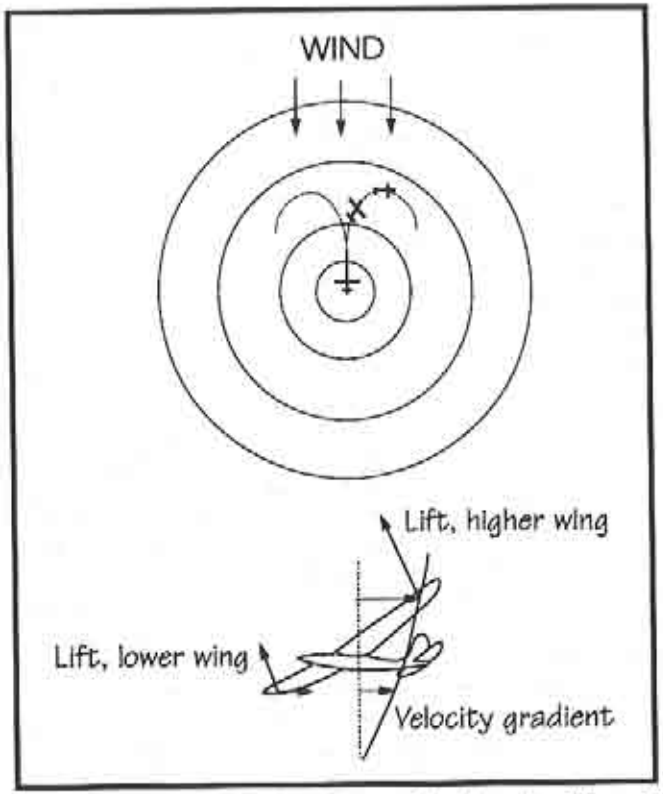


Flow over dune

Note that ahead of the dune, near ground level, the velocity is very low. Aeronautical engineers call this the "stagnation region." At higher altitudes, the velocity increases. At the crest of the dune, just the opposite effect is observed. The velocity just a short distance above the ground is about 1.5 times as great as the "free stream" velocity; that is, the velocity which the wind would have over level ground some distance from the dune.

Some of the problems caused by these velocity variations are now described. First, a glider heading down the dune into the wind has a very persistent tendency to turn, either way, and head back into the side of the dune. Anyone who has tried to glide a Nordic or even a hand-launched glider down a hillside has experienced this problem. This turning tendency seems to be associated with the vertical velocity gradient, or, in other words, the increase in wind speed at higher altitudes above the ground. Any slight bank of the model will cause the higher wing to experience a slightly higher air speed, causing increased lift. As a result, the bank angle will increase, causing a turn. By the time the model has turned through 90 degrees, the higher wing will also be subjected to a higher angle of attack, resulting in a still greater rolling tendency. The maneuver and its explanation are shown in the attached figure.

What is the effect of this turning tendency on the radio control flyer? It simply means that he has to stay "on the ball"; quickly offsetting any turning tendency if he wants to keep his glider headed into the wind. Also, the control must be sufficiently powerful, or the model may veer around despite full control in the opposite direction.

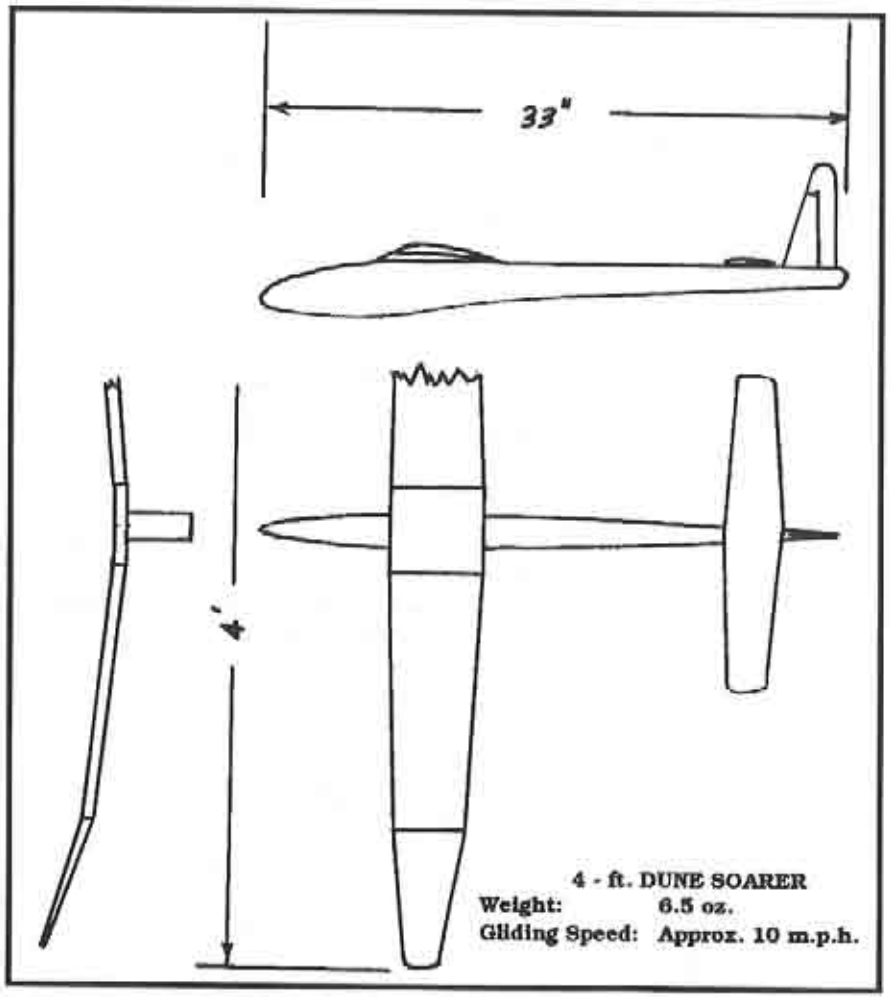


A radio controlled glider flying parallel to the front of a dune has a similar tendency to roll and turn into the dune. It is not uncommon to find that full rudder is required to hold the glider on a straight course as it flies across the region of maximum up currents.

A second problem is keeping the glider positioned over the up slope of the dune and preventing it from being blown back across the crest and into the turbulent region on the leeward side. Reference to the figure showing the distribution of wind velocity illustrates why this problem arises. As stated previously, the wind velocity across the crest of a dune is at least 1.5 times the "free stream" velocity; that is, the velocity which the wind would have over level ground. Therefore, if the wind velocity is close to the flying speed of the model and the flyer allows the model to get too near the crest of the dune, it will most likely be carried back over his head and will enter a region of downdrafts, with no possibility of penetrating back into the favorable region.

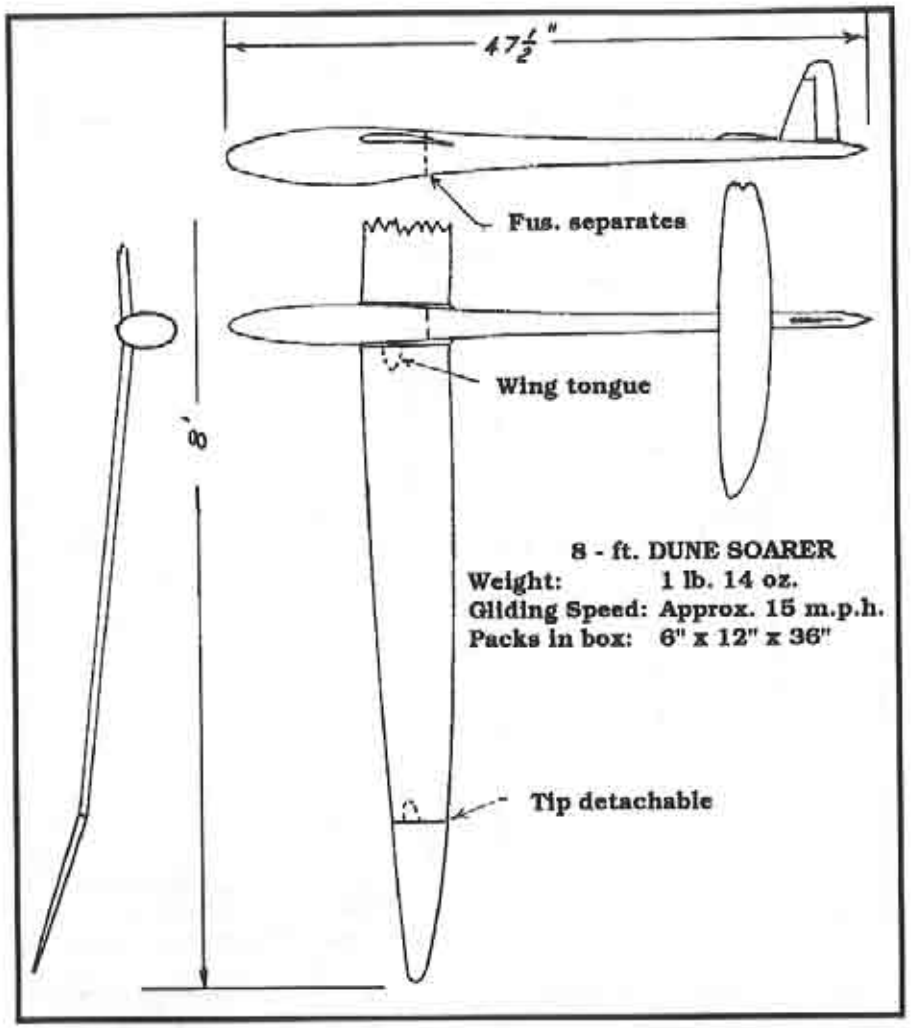
A few practical tips on dune soaring, based on the author's experience, are now discussed. All of this experience has been with rudder only control. Both escapement and pulse controls on the rudder have been used successfully. The desired maneuvers would undoubtedly be easier to perform with multi controls. In particular, elevator control would be useful to adjust the glide speed to penetrate into regions of higher wind velocity. The use of rudder control alone, however, is adequate in favorable wind conditions and requires a little more skill to get good flights.

The control system should be a type which allows long battery life. Dune soaring doesn't involve delays due to filling



gas tanks, starting motors, and waiting in line for flights, so that the model may be kept in the air almost continually. Oversize batteries will help to provide consistent control over these long periods of activity.

A good plan is to come to the flying site with two or three models, each with a different wing loading, so that the model may be used which is best for the particular wing velocity encountered. In light winds, a heavily loaded model will refuse to soar and will glide far down to the base of the dune on each flight. Retrieving the model is fine exercise, but it can get pretty exhausting after a few climbs up the dune, especially since the sand slides back a foot or so for each step taken up the slope. A light model, on the other hand, if flown in strong winds, will be unable to make headway as it soars to higher altitudes, and will be carried back over the flyer's head and dumped into the turbulent region behind the dune. The gliding speed of the model should preferably be just a little greater than the maximum velocity encountered at the crest of the dune. The model then may be maneuvered back and forth in the updraft region by flying figure 8's over the



sloping side of the dune. A model may be "landed" without requiring much of a chase by gliding it overhead in the region where the updrafts have leveled out and allowing it to descend near the top of the dune.

Drawings of two of the author's models are given in the attached figures. There is nothing very unusual about these designs. Many existing Nordic gliders could be converted to radio control with good results.

The complete story of dune soaring can't be told in words, it must be experienced first hand. Any RC enthusiast who is looking for a change, and wants to follow in the footsteps of the Wright brothers, or who visits the Outer Banks for swimming, sunbathing, duck hunting, or fishing, should remember to take advantage of the best facilities on the East Coast for year-round sport of dune soaring.

Changes since this article was written:

It is true that when this article was written, I could drive to the dunes on a fine winter day and see only two or three cars drive by all day. What a difference today! Thousands of people live on the Outer Banks year round, and there are three shopping malls, a K-Mart and a Wal-Mart, and all the usual fast food restaurants. It is true that the beach is less crowded than in summer, and the dunes themselves at Jockey's Ridge have been protected from development. The local civic leaders convinced the State to make the area a State Park.

Unfortunately, the dunes themselves are not as good for soaring as in the old days. The article states that Jockey's Ridge was 160 feet above sea level. That may be a slight exaggeration, but I measured it more accurately last year and it was down to 100 feet above sea level, or about 65 feet above the surroundings. The ridge also use to be about 200 yards long. A speed contest was held there by the local glider club around 1970. Today the dune is shaped more like a rounded hill, with more gentle slopes than in the old days. The sand is eroded from the dunes by the high winds, and catches inn the vegetation surrounding the area, so it is not returned to the dunes. The vegetation, of course, comes from seeds spread by all the lawns and landscaping planted by the many inhabitants of the area. Remember the pictures taken by the wright brothers in 1903, which show nothing but sand?

The dunes are now a favorite spot for hang gliders, and a hang gliding school operates year round. These full-scale machines don't bother the RC gliders very much, as the RC models can usually soar above them.

I don't mean to imply that the dunes are no use for soaring. This area of North Carolina is a coastal plain, and Jockey's Ridge is the highest hill for almost 200 miles around. I go down there several times a year for fun flying. With today's improved gliders, and proportional control systems, the problems of flying mentioned in the article are greatly reduced. The old gliders were more of a challenge, however, and maybe more fun. ■

Thanks go to Mr. Phillips for sharing this article with us. And, thanks go to B^2 for obtaining permission to reprint the original article and doing all the computer work so it could be provided on disk!

Judy ■

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on the Wing

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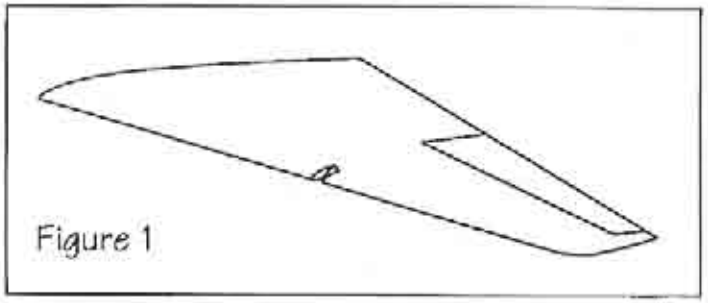
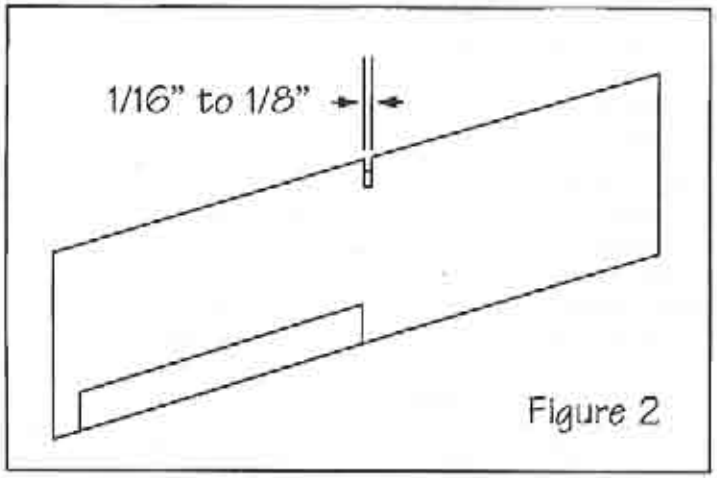
Slots for swept 'wings?

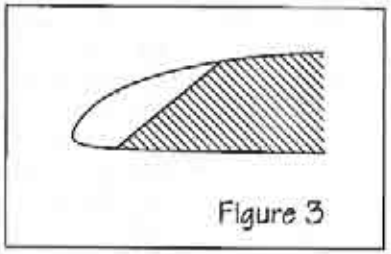
There is little doubt the design of swept wings presents a number of challenges. Perhaps one of the greatest challenges is directly related to sweep itself. In previous columns we've discussed the deleterious effects of cross-span flow, and this month we'll do it again.

Cross-span flow occurs any time the wing is swept. For wings which are swept back, the flow tends towards the wing tip, while the flow on swept forward wings tends toward the fuselage. Some designs can take advantage of cross-span flow, as the NASA X-29. Our models, however, do not usually react to cross-span flow in positive ways.

If the air flow runs parallel to the chord line, laminar separation can be controlled either during the airfoil design process or by strategically located "trip strips." There is no way to know, however, where the boundary layer will break away under cross-span flow conditions, but for swept back wings the end panels of the wing will surely be affected. Since the pitch and roll control surfaces are in this area, positive control will be problematic. Additionally, CLmax will be reduced and large amounts of drag will be cre-







ated.

The classic method of dealing with cross-span flow is to install a fence parallel to the local wing chord, extending over the leading edge and back well past the quarter chord point. The idea is to create a barrier to the flow, much like the action of a tip plate at the end of a wing. One fence on each wing proved very effective on Akaflieg Braunschweig's SB13. The major problem with fences is their inherent high drag—a sum of their parasitic drag and interfence drag, plus their induced drag, a product of their being at an angle to the oncoming air flow.

We recently received an interesting letter from Mark Nankivil in which he explained a rather unique leading edge slot which he feels will be as effective as a fence and yet present far less drag. While Mark borrowed the idea from high speed aircraft, it should certainly be adaptable to model use.

"I want to make a case for flying wings in the 10 cell F5B event and also in Speed 400 and 7 cell pylon racing. As you probably know, there has been some good success in Europe with wings in electric pylon racing... the Aussie Electric Flight Newsletter shows success Down Under, too.

"In flying the F5B event, the one challenge is to minimize the turning radius during the distance portion of the task. In "Faszination Nurflügel" the F3E (now F5B) model by Urs Leodolter was shown and discussed in one chapter. As I recall, straight line speed was not the problem, it was turning radius and the time wasted in making the turns at each base on the distance task. The flying wing would essentially high speed stall if wrapped into too tight of a turn. My thoughts on this are to eliminate the flow separation on the upper surface in tight turns by using a vortex to keep the flow attached in the tight turns.

"As I see it, two ways of achieving this are to go with a fixed canard or leading edge slots...

"Nothing original on my part, I just looked at full size delta wing and swept wing practices on the better operational fighters. Deltas (F-102, F-106, Mirage, etc.) have a high instantaneous turn rate but immediately run into high drag growth which inhibits sustained turn rate. The Israelis got around most of this problem by going to a fixed canard on their Kfir that improved the sustained turn rate dramatically. I think this will work in model form. However, the angle of attack of the canard would be difficult to optimize and drag gain elsewhere in the flight envelope would be likely without a lot of effort being spent on canard location and its angle of attack.

"The more enticing method would be to go with leading edge slots as used on the Sukhoi Su-15 Flagon or Saab Viggen. This lot is a vertical cut in the leading edge that forms a vortex over the top of the wing when the angle of attack increases. When the nose is down and the model is going for speed, the slot has very low drag, much better than a fence, and should have minimal effect on airframe drag. It also has the advantage that it can be placed where it is needed along the span of the wing...

"The slots will be tested later this Spring on a two meter EH flying wing for use in the 10 cell F5B class. More on this as it comes to pass..."

The slot, shown in various views in Figures 1, 2, and 3, creates a small vortex which turbulates the flow in the region behind the slot. This vortex mixes the stagnant boundary layer with air molecules having higher energy. The action of the slot is similar to that of a variable orientation trip strip. It will not stop the cross-span flow, but will inhibit the laminar separation which can be so detrimental to consistent pitch and roll control. There should be an increase in effectiveness as the CL increases.

We encourage Mark to experiment with leading edge slots and share his findings with *RCSD* readers.

Mark concluded his letter, "If I can solve the turn rate/drag increase problem, then I think there can be a quantum leap in competitiveness for flying wings in F5B and F3B. I'm excited about the possibilities!"

If you have a project which may be of interest to "On the 'Wing... readers, please forward a description to B^{2}Kuhlman, P.O. Box 975, Olalla WA 98359-0975. ■

Another contact to add to the list.

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Mike Stump with Saturn 2.9T.

The Layne/Urwyler Saturn 2.9T

...by Mike Stump
Cadillac, Michigan

The Saturn 2.9T is an open class Sailplane designed & kitted by Layne/Urwyler. Proprietors David Layne & Pete Urwyler have developed a line of kits including 3 sailplanes and 1 electric sailplane, all using the Quabeck family of airfoils, with light weight, fiberglass/kevlar fuselages. This Saturn 2.9T kit is intended for those who should have some full house sailplane experience both in building and flying. Though it is not an entry level kit the Saturn 2.9T is well behaved in the air and performs very well.

The 2.9T features a 113" wingspan with an area of 938 sq. in. Advertised kit weight range is 65-72 ounces for a wing loading of 10 - 11 ounces per square ft. The airfoil on the 2.9 T is the HQ 2.0/9 which transitions to 2.0/8. The fuselage, including rudder, is 54 1/4" long and is made of epoxy-glass reinforced with kevlar cloth yielding a strong light structure.

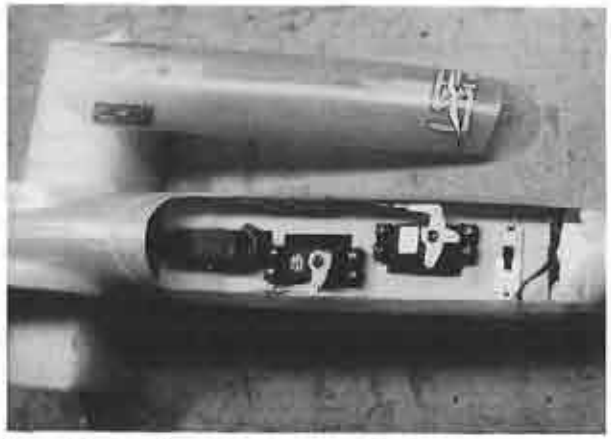
Delivery was by UPS via an extra large carton that was as well packed for protection of the contents as any I've seen. This box will make an excellent transport case for the Saturn 2.9T after construction. The kit, whether purchased pre-sheeted or un-sheeted comes with all necessary hardware including wiring for the wing servos and 4-pin molex connectors. Also included are well drawn full size plans and a 12 page set of instructions with supplemental drawings. Both were very good for helping you finish either version of the kit. Some of the building sequences in the instructions aren't the same as I've used in construction of other models, but as in most cases they are more of a guideline to the finished product.

The wings, stab, and rudder are sheeted with obechi over white foam cores. The wing uses fiberglass reinforcement between the obechi and cores, top and bottom from LE to TE in the inner half of each wing continuing to the tip along the TE. Carbon fiber is used above and below the spar area out into each panel for 42 inches.

The spar/joiner system of the Saturn is truly unique in materials used as compared to many other popular designs being flown. The wing joiner used is a 36" long aluminum tube, 3/4" in diameter that is pre-bent at the center for dihedral. This aluminum tube is very light and quite strong. There are two other wing joiner tubes available that are heavier in weight to be used for ballast. A chrome-moly tube weighs 6-7 ounces more than the aluminum for an increase in wing loading of 1 oz. per sq. ft. There is also a steel tube that weighs yet another 16 ounces more for a net increase of 3-4 oz. per sq. ft. over the dry wing loading. These joiners are available directly from Layne/Urwyler at a cost of $10.00 each.

The receiver tube in the wings is 3/4" ID PVC tubing. In this method of construction the receiver tube doubles as the spar in combination with the top & bottom carbon fiber reinforcement. In the un-sheeted version of the kit the receiver tube is already installed in the core. (The tube is installed prior to the core being cut) Since I purchased the pre-sheeted

Larry Jeffery launches Saturn 2.9T for LSF Secretary, Cal Posthuma.



Saturn fuselage forward of the wings. JR 649S receiver in plywood tray at left. Rudder (JR 901) and Elevator (JR 9021) servos, switch, and 1200 mah battery to the right.

Bottom of Saturn 2.9T wing shows servo bay cover.

version, this review will cover the methods used to finish that kit, however if you've vacuum bagged wings before, the un-sheeted version would mean very little extra work.

The tubes for the stab and rudder drive wires are molded into the fuselage shell during lay-up which makes for easy radio installation and a light-weight finished fuse. The T-tail for this review sailplane is an all flying stab mounted on a molded fiberglass t-tail rocker, which is pre-mounted to the top of the fin prior to shipping. The mounting bracket for this rocker also allows for a very small amount of adjustment to fine tune the stab angle to the wing. Motion is transferred to the rocker at the top of the fin by a molded carbon fiber bellcrank which is installed at the base of the fin. This makes for a very easy to install and maintain, t-tail drive system which is clean and relatively light. By the time you read this review Layne/Urwyler will have made a running change with the 2.9T to a bolt-on fixed stab with an elevator. For those currently using the flying stab version, the new style fuselage will be available if you wish to upgrade.

Construction (Wings, Stabs, Rudder)

The pre-sheeted version of the 2.9T comes with all surfaces (wings, elevator, and rudder) sheeted with obechi. The hingeline for the flaps and ailerons are routed from the wings.

To finish the sheeted surfaces you need to install and shape leading edges, tip blocks, ribs, and caps on all exposed foam surfaces. Cut away the wing control surfaces and face them. A word of

warning is due here. In areas where the joint will be visible, do not use CA to glue other parts to the obechi skin. If you are going to use a clear finish, CA traces on obechi will show as a yellowed area. Ed Slegers wrote about this in an article in *RCSD* that I was to read about a week after installing my LE and facing the controls and lo and behold it happened. Use white glue or epoxy for best results.

Lightly sand the wing to prepare for finishing and sharpen trailing edge. Before sanding I also chose to cut out my servo bays and install the ply covers. The servo bay covers are made from 2 1/4 x 2 1/4 squares of 1/16" ply. The servo bay is traced from each piece; cut away the obechi skin and remove the foam from the servo bay. To mount the cover I glued 1/4 x 1/4 spruce posts in each corner with enough clearance below the sheeting so the covers were flush with the wing bottom. All of this was done before the wing was sanded and sealed.

Use both the top and bottom foam cradles to support the wings and control surfaces while sanding. I used a rubber palm sander with 240 wet or dry (dry) for most sanding finishing with 400 grit before sealing. These were my first obechi wings and while I anguished over some of the steps I was very pleased with the results.

After all of the sanding and shaping it was time for the big step, sealing the wing. I had watched others use monokote and other coverings over obechi with good results, but with a tremendous effort. You also risk melting the foam as the obechi is so thin.

After looking at many different urethanes, verathanes, polyurethanes, and other wood sealers and talking to many that had finished obechi wings I settled on what I've found to be an easy to use product. I went to my local K-Mart and purchased Carver Tripp Environmentally Responsible Clear Poly (GLOSS). A $10.00 can has enough to do 2-3 sailplanes (lots cheaper than films). I applied this with an inexpensive 2" foam brush sanding very lightly with tired 240 grit between coats. The Carver Tripp poly dries to sandable hardness in about 45 minutes. On the 4th light coat a good sheen was noticeable and I made that my final seal coat. Carver Tripp does make an environmentally responsible sanding sealer that may save a coat or two of clear poly that I intend to try on my next obechi wings.

I wanted to add some color for visibility before hinging the flaps and ailerons and installing the servos. For the bottom of the wings I chose an inexpensive (97¢ at Wal Mart) flat black enamel (keep it light) for the bottom of the wing and on the top I painted a portion from the first LE break to mid-tip gloss red (same cheap stuff). The enamel flowed out and dried well over the clear seal coats for a good looking yet light finish.

Hinging was done with wing tape supplied with the kit (3M #600) used as the inside tape along with heavier hinge tape used on the outside of the control surfaces from Greco Technologies. The # 600 tape appears as it would be adequate for all applications but I picked some of this up at the Toledo show and had been itching to try it. The other new product I tried was mylar gap sealing tape over all hinge line gaps (top of flaps, bottom of aileron, and rudder). This seals the open side of all hinge lines well. Both of these products only come in 10 foot rolls which is just enough for a plane the size of the Saturn 2.9T.

I installed the wing servos next using the JR 3321 wing mount servos for the flaps and JR 341 micro servos for the ailerons. All four servos are mounted to the ply servo bay covers using black RPV adhesive (like shoe goo) purchased at any hardware or sporting goods store. This is without a doubt the quickest, slickest way to mount servos for easy access and service. The adhesive is easily cut with dental floss for adjustment, service, or removal.

The servo arrangement is the same as other planes I've set up for the JR X-388s or X-347 (*RCSD* JULY '93). Servos are connected to the receiver via 4-pin molex connectors supplied with the kit.

The stab and rudder require very little work before sealing and painting. End caps for the stab and rudder top/bottom caps as well as sanding an angle into the LE of the rudder as per instructions before adding the front face are it. Seal with clear poly just as with the wings and paint if you wish and all of the flying surfaces are done.

Fuselage

The fuselage construction begins during construction of the wing when the joiner receiver tube is installed. Proper alignment as with all wings is important. This joiner receiver tube is a straight section of PVC tube and is very important to the aircraft. The joiner with the dihedral bend fits into this section and is kept from turning by friction. This is a very effective and tight wing mounting system. After installing the root ribs on the wing you can install the rear wing alignment pins and their receiver tube in the fuselage. I replaced the aluminum tube in the kit with brass for a better bond to the fuse.

Next install the control drive wires, and t-tail bellcrank and pushrods as per plan. This system is very tight, re-centers well, and is as solid a t-tail system as can be found. T-nuts need to be installed in the t-tail cradle to hold the stab bolts. Finish off the fin area with the fin post, install the radio tray up front and you're ready for radio installation. The fuselage is now ready to paint at this stage as well. I opted for the beauty of natural fiberglass, kevlar, & epoxy.

The forward radio area of the Saturn is fairly roomy thanks to the 2.9T's generous nose moment. With standard servos it is necessary to mount them in-line in the fuse rather than side by side, but there is plenty of room. I used a 1200 mah battery pack with (4) Sanyo KR1200AE cells for power, a JR 9021 Servo for elevator and a JR 901 Servo for the rudder. Both servos were offset slightly to the side of their drive wire to eliminate any flex. The JR649s PCM receiver picks up the signal. This is a 9-channel S-PCM receiver that is the smallest 9-channel PCM receiver made. It weighs just 1 ounce.

Set-Up

After some fine tuning of linkages and lining everything up it was time for balancing. To balance the 2.9T at the recommended point 6" ahead of the TE it took only 2 ounces ahead of the battery. For a t-tail fuselage with a long tail moment, to balance with that little bit of nose weight is amazing. Total airplane weight, ready to fly is 68 ounces for a 10.4 oz. sq. ft. wing loading. The tow hook is also installed to be 6" ahead of the TE.

Throws were set up for maximum up aileron in each direction with about 1/4" down. (I get my differential using the travel adjustment, not differential mix in the radio program.) Elevator and rudder throws were set to what looked to be right and hi rudder mix rates were programmed into my X-388s for launch and landing modes. Camber is set to a maximum throw of about 1/4" along the entire Trailing edge. Set the flaps for landing to 90°, with ailerons (crow) rising approximately 10-15° or to preference. I also have down elevator compensation programmed into landing mode. Charge it up and wait for a good trim flying day.

Flying

I picked a calm evening in late August for the first flights. After a running hand launch just to make sure the stab incidence was relatively close we went to the winch. My club's field is relatively short across the field which was into what wind there was that evening so the lines were set at 450 - 500 ft. for these first

flights.

The first launch was a little too steep with some tendency to stall. After getting to the top, and having a chance to trim the ship out with some altitude I added the necessary down-trim to get the Saturn moving forward well. Subsequent launches showed that with the proper stab trim the launches were steep, straight, and solid.

After two trim launches it was time to see how the Saturn 2.9T really performed. Launching into relatively calm air at about 7:00 pm I was able to sustain flights of between 4-5 minutes, working on flying smoothly with minimum turns. Handling while circling was solid through the circle as long as speed is maintained. Add some camber to the wing and the 2.9T can slow down and work tighter circles although it seems to work best when the wings are kept as close to horizontal as possible for the diameter of the circle. The real pleasant surprise with the Saturn is that the HQ airfoil works light air very well as long as the plane keeps moving. I also gave the joiner/spar system some serious stress testing by loading up the tow-line at the top before zooming. There was just a slight amount of flex noticed in the wing. About what you would expect to see from a sailplane with this wingspan.

After more flights I have added exponential on the elevator channel of my X-388s (about 60%). The t-tail, with the stab up in a clean airflow was very sensitive at the top of the launch and during the zoom so I found it necessary to soften the stab throw around neutral in this situation. This change made the Saturn very smooth during the transition to zoom resulting in predictable handling and high launches.

From a contest flier's point of view, maybe the best flying characteristic of the 2.9T are its handling characteristics while landing. As with most modern sailplanes, set-up is critical to good landings. The Saturn begins to slow down nicely without going all of the way to 90° of flap allowing the pilot to control speed while reducing altitude during the final approach. With the fuselage kept at a slight nose-down attitude the Saturn tracks straight with no indication that it is close to stall. The all-flying t-tail provides solid control until landing.

My first three flights ended with me catching the Saturn before I figured it was time to try some spot landings. To help in stopping I've mounted a single shark tooth (Goldberg Wingtip Skid) on the nose although I am still considering adding what I call the California Keel at around the wing TE area under the fuselage. Of course this keel would be installed solely to protect the flaps from the ground.

The next test for the Saturn 2.9T was Labor Day Weekend at a contest. Conditions were 12 - 20 mph winds gusting occasionally higher and fragmenting much of the lower level lift. I flew the first round dry (unballasted) using the aluminum joiner tube. The Saturn was able to penetrate reasonably well in the upper level winds but due to the relatively light 68 oz. weight it was getting bounced around a lot. Rounds 2 & 3 were flown with the chrome-moly tube installed. The 1 oz. per sq. foot increase in wing loading helped smooth things out a lot. The results of flights which were # 8, 9, & 10 on this airplane were a second place in tough conditions. The Saturn did well off launch using the sky covering ability of the HQ airfoils to fly efficiently for some distance off field searching for lift. The glide at this speed is relatively flat so that very little altitude is lost for the distance traveled.

In subsequent flights I have found the 2.9T to be capable of working light lift in both calm air and windy conditions. I've had a couple occasions to work thermals close to the ground (which is a little harder on the heart with unlimited ships) and have been able to successfully stay aloft until the lift I was working finally broke by concentrating on smooth flying. The 2nd contest for the 2.9T resulted in an overall win at the Greater Detroit Soaring and Hiking Society contest for the MSL (Michigan Soaring League). The more I've flown the Saturn 2.9T, the more I like it.

Summary

The Saturn 2.9T, while certainly not a kit for entry level aileron sailplane pilots is a good flying predictable design and a great value for the money. David Layne of Layne/Urwyler is always only a phone call away for any advice or support while preparing this ship. The pre-sheeted version is relatively quick to assemble and finish. I estimate the total hours (not including cure & drying time) to have the Saturn 2.9T ready to fly at approximately 25. With this being my first obechi sheeted airplane I would guess that this time could be cut to 15 - 18 hours now that I know the steps.

The price, $199.00 for the kit and $299.00 for the pre-sheeted version is a good chunk of change, but I think it's a real fair value. All parts were good quality and the pre-sheeted wings were excellently prepared and easy to finish. This was my first attempt at this type of construction and finish and the experience was pleasant and educational. I'm sure to do more with obechi sheeted wings soon.

For more information on the Saturn 2.9T or any of the line of Saturns by Layne/Urwyler, contact Dave Layne at 209-529-8457. ■

Thermals Everywhere or Hand-Launch Topics

...by Scott Smith
2 Sugarpine, Irvine, CA 92714
(714) 651-8488
evenings after 7:00 PST

Everything is Hand Launch!

Gerald Fukuoka of Johnson Atoll (which is WAY out in the Pacific Ocean somewhere), writes that on Maui, the contest thermal ships all lack tow hooks. The thermals are so strong that everyone simply throws their glider. Just another reason to choose to vacation in Hawaii!

First Annual World Hand-Launch Jamboree

Steve Strickland of the Torrey Pines Gulls has informed me that they are sponsoring the first annual World Hand-Launch Jamboree on October 29 and 30 near San Diego. From what he tells me, THIS IS A BIG EVENT. There will be 10 events: 6 on Saturday and 4 on Sunday. During the afternoons, they will have fun-fly events. Saturday evening they will have a catered barbecue. Camping will be available at the flying site; however there are no facilities. There will be more details in a subsequent issue.

Those of you who don't live in Southern California will appreciate Southern California weather in late October and November. The days are typically brilliant sun with deep blue skies, daytime temperatures in the 70's, and hardly ever any rain (knock on wood). The dryness and sunniness combine for awesome thermals.

Moreover, being close to San Diego, there are many family activities available. See your travel agent for details.

Most importantly, I will be there. So, whatever else you have planned, cancel it and borrow whatever resources you need to attend, but BE THERE! Aside from signing autographs, my probable purpose will be to boost everyone else's contest standings by performing miserably.

Follow-up On Joe Wurts' Thermalling Techniques

I entered the Poway hand-launch contest in late June. Scored 13th out of 15, and I flew reasonably well. Shows how competitive this class is getting. The conditions were so good that everyone maxed the 5 minute round; indeed only a total of 20 throws were required by all 15 contestants. 8 of the final normalized scores were above 900 (out of 1000), and 4 more were above 800.

I wonder how many people Joe has been talking to.

Some Suggestions on Bagging Balsa onto Foam

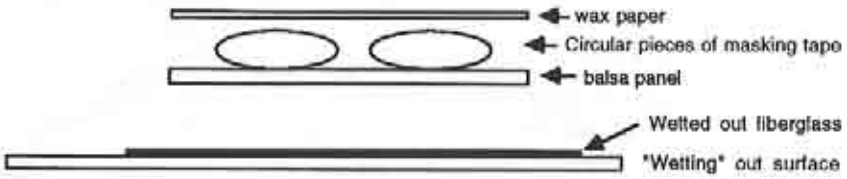
Many of the high-tech hand-launch kits call for laminating 1/32" balsa sheet to foam cores. If you are just starting to do this, you may be concerned about the maxim to use as little epoxy as possible to save weight. Balsa will soak up laminating epoxy, whereas foam is too fragile to squeegee much. What to do?

Joe Wurts suggested using 0.75 oz. fiberglass as a medium for "holding" the epoxy. After the fiberglass is wetted out and has its excess epoxy squeegeed out, it is placed between the balsa sheet and the foam, then the sandwich is vacuum bagged. This has the advantage of not applying epoxy directly either to the balsa or the foam, so excess epoxy is avoided.

Sounds like a great idea, so I tried this technique. Problem is, do you realize how much the wetted-out 0.75 oz. fiberglass wants to adhere to everything but the balsa wood? The static electricity and the capillary action are truly impressive; the fiberglass will roll onto itself and adhere to everything in a horrible gooey stringy mess. It's absolutely infuriating; the impulse to mutter obscenities is overwhelming. After throwing the first attempt away in disgust, I sat and thought about how I could control the rogue sheet of messy, gooey, awful fiberglass.

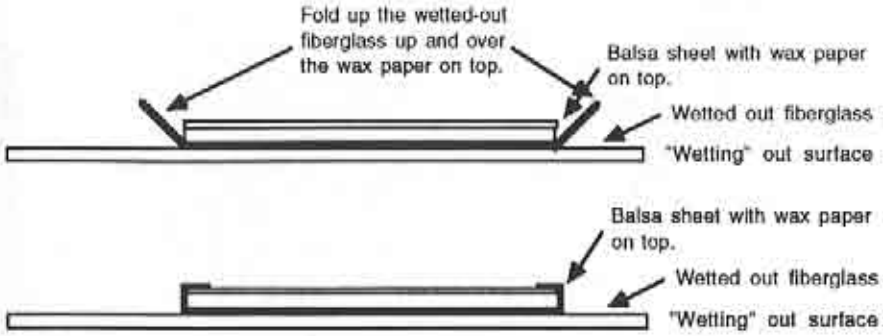
Here's how I did it. Cut a piece of fiberglass with at least 1/2" of excess around the perimeter of the balsa panel to be laminated. Repeat for all the balsa panels to be laminated.

Here's the secret. Cut a piece of wax paper or "stiff" Saran wrap type material the same size and shape for each panel. Tape each of these wax paper pieces to its corresponding balsa panel as shown in the following side-view illustration:



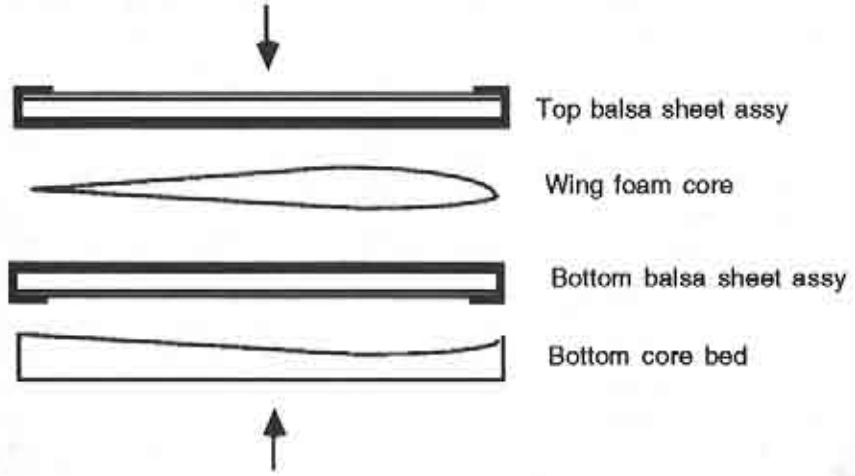
Place the balsa/wax sheet assembly onto the wetted out fiberglass as shown:

Fold the edges of the wetted out fiberglass onto the wax paper on top of the balsa as shown.



Hopefully, the fiberglass is now adhering to the wax paper on top of the balsa panel enough to peel away the wetting-out surface below:

Repeat for the other balsa panels, then assemble as shown:



When assembled, it will look something like this:

At this point, tape it with masking tape, place it and the others into the vacuum bag, and proceed with bagging.

When it is removed from the bag, the excess fiberglass can be easily peeled away or cut with a razor blade from the wax paper. ■

Club Launch – System Reliability

...by David C. Condon
Mission Viejo, California

I belong to a fun oriented, active soaring club, the Torrey Pines Gulls (TPG) in San Diego California. TPG has 150 to 200 members (depending on the month of the year), 80 to 100 people at the monthly meetings, a new-pilot training program, and a competition program in almost every facet of RC soaring. The club is fortunate to have a great thermal flying field located in nearby Poway and a world class slope site at Torrey Pines State Park.

During the 1993 thermal contest season the monthly club contests had about 40 contestants, several flying both open and two-meter class planes, and four or five tasks. The regional contest hosted by the club had over 80 contestants. Usually, four winch–retriever systems were set up, but it was a full-time job to keep at least two operating. By any standard, that's poor reliability! The problems were line breakage – both winch and retriever – and winch batteries that would not last the entire contest. During the year, the Winchmaster worked hard to do whatever it took to improve the performance. Heavier winch and retriever line, different line materials and larger batteries were tried. While things improved, it was not enough. My personal interest in this increased when I became the 1994 Winchmaster for the club. If your club has had similar problems, you may be interested in what was found and how it was corrected.

In time the root cause of the problems were found. A straight line from the winch drum to the turnaround pulley was underground most of the time. This caused drag and abrasion which accounted for much of the winch line breakage. Although the wild grass is mowed several times a year, it also adds drag, especially if wet. The drag on the winch ground–line accounted for most of the retriever line breakage. The short useful time from the batteries came from two sources: the winch ground–line drag and marginal–to–poor wiring. Poor wiring lowers the voltage to the motor causing less torque and weak launches. Each launch drew more power from the battery to make up for these two losses which gave fewer launches before the battery gave out.

The source of the problems were not as obvious then as it is now, given the benefit of hindsight. The degree of line drag was not obvious since almost every "flat" field where I have flown has drag on the winch ground–line. The degree of the effect of the topology and grass were underestimated. Last year, from the point of view of winch operation, the TPG field looked "normal", but looking at it today, it is worse than most. The wiring looked great too; i.e., big wire and heavy terminals. However, upon really close examination, a few short pieces of smaller wire were found and most of the terminals either were not soldered or were not soldered properly. Dirty terminals and corroded connection hardware was also found.

The solutions were to elevate the winch line and clean up the wiring. Correcting the wiring was easy, just have it done by someone who knows how. Correcting the problem due to the field topology was another matter. The idea of raising the turnaround was suggested and accepted, but resolving the issue of permanent or not took longer. At issue was safety, security of the equipment (the field is accessible by the public) and portability. It was finally decided on a permanent base in the ground with everything above ground removable. After elevating the turnaround pulley about four feet it was clear that further improvement would result if the winch was also elevated about two feet. Here's how it was all done.

Torrey Pines Gulls Poway field. Elevated winch platform.

The elevated turnaround consists of a 56" length of 2" pipe (1 1/2" would probably be OK) set at an angle of 30 degrees from the vertical (toward the winch) with the turnaround pulley assembly bolted to a horizontal plate welded to the top. A 20" length of pipe, the base, is set into concrete with the top slightly above the ground surface. A pipe coupling is used to connect the two pipes. The above ground pipe is painted a red and white stripe pattern for maximum visibility. For off–field use, the turnaround pulley assembly can be removed and used in the usual manner.

The elevated winch sits on a simple platform consisting of plywood supported by two 1 1/2" pipes set in concrete. The winch is bolted to the platform with wing nuts for ease of attachment and has slotted holes in the winch base for alignment. Each pipe is actually two pipes joined by a union fitting. One piece, the "lower" (16"), is set in concrete with the top slightly above the ground and the other, the "upper" (24"), screws into a pipe–stand fitting on the bottom of the plywood. Assembly at the field starts with the two pieces of "upper" pipe being screwed into the two fittings on the bottom of the plywood. This assembly is then connected to the two "lower" pipes with the union fittings. The assembled platform is rigidly held by the concrete encased pipes. The winch is then set on the platform bolts, aligned, and held firmly with the wing nuts. When not in use, a cap is placed on all in–ground pipe–ends to protect the exposed threads. A lanyard is attached to each cap to reduce the possibility of theft. For off–field use the winch can be set on the ground in the usual manner.

I expected all four winch platform parts to be interchangeable but I did not account for the effect of factory threads and those made when the pipe was cut. The depth of engagement into the pipe fittings was different resulting in slightly

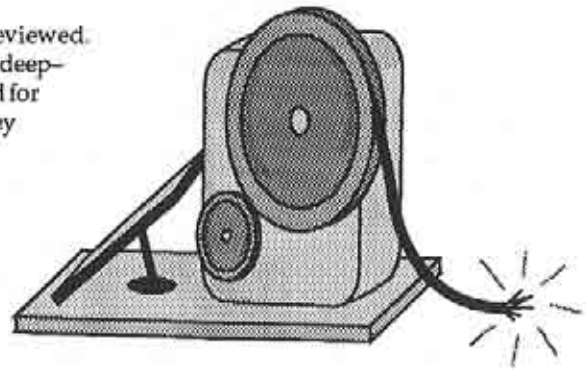
Torrey Pines Gulls Poway field. Elevated turn-around pulley.

different overall length. To distinguish matting parts, a color–code scheme was used, i.e., all parts for each winch's platform have the same color somewhere on all loose parts. Larger associated parts are labeled. The result is that each winch has an associated platform made of a set of associated parts. In practice it is not a limitation.

Battery care was also reviewed. High capacity batteries, not deep–draw as they are not intended for rapid discharge, are used. They are charged before and after each contest using an automatic charger with a maximum current less than five amperes (excess current causes heat that shortens the life of the battery). The water level is checked before each charging. The battery exterior and terminals are cleaned periodically. All washers and wing nuts were replaced.

The first contest use was in May. The field was wet with a drizzle until about 10 AM. The system worked great! Even with the wet grass, the retriever returned the line quicker than ever before under any conditions. A slight protrusion where the turnaround pulley attached to the top of the pipe caused the line to hang up but was corrected with tape. Although we were sensitive to this possible problem we mis–judged the effect of any protrusion. When the model is released from the line, about 10 to 30 feet of the line drops immediately. If the release was near or directly over the turnaround, the line is probably behind the turnaround. When the retriever is engaged, it can snag the slightest protrusion on the rear of the turnaround support.

The biggest thing we learned was that the little things, that on the surface look insignificant, in fact really count. We have had two club and one regional contest and it looks like we have a winning combination. A complete evaluation with regard to line life will take the rest of the year. ■



Wire Installation for Wing Servos

...by Jim Thomas
Woodinville, Washington

The May 1994 issue of *RCSD* contained my approach on how to mount servos in foam-core wings. A logical "extension" (pun intended) to this article is the present one: how to install wires in the wings for the servos.

There are two phases to this job. The first is actually routing/installing the wires between the wing root (receiver side) and the servo opening. The second is making the electrical connections between the receiver and servos. Wire routing can be done before the wing is skinned, which generally results in a permanent installation. It can also be done after the wing is skinned which results in a removable harness.

Wire installation before the wing is skinned is as follows. The core is prepared for skinning with the spar and any other parts installed. The locations of the servos is picked and a small piece of foam (about 1/2" x 1/2" x 1/8" deep) is removed at the center of each location. A small area of foam is also removed from the wing root. A knife slit is made in the bottom surface of the core along the route that the wires will take from the servo location(s) to the wing root. This slit should be no more than 1/2 the thickness of the wing core at any spot. The hook-up wire is pressed into the slot, starting from the root and ending at each servo location. Leave about 2-3" of excess at each end. Roll the excess up and place it in the cutouts that you made earlier. Now tack glue a piece of balsa over each of these cutouts, being careful not to glue the wires. A drop at each corner should be enough. This will protect the excess wire from being glued permanently in place during the wing skinning step. You will need this wire to complete your electrical connections.

Skin the wing as planned; then carefully cut out the areas where the servos will go and the wing root location where the wires exit the wing. Be very careful not to cut the wires, as they will be very difficult to replace. You should now have servo cutouts with 2-3" of wire available to connect to the servo at one end, and to a plug at the other end.

To install the wires after skinning, I prefer to burn a channel from the wing root to the servo cutouts using the red-hot tip of a piece of 3/16" music wire. I generally do this when the wing is ready to finish, after the servo cutouts have been made.

The process is as follows. If a wing root rib has been installed, drill it with a 1/4" drill at the 1/2 thickness point at the desired location. Place the wing in the top cradle and weight it down so it won't move. Use a straight edge along the line you intend to burn. Let it extend off the root end so you can align the hot wire as you burn the channel. Mark the 3/16" rod with a piece of tape at the depth that you want to burn to, typically from the root to the aileron servo cutout. Make a couple of rests for the music wire that are exactly the same height as the bottom of the 1/4" hole that you cut in the wing root. (Remember that this is actually towards the top of the wing since it is upside down in the cradle.) This is critical so you burn the hole down the exact center of the thickness of the wing, and not veer off and punch through the top or bottom of the wing. A sketch of this setup is shown at the end of the article.

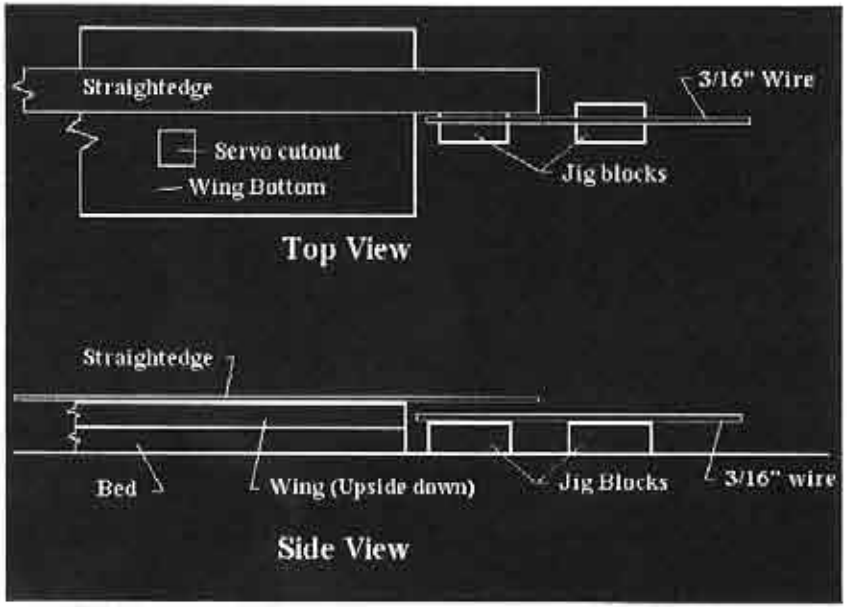
Heat the tip of the music wire red hot, and then start to burn the hole. Move as quickly as possible without forcing, stay aligned with the straight edge to ensure that you end up where you want, and keep the wire in contact with the rests. If necessary, withdraw the rod, re-heat, then continue. Once you get to the aileron cutout, withdraw the rod and you will have a nice, smooth channel to string the

wires through.

The hard part is done. All that is left is to wire the servos. If you installed the wire before skinning: cut the plug off of the servo, leaving at least 1" of wire on the servo; solder the servo wires to the extension making note of the color coding; use heat shrink or other insulation on at least two of the wires to prevent shorting; tuck the excess wire into a convenient recess in the servo cutout; and install the servo.

If you burned a channel for the wires, connect the wire extension to the servo first. String the wires down the channel from the servo cutout until they extend out of the root, and install the servo.

There are many ways to connect the wires protruding from the root of the wing to the receiver. Since the factory connectors were cut off of the servos before the servos were wired into the wing, you have a corresponding number of connectors to wire to the fuselage mounted plug. Deans plugs, molex connectors, factory extensions, the choices at this point are many; just pick your favorite. ■



New Product: ESTEEM ...from Inventec Corporation
See page 47.

NEW PRODUCTS

The information in this column has been derived from manufacturers press releases or other material submitted by a manufacturer about their product. The appearance of any product in this column does not constitute an endorsement of the product by the *R/C Soaring Digest*.

ESTEEM

...from Inventec Corporation

"The Bucks County, Pennsylvania located company, Inventec Corporation, has completed the first production of its new open class sailplane. The new aircraft, ESTEEM, is the result of 3 years of intense international and domestic travel, meeting with some of the world's famous manufacturers and pilots. The company is dedicated to demonstrate, with the help of ESTEEM, that a modified SD7080 airfoil has excellent soaring capabilities combined with solid direction tracking and stability at extreme low speeds as in landing. Drooped trailing edges and substantial added flaps for most of the launch trajectory assures over 600 feet altitudes followed by zooming. Here are a few extras from the new aircraft specification:

1. Reduced camber towards tips to the root basic SD7080 airfoil.
2. Wing span 110 inches, obeche covered. Spar is carbon fiber 1/2" dia. tube installed into most of the wing panel length.
3. Triple tapered at leading edges, double tapered at trailing edges, wing planform design. Slightly swept backwards wing panels make ESTEEM impossible to tip stall even intentionally.
4. Very ambitious fuselage design, long and narrow boom, flexible and not rigid, allows an extreme light but strong stab and rudder control combination to co-exist even after intentional hard landings. The fuselage length is 52 inches, and includes a tee type fin and stab combination. Its strength comes from a perfect, round cross-section with evenly distributed loads opposite to flat surfaces or abrupt changes in shape.
5. Following Inventec Corporation's manual, the craft can be completed and ready-to-fly at about 56 to 58 ounces and it does require as much radio gear as can be afforded. The plane is a delight for the intermediate flyer, and a dream for the advanced. Not recommended for those with little experience. A little light work is required to complete the kit.

"For more information, please contact: Inventec Corporation at (215) 953-1736, 9:00 A.M. - 9:00 P.M. EST, Monday through Friday." ■

R/C Soaring Video Tapes

...from Tallant Productions

Tallant Productions of Northern California is currently producing a series of video programs dealing with the many aspects of R/C soaring. This series of tapes will include topics such as Thermal Flying, Slope Racing, How To's on Trimming, Building, and much more. Programs will include interviews with people like Mark Allen, Daryl Perkins, and Rich Spicer of RnR Products. Scheduled for production are videos showing new products and the latest sailplane designs like Mark Allen's new Skyhawk. Tallant Productions has been in the video production business for fifteen years and uses only professional broadcast quality video equipment for shooting and editing.

Available now is "The 1994 International Slope Race. Return to Davenport". Wayne Tallant and Dave Castetter of Tallant Productions were on hand to bring you this exciting coverage of the ISR for immediate release, and they are sure they have a winner! Narrated by Mark Allen, this is slope racing at its best, in 40+ MPH winds, with super fast starts, spectacular mid-airs, and four sailplanes at a time engaging in wingtip to wingtip racing. For the first time in several years, the ISR has returned to the beautiful background of the rugged Northern California coastline at the Big Creek slope site north of Davenport. This favorite race site of pilots on the slope circuit provides action you won't want to miss. Whether you've seen live slope racing or have always wondered what slope racing is like, this video is definitely for you !

To Order your VHS copy of "The 1994 ISR" send a Check or Money Order for $24.95 + $5.00 S/H to : Tallant Productions, 6922 Hutchins Ave., Sebastopol, CA 95472. Please Specify "ISR" when ordering and include your phone number. CA Residents add 7.5% sales tax. Dealer inquires welcome; please call Wayne Tallant at (707) 823-3534. ■

"If It Walks Like a Duck..."

...by Dr. Manny Tau
TauCom
San Clemente, California

Rebuttal to the recent "Electronic News" article from *Thermal Topics*, Modesto R/C Club Newsletter, Dave Darling, Editor, Modesto, California.

I'd like to take an opportunity to share some general information about antennas, since this is a complex subject unfamiliar to many RC pilots. What prompted me to write about this are the various inaccurate articles I've encountered in publications, along with being the distributor for an aftermarket rubber ducky antenna, the RC POWER DUCK. So I thought I'd put in my 2 cents worth, in hopes to provide accurate and useful information to all.

Antennas are basically simple in their concept. The function of an antenna is to radiate RF (radio frequency) power emanating from a transmitter as efficiently as possible, with theoretically no reflection of power back into the transmitter. I say theoretically since the materials used and design of an antenna does produce resistance, which translates into power reflection back into the transmitter.

The length of an antenna is VERY IMPORTANT, since it has a relationship with the wavelength of the RF (in our case, in the 50, 53, or 72MHz band). Formulas are used to calculate the optimal length for the frequency used, along with taking into consideration such variables as structural design, conductability of the materials used, and the diameter of the antenna material. The SWR (standing wave ratio) is used as a measurement of the reflected power out in its relationship with reflected power back into the transmitter. A 1:1 SWR is idealistic, but commonly an efficient antenna rates somewhere around 1.2 - 2.0:1. The higher the ratio, the less efficient an antenna is measured. A SWR of 4:1 is considered unacceptable.

Antenna designs vary with their abilities to alter the antenna radiation patterns. Telescopic and rubber ducky antennas are fairly omni-directional, although the radiation patterns have lobes and nulls of RF strengths emanating perpendicular to the antenna. The rubber ducky antennas tend to have a somewhat 3 dimensional toroid, or doughnut type radiation pattern on a plane perpendicular to the antenna. Using a field strength meter to attempt to map out the radiation pattern must be carefully done. This is due to the confounding effects of variables such as an adjacent human body acting as a ground plane, or measuring overlapping radiation lobes in its relationship of proximity with the antenna.

Omni-directional antennas do not radiate more RF off or near the tip. Specially designed antennas such as yagis or beam antennas accomplish this by utilizing a totally different structural design that involves the use of director, driven, and reflector elements. The notion that a telescopic or a rubber ducky antenna radiates near the tip (one article) or off of the tip (a different article) is inaccurate. Simple telescopic antennas radiate similarly, so the idea that the Airtronics telescopic antennas radiate differently from the JR or Futaba telescopic antennas, does not make any sense. There have been some rumors that the radiation pattern from a rubber ducky antenna can reflect RF back into the transmitter, causing memory loss with the computer chips. This too is inaccurate.

A collapsed telescopic antenna, when RF is being radiated, has a worse SWR than a rubber ducky antenna, along with wreaking havoc on the radiation pattern. No problems have been reported with memory losses with an operating collapsed telescopic antenna, such as in range checks. The idea that the forward RF radiation is causing problems with the EEPROMS or microprocessor in a computer radio is also inaccurate. Our RC transmitters usually transmit about 500 milliwatts, which is under the 700 milliwatts allowable by the FCC. This is relatively very little power and does not have deleterious effects on the electronic components.

There have been some rare and inconsistent occasions where there have been memory losses reported with the older 4 model memory Visions, and that the cause was due to the use of a rubber ducky antenna. This too is not accurate. Investigations into this problem, along with conversations with technicians at Control System Laboratories (ATRCS developer) and Airtronics, yielded some interesting information. It seems as though the problem lies with the microprocessor of the Vision. The Vision's microprocessor, known to be a power hog, on rare and inconsistent occasions is very sensitive to low voltage conditions of the transmitter's nicad batteries.

When a low voltage condition occurs, such as in owners attempting to cycle their nicads via the transmitter, accidently leaving the transmitter on (reported cases of this with the telescopic antenna), or failing nicad performance, results in the microprocessor losing the address of the particular model memory. No memory is lost, just its ability to find the address of that particular memory. The microprocessor attempts to reboot, but does not have enough power to have its electronic pointer ("the watchdog") find the address, resulting in the inability to access the particular memory and its recorded values.

Let me point out that this is a rare and inconsistent problem with the older Visions. I have not heard of this problem yet with the newer version Visions with the 8 model memory. Approximately 5,000 Visions have been sold, and only a handful of these complaints have been experienced over at the Technical department at Airtronics (approximately .001% failure rate, statistically highly insignificant). Do not be concerned, the Vision is still one of the most highly rated transmitters for sailplanes to this date (I've had mine for over 3 years without any problems.) and continues to be my favorite. If you're experiencing memory loss (transmitter that is... my memory is perfect, it's only short...), replacing the rubber ducky back to a telescopic ignores the possible microprocessor problem. Have this checked out by the techs over at Airtronics. They are very helpful, and their service is fast and pleasant. My experiences with the techs and Bob Renaud have always been extremely helpful and friendly, even in the light of my aftermarket product. To digress a little back to the SWR issue, most telescopic antennas are broadband, meaning they will work from 50MHz to 100MHz, and possibly have a SWR of 2:1 or higher. There are approximately 4 different aftermarket rubber ducky antennas available (Tom Overton, Hitec, Ace, & TauCom), and I can provide specific information only about the RC POWER DUCK. This particular rubber ducky antenna is each individually hand tuned for our RC transmitters in the 72MHz band. The antennas are individually hand tuned (after being fully assembled with all of its components) for 72.500MHz (and covers the entire 72MHz band), with an SWR of approximately 1.2 - 1.5:1. This process results in a highly efficient antenna for our RC purposes, with range tests of over 4500 feet, even though it is shorter in length when compared to a stock telescopic antenna. The limiting factor here is one's eyesight, and with my prescription sunglasses, 2000 feet altitude (triangulated vision distance is actually more) is all I can uncomfortably handle. (I'm just amazed at these cross country pilots with their 3000 feet altitudes and 17 ft. wingspan gliders.)

Since its retail debut last August of

1993, over 1200 antennas have been sold, with approximately 6 complaints about glitching or range (approximately .005% possible failure rate, statistically highly insignificant). It's really difficult to pinpoint the electronic problems that occur with our RC gear (cracked crystals, intermittent connections, circuit board component failures, etc.), and quite often the rubber ducky antenna is the scapegoat. If any problems arise, please have the entire electronic gear checked out. It's worth the effort and patience.

The statement of "be warned and beware" without validation through comprehensive technical investigations, tends to foster inaccurate concerns and promotes disinformation that does not forward our hobby and sport. Being "informed and aware" is a stance that I'd like to promote, which is more conducive to a collective collegial effort to enhance and forward our hobby.

This is only a brief overview of antenna theory, and please feel free to contact me anytime if you would like more specific information or have any questions. (Yes, ducks work on 6 meters, and yes, extended tx battery life has been reported.) I immensely enjoy RC soaring, and I'm more than happy to contribute any way I can to reciprocate the fun times and great people.

You can reach me through E-mail anytime, since I log on daily. Compuserve's Modelnet forum, section 4-RC Soaring, ID number 73617,1731; or via the Internet into CIS, 73617.1731@compuserve.com.

Many thermals and speed runs.

Dr. Manny Tau
WH6OQ TauCom. ■

Kansas Flatland Open '94

...by Ed Kempf
Olathe, Kansas

June 25th at Hillsdale Lake, Hillsdale, Kansas, the Kansas Flatland Open '94, was an event for Unlimited Class Sailplanes. Participants could fly any class sailplane during any round of competition as long as they did not change the transmitter frequency registered. The weather was perfect on Saturday, but became windy on Sunday. Five rounds were flown on Saturday with three rounds to complete the competition done on Sunday.

This contest brought pilots from six states: Kansas, Missouri, Iowa, Nebraska, Oklahoma and Washington. There were pilots of National fame: Dale Nutter of Tulsa, Oklahoma, Rusty Shaw from Ottumwa, Iowa, Mike Fox from Davenport, Iowa, Jim Thomas from Woodinville, Washington, and Charles Fox from Davenport, Iowa. This group of pilots made for some great competition and watching them perform that pilot stuff, you had to learn a thing or two.

In Sportsman, First place went to David Beardsley of Wichita, Kansas. Second place went to Jeff Pfeifer of Overland Park, Kansas. Third Place went to Jim Baker from Lincoln, Nebraska.

In Expert Class, First Place was won by Dale Nutter of Tulsa, Oklahoma. Dale also received an Infinity 600A radio for his effort. Second Place went to Mike Teague also from Tulsa, Oklahoma. Third place went to Rusty Shaw of Ottumwa, Iowa.

On Saturday night the pilots were treated to BBQ, Kansas City style. There was plenty to eat and all had a good time. Several door prizes were given away including a WASP kit produced and designed by Mike Fox, an AVION fuselage from Wright Manufacturing, and a Radio South field charger.

At this time I would like to take a little time to say thanks to the Manufacturers, Distributors and Retailers that donated prizes to our contest and other contests. Because of their support and contributions they help make the contests more exciting and fun. Airtronics was a major sponsor of this contest and I want to thank Bob and Tim for all their help. They donated the Infinity 600A and a Falcon 880, both of which I have been told will see use very shortly. Others distributors and retailers who helped with our contest were Flo-Mow Hobbies, Hobby Haven, Levoe Designs, Viking Models, Ace R/C, Futaba, JR Radio, Taucom, SIG Manufacturing, Eric Sanders (Compufoil software), and Majestic Models.

In closing, I feel this was a good contest, with a great bunch of flyers and helpers who's help and cooperation made it the contest that it was. Next year, we will try to make it even bigger and better.

See ya there.

Ed Kempf, CD ■

Kansas Flatland Open '94 - Group Photo

Dale Nutter, overall winner, with Infinity 600A radio.

The prize list of winners is as follows:

Dale Nutter - Airtronics Infinity 600A Radio
Stanton Runyan - ASD Falcon 880
Lee Branum - JR Max 6 Radio
Doug Drullinger - Futaba 4 Channel Radio
Ed Kempf - Sig Risor 100 (Pilots Drawing)
Rusty Shaw - Viking Smoothie Fuse
with Cores by Majestic Models
Daryl Reimer - Super V Fuse
with Cores by Majestic Models
Steve Rohman - Sig Samurai
Ed Ley - Hobbico Radio Case
Lee Branum - Great Plains Spirit
Joe Shipley - Ace R/C Abacus
Steve Rohman - Ace R/C AT2000
John Ostmeyer - Gift Cert. Compufoil
Jim Baker - Gift Cert. Compufoil
Tim Gastinger - Gift Cert. Hobby Craft
Dale Nutter - Taucom antenna

R/C Soaring Resources

The contacts listed here have volunteered to answer questions on soaring sites or contests in their area.

Contacts & Soaring Groups

Arizona - Southern Arizona Glider Enthusiasts, Bill Melcher (contact), 14260 N. Silwind Way, Tucson, AZ 85737; (602) 325-2729. SAGE welcomes all level of flyers!

California - California Slope Racers, John Dvorak, 1063 Glen Echo Ave., San Jose, CA 95125; (408) 259-4205.

California - Northern California Soaring League, Mike Clancy (President), 2018 El Dorado Ct, Novato, CA 94947; (415) 897-2917.

Canada - Southern Ontario Glider Group, "Wings" Program, dedicated instructors, Fred Freeman, (416) 627-9090, or David Woodhouse (519) 821-4346.

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

Florida - Florida Soaring Society, Ray Alonzo (President), 3903 Blue Maidencane Pl., Valrico, FL 33594; (813) 654-3075 H, (813) 681-1122 W.

Illinois (South & Southwest) - Silent Order of Aeromodeling by Radio (S.O.A.R.), Jim McIntyre (contact), 23546 W. Fern St., Plainfield, IL 60544-2324; (815) 436-2744.

Illinois (North & Northwest) - S.O.A.R., Bill Christian (contact), 1604 N. Chestnut Ave., Arlington Heights, IL 60004; (708) 259-4617.

Iowa - Eastern Iowa Soaring Society (Iowa, Illinois, Wisconsin, Minnesota), Bob Baker (Editor), 1408 62nd St., Des Moines, IA 50311; (515) 277-5258.

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

Maine - DownEast Soaring Club (Northern New England area), Steve Savoie (Contact), RR#3 Box 569, Gorham, ME 04038; (207) 929-6639.

Maryland - Baltimore Area Soaring Society, Bill Cavanaugh (President), 1428 Park Ave., Baltimore, MD 21217; (410) 523-0778.

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

Nebraska - S.W.I.F.T., Christopher Knowles (contact), 12821 Jackson St., Omaha, NE 68154-2934; (402) 330-5335.

Nevada - Las Vegas Soaring Club, Jeff Burg (President), 853 Shrubbery Lane, Las Vegas, NV 89110; (702) 459-8100.

Northwest Soaring Society (Oregon, Washington, Idaho, Montana, Alaska, British Columbia, Alberta), Roger Breedlove (Editor), 6680 S.W. Wisteria Pl, Beaverton, OR 97005; (503) 646-1695 (H) (503) 297-7691 (O).

Texas - Texas Soaring Conference (Texas, Oklahoma, New Mexico, Louisiana, Arkansas), Gordon Jones (Contact), 214 Sunflower Drive, Garland, Tx 75041; (214) 271-5334.

Utah - Intermountain Silent Flyers (IMSF), Bob Harman (contact), (801) 571-6406... "Come Fly With Us!"

Washington - Seattle Area Soaring Society, Waid Reynolds (Editor), 12448 83rd Avenue South, Seattle, WA 98178; (206) 772-0291.

Seminars & Workshops

Free instruction for beginners on construction and flight techniques, Friday & week-ends (Excluding contest days), Bob Pairman, 3274 Kathleen St., San Jose, CA 95124; (408) 377-2115.

Reference Material

Madison Area Radio Control Society (M.A.R.C.S.) *National Sailplane Symposium Proceedings*, 2 day conference, on the subject and direction of soaring. 1983 for $7.00, 1984 for $7.00, 1985 for $8.00, 1986 for $8.00, 1987 for $9.00, 1988 for $9.00, 1989 for $10.00, 1992 for $12.00. Delivery in U.S.A. is $3.00 per copy. Outside U.S.A. is $6.00 per copy. Set of 8 sent UPS in U.S.A. for $75.00, outside U.S.A. for $80.00. Last 4 (1987-1992) in U.S.A. is $45.00, outside is $50.00. Allan Scidmore, 5013 Dorsett Dr., Madison, WI 53711.

BBS

BBS: SLOPETECH, Southern California; (714) 525-7932, 2400 - 8-N-1

BBS: South Bay Soaring Society, Northern California; (408) 281-4895, 8-N-1

NASSA
North American Scale Soaring Association

The North American Scale Soaring Association is an organization of scale soaring enthusiasts dedicated to the furtherance and enjoyment of scale soaring in North America. Membership dues are $10.00 a year or $5.00 after August 1st, and provide for sponsorship of NASSA Scale Fun Flys & Rallies, and for the implementation of a National Scale Building and Soaring Achievement Program. Join NASSA and join a network of scale soaring enthusiasts that influence the direction of scale sailplanes in North America. Please provide your address, phone #, and AMA #, and we will send you a membership card and membership roster. A bi-monthly column keeping NASSA members up to date is included in *RCSD*, with additional information available periodically direct from NASSA. Help promote and support the continuation of scale soaring by sending $10.00 (or $5.00 after Aug. 1st) to: NASSA, P.O. Box 4267, W. Richland, WA 99352.

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F3B/USA is a bi-monthly publication dedicated to the sports of F3B and F3F. The journal is intended for the beginning as well as experienced multi-task soaring enthusiast. Articles cover a wide variety of areas including: technical data issues, description of techniques, and articles written by and about the top people in the sports.

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For More Info Write: F3B/USA,
87 1/2 N. Catalina, Pasadena, CA 91106

LSF

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

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

League of Silent Flight
10173 St. Joe Rd.
Ft. Wayne, IN 46835

The Vintage Sailplane Association

Soaring from the past and into the future! The VSA is dedicated to the preservation and flying of vintage and classic sailplanes. Members include modelers, historians, collectors, soaring veterans, and enthusiasts from around the world. Vintage sailplane meets are held each year. VSA publishes the quarterly **BUNGEE CORD** newsletter. Sample issue: $1.00. Membership is $15.00 per year. For more information, write to the:

Vintage Sailplane Association
Route 1, Box 239
Lovettsville, VA 22080

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T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is affiliated with The Hunsaker Foundation which is dedicated to furthering education and research in a variety of disciplines. Full information package including one back issue of newsletter is $2.50 US ($3.00 foreign). Subscription rates are $18.00 (US) or $22.00 (Foreign) per year for twelve issues.

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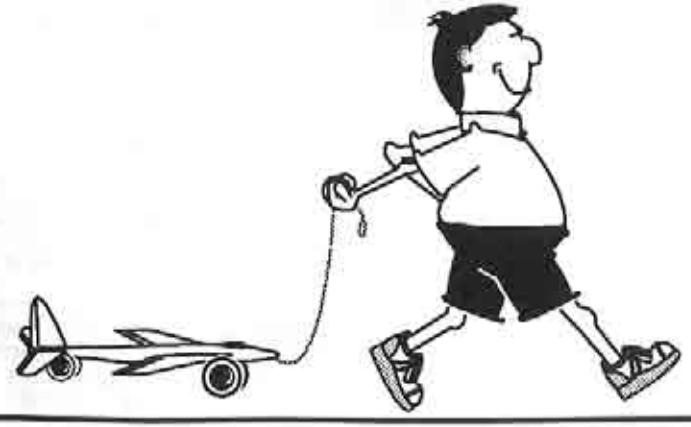
For Info., Contact NSS Secretary/Treasurer
Robert Massmann
282 Jodie Lane
Wilmington, OH 45177
(513) 382-4612

Schedule of Special Events

Date	Event	Location	Contact
Aug. 13-14	2m - Unl	Morriston, FL	F. Stromner, (813) 844-7225
Aug. 13-14 & Aug. 20-21	Holland Glide	Amsterdam / Amay Belgium	Jack Sile, 0449-675190
Aug. 20-21	Summer Soaring Festival	Carson, CA	Kevin Andersen, (310) 372-2585
Aug. 21	S.O.A.R. Contest	Illinois	Bill Christian, (708) 259-4617
Aug. 27	NASF Fall Soar	Huntsville, AL	Ron Swinehart, (205) 883-7831
Aug. 27	Sailplane Contest	Milwaukee, WI	John Hohensee, (414) 521-2472
Aug. 27-28	2m - Unl (Hand Tow)	Morriston, FL	E. Wilding, (904) 375-0918
Sept. 2-5	USA F3B Team Selection	Toldeo, OH	Mike Stump, (616) 775-7445
Sept. 3-4	Unlimited	Morriston, FL	K. Goodwin, (904) 528-3744
Sept. 10	1.5M Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Sept. 10-11	F3J - Germany - Heerieden, Bavaria		Jack Sile, 0449-675190
Sept. 17	1.5M Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Sept. 17-18	SIG/EISS Glider Contest	Blakesburg, IA	Jim Porter, (800) 524-7805
Sept. 18	S.O.A.R. Contest	Illinois	Wayne Fredette, (708) 532-3904
Sept. 24	SASS Novice Classic	Seattle, WA	Sherman Knight, (206) 455-2345
Sept. 24-25	TNT	Austin, TX	George Parks, (512) 443-7029
Sept. 24-25	2m - Unl	Orlando, FL	Ed White, (407) 321-1863
Sept. 25 & Oct. 2	2m Postal - Details 5/94 RCSD - Everywhere		Steen Hoej Rasmussen
Sept. 25	F3J SOAR-IN	Madison, WI	Cark Mohs, (608) 238-2321
Oct. 1	Fall Slope Fun Fly	Madison, WI	Al Scidmore, (608) 271-5500
Oct. 1	1.5M Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Oct. 1-2	CVRC Fall Soaring Festival	Visalia, CA	Phil Hill, (209) 686-8867
Oct. 8-9	2m - Unl	W. Palm Beach, FL	J. Wilson
Oct. 9	SASS Novice Classic	Seattle, WA	Sherman Knight, (206) 455-2345
Oct. 9	1.5M Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Oct. 9-10	S.O.A.R. Fun Fly	Illinois	Stan Watson, (708) 448-6371
Oct. 15	1.5M Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Oct. 15-16	Last Fling of Summer	Tulsa, OK	Perry Gilstrap, (918) 455-1203
Oct. 22-23	2m - Unl	Morriston, FL	Bob Wargo, (813) 938-6582
Oct. 23	S.O.A.R. Contest	Illinois	Wayne Fredette, (708) 532-3904
Nov. 6	S.O.A.R. Turkey Shoot	Illinois	Tom Blood, (708) 377-8641
Nov. 25-27	Tangerine	Orlando, FL	Ed White, (407) 321-1863
Dec. 3	Hand Launch	Poway, CA	Bill West, (619) 222-5296

If there are contests missing from this schedule, that you feel should be added, please ask the CD or a spokesman to let us know via phone, FAX, or a quick note.



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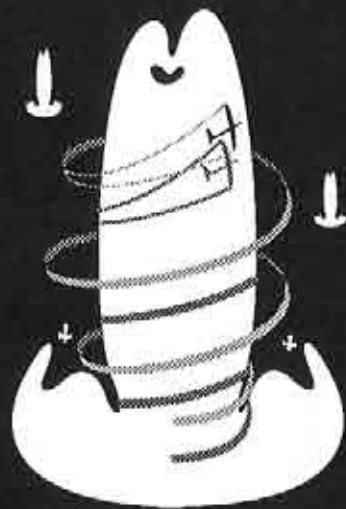

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PRECISION AMAP WING CUTTER, replacement parts, and service. AMAP Model Products, 2943 Broadway, Oakland, CA 94611. Butch Hollidge, (510) 451-6129 or FAX (510) 834-0349.

Wanted

An old Graupner CIRRUS glider, plans or fuselage & plans. Todd Presley, 3803 Kainuki Ave., Honolulu, HI 96816; (808) 732-1432.

Latest version of Tekoa Feather Cut. Marshall McClung @ (703) 989-9494, Virginia.

For Sale - Personal

ELF 2 meter, original prototype HQ 2.5/9.5, obechi wings... $150.00; Raven with gull wings, HQ3/11, root 3/9 tips, very beautiful in flight... $350.00. Both planes built by Dale King, Elf Engineering, 1111 Highridge Dr., Wylie, TX 75098; (214) 475-8093.

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Dodgson WINDSONG, 136" span, VG condition, RTF w/new covering & paint, all new servos (JR), batteries & switch... $325.00; 7 - 10 cell ELECTRIC AIRTRONICS OLYMPIC II, 100" span w/spoilers complete and RTF, includes new Astro G.05 motor, mini servos, 12.5 x 6.5 glass folding prop, 1500 Mah 10 - cell flight pack, 550 Mah Rx pack, and switch all installed... $250.00; CHUPEROSA, 7037 aileron version for slope w/glassed fuse, ready to fly... $45.00 — E-214 poly version with wing completed, fuse in kit form... $40. All + shipping. Steve Pasierb (410) 661-6641, Maryland.

M.A.P. 19 PLUS, electric, new, RTF. Just add receiver and go flying. Asking $550.00 or trade for scale sailplane. Ray Cindric @ (704) 549-5511, 5 - 9 PM EST or pot luck on weekends.

GROB 103 TWIN ACRO... $450.00; Graupner CHERRY, SE... $100.00; 1/4 scale ASH-26... $740.00; fully molded DIAMANT... $520.00. UPS shipping not included. Call Stanley @ (305) 687-7706, Florida.

Saratoga WINDSONG, 134", 9 oz./sq. ft., Airtronics module series MD7-SP radio system, narrow band, servos included (3 mini, 2 standard, 3 microlite 501 [unused]), radio mixing of all channels, differential, pre-set trims. Free winch (Ford long nose starter) with pre-paid shipping. All for $425.00. Barry @ (216) 585-2213, Ohio.

NSP SPARROW, RTF, red 66" SD7080 wing w/gloss white fiberglass fuse, perfect condition, flies great... $130.00 w/out servos. $220.00 + shipping w/3 Futaba 133 micro servos, just add receiver, battery, and fly. Kevin Chin @ (510) 352-3229, Calif.

Ben Clerx MAKO... $200.00; SATURN 2.9T... $250.00; Canadian NATS winner MISTRAL... $150.00; CMP PHOENIX... $150.00; CMP MARIAH... $100.00; SAGITTA 600... $75.00; Off The Ground Models PRODIGY.... $85.00; SAGITTA 900... $100.00; GRAND ESPIRIT... $250.00; LEGIONAIRE 140... $250.00; LEGEND... $175.00; AQUILA GRANDE... $160.00; Bob Smith SUNDANCER II... $100.00; SPIRIT 100... $50.00; HEAT SEEKER plans, fuse & cores... $75.00. Contact Tom after 7:00 PM MDT @ (303) 979-8073, Colorado.

Kits: Eisman "Gentron BQ" T-tail, F3B, 122" glass & CF fuse, beautifully finished presheeted wings and tail feathers... $200.00; Eisman "VAMPIRE", V-tail 86", otherwise as above... $200.00; Model Technic SB-10, 126", duralene-type plastic fuse, pre-sheeted wings & tail, plug-in aileron linkage... $200.00; VS SALTO 2m... $75.00; Astro Flight ASW-17, 132"... $125.00; SAILAIRE, 150"... $125.00; Klaus-Deiter Horn ASW-17, 60", glass fuse, pre-sheeted wings, a top quality German kit... $100.00; Multiplex "CORTINA" flying wing, 138", glass pod, pre-sheeted wing w/spoilers installed... $250.00; Airtronics "ADANTE", 99", glass fuse, foam cores... $75.00; COYOTE... $50.00; HOBIE HAWK wings & fuse (uncovered)... $100.00. Shipping negotiable. All above are NIB. Craig LaChance @ (805) 529-1349, Calif.

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WINGERON/ELEVATOR: Builder option- no mix req'd- add elevator to stab/use std servo to drive wings for roll only

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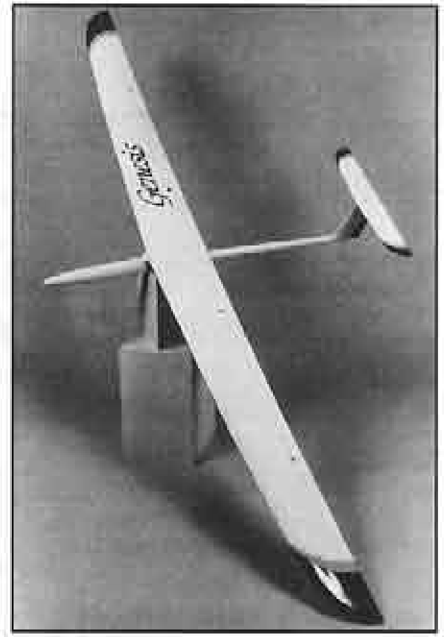

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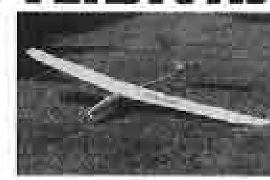

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Wing Span:	110"
Wing Area:	900 sq.in.
Weight:	68 oz
Aspect Ratio:	13.44
Airfoil Wind:	SD7037
Airfoil Stabilizer:	SD8020
Loading:	10.8 oz.sq.ft.

Features: Fiberglass Kevlar epoxy fuselage and canopy. Prepainted vacuum-bagged carbon, glass wings and stabilizers. Ailerons, flaps and servo holes pre-cut. Fuselage pre-drilled for wing rod and tow hook. Pre-installed tow hook and V-tail block. Triple taper wing. Bolt on V-tail with servos in tail. *Basic A.R.F. $579, Basic Kit $189.*

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Aspect Ratio:	10.10
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Airfoil Wing (option):	SD7037
Airfoil Stabilizer:	SD8020
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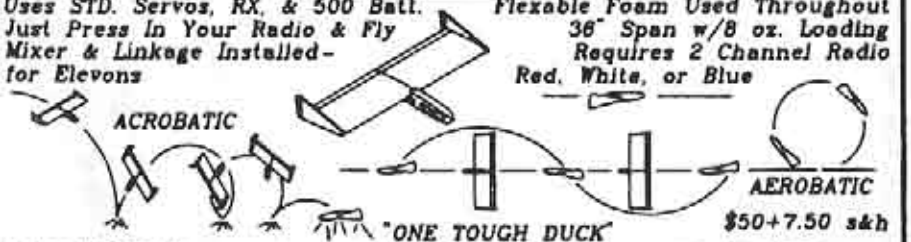

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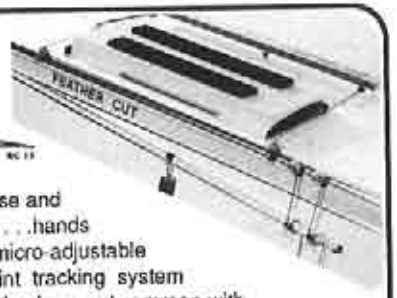

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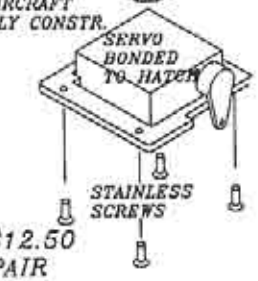

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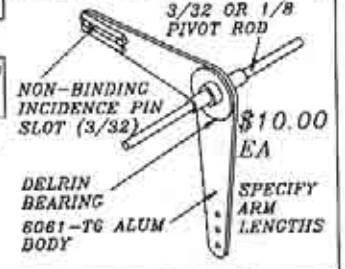

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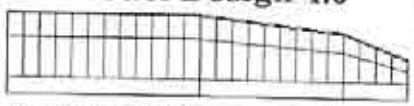

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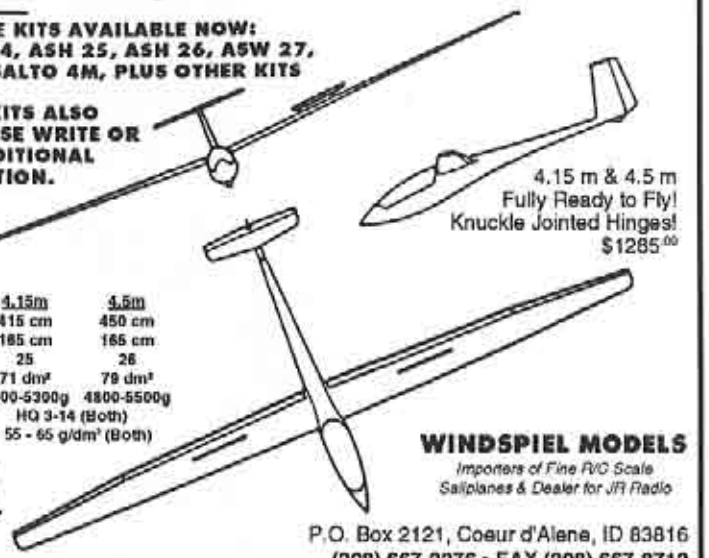

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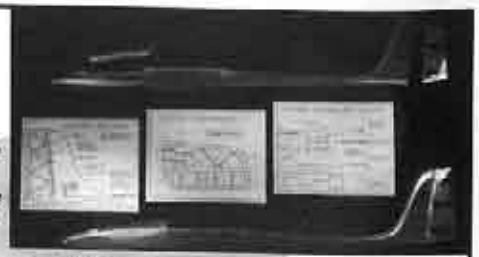

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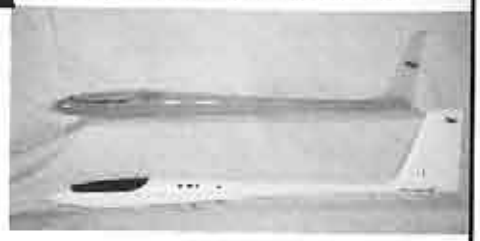

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"Another Wright Manufactured Product"

Specifications: Length: 40 inches; weight: 6oz.; width at widest point: 2" molded fin; full flying removeable stabilizer; accomodates 2-meter plug in wings with a 9-10" root chord up to 84" long.

Capacity: Up to 4 standard servos; standard receiver; up to 1200 mah battery power; switch harness.

Includes: Molded glass canopy.

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open-class competition

Spartacus is an open-class thermal duration competition sailplane fuselage. Spartacus combines the beauty of our popular AVION in an open-class configuration. ***Spartacus Competitor*** *is reinforced in high stress areas with carbon tow and kevlar tape. Spartacus is designed to accomodate an SD7037 airfoil with a 10" root chord.*

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Specifications: Length: 53 inches; weight: 11ozs; width at widest point: 2.2", molded fin; accomodates open-class plug in wings using an SD7037 airfoil with a 10" root chord.

Capacity: Up to 6 standard servos; standard 8-channel receiver; up to 1200 mah battery power; switch harness.

Includes: Molded canopy.

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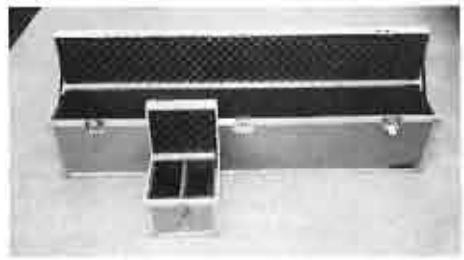

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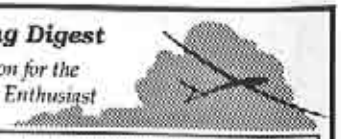

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An in-house vacuum form machine allows us to produce our own canopies. If you are looking for a canopy or other vacuum formed accessories (including sailplane, power, etc.), please let us know. We have a large inventory of canopies and do short production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

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54" fuse, canopy, plans	$75.00	$10.00
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54" fuse, canopy, plans	$75.00	$10.00
1/5 Scale Rhoenbussard (112.5"/Scale/4)		
40" fuse, plans	$75.00	$10.00
1/5 Scale ASW-17 (135"/Mod. Eppler/4-5)		
49" fuse, canopy, tray, dwg.	$85.00	$10.00
1/5 Scale Orlice (135"/E392/3-4)		
49" fuse, canopy, tray, dwg.	$75.00	$10.00
1/5 Scale Ornith (142"/E392/3-4)		
49" fuse, canopy, tray, dwg.	$85.00	$10.00
1/4 Scale DG-100/200 (147.5"/Wortman/4 - 5)		
64" kevlar reinf. fuse, canopy, tray, docu.	$175.00	$20.00
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58.5" fuse, canopy, frame, docu. pkg.	$135.00	$20.00
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1/4 Scale HP-18 (147"/RITZ III/4)		
69" fuse, canopy, plans	$135.00	$20.00
1/4 + 10% Scale Salto (142.5"/RITZ I/ 3-4)		
61" fuse, canopy, frame, docu. pkg.	$135.00	$20.00
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62" fuse, canopy, plans	$135.00	$20.00
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51" kevlar reinf. fuse, plans	$80.00	$10.00
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Issue 1 kicks off with a good mix of articles on slope, flat field, scale and electric models and special features on Selig Donovan Aerofoils, Lost Foam modelling, The Aerodynamics of Flaps, plus the European shows and a super PSS plan of the Mig 3 WW2 Russian Fighter

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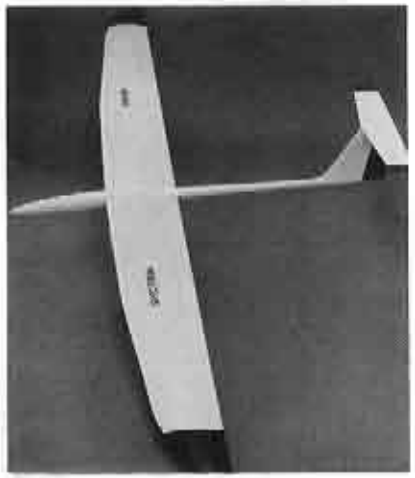

SPECTRUM
SPECIFICATIONS:

Wing Span:	**104 inches**
Wing Area:	**855 square inches**
Airfoil:	**S3021 or RG15**
Aspect Ratio:	**13:1**
Weight:	**60 ounces**
Wing Loading:	**10 ounces/square foot**
Price:	**$395.00 + Shipping**

Also available for the Two Meter flyer, the *Spectrum Two Meter*

Wing Span:	**78 1/2 inches**	**Wing Area:**	**554 square inches**
Airfoil:	**S3021**	**Aspect Ratio:**	**11.2:1**
Weight:	**40 - 43 ounces**	**Wing Loading:**	**10 ounces/square foot**
Price:	**$295.00 + Shipping**		

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SPECIFICATIONS:

Wing Span:	113"	Wing Area:	938 Sq. In.
Airfoil:	HQ 2.0/9 - 2.0/8	Weight:	65 - 72 Oz
Wing Loading:	10.0 - 11.0 Oz./Sq. Ft.		

Standard Kit Price: $199.00
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Unlimited Class Racer

Raider Racer $419.95 Thermal Raider $439.95

The Raider is the latest soaring masterpiece from designer Charlie Richardson. This plane is a direct and more potent decendent of the incredibly successful and blazingly fast "Renegade" slope racer. Charlie has succeeded in designing a multi-purpose Unlimited Class Slope Racer or Thermal Duration plane that has an outrageous L/D, fast acceleration, hands-off high speed stability, agile turning ability, and a super strong structure.

Everything on the Raider has been optimized for fast acceleration, high energy turning, thermaling, mid-air survivability, and fast ballast adjustment.

The Raider's modular design allows for plug-in replacement of any damaged parts. Flaps come down a full 90 degrees so it can be landed in small areas with high wing loadings. For those who don't need to wipe out the competition, the Raider is the best big speed machine around and just loves to speck out in thermals.

The Thermal Raider has more span, area, and aspect ratio than the Racer verson. Even with such a light wing loading the Thermal Raider retains the fantastic speed range and crisp handling of the Racer.

Raider Racer

Span: 96"
Airfoil: RG-15
Aspect Ratio: 11.8
Surface Area: 690 sq. in.
Wing Loading: 24-35oz. sq.ft.

Thermal Raider

Span: 104"
Airfoil: RG-15
Aspect Ratio: 12.5
Surface Area: 970 sq. in.
Wing Loading: 20-31oz. sq.ft.

A Highly Prefabricated Plane Requiring Little Assembly

Features

- High Quality Molded Epoxy/Fiberglass/Kevlar Fuselage With Slip On Nose Cone
- Vacuum-Bagged RG-15 Composite Wings Featuring Blue Foam Cores Skinned With Carbon Fiber And Glass
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- Bolt-On Modular Tail Surfaces With Bagged Glass Stab
- Optional 1000 mah Battery Pack And Replacement Parts

CLIMMAX

High Performance 60" Span Hand Launch Thermal Glider

Kit Price $59.95
Pre-Fab Price $159.95
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Pre-Fab FG Price $169.95

The Climmax is designed for Hand launch Thermal Competition and slope and thermal sport flying. The outstanding SD-7037 airfoil has been modified to prevent tip stalling and enhance upwind penetration in breezy conditions. Its clean aerodynamic profile allows for maximum altitude hand launches and it's high-aspect ratio flying rudder gives Climmax the ability to make tight, flat turns in small thermals. Climmax is also excellent for minimum-lift slope sites where only the lightest planes will stay aloft.

An outstanding speed range and tight turning ability make Climmax a fun choice for light lift slope aerobatics such as snap rolls and loops.

The new fiberglass/kevlar body gives the competition pilot the ultimate edge in handlaunch thermaling performance and dead-air glide ratio.

Specifications

- Airfoil: SD-7037
- Wing Area: 400 sq. in.
- Wing Loading 5.0-8.0 oz. per sq.ft.
- Two Channel: Rudder, Elevator
- Flying Weight 12-14.5 oz. (FG)
- Machine Cut Balsa, Spruce, And Plywood
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- Flying Weight 14-16 oz (all wood kit)

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60" Span Class Slope Racer

ARF Kit $269.95

RENEGADE

The Renegade is the new "Bad Boy" on the Slopes of California, winning everything in the new 60" span racing class. The RG-15 airfoil gives the Renegade a blistering speed range and the ability to carry a massive ballast load if needed. Its flaperon system cranks the plane through high-G pylon turns with little energy loss. Don't let Renegade's bad attitude scare you off because it is very stable at all speeds and has remarkable light lift and thermaling ability. This rugged plane gives you big plane speed at a small plane price.

Highly Prefabricated Requiring Little Assembly

- High Quality Molded Epoxy/Fiberglass/Kevlar Fuselage With Slip On Nose Cone - Installed Elevator Cable
- Vacuum-Bagged RG-15 Composite Wings Featuring Blue Foam Cores Skinned With Carbon Fiber And Glass
- Pre-cut And Hinged Aileron
- Bolt-On Wing And Tail Surfaces - Optional Ballast Kit

Renegade sweeps 60" Class and gets SECOND Overall in Unlimited Class Slope Racing At '93 Torrey Pines Speed Week

The Contender is designed for those who desire the ultimate in speed and aerobatics, featuring three channel control with wingerons, elevator, and full flying rudder. Contender's long tail moment and stabilizer design give it hands-off stability even at extreme speeds. The airfoil and wing design allows for an incredible speed range with the ability to turn or climb sharply with unmatched energy retention. Wings are constructed with blue foam cores, Carbon Fiber, and plywood wing skins and spars. The fuselage is designed with a large ballast compartment over the C.G. where up to 20 ounces of ballast can be placed for high lift conditions or slope racing. At the standard flying weight of 50 ounces, the Contender is very fast and will fly great in winds averaging as low as 5-7 m.p.h.

Specifications

- High Speed 2 Meter Aerobatic Slope Plane
- Transition Modified S3016 Airfoil
- Wing Area 400 Sq. inches
- Flying Weight (unballasted) 50 ounces
- Wing Loading 17.0 to 24.0 oz. per sq. ft.
- Three Channel: Wingeron, Rudder, Elevator

Features

- Machine Cut Balsa, Spruce, And Plywood
- Quality Blue Foam Cores And Carbon Fiber
- Wingeron Linkages And Control Cables
- Hardened Steel Wing Rod
- Complete Hardware Package
- Rolled Plans And Detailed Instructions

The Ultimate Aerobatic Speed Machine

FiberGlass/Kevlar Body Now Available !

CONTENDER

Wood Kit $109.95
Glass Body Kit $169.95 .. Composite ARF $289.95

The Renegade kit has all of the high performance flying ability of the composite version but at a lower price. Each kit features precision cut foam cores, full hardware kit, full size plans, and can fit any type of radio gear. The Renegade is one of the most versitle slope planes anywhere and can be built very light to accomodate those small slopes or thermal flying areas.

Features

- Airfoil: S-3014
- Wing Area: 360 sq. in.
- Flying Weight 26-32 oz. (unballasted)
- Two Channel: Aileron / Flaperon-Elevator
- Bolt On Wing - Foam Wing Cores
- Pre-cut Wood Parts
- Hatwarc Kit - Full Size Plans
- Standard Or Micro RC Compatible

Wood Kit $65.95
Pre-Fab $159.95

High Performance C.R. Aircraft Sailplanes

- California Residents Tax 7.75%
- Shipping & Handling $5.00

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* Prices Subject to Change Without Notice
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