December, 1999
Vol. 16, No. 12
U.S.A. $3.50

R/C Soaring Digest

Radio controlled

THE JOURNAL FOR R/C SOARING ENTHUSIASTS

R/C Radio controlled SOARING DIGEST
THE JOURNAL FOR R/C SOARING ENTHUSIASTS

ARMED & DANGEROUS

Gordy Stahl, Traveling Reporter, is on his way to Visalia armed with a Psyko, and a pre-Visalia smile.

Photography by Michael Volz, Germany.

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

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

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

Please address correspondence to:
Jerry & Judy Slates
R/C Soaring Digest
P.O. Box 2108
Wylie, TX 75098-2108 U.S.A.
(972) 442-3910, FAX (972) 442-5258
e-mail: rcsdigest@aol.com
http://www.halcyon.com/bsquared/RCSD.html

Feature Columnists
Bill & Bunny Kuhlman (B^2), Robin Lehman, Lee Murray, Tom Nagel, Mark Nankivil, Dave Register, Dave Sanders, Steve Savoie, Jerry Slates, Gordy Stahl

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

TABLE OF CONTENTS

OTHER GOOD STUFF

Damaged or Improperly Bound Copy?
Please let us know, and we'll replace it.
Something always slips by every month!

RCSD ON THE WEB

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

Subscription Information
Highlights & Mailing Status of the Current Issue
RCSD Feature Columnists, Reporters, and Editors ..... E-mail/web addresses, plus general information about their areas of interest.
"Getting Started in RC Soaring" ..... Getting started guide - Adobe Acrobat PDF format
"Building Along" Construction Aids
..... **Modifying & Building the MB Raven (Parts 1-4)** ..... Bill & Bunny Kuhlman
..... **1/5 Scale Pilatus B-4** ..... Jerry Slates
..... **Low Tech Design & Construction - RES Model** ..... Coming Soon
..... **1/12 Scale U-2R/TR-1** ..... Coming Soon
Links to Clubs & Organizations
Hot Topics
Event Coverage (Color Photography!)
"In the News" - A compilation of news items of interest to soaring enthusiasts.
On-Line Articles - Great articles originally written for the printed version of *RCSD*.
Bookshelf Listings - A listing of recently published books of interest to aeromodelers.
Complete RCSD Index, 1984-1998

The Soaring Site

Specialty Books for Aircraft Modelers

B^2 tell us that they now have ListBot signups on their B^{2}Streamlines web site. For those of you interested in keeping up to date on the books they offer, there are three separate mailing lists you can sign up for:

- B2Streamlines - to announce major changes to the web site (sign up on the B2Streamlines home page <http://www.halcyon.com/bsquared/>)
- B2StreamlinesNewBook - to announce availability of B2Streamlines' new books (sign up on <http://www.halcyon.com/bsquared/booktitles.html>)
- B2StreamlinesUsedBooks - to announce additions to the used book on-line catalog (sign up on <http://www.halcyon.com/bsquared/usedbooks.html>)

On the Subject of Noise O.S. .91

The subject of noise came up in Robin's "Hot Air" column, November, 1999. We received the following e-mail regarding 'noise':

"O.S. has come out with a O.S. .91 with a new muffler. The muffler is larger, but oh so effective, and the motor seems very powerful. The case is the same as a .61, so the weight is almost the same. We live in Florida and subscribe to your *Soaring Digest*. Our club is the Central Florida Sports Flyers. Both my wife and I fly electric sailplanes and glow fuel. There is a member who flies in from Peru in the winter time, who flies a 60 size Stik (2 clicks of power) and a member who flies a 120 Cloud Dancer. They both are using a Graupner 3 blade prop. I think it's about a 14x7. The motor with the 3 blade prop is so quiet; it is super. Thank you again."

(signed) Brent Bills, Florida

Thanks for the info., Bill. It's appreciated.

Hobie Hawk

Dave Acker in Washington dropped us the following note:

"A friend has given me a Hobie Hawk, but I'm having a devil of a time launching it on a high start. I suspect hook location. Is there anyone in your neck of the woods that flies a Hawk? If so, please find out the hook location for me."

Sorry, Dave, but can't help you here. Anyone out there have an answer for Dave? If so, please let us know!

Help - Wanted!

We received the following request from Joel Lefkowitz in Connecticut:

"I would like to place the following ad: **HELP**! Have kit, but no construction booklet to build Sagitta XC by Airtronics."

We'd like to hear from anyone that can help out here. You can reach Joel at 287 Castlewood Dr., Bloomfield, CT 06002. While you can contact him direct, several of us at RCSD are most interested in how to obtain the instructions, as well.

There was a second part to Joel's letter:

"Great article about "Apogee". Too bad the kit is no longer available. Any way to purchase plans?"

Watch your mail box, Joel. A copy is on its way, thanks to Dale Uecker and Lee Murray.

Getting Started in RC Soaring?

Or, want to help others get started in the hobby? The *RCSD* Team prepared a guide entitled "Getting Started in RC Soaring"; it was finalized and stuffed, at the last minute, in the center of your November issue. It covers easy to build and fly RC planes, what radio will likely work best for the beginner (and why), getting started costs, suppliers, sources and additional resources. But, for anyone considering giving this hobby a try, we warn you: this hobby can be so addicting, that once you experience its magic, you'll be hooked for life!

The guide is also available to download from our web site in Adobe Acrobat PDF format, 2 pages, legal size paper. It's on the main page.

The handout is **intentionally not copyrighted**. It may be reproduced and distributed **freely**. As Tom Nagel says, "It is a Christmas present from the *RCSD* team to the soaring community."

And, speaking of Tom, it was his idea. And wanting to make sure everyone on-line knew about it, he posted a message to the RCSE forum. For those of you not on-line, this is what Tom said:

"*Radio Control Soaring Digest* has an early Christmas gift for the sailplane community. How many times have you been flying and had some on-looker come up and ask you how much it costs, where you can get it, and how does it work? *RCSD's* one page flyer, "Getting Started in RC Soaring", is designed to answer those initial questions. Get a copy, run it through the copier a few times, and keep the copies in your flight bag. Pass them out to anyone who looks interested. Think of it as a zamistat FAQ.

"This one page flyer, included in this month's issue, is intentionally un-copyrighted and designed to be freely copied and passed out, used in club newsletters, left at hobby shops, whatever. You may not agree with every suggestion or point made in the "Getting Started" flyer. It took the *RCSD* columnists quite a while to reach consensus. (Send RCSDigest your comments and suggestions for future updates to this document.) But, I'll bet most of you will agree with big chunks of the content.

"For those of you that are not *RCSD* subscribers:

a. A copy is available on line at: http://www.halcyon.com/bsquared/RCSD.html
b. Watch out for Gordy."

Thanks, Tom!

GSinRCS Comments #1

The first e-mail request we received regarding "GSinRCS" was from Martin Timm, a subscriber in New York. He says:

"Having received the most recent *RC Soaring Digest*, I was impressed with the "Getting Started in RC Soaring" pamphlet that was included. It does a very nice job of going over the basics in clear understandable language and pointing the newcomer to some very useful places for obtaining additional information and starter equipment.

"Being the newsletter editor and unofficial librarian for the Clarence Sailplane Society in Buffalo, NY, I am always looking for material such as this to help explain what it is that we do. I would like to make copies of this pamphlet to hand out to interested newcomers, but being sensitive to copyright issues, I wanted to check with you first, even though I found no copyright information in the pamphlet.

"Please let me know if you have any objection to my copying and distributing this information."

Sincerely, (signed) Martin R. Timm, Editor, Clarence Silent Flyair

That's great to hear! It took 10 of us, behind the scenes, a flurry of e-mail to get it ready to send out with the November issue! Needless to say, we have not had the opportunity to address the handout, but will do so in the December issue.

The handout is intentionally not copyrighted. It may be reproduced and distributed freely. It is a Christmas present from the RCSD team to the soaring community.

Thanks for asking! ED.

GSinRCS Comments #2

This response was triggered by Tom's posting, suggesting future updates to the document:

"Regarding the handout document. I liked it and thought it was a great idea. My suggestions are:

1. Not be so specific to DAW stuff. They are good, but not the only manufacture of foamie kits. I would prefer more generic references like "Warbird" or "Wing," accompanied by a more complete list at the end.
2. What about flatlanders? I don't recall much mention for inland guys who must fly thermal or HLG. There are

several great ways to get started in this hobby via that avenue also (Skeeter, Dragonette, Javelin, TG-3, Highlander).

3. Include more weblinks to additional info. Granted, this could add a whole other page, but a what a great reference!"

(signed) Nathan Woods, Temple Hill Slope Squadron, Orange, California

Thanks for the suggestions, Nathan. It's appreciated!

GSinRCS Comments #3

Another RCSE posting:

"I have to say, I really like the idea of getting the lower end Focus III SS as a first run radio. I know a lot of folks tell you "get the most expensive radio out there because you will eventually buy it anyway" (which I recently did... though not the most expensive).

"However, for the first timers, it's a much better path to get into the hobby cheaply and then determine whether you will stick with it. Its analogous to getting the most expensive golf clubs, then after a season, realizing you don't want to do it anymore. There you are, stuck with this ritzy set of clubs gathering dust in the garage.

"If the new flyers stick with the hobby, THEN they can invest. Those that don't haven't lost much on the attempt. Besides, if you do fly slope combat, your going to destroy your equipment anyway, right?"

(signed) Greg, RCSE

GSinRCS Comments #4

This posting is from John Derstine, Pennsylvania:

"My only objection is a personal preference regarding choice of radio and how it is set up. Granted, most slopers using two channels put the rudder on the right with the elevator. I have done this myself many times, but I learned to fly the rudder on the left BEFORE doing this. If you never intend to be anything other than a one handed, two channel, slope junkie, fine. If you ever plan on transitioning to four channel aircraft, especially scale or power planes, do yourself a favor and learn what the rudder does and learn to use it with your left hand. You will be a better pilot for the time invested. And as a bonus, when you add ailerons, you won't have to learn all over again when you put the rudder back on the left, and discover yaw is different than roll.

"A better idea yet, although sacrilege on a soaring site perhaps, is start out with a four channel power gas or electric trainer and learn to fly the way real airplanes fly. Learn all axis of control and how they affect an aircraft and, while you are doing this, you will no doubt be learning to fly a pattern around the field. This is good discipline for almost any fun fly or event other than a TD event. One of the biggest problems we have had at Elmira was getting everyone to fly the same direction in the landing pattern and landing parallel to the flight line.

"The learning curve may be steeper by a bit, but the benefits will last a lifetime."

(signed) John Derstine

John also says, "I would give you free reign to print it (the above) as an alternate view in a future issue. I feel strongly about the importance of good flying habits. In any event, it wasn't a criticism, just another approach."

GSinRCS Comments?

We appreciate the feedback received to date. We hope to hear from more of you. Mark Nankivil, in Missouri, has already dropped off copies of the handout at his local hobby shops. Anybody else doing something along the same lines? And, are there any more suggestions for future updates to the handout?

This has gotta be the longest editorial we've done in a long time. But we think the subject matter important to our favorite hobby, and hope you do too.

Happy Holidays to You and Yours!
Judy & Jerry Slates

Announcement

PENSACOLA 2000 SCALE SAILPLANE AEROTOW MEET

from Asher Carmichael

Pensacola Aeromodelers is pleased to announce the fourth annual Gulf Coast Scale/Aerotow meet. This event promises to be an outstanding opportunity for pilots from around the country to meet, exchange ideas and improve our skills.

The dates for the event are February 11th-13th, 2000. We have also scheduled the next weekend, February 18th-20th, 2000, as a rain date. The primary flying site for Saturday and Sunday is site 8 in beautiful Pensacola, Florida. For those who don't know, Site 8 is a 640-acre US Navy practice field that is grass covered and fully maintained. This location is unmatched for sailplanes and is used regularly by local fliers for thermal duration, scale/aerotow, and free flight activities. It is definitely a premier site.

Friday's flying site will be at Coastal Airport on Alternate 90 just 3 miles to the west of Site 8. Tony Fiorentino a fellow giant scale modeler has arranged for the use of this full size glider port for our Friday activities. Naval Aviation Ops preclude the use of Site 8 on weekdays. Many thanks to Tony.

Rules and any competition format will be announced at the pilot's meeting. AMA insurance and membership is required for all pilots. There will be a transmitter impound area and frequency control will be enforced. A $10.00 per pilot entry fee will be charged the day of registration.

We hope you will plan to join us in February. We guarantee a good time and a chance to see some beautiful and large sailplanes and towplanes (1/2.5 and 1/3 scale). If you have any questions just call Asher Carmichael at 334-626-9141 (Acarmic985@aol.com) or Rusty Rood at 850-432-3743 (fishon@aol.com). The weather should be fine this time of year but please check in with Rusty or me no later than the Wednesday or Thursday evening before the scheduled dates for weather and event status. SEE YOU IN FEBRUARY!

Accommodations:

Ramada Limited
I-10 & Pine Forest Rd.
850-944-0333 Local
800-2RAMADA National
(The best place to stay close to the ground floor access on the outside. Brand new 1996.)

Rodeway Inn
I-10 & Pine Forest Rd.
Pensacola, FL
850-477-9150
800-228-2000 National
(Convenient and reasonable. Across the highway from Ramada and Crackerbarrel Restaurant.)

■

Results of the June 6-7, 1999
Open Division/Top 10
International Hand Launch Glider Festival
Poway, California
Reported by Tom Gressman
Littleton, Colorado

#	Name	Country	Aircraft	Wing Config.	Points (13 rounds)	Normal Score
1	Joe Wurts	USA	Maple Leaf Encore	flapperon	11,777.23	1000
2	Paul Anderson	USA	Leza	flapperon	11,545.99	980
3	Ralph Mittlebach	Germany	Own Design	poly	11,507.53	977
4	John Roe	USA	DJ Aerotech Wizard Lite	flapperon	11,258.98	956
5	A. Markiewicz	USA	Own Design	flapperon	11,202.12	951
6	Daryl Perkins	USA	NSP Psykologic	flapperon	11,119.60	944
7	Martin Berner	Austria	Own Design	poly	10,933.99	928
8	Paul Siegel	USA	NSP Logic	poly	10,819.41	919
9	Patrick Dionisio	USA	NSP Logic	flapperon	10,762.29	914
10	Derek Boyer	USA	DJ Aerotech Monarch D Lite Modified	poly	10,450.71	887

Jer's Workbench

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

Winter Check Up

Well, it's that time of year again, December going on January. For most of us, that means it's wet, cold, or just plain all around miserable weather, and we're unable to get out and do much flying. So, now's a good time to check out our equipment in anticipation of the coming spring. When's the last time you did this?

Let's start with our primary model, the one that gets flown most of the time: it's likely dirty and needs a bath. My favorite cleaning agents are rubbing alcohol and Pledge, so that's what I use to remove the dust, grass stains, and dirt. Once it's clean and shining on the outside, I remove the battery pack and receiver, looking for any dirt or grass that may have become lodged in the nose; I dump it out.

Once the battery pack is removed, the wiring is checked carefully to determine whether or not there are any cracks in the installation. Check the copper wire carefully, where any cracks appear, to identify broken strands requiring repair or replacement. Next, the on/off switch is inspected, after that, the servo leads. Once satisfied that all the wiring is in tip top shape, the battery pack and receiver are repacked, with care. Any nose weights removed with the battery pack are reinstalled, as well.

Checking the condition of the servos is next. Using the index finger, ever so very gently, see if you can move the servo arm. Do you detect any movement? Is the movement in the gear train, or the output shaft? If any movement is detected, it requires repair. While you can undertake to repair the servo yourself, if you do not feel confident about taking a servo apart and putting it back together again, you can send it to the manufacturer for a nominal repair fee.

Now, for the control surfaces. Using the index finger, again, place it on the trailing edge of the elevator, and try to move it up and down. Is there any movement? If so, where is the movement? Is it caused by a worn out control horn? Push rod flexing? Or, loose hinges? As each trouble spot is located, it should be repaired. I repeat each of these steps for the rudder, ailerons, and flaps.

The kinds of things we're reviewing here do, indeed, wear out: wiring, servos, control horns, push rods, and hinges. Once the repairs are complete, I can relax, looking forward to enjoyable flying next season.

Of course, if there are other planes in the fleet, then they require the same check-up, as well!

And, now, for the tool box. It likely needs to be cleaned out. I check for extra tubes of 5 minute epoxy, bottles of CA, or extra tools. It sure lightens the load when they're returned to their proper place, or owner, and could help you keep a friend.

That's it for now! Have a happy holiday season, and a joyful new millennium! ■

2000 Montague Cross Country Challenge

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

on the Wing

P.O. Box 975
Olalla, Washington
98359-0975
E-mail: bsquared@halcyon.com
http://www.halcyon.com/bsquared/

Giuseppe's X-4 in flight. Yes, it's a great performer!

Steve Savoie's Winter '99 Scale Project — Northrop's X-4 Bantam

It was already dark outside when the 'phone rang. On the other end was Steve Savoie, excitedly relating the recent successful flight of his scale U-2. Buoyed by a spectacular slope flight, he went on to relate his idea for another scale project — Northrop's X-4 Bantam. Steve thought he might be proposing an outrageous idea, but we assured him success was more than a possibility.

Our foundation for this upbeat attitude is derived from the efforts of Giuseppe Ghisleri. Giuseppe, who lives in Italy, built a near scale X-4 for flying on a local slope. The model is typical PSS construction and approximately 1/6 scale. The foam wings use the Eppler 224 at the root, Eppler 230 at the tip, and are sheeted with balsa. The blue foam fuselage is covered with fiberglass. The resulting model is lightweight and thermals easily in the conditions at Grone, an Alpine flying site which has a sun-facing rock face and a lot of thermal activity. The model will spin when given full up elevator and full aileron, but recovery is automatic upon release of the sticks.

Steve, somewhat surprised by our very positive attitude, went on to say that although he would be constructing the model, he thought other *RCSD* columnists might at some point be involved in some aspect of the project.

In the end, he "hired" us as consultants to do three things: (1) choose an airfoil for the wing, (2) compute how much, if any, twist should be used, and (3) determine a safe CG location. This month's column is devoted to explaining our responses to these three requests. Because the required wing twist is directly related to the aerodynamic characteristics of the airfoil(s) used — zero lift angle and pitching moment — choosing an airfoil is the first task to be tackled.

Choosing the Airfoil

As long term readers know, we are great proponents of the EH sections for swept wing tailless models. To reiterate what we've said previously about these sections, they have low pitching moments, docile stall characteristics, and lend themselves to reasonable modifications of camber and/or thickness.

Giuseppe Ghisleri and his X-4 on the slope. At 1/6 scale, it's a compact package.

The original X-4 used the NACA 0010-64 section. This is a symmetrical profile of 10% thickness. Steve would like very much to be able to thermal this model, and he asked if we could recommend a section with about 2% camber. The EH 2.0/10.0 provides the correct thickness for this model and has sufficient camber to be considered a soaring section.

Using the EH 2.0/10.0 directly does pose a difficulty, however. Because of the camber, the curvature of the upper surface is noticeably greater than that of the NACA 0010-64. The leading and trailing edges of the wing root will be slightly lower on the model than on the full size aircraft. This can be seen in Figure 1-A.

To reduce this difference, we slimmed the EH 2.0/10.0 to 6.5% thickness. See Figure 1-B. This modification should very much improve the appearance of the model when viewed from above, as the resulting contour is closer to that of the NACA 0010-64 and the location of the leading and trailing edges is more closely aligned to the original. See Figure 1-C. The thinning procedure flattens the lower surface somewhat, but certainly not in an objectionable way when viewed from a distance or in flight. The lower surface remains convex at 6.5% thickness, but does becomes concave if the section is thinned further.

Despite being just 6.5% thick, the wing has a chord large enough to ensure good spar height and plenty of clearance for standard size servos. Aerodynamically speaking, this thinning of the airfoil reduces the drag produced by the wing, but the pitching moment remains the same because the camber line has not been altered. Steve, of course, will have to make the eventual choice for the wing section, EH 2.0/10.0 or EH 2.0/6.5, based on how

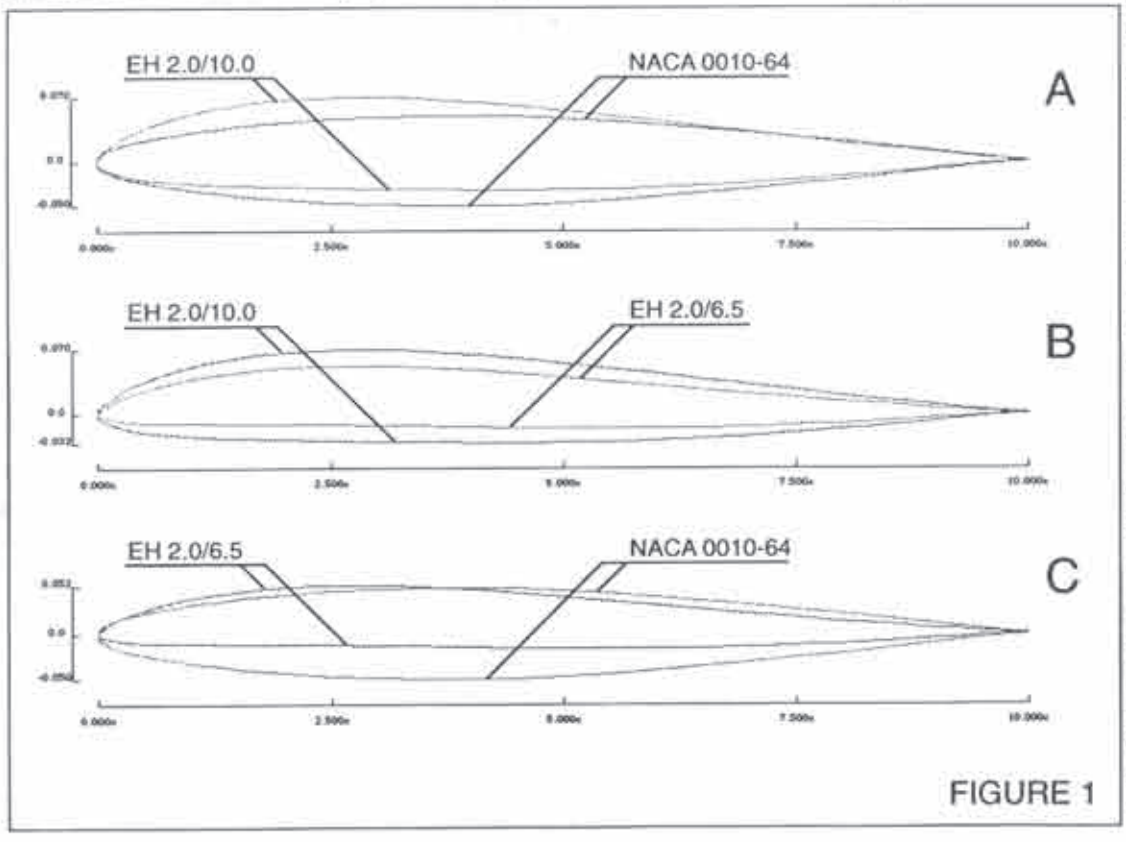


FIGURE 1

Table 1: Input Data for Twist Computation

Parameter	Dimension
Span	26.83
Root chord, projected to C_L	10.25
Tip Chord	5.0
Sweep angle (1/4 chord)	38 degrees
EH 2.0/6.5 zero lift angle, $a_{l=0}$	-1.0 degrees
EH 2.0/6.5 pitching moment, c_m	~0.00

Table 2: Required Twist

$C_{Ldesign}$	Twist
0.1	-1.6 degrees
0.2	-3.1 degrees
0.3	-4.7 degrees
0.4	-6.2 degrees
0.5	-7.8 degrees
0.6	-9.3 degrees

comfortable he is with building and flying a thin section.

Computing the Necessary Wing Twist

The X-4 data used in Table 1 was taken from "The X-Planes," while aerodynamic data for the EH 2.0/6.5 was derived from EH 2.0/10.0 polars published on the UIUC web site. The data from Table 1 was input into the Panknin twist formula. The results are shown in Table 2.

The design coefficient of lift, CL_{design}, is the coefficient of lift at cruise velocity. Traveling between thermals should be accomplished at neutral trim. Slow speed flight and thermalling should always be achieved by inputting some amount of up elevator, while high speed flight should require only a very small amount of down trim.

Keeping the above in mind, the wing cores should be cut in one piece with 1.6 to 2.0 degrees of twist (washout; i.e., leading edge down). Thermalling then requires some amount of up trim.

Determining the Proper CG Location

Determining the mean aerodynamic chord, MAC, of a swept wing tailless airplane would seem to be fairly simple, and indeed it is. The difficulty in placing the CG arises when attempting to determine an adequate static margin, the distance between the neutral point (25% MAC) and the CG. The problem is twofold: (1) the aerodynamic center must be established, and (2) the static margin determined. Let's take a look at the latter difficulty first.

If the static margin is too large, the elevator is relatively insensitive. The aircraft is too stable in pitch. Large amounts of up elevator will be required to achieve level flight, and performance will suffer as a result. In the worst case, there will be insufficient up elevator travel to prevent an unrecoverable dive.

On the other hand, if the static margin is too small, the elevator will be overly sensitive. The aircraft will be unstable in pitch. This can lead to erratic flight; even when very small control inputs are given, and pilot induced oscillations may cause loss of the aircraft. In the worst case, the aircraft is uncontrollable unless a "black box" with a high feedback frequency is put into use. The designer strives to keep pilot input to an acceptable level while reducing the static margin to the minimum.

This leads us back to the first difficulty. Since the static margin is always measured in relation to the aerodynamic center, it is imperative that the aerodynamic center be located accurately. You do not under any circumstances want to have the CG behind the aerodynamic center. For safety, modellers usually locate the aerodynamic center as accurately as possible and begin flight testing with a static margin which is known to be larger than will eventually be found practical.

Interestingly, the X-4 was first flown with a too small static margin. The aerodynamic center is assumed to be at 25% MAC. On its maiden flight, the X-4 CG was set at 22% MAC, a static margin of 3%, and longitudinal instability was in evidence. The instability disappeared when the CG was relocated to 19.7% MAC, 5.3% static margin, and this static margin was retained for all subsequent flights. It's interesting to note that Giuseppe Ghisleri's model flies well with a static margin of 5% MAC, almost exactly that of the full size aircraft.

For Steve's model, we're recommending an initial static margin of 6% MAC. This will require a small amount of up trim for level flight. As flight testing progresses, the CG can be moved aft while elevator sensitivity is evaluated and up trim reduced. The static margin should eventually be found to be around 5% MAC. See Table 3 for planform geometric data and Table 4 for an evaluation of CG location vs. static margin.

Additional Items of Interest

The X-4 was not designed to reach velocities greater than sound. Its primary purpose was to determine if sonic and supersonic flight could be made easier by the elimination of the interference between the wing shock wave and the horizontal stabilizer. Despite a subsonic maximum attained speed of Mach .94, the X-4 proved to be a good research vehicle, fulfilling all design expectations. Two were built, and both survived their flying years without a single major mishap.

The split drag brakes on the X-4 were large, and both surfaces could be opened to 60 degrees. The increase in drag was dramatic, and the glide ratio dropped to below 3:1 when the brakes were fully open. The X-4 was used as a testbed to simulate the landing patterns of aircraft still in the design stage, notably the X-15. We recommend Steve construct operable drag brakes on his model. In a recent e-mail message, he mentioned he had designed a mecha-

Table 3: Planform Geometric Data

Dimension	Value
Mean Chord, $\bar{c}$	7.625
Taper Ratio	0.488
Aspect Ratio	3.52
Aerodynamic Center	7.2 behind apex

Table 4: CG Location vs. Static Margin

Static Margin	CG
0.03	6.97 behind apex
0.04	6.89 behind apex
0.05	6.82 behind apex
0.06	6.74 behind apex
0.07	6.67 behind apex
0.08	6.59 behind apex

nism for scale operation of this feature.

The X-4 was also used as a research vehicle for exploring blunt trailing edges. This aspect of X-4 flight testing was initiated in response to porpoising at speeds of Mach .87 and above, and a tendency to tuck at speeds above Mach .71. The investigation first involved blunting the trailing edge of the drag brakes. This was accomplished by inserting wooden blocks between the upper and lower surfaces so they could not be fully closed. This opened the upper and lower flap surfaces five degrees. The results were promising, and balsa blocks were inserted in the trailing edge of the ailerons as well. These blocks were large enough to make the trailing edge thickness one half of the thickness at the hinge point (~80% chord). The porpoising and tuck were substantially inhibited, and Scott Crossfield was able to safely reach Mach 0.94, the highest speed recorded for the aircraft. Despite the possibility of making construction easier, such thick trailing edges on a model are not practical and would markedly hurt performance.

The name "Bantam" came from the aircraft's diminutive size. Nearly every part of the aircraft could be accessed by someone standing on the ground. The X-4 remains one of the smallest X-planes built.

Thanks to Steve for offering us the opportunity of participating in his scale project. Being such enthusiasts of tailless aircraft, we of course had an initial interest in the project. But once we got involved in learning about the aircraft, our interest rapidly intensified. We were quite surprised by its unique features and the extent of the X-4 research environment. We can't wait for the build-along articles to start!

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

References:

Miller, Jay. The X-Planes: X-1 to X-31. Orion Books, New York. 1988.

UIUC Airfoil Coordinate Database. <http://amber.aae.uiuc.edu/~m-selig/ads/coord_database.html>

■

Know Your Metals

by Roy Vaillancourt

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

Brass:

Brass is really an alloy of 70 percent Copper and 30 percent Zinc. Brass is an excellent metal for cold working and shares many of the same properties of Copper but Brass is stronger. Increasing the Zinc content increases strength and ductility. Brass can also be annealed the same way Copper is. Brass is considered a "self lubricating" metal and very rarely requires a lubricant in either machining or in use. Brass sometimes has Lead added to aid in machining and forming. There are many special alloys available but the three basic forms of Brass in use today are:

C260

Known as "cartridge brass" C260 has a high Zinc content that gives it optimum strength and ductility yet still retains the high formability of Copper. It has excellent cold workability and is used extensively in the automotive field. It is also the most common form of Brass used for plumbing goods, builder's hardware, and ammunition components.

C330

Most widely used for the fabrication of tubing. A low Lead content of .5 percent gives this alloy good machinability and excellent cold working properties. It can be fabricated by forming, bending, machining, piercing and punching. It can also be brazed, soldered and welded similar to Copper. Of all the Brass alloys this is the one that is used most widely for brazing steels and dissimilar metals together.

C360

Considered a "Leaded" Brass, this alloy also has a high Zinc content of up to 37 percent. The inclusion of lead gives this high strength alloy a "free-cutting" quality making it easier to machine. Often called "Leaded Brass" or "Free machining Brass" it finishes well and is the most easily plated, soldered and brazed Brass alloy.

Steels:

For our purposes there are basically two types of steels that could be found in the average shop, Carbon Steel and Stainless Steel.

Carbon Steels:

Carbon Steels come in a variety of alloys. Too many to list here. The predominant elements in Carbon Steels are Iron and Carbon. The Carbon content can range from a few hundredths to just over 1 percent. Doesn't sound like big numbers, huh? (Low Carbon Steels 0 - .30 %, Medium Carbon Steel .31-.70 %, High Carbon Steel .71-1.3 %). Carbon Steel in its various forms represents more than three-quarters of the steels in production today. Carbon Steel is generally fine grained, and has little to no alloying agents. Most Carbon Steels are classified as hot rolled, cold drawn or cold rolled and are available in bar, sheet, wire, tubing, and structural shapes. They are also castable and forgeable. Carbon Steels are heat treatable to a degree. The carbon content is what gives these steels their heat treatable strength properties. For example, the higher the carbon content, the stronger the material can be heat treated to. The music wire we use for landing gear is one of the medium Carbon Steels heat-treated to a tough condition. One draw back to these steels is that they contain high amounts of Iron. This means they rust easily. They should not be left bare, as they will form an oxidation layer of rust. Unlike Aluminum, this oxidation layer keeps on going until it has taken over the whole part. Eventually the part will deteriorate and disappear. Leaving you with a pile of rust... The best cutting agent for carbon steels is plain old motor oil. 30W works the best. Straight out of the can or bottle. Finishing steel is very easy. Clean off all oils and sand off all rust followed by a wipe down with thinner. Apply a coat of primer as soon as possible and finish off with the color of your choice.

Stainless Steel:

Stainless Steels are high-alloy steels well known for their outstanding corrosion resistance. Valued for tough mechanical properties such as high strength and extreme thermal capacities they provide low maintenance and long service life. Typically, Stainless Steels are iron-nickel-chromium alloys with a generally high percentage of nickel. There are two classes of Stainless Steels: Non-Ferritic (300 series) and Ferritic (400 series). The Ferritic class (400 series) contains a higher percentage of iron and approx 12% chrome; even though these steels are classified as "stainless", they do rust. The 400 series is magnetic and is heat treatable while the 300 series is not magnetic (generally) and is not heat-treatable. The 300 series contains a higher percentage of nickel and approx 17% chrome. It is the higher contents of nickel and chrome that give the 300 series their corrosion resistance. Most fasteners such as nuts, bolts and washers are of the 300 series. In cases where extreme high strength is required, nuts and bolts would be made from heat treated 400 series and then coated to prevent corrosion. The best cutting agent for most Stainless is USED motor oil thinned with a little Kerosene. The older the motor oil the better. You know, the stuff you drain out of your car after 70,000 miles. Don't mix it with rocks or sand, just add a little Kerosene and you're good to go.

Finishing any Stainless is just like finishing any Carbon Steel with one exception. The Non-Ferritic series does not rust and therefore does not require any finishing at all if you don't need it painted. It can be left bare and will hold its luster for a very long time. Much longer than most of our models survive. The Ferritic series does rust so it should be given the prep and prime and paint treatment.

I hope that this has helped you gain a little more knowledge on the various materials we use and why we use them. Good luck on your metal working!

■

"SHORT CUTS"

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

Flight of the U-2
U-2 Building Project
The Final Chapter - Part 8

The U-2 building project started almost 1 year ago to date; the U-2 finally came to life on a cold November morning over the shores of Lake Ontario in upstate New York. This event was long in coming; it was quite satisfying to see the 1/10 scale U-2 finally in "controlled flight".

As most of you know, the plane first took to the skies at the Elmira Aerotow last June and, after release at 2000', fell into an uncontrolled flat spin due to severely misplaced center of gravity and excessive elevator control. The 130" black beast was later located, undamaged, 50' up in a maple tree; and so I was given a second chance to get her flying again.

The second attempt to fly this untamed monster was almost just as bad, when the U-2 was aerotowed to about 15' altitude in order to test the newly repositioned CG. Upon release, the plane still suffered from excessive pitch oscillations causing a tip to hook the ground, resulting in a 15' cartwheel. The only good to come from that flight was to prove the airframe's survivability (one 5/16 carbon fiber wing rod was cracked), as the 7.8 pound aircraft hit the ground on her back. At this point, I felt it was time to pack it up before somebody got hurt, because up until then it was only my pride.

I was quite frustrated because I knew that many newly constructed planes have made their maiden flights at Elmira without incident; so why was I having such a problem? Well, to start off with, most of those planes were constructed from tried and proven designs with recommended control throws and CG ranges, including well matched airfoils suited for the proper wing loading. I, on the other hand, had a one off design, no recommended CG, no recommended throws, and the wing design (airfoil selections and washout) was a best gestimate. It was a big gamble that could have gone much better.

Anyway, the wing rod was replaced and the bottom side of the wings were striped out with yellow to take pilot error (orientation of a black on black aircraft) out of the equation. I also built an aerotow dolly wide enough to accept the 8.5" wide fuselage for eventual aerotow. This summer, Dave Garwood and myself discussed where and when the next test flight should be flown.

This was another big gamble, because we had only one airframe available and were certain that several attempts would be required, in order to get the CG just right, if that spot ever existed. We also wondered if the plane would ever be controllable with such extremes as wing taper, wing positioning relative to the fuselage length, and the possible influence of scale effects. Would this plane every obtain controllable flight no matter what we did?

We agreed that a nice gentle slope with high meadow grass for landing (crashing) would be in our best interests for verifying the CG through hand toss flight. The next step would then be a flight test, over a slope having smooth lift and a large landing area. Dave said he knew of such a spot, that worked a NW wind, on the shores of Lake Ontario. It was just a matter of time, waiting for the weather conditions to be just right and at a time when we were both available on an open weekend.

We were both on e-mail early during the first week of October, planning the flight for the first weekend of the month; however, the wind never materialized, so we called off the first attempt around 5 AM one early Saturday morning. Almost one month later, a front began moving across the northeast, bringing a trough of strong northwest winds that lasted 5 days straight. On Saturday, November 6th, I met up with Dave and between the two of us arrived on the scene with 8 planes and the Black Beast.

Steve Savoie & the "Beast". Photography by Dave Garwood.

The site has an 80' high slope at about 50 degrees; it's quite rugged with not much of a walkway from where the slope face ends and where the water begins. A faulted flight would end with either a damaged aircraft or one (including pilot) that was quite wet. We both flew a few test flights with the heavy planes, just to get acquainted with the slope characteristics and landing approach. The U-2 was being assembled when Joe Chovan showed up with a gaggle of planes himself. Finishing the assembly, we conducted about 5 hand throws into the 25 mph winds.

The CG had already been moved 1 1/4" forward since the last Elmira flight, and plenty of spare lead was stashed in the flight box, just in case. After the 3rd toss, Dave suggested I tone down the elevator; so I dialed it down to 40% on dual rate. The next throw was much more controlled than the first three. Then we tried to trim a bit up and get some distance out of a short flight. It was a great idea, thanks to Dave, and resulted in about a 40' flight. We had good pitch control and the ailerons were cleanly biting into the crisp, 45 degree air.

Dave and Joe went on to get a couple more flights on their own planes, when I gave the U-2 a final preflight. At this point, Dave mentioned that he had attended an event where he saw a scale fuselage crushed by an overeager helper trying to hold the wings level during a gusty launch; so, we asked Joe's partner, Brian, to hold the right wing tip level, as Dave threw the plane. We had already decided on a game plan; Dave and Brian would walk up to the edge of the slope, keeping the plane low and out of the wind, until I gave them the nod.

The 130" wing, with its 15" roots, really grabbed the wind; it was a struggle just to hold her for more that 5 or 10 seconds. Dave suggested that I use the ailerons to help them steady the plane; and it worked, quite to my surprise.

Upon my nod, Brian released the tip and Dave gave the "Beast" one of the best throws off a slope I've ever seen. To all of our amazement, and pleasure, she went straight up and out on a clean climb to about 300', without much stick correction. I knew that now was the time to turn, and run the slope, because I didn't want to get too far out in front of the hill. Her ailerons were very crisp for such a large wing; she banked around nicely without any rudder input, executing a light 20 degree bank, first right then left. Eventually, I trimmed in a bit more up, wanting more altitude, just in case of a tip stall.

This conservative approach proved unnecessary, but it did help me relax, as the turns were gradually getting more aggressive. First 30, then 40, and even 70 degree banks cleanly cut through the raw Canadian wind. We did trim up again, gaining altitude, to test the affect on pitch when those big 4" flaps were pulled to full (35 degrees, scale). Surprisingly enough, pitch was not affected; the plane just gained altitude, and drifted back over our heads a bit. We trimmed in down, in order to keep her out in front of the slope.

With the flaps back up, we increased the speed a bit; it was time to fly the plane in, closer to slope, where the photographers were waiting for just that perfect shot. While the U-2 had responded very well to tighter turns at higher speeds, I found that I just didn't have the guts to get her "twenty feet off the slope at eye level" for my photographer friend. (Maybe next time, Dave.)

Throughout all the flights that day, rudder was never used, and really wasn't needed. I'd much rather evaluate its affects on a nice, warm, thermal day after release from an aerotow in more reasonable winds.

With my gloveless hands starting to cramp, I handed the transmitter over to Dave for his evaluation. He felt that the plane had no recognizable bad habits, suggesting a forced stall at altitude. I disagreed, remembering that long, painful, flat spin over the countryside of Elmira. Dave reminded me that the CG is now properly placed and would prevent the spin; while I believed him right, I just didn't feel up to it at the time. A request to do a barrel roll was also denied; I just wanted to fly the "Beast" and get a better feel for the tips, control surface throws, and CG.

By now, we easily had 45 minutes of flying time on the plane; it was time to bring her down for the first (controlled?) landing, as well as a thorough post flight check. Well, I botched the downwind turn, drifting way back 50' above and 100' behind the distant tree line. The nose was pointed down and the HQ mix of airfoils penetrated nicely into the now 30 mph breeze, positioning the plane for a good approach. Then, just for a second, I thought of pulling the flaps, slowing her down for approach; but common sense got the better of me. I just kept the wings level and left the flaps alone as she entered ground induce turbulence. A bit of stick work later, and she was on the ground without much effort, though my heart rate was up a bit more.

What a pleasure it was to have the "Beast" back on the ground in one piece. It was also satisfying to know that the airfoil selections (HQ 2.5 10/ 3 12/3.5 13) and washout angle had produced a decent flying wing. The match up of wing loading was also good, although she could have just as easily flown with another 2 pounds of lead in her belly. But hey, I wanted a wing loading which leaned more towards slow thermal flight than hot slope speeds. (It was also mentioned after Elmira that turbulence from the blanked off jet intakes in the forward fuselage section could be tripping up the elevator causing the pitch problems, but this appears not to be the case.)

Conclusion

So, what did we learn during this year long project? Well, picking the U-2, a plane known unto itself to have flying difficulties in real life, was quite risky and could have possibly never properly flown. I also realize that regardless of what the numbers say about CG location, it's still best to fall back on TLAR. Had this wing been placed on a more conventional airframe, I would have just gone right to the root and balanced out the plane, like an OLY II. I was also a bit overconfident by attempting the first flight attempts in such a rushed manner. It's OK for a proven design, but not something as radical as this. I was also satisfied that I had the pure perseverance not to give up and to be lucky enough to get a second and even third chance to test fly this thing without incurring severe damage. (Guess the extra $13.00 of Kevlar was worth the bother.)

Finally, this project could not have been undertaken without the inspiration of Dave Garwood, both the technical and practical input from Jerry Slates and B^2, as well as the proper composite material match, which was supplied by Aerospace Composite Products.

And, what's on the agenda for the U-2? Last week I took the fuselage into the local camera shop to match up a "point and shot" 35 mm camera for installation into the "Q bay", and will be replacing the carbon/Kevlar belly hatch with a thermally formed Plexiglass or lexan unit. Hopefully, I can get some surveillance flights over Elmira at the 2000 Aerotow event.

The molds are still in great shape and we'll pull Dave's fuselage in the months to come. Many folks I met at Elmira and elsewhere wanted to know if the plane would be kitted, to which I replied that I just wanted to get it flying, first. So, to those individuals who have asked, if there is still sincere interest, I may manufacture a limited quantity of fuselages, cores, and drawings.

And now, on to the X-4.

■

HAVE SAILPLANE, WILL TRAVEL!

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

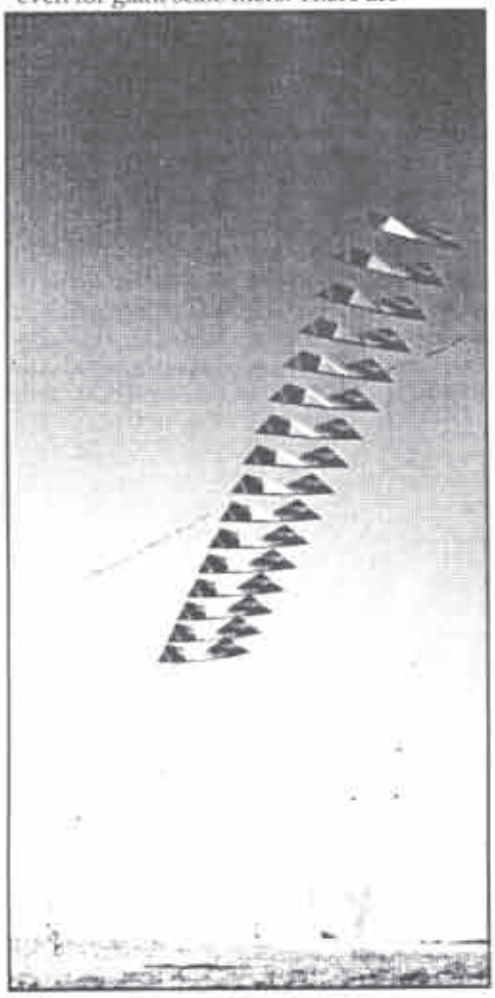
This column is dedicated to soaring vacations. This month, Jim Cook takes us to the Academy of Model Aeronautics International Aeromodeling Center in Muncie, Indiana.

Flying in Central Indiana

By Jim Cook
Livingston, Texas

We live in our RV, a twenty-nine foot fifth-wheel travel trailer. We have been slowly meandering around the country on a sort of permanent vacation for four years. We carry an electric Zagi 400, DAW Dragonette, electric Lazy-Bee and Oly 650. My wife is often surprised to open a cabinet and find the odd r/c transmitter or battery charger tucked away. Wings decorate the walls in our bedroom/hangar.

In October we traveled to Muncie, Indiana. We were attracted to the Hoosier State not just because of the vast alfalfa fields or breathtaking hog farms, but to visit the AMA Museum and flying field. The field is located a half-mile east of Muncie on Memorial Drive. This major flying site has over a thousand acres of gently rolling grasslands. Now that should be big enough even for giant scale fliers! There are



Kite Convention - Big man flies huge stack of "Revolution" kites!

electrical outlets to charge your batteries. What more could you need?

We parked our travel trailer and I hauled out my purple Zagi 400. Yes it's a deep shade of purple. Not puce, not lavender, but a manly shade of purple. Tom Broeski was selling these kits at a hand-launch contest I attended last spring. By the time I got around to buying one, purple was the only color he had left. By the way, at a great distance, purple blends into deep blue sky very nicely. Not necessarily a good feature.

At the AMA field my purple Zagi 400 with its electric motor got several curious looks from the regular wet power fliers. But they were soon impressed when I tossed this piece of motorized foam into the air, hit the throttle and watched her streak skyward. I caught a few thermals and had a couple of twelve-minute rides. The Zagi 400 is a marvelous model. At various times I have specked it out in a thermal, slope soared for over an hour and just buzzed around the field. It is ideal for carrying in our RV since it has no delicate tail feathers and does not require a seven hundred-foot long clear area for stretching out a high start. Just charge the nicads and let 'er rip! Since I got the Zagi 400, my other models have been more than a little envious.

We visited the AMA museum. There are hundreds of beautiful models nicely displayed. It's a fantastic collection of planes from early examples of exquisite free flighters through today's winged wonders. One rainy day, I practiced flying inverted on the model flight simulators they have set up. The museum also has an extensive model aircraft research library.

Perhaps your traveling companion might not want to spend every blessed minute flying models, looking at models or talking to other modelers. Just five miles from the AMA

field is McGalliard Road, where you can find all kinds of shopping, including malls and many popular chain restaurants. If you really want to do some city slickin', Indianapolis is about an hour away. Notices of area activities can be found in the lobby of the AMA museum.

Muncie is also the home to Dave Letterman's alma mater, Ball State University. There's always something going on in a college town. During our visit, the Bolshoi Ballet performed at the university. Free admission! From our third row seats we watched the Russian dancers impersonate Sukhois doing the four minute Free Style.

If you plan to go to Muncie, you should call ahead to see if the field will be available. In addition to "The Nats", the field is sometimes rented out to other organizations. We didn't call ahead and soon found out the American Kitefliers Association convention was going to start in a few days with no open flying allowed. We hung around anyway and were rewarded with a sky full of flying octopuses, colorful tapestries and wild stunt kite antics. Kite buggies raced right out our front window.

About 20 miles from the AMA field near Millville, we visited Wilbur Wright's birthplace, something every pilot (or aviation/history buff) should see. We walked the hallowed ground. It is a wonderful place to sit and think. Wilbur was born at this very location in 1867. Here you'll find a replica of the home he was born in, complete with smokehouse. Next door, there's a small museum with a full scale Wright flyer replica an enthusiast spent 10 years constructing. Amazing, especially when you consider the original was designed and built in one winter, sans plans. After you have soaked all this in, the neat part arrives. There's a radio control grass strip right behind the museum, operated by the Henry Co. Wright Flyers Inc. R/C Club. Imagine, flying at Brother Wilbur's birthplace!

Jim Cook launches his electric Zagi at the Henry Co. Wright Flyers Inc. flying field.

If you're a camper, the AMA museum has a list of campgrounds in the area. If you don't mind roughing it, you can camp right there at the field, no charge. Pay phones are available on the field and in the museum. You can take showers at the museum during office hours. To fly at the AMA site or the Henry County Wright Flyers airstrip, all you need is a current AMA card (according to what one of the members told us).

After a pleasant week we hitched up and headed west, searching for the next flying site.

***

Thanks, Jim!

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

■

GORDY'S TRAVELS

Visalia, The Real Story

by Gordy Stahl
Louisville, Kentucky
GordySoar@aol.com

Friday

Volz and I got there at 7 am in order to get his booth set up. We were guests of the TPG, that's the Torrey Pines Gulls group and George Joy, who got there early in the week to make sure the club had its turf. I started getting my planes out, assembling and fast charging.

The 'commons' were already filled with electrics and hand launch planes ripping around; there were winches and bungees spread every which way with sailplanes launching. I was burning to get up in the air.

I had built a Hera and Emerald in motels over the previous three nights and test tossed them (two tosses each) in light lift at Los Banos the day before.

The Hera was already sold (long story) and I was trying to decide whether to fly it (or the Emerald, or my trusty Citation) in the contest. The Hera's very anxious buyer loomed nearby, watching, so I decided not to fly it and give it to him, instead.

Grabbing the Emerald, I headed over to the winch area. At this point there were very few channel pins left on the board; the air was extremely busy with airplanes of all kinds.

I have to tell you that I had some pretty strong (but unfounded) prejudices against the Emerald prior to buying it, so I was not all that optimistic about flying it; rather, I was strongly thinking of selling it.

However, the first launch was big and straight. Hmmmn, I thought, "Maybe it's not so bad, after all. It hooks up into a thermal and zooms. I like that a lot." And, decided right then to fly it.

As the morning passed, more and more guys arrived and the limited parking area was a checkerboard of cars, vans, trailers and motor homes. Michael Volz continued to organize his booth, often swamped with decerning sailplaners anxious to check out his wares.

Michael had some very expensive and innovative 'Trophies' made for the world's premier contests, and Visalia had earned the right to be considered as USA's "big dog" event. The trophies cost hundreds each, and consist of a gorgeous exotic wood box, containing a special silver or gold plated Volz Wing Maxx servo, an engraved plate on the outside noting the category of the trophy.

The 'big dogs' were holding court in groups around the site; Ben Clerx, Joe Wurts, Daryl Perkins, Skip Miller, Tim Renaud, and Gordon Jennings, as well as other famous fliers were sharing tips and chiding each other. First timers to the event were excited to finally put a face and voice to the legends.

All the vendors were moving into place; some used sailplane stuff was placed out, snatched up by the early bird shoppers.

This day was about set up and flying, which continued through the day and into the dark of night. Did I say airplanes? Well, the ante goes up as the day continues, with giant rocket launches right through RC bird airspace. Friday was not a place for "babies". It's big boy fun, and everyone enjoys the 'on the edge' activities. There's a lot of laughing going on.

Friday nite was pretty surrealistic, with lots of electic foam ships sporting Tim Cone's NiteOps lite systems. There were lots of Twin Stars having fun; a bunch of the new Zagi speed 400 foam wings and the smaller Razors filled the air, as well. The sky was filled with green streaks.

Lots of clubs came as groups and, as the darkness fell, the smell of the cook outs filled the air; and, Barleypops were shared. The night was filled with tall tales of soaring, discussions on design, questions on equipment, remembrance of past events and soaring pals, discussions on strategy,

Gordy Stahl (L) & Sam Girardi (R)

and speculation as to which of the big dogs would take the prize this year.

About 10 pm things got really quiet; those staying off field headed off and those on field headed in. Great thermals and big landing points surely filled their dreams.

Saturday

Pilots meeting was (Groan!) 7:30 am. Vendors were already set up; contestants' planes were charged and wings were taped. The impound was filling fast; those that had not registered the day before were picking up their T-shirts. Winches were uncovered and checked, while lines were run; the final preparations had begun. This is a dead serious event - the officials are official! Rules are discussed and clarified, in depth. Michael Volz explained the incredible trophies; others having announcements were given time, as well.

Here's the deal... Each pilot was assigned a Group letter. Mine was B. A hat was held up at the end of the pilots meeting and one letter was drawn to start the day of soaring.

Maybe it was a P... Anyway, the first task was a 3 minute.

The air was calm, warming from cool and dewy. Those who weren't in the first group breathed a sigh of relief that they weren't the sacrificial goats, then realized that a 3 was a cake walk; those going first had no

down wind to complicate their landing approaches.

Most watched the 'target shaped' landing area. Three circles, the outer appeared to be about 4 feet in diameter, with one further inside, and a bullseye of about 12". (Probably all were bigger, but they all seemed smaller to those approaching for a landing.) The first ring got you 20 points, the next 40, and the bullseye got you the max of 80. Everything outside the target, but within the immediate grassy area, got you 5 points. (There wasn't much 'immediate area'.) A flip over, or a lost part on landing, counted as zero; you don't win at Visalia with a zero landing.

Launches sounded like gattling guns firing. As your group was called, you got your radio, time card, and airplane; then you waited in a group staging area to be assigned a winch que line; you and your timer move up, all the time scanning the sky for activity to give you an edge or at least an idea as to where the thermals were likely to pop. No goofing, adjusting, or turning on is allowed while in the winch que.

And, then it's your turn. You step up immediately after the launched pilot has been lead away, their timers looking a lot like guide dogs, directing them to the landing zones. No loitering was allowed in the winch areas, so you step up quickly as the Launch Master calls out, "Ready on 1! Launch 1!" You launch or you are in deep trouble; then it's your turn to be led away by your timer.

A constant mumble of times and tips was coming from the 'commons', the area between the winchs and the landing zone. An occasional cheer was heard, as well as lots of gasps of disappointment. In between 'ups' was a good time to catch a quick nap, shop, visit, munch, or just watch the action. After each round the standings were posted.

When my group was called, I rushed up, waiting for the call to the winch que area, when I noticed that the tape on my nose skeg was on upside down! I rushed back to our area, cut the fibre tape holding the nose skeg, and stripped it off. Looking around for more tape, I could only locate some plastic wing stuff. Oh well, I thought, "A bunch of it wrapped on should do the trick."

Returning to the launch que, my timer and I moved up. The launch was great and the butterflies were flying in my stomach, again... But, "No problem," I thought. "The air is super buoyant; getting ONLY three minutes is gonna be the challenge." Things were going much too good - I was lined up on the approach; the count down was dead on - I could make a perfect round...

The Emerald was rock steady; the crow and elevator comp was dead on, too. It was approaching perfectly; I dropped the nose, the skeg dug into the center of the bullseye, and... The tape rips! The skeg was embedded, but the nose of the plane slide forward for a 5! Bummer!!!!!! "Well there's always next round," I thought. I didn't have expectations for a standing of higher than 100 out of the nearly 200 fliers in Open Class, anyway.

So, I went back to our area in search of the right tape, catching bits of conversations on my way: whining and excuses, cajoling and kidding, or words of sympathy.

I put the plane back on charge, rechecking system and linkage, in hopes of avoiding any destruction to my plane.

When the first round results were posted, I was #147, behind just about everyone else!

I wasn't bummed, though; I was inspired. It seemed like I'd have a chance to do well, after all. My time was great and I actually did hit the target; if it weren't for the tape thing, I'd been tied for first place! Wow!

The rounds progressed and the standings shuffled. At the end of the first day, I had moved up.

That nite things were quieter, cuz everyone was tireder, but we had a great BBQ on the field; the topics of discussions were pretty obvious. Most began, "And if only I would have..." It was a really great day.

Sunday

Sunday was the day when the big dogs made their moves and the hopefuls were determined. Overall, a Falcon 600 two meter was in the lead.

The air was still good, for me, at least. (Lots of guys might argue that.) I had moved up to the top of what's referred to as the third page (about 79th). The last task was to be an 8; and, I launched right at a hawk! ZOOOOM! "Man it's hazy," I thought. There are constant tornado-like dust devils in the distance filling the air with dust.

My plane was almost impossible to keep track of and I warned my timer to help me keep watch. The count was gonna be no problem; I was on track for the target. The Emerald was still rock steady and I could see the nose skeg trusted firmly to the nose. I was running a little late on time, but it's the landing points I was focusing on, now. A tail wind was coming up; the plane sped up a little and it got a small lift from its two foot altitude up to about three; but, no problems as far as I could see. She was on track for another bullseye. Bango, I hit it and, at the same time, another tail wind gust and over she tipped! Right on her back. BUMMER, again...

The landing area was totally controlled by landing judges. They and only they could read your time and mark it; they and only they could determine your landing points.

(There were a few other 'undercover' timers who time our timers to make sure that there are no 'accidents' with times; unfortunately, there have been a few 'errors', in the past, and pilots have been quietly escorted off the site. While fun, this is a world class serious event.)

And, now we wait. There are a few fly-offs to determine ties in the top ten; then the 'second page and below' results are posted. I moved up to 59th, and while it may not sound that impressive, keep in mind I did better than over 100 other really good sticks and I was on the 'second page'!

Scans were made to see who was not on those pages to try to figure out who was on the first page. Then a quick check was made to see who of your friends you could give the raspberries to for beating them, and then a little strutting.

The winners were called up and Volz presented his wood, silver and gold trophies, the Visalia award plaques; there were rounds of applause... And then, it was over.

"Bummer," I thought. "It's over." I didn't want it to be over. It's like, "Hey, let's do another round!" But that's not gonna happen. Tents are dropping, last minute deals are being made, stuff is packed, hands are shaken, and cars are pulling out.

I hope I can make it again next year. Maybe I will hang on to that Emerald after all.

That's the way I saw it. Until next month. Gordy, signing off. ■

TECH TOPICS

by Dave Register
Bartlesville, Oklahoma
regdave@aol.com

About a year back we discussed the design of a simple 2 channel HLG, the Tahlequah.. The purpose was to put into practice a number of design ideas we had discussed in earlier columns. This ship was intended as a simple to build starting point from which one could branch out a bit with their own ideas.

Tim Johnson up Seattle way has taken the concept quite a bit further with a glassed wing and molded fuselage. A picture of Tim's 'Tally3' (the Tally4 is every bit as good looking!) shows some very nice work and a number of improvements to the original design. Jim sent along some very helpful notes on scratch building the plugs and molds and, with Jim's permission, we'll turn part of the column over to him this month. So for those who have thought about scratch building (any design, not just this one), please read on.

Scratch Building Plugs & Molds

by Tim A. Johnson
Seattle, Washington

Drawing the fuse

The goal on the fuse was to get a more streamlined shape, thus the need for a mold. I took the side profile of the original Tahlequah and took the squareness out of it. The rear approached the size of the carbon boom. The nose was dialed in with a French curve. The wing saddle is the same, leaving a little overhang over the top of the wing. The width is a little narrower at 1". I made sure my radio gear would fit in the drawings.

Building the plug

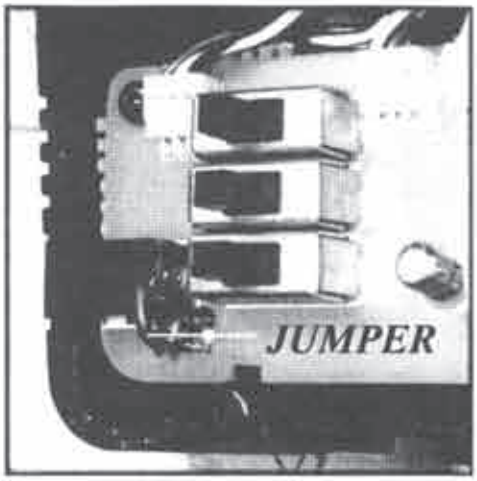
I used 2 pieces of 3/4" x 1 1/2" x 14" clear pine and added a few drops of CA to hold them together. A jigsaw was used to rough in the side profile 1st, then the top view. I drew longitudinal lines around the rough shape and went to work with the table top sander and a 60 grit belt, trying to keep the shape symmetrical. Final sanding was with 320 grit by hand. The plug was finished with 15 coats of Partall wax until it was glossy smooth.

The mold

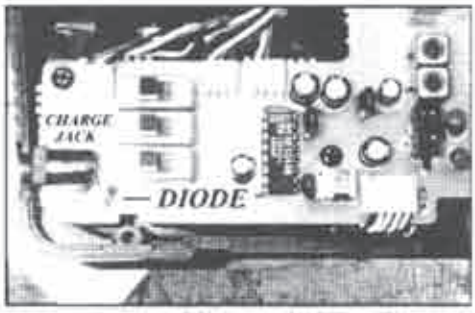
The fuse plug was split in half and glued to a piece of 1/4" Plexiglas with white silicone. When the silicone was dry, it was trimmed flush with the Plexiglas and fuse side, the idea is to keep epoxy from seeping under the plug. Using an air brush, the plug was sprayed with PVA, a mold release film. I used tooling epoxy, which is thick, and 6 oz. glass and built up the mold to a 1/4" thickness. This should include a 1 1/2" flange around the perimeter of the plug. Mold building should take a couple days so as not to build up too much heat. I let it cure for a week, then popped the mold off the Plexiglas. After the plug halves were out, they were glued back together and the mold put around them. Alignment holes were then drilled in the mold halves using threaded drywall screws.

The Lay-up

Laminating epoxy was used in the lay-ups. The glass is 3 oz. crowfoot weave with 2 oz. Kevlar on the sides. The other lay-up is 2 oz. Kevlar with 2 oz. Kevlar side doubler. The molds were prepped with several layers of PVA, just brushed on. When dry, epoxy was mixed up and brushed into the mold halves and the cloth laid in and wetted out. Excess epoxy was sopped up with toilet paper. When the epoxy is stiff enough, trim fabric on one side of the mold 3/8" long and flush on the other side, vice versa on the opposite mold half. Mix up more epoxy and paint some in the seam area. Then the mold halves are slid together and screws inserted in the alignment holes. I used a coat hanger with a circle bent into the end to reach in through the opening in the mold at the wing saddle. The seam was massaged to get a good bond. After 24 hours curing, the mold is parted and the fuse is popped out. Both lay-ups seemed adequate and final weight is .6 oz. This is a lot simpler than it sounds. These fuses are really strong. The actual working time to do a fuse is about 1/2 hour.



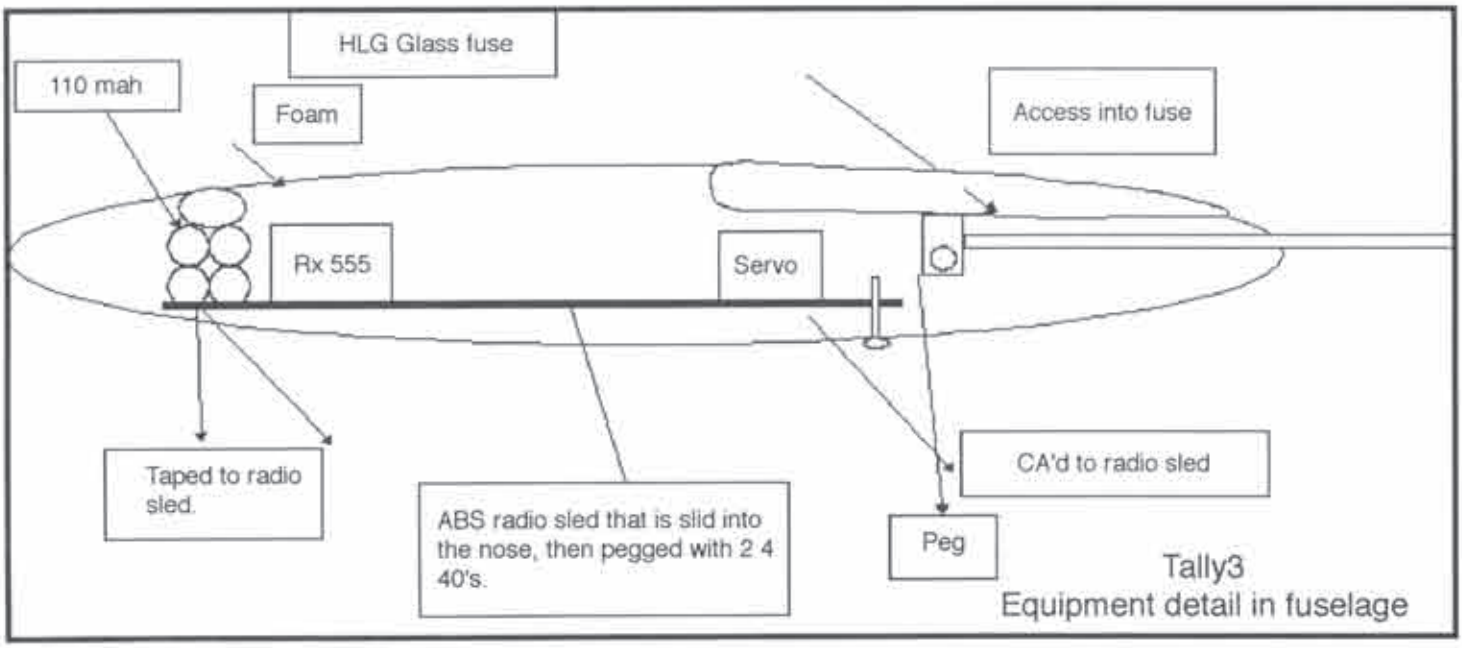
Jumper for charge circuits on the Hitec III.



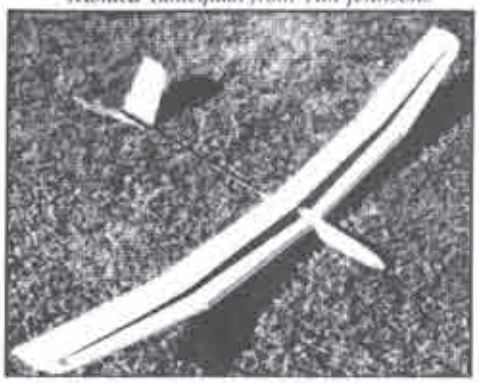
Layout of diode on the Hitec III.

Boom installed

The same as the original design. I cut a hole in the rear of the glass fuse. Use a hard-wood former in same location for the wing hold down. I leave a space under the former which allows the ABS sled to be slid forward and backward in the fuse.



Molded Tahlequah from Tim Johnson.



Radio gear

110 mah battery, Hitech 555 and Cirrus HS 10 BB. I use a Radio shack 3/32 jack and charge plug so the plane can be charged without removing the wing. Handy at contests. With the wing in place, make up lead weights to match that of the radio gear. I taped them to the fuse until I got the proper balance. Then I cut a piece of 1/16"x 3/4" ABS sheet, taped the gear to it and slide it into the nose. The servos go just ahead of the wing saddle and get glued to the ABS with CA on a thin foam tape.

Wing

The wings are vacuum bagged using 1.5 oz. cloth with 12" center doubler. The spar is 1 1/2" uni-carbon at the root, top and bottom. I use 3 oz. cloth to secure joints. I still use the vertical grain balsa block and one hold down screw. When the wing is on, I use a piece of strapping tape at the leading edge and one at the trailing edge to keep the wing straight. The tape gives if you have a bad landing. Wings weigh 3.5 to 4 oz.

I've included a couple of mold making sites that have been helpful. I've picked up a lot of info from the internet.

http://members.xoom.com/JTProuty/plugs.html

http://members.xoom.com/JoedyDrulia/fmold/fmold.html

http://www.scrollsander.com/Soaring-Fuselayup.htm

http://members.xoom.com/JTProuty/molds.html

I also plan on trying a bagged foam tail group.

(Back to Dave.)

T2/GF

Meanwhile, back here in Okie country, the original Tahlequah design has evolved into the T2/GF. In particular, the wing planform now is the Schuemann-Ellipse with Reynold's number correction we discussed earlier this year. And yes, that layout really works as advertised.

As noted two columns ago, some changes to the layout had to be made to improve the yaw-roll coupling due to the small tip panels. Some details of this design: 6" root chord, 5-1/8" poly chord and 2-3/4" tip chord. The main section is 19" and the tip section is 10-1/2". To address the yaw-roll coupling issue, the included V-angle in the tail has been reduced to 90 degrees. In the wing, the root angle is 12 degrees while the poly tip angles are 18 degrees. Using 110maH battery, 2 FMA S-70s and the Hitec 3ch AM Rx (no case). All up weight is right around 7.5 oz. The T2/GF has been flying for about 6 months and is still slowly evolving.

Next step with this design is to evaluate the effectiveness of tip airfoil transition (the tips are taped on just for this purpose!). Hopefully, in a few months, we'll be able to report some interesting results on that score. Right now the same airfoil is used throughout and – 1/4" of wash-out is needed to give REALLY tight turns with good tip stall resistance.

Diode Jumper For The Hitec IIISS

If you're smart, you've already got some sort of battery cycling/charging system. Maybe Santa's been nice to you and brought one. There are many very good models out there but I've just been a bit slow on the uptake with these really neat units.

Recently, I bought an FMA Einstein system and it does everything it claims it will very nicely. I've learned a LOT about my battery capacities. Found a marginal pack that I'm glad was caught before it was too late. But I also ran smack into the Tx diode problem for cycling the transmitter pack. The diode is placed in the charging circuit to prevent reverse polarity in the charging system. Reverse charging polarity is a great way to fry your battery pack and sometimes take out the Tx electronics along with it. So the diode is an excellent safety idea. But it does keep you from cycling your pack unless you remove it from the Tx every time.

For most systems, the charging jack has a well defined polarity (outside is negative, inside is positive). Then along comes JR and turns it around the other way so if you've got a JR charger; DON'T stick it into any other brand. Same goes for any other brand going into a JR system. On the Einstein, there's a special adapter for JR systems and that's probably the case with the other quality vendors of this type of equipment.

There's been quite a bit of discussion about jumpers around the diode for various Tx types. Since the one I use a lot these days is the Hitec IIISS, I took a look at how to do this and it turned out to be very easy. The jumper itself is simply a wire (preferably insulated) around the diode. If needed, the jumper can be removed and the diode circuit is restored to its original function. The pictures are pretty self explanatory, so I won't give a lot of discussion other than to note:

If you perform this modification, any warranty for your transmitter is instantly void!

So although this is a very handy modification for battery analysis, it will cancel your warranty. Be sure you only use the charger intended for your radio, or a battery management system specifically set up to handle the polarity properly.

For the Hitec IIISS AM, remove the back cover by taking out the 4 screws in the back of the Tx. Looking at the back of the circuit board, the diode is located just to the lower right of the charging jack. The polarity of the diode is such that you just need to hop a wire from the exposed diode lead to the center terminal on the charging jack. Very simple. Pre-tin the wire ends and the center contact on the charging jack so you don't have to give it much of a heat soak. Use soldering paste to help it wet the surface. And by the way, Don't forget to take the battery out of the tranny before you start this little operation!

See you next millennium! ■

Photo by Frank Traut of his 1/3 Piper towing a very large sailplane.

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

The Future
4 June 2009

I thought I might share a dream I had just a few short weeks ago. It was on 4 June 2009 to be precise.

A Perfect Solo Day!

As I drove up to the field, thermals were busting out all over the place and the telltale cream puff clouds were everywhere. I couldn't wait to get started! I tumbled out of the van and started rigging the towplane and glider…

Before I left the house, I called Ron and Jim, but I knew that they would both be busy working overtime. That being the case, I put the drone into the van along with my ASW 34.

As you all know this beautiful composite 1:3 sized stall-proof canard (it always looks like it's flying backwards to me) glider will go up in the very lightest of lift. I always take it with me when I'm going to airtow alone.

I put the wings on the drone, checked the onboard computer and made sure all the controls were working properly. I've flown at this field many times before, and so the GPS co-ordinates were already programmed in. All I had to do was decide whether to takeoff to the South or North. I chose North for a slight headwind.

The GRP Vario on Board Computer: Tow Yourself!

I checked out this GRPS computer three years ago and found it to be flawless. You can program the exact takeoff speed, direction, rate of climb, rate of turn, and most amazing of all, the computer automatically compensates for wind. While it's true that we still occasionally do airtow each other, the drone tug with GRPS gives us smoother and better tows every time. Best of all, when there's only two or three of us at the field, we can all fly our sailplanes and get in as much thermalling as possible. It's great fun to have three or more sailplanes working the same thermal (as long as we all are flying in the same direction). Very best of all, you can airtow yourself!!!!!

It Will Land Itself Perfectly Every Time!

Not only does the GRPS fly our towplane steadily and smoothly to height and then, after release, fly it in for a perfect landing every time (no matter what the wind's doing), with the downlink to the audible computer software, it also gives us our altitude, airspeed, rate of climb and battery voltage. It's great not to have to charge our batteries every time we fly, but just in case we forget and let the batteries get too low, it's great to be certain there's enough juice there… You can't be too careful!

Getting the Towplane Ready to Tow!

Anyway after less than ten seconds of "programming" the "brains" of our tug and I am ready to go. Just to be on the safe side, even if I don't have to, I always charge the tug's electric batteries at home before I come out to airtow. I just want to be certain that I'll have enough juice for six to eight high tows. Given today's thermal conditions, I'd hope to need only one or two launches! That should give me more than enough soaring for the rest of the day! Just in case (as always), I brought the solar charger, but this has always proved to be unnecessary. I bet the day I forget it, will be the day I'll have a problem with the batteries in the tug! Unfortunately after all this time, Murphy's Law is as potent as ever…

I put on the drone's wings and walk it out to the middle of the field. I marvel at how lightweight this 125 inch bird is – these sorts of tugs with powerful gas motors used to weigh in the thirty plus pound range, now this one pushes the scale at exactly 8.7 kilos. Ever since the Kavalon/Kevlar/Carbon (KKC) composites came out, our rather large models have lost about 75% of their weight. This means that when desired, the towplane can fly very slowly and realistically.

The same lightweight revolution holds true for gliders. As you know, just a few short years ago the sailplanes used to weigh up to 20 kilos for a large one and maybe 7 kilos for a four meter 1:4 bird. These days when it's calm, I no longer have to bring out my 1:3 size ships but often fly smaller and even lighter birds. My 1:4 Discus VI with a 4.7-meter wingspan weighs a mere 4.85 Kilos! I reserve this particular bird for no wind conditions and does it ever fly!

Reading the ASW 34

How I digressed while putting on the wings! The tug's now ready to go and in the middle of the field. I stretch out the towline, come back and rig up the ASW 34. I've had quite a few flights on this bird, and really enjoy it. I can fly it manually on the sticks when I want, but if I wish I could go to the automatic mode, I can sit back and just watch this sailplane sniff out and catch its own thermals.

The GRPS Various

The new GRPS vario is really handy in this regard. If I want to have a sandwich and don't wish to land for lunch, I can switch on the automatic sensor, which puts the glider into the thermal search mode. I've been very careful to program in the maximum parameters of flight so that when and if necessary and or desired I can take over and fly my bird. I've found that the best visibility is no more than 2000 feet away, and so I programmed a circle with me at the center and so the glider flies no more than half a mile away in any direction. If it catches a thermal and drifts downwind, if more than 2001 feet away, it will break off circling, head directly upwind (towards me) until it catches

another thermal, or starts to fly the search mode again (whichever the computer "thinks" is best).

To Land or Not to Land: The Auto Flight Mode

I remember the old days when I'd catch a thermal just before lunch and be torn between a good sandwich and a good flight. Once in awhile even, I'd land just to go get a drink or for something more urgent... Now with the GRPS "Auto Flight" mode I am not forced to make this difficult decision. I can simply flip the Auto Flight switch and the GRPSx 23069 will do the rest! I can put the radio down; have my sandwich or a drink or whatever – take a break without having to land. If I'm up high, "how do I find the glider again?" you might ask. Well there is something new I can tell you about, but more on that later.

We're Ready to Tow!

How my mind wanders! Anyway with the wings on the glider I walk it out to the end of the towline and hook up. Now we're ready to go.

I've found that the autopilot in the sailplane, or at least this particular sailplane needs to be given a little up trim while on tow, and then once the release has been flipped it goes to neutral trim. This gives the glider a perfect climb out and gets me to altitude in a minimum of flying time. Frankly I find it great fun to get everything ready, go back and have a seat and let the tug and the 34 do their thing all by themselves. I've always liked being around airports and watching the big birds land and takeoff. Watching these two R/C models do their thing gives me the same thrill.

I check all the controls on the sailplane. Everything works. We're ready to go. I then flip on the autopilot, walk back well off the field and relax in my lounge chair. We're ready to go! I give a look around to make sure there's no full sized aircraft coming into the airspace, then I flip the full throttle on the tug and off we go.

Quiet Tows!

I marvel at how quiet and how powerful the new MTF electric motor is. The five bladed molded carbon/Kevlar prop. with the new Anjek airfoil is a wonder – you can't hear at ten feet!!!!! It's the quietest prop I've ever (not) heard. This is truly silent powered flight! What I like best about all this is that I've finally found out how to make my canopies whistle.

Whistling Canopies

Well, over fifteen years ago I had a buddy who flew a RIPO DG600, and this bird whistled no matter where it went and no matter how slowly it flew. It was music to my ears. I've always like the whistling sound, because it simulates what the full sized sailplanes sound like.

Anyway, we finally found the formula to make all sailplanes whistle at will – all it takes is a tiny space in the rear of the canopy, but it has to be placed just exactly right depending on what the shape of the canopy and the fuselage is. It's sort of like whistling with your lips, and it's why it's so hard for kids to learn how to whistle. If you pucker up your lips and blow, you have to have just the right hole in just the right place in order to make a sound. The same thing's true of sailplane canopies! The crack between the canopy and the fuselage has to be just right or you won't get that whistle.

No More Vibration!

Not only was there a lot of noise with the gas motors, which we used to fly, but also the vibration was a real killer! Now the installation is super easy – just screw the electric motor to the firewall with a little bit of right thrust. No worries about vibration or mufflers! No noise, no vibration, and above all no problems.

Takeoff! And Up They Go!

As the drone and my beloved 34 takes off, all I can hear is my happily whistling canopy! What a great sound! I remember the old days when the towplanes used to be so darn loud they hurt your ears. Compared to this, even those superb German mufflers were all too loud!

As I watch the tug pulling the 34 up in a climbing left turn, they fly through a thermal. First the towplane rises abnormally high, then, as the sailplane flies through the lift, it too ascends. A little later the inevitable sink affects the rate of climb, but all is well and both the drone and the sailplane are rock steady. They fly the airtow better than I ever could! The great thing about the pre-programmed airtow flights is that the airspeed remains almost constant throughout the entire flight. When the rate of climb is programmed in properly (not too steep and not too shallow), the airspeed remains constant within two or three kilometers per hour, which make it really easy to program the glider for its gentle but constant rate of climb, as well.

More Powerful than Ever!

With fewer moving parts, these new brushless ball bearing geared electric motors put out lots of thrust and with our wonderful NHMBT batteries, we can fly at full throttle for well over an hour and a half without having to recharge (the motor battery). Not only that, an 18,000 Ma battery only weighs in a mere .35 kilo!

I'm also reminded as I watch how slowly and gracefully this tandem team keeps ascending, that the new and powerful Scymitar motor weighs less .3 K, so that the entire power pack in front weighs just over half a Kilo. This enables us to build incredibly light airframes and so voila, here I am witnessing a beautiful scale-like tow and loving it!

Auto Release

My onboard vario keeps counting off the height. I have it programmed to release at 350 meters. My rate of climb is approximately 110 meters per minute, so I have a little over two minutes to enjoy the spectacle. I hear the telltale beep of the automatic release and see the drone fly straight until it senses that the sailplane has indeed really unhooked. By the way, I find that all you need to do is program in a ten meter "stretch" - meaning that once the sensor knows that the glider has gone ten meters further away than the towplane, it automatically switches the drone into landing mode.

Landing Mode

I always find it fun to watch the towplane come in for a landing. It noses down, does a split-S, heads downwind and then lines up for a perfect landing. When the shadow on the ground meets the wheels, I give a faint sigh of relief! Another flawless tow! The tug taxis to the side of the field and the motor stops.

Finding the ASW34 with Auto Spot

Where's the 34? I search the skies, but I can't spot where it is. No sweat; I flip the Auto Spot button and soon find the 34 under a nice cloud to the Northeast. As you all know the Auto Spot feature is indispensable (I wrote about that three months ago.). Frankly, I wouldn't dare fly my sailplane on Auto Glide or Auto Search mode if I didn't have the Auto Spot feature in my radio. It's really a great device and points a compass exactly where you should look. Then all you need to do is to aim antenna in the same direction, much like a rifle sight. The audible keeps beeping until your antenna points to exactly where the sailplane is flying and then sounds a steady pitch, signaling "on target". Lo and behold there it is every time! I find this a fantastic help, because my eyes aren't as good as they used to be! By the way I've never heard of a single glider being lost because somebody took their eyes off it - as long as they're flying with Auto Spot! It's well worth the $227 extra to add this feature to whatever radio you may now be flying! It'll pay for itself many times over!

Thermalling!

With the 34 in sight, I now switch the autopilot off and enjoy some thermalling myself. The great thing about manual thermalling is, if I lose sight of the sailplane, I can switch on the Come Back mode and the sailplane will automatically fly right over the middle of the field. Or I can use the Auto Spot to find it. I find both of these modes very handy! I often lose sight of the glider, but now I don't have any fear of losing my bird - I simply flip the switch and find it, one way or the other. If I get too high, I can spin the 34 down. This particular bird spins very easily and slowly. With spoilers out, the 34 comes down as gently as a goose down feather!

If You Screw Up, The Computer Will Find Lift!

The other wonderful thing about all this "auto pilot" stuff is that when I screw up with my thermal searching, and begin to get too low, I can simply flip a switch, and most of the time the computer will find a better thermal and fly it to height faster and more efficiently than I could possibly do. It also keeps track of when and where the glider encountered lift and flies directly there. Sometimes the only lift is too far away; once in a while I do have to land and try another tow, but that's almost a thing of the past!

I Always Know When There's Lift!

When I go out to fly all by myself, I never go unless I'm pretty certain that there will be lift. I always check this on my weather computer. This handy little device rests outside my windowsill and computes the combination of humidity, barometric pressure and temperature and unfailingly

reads out at what time the thermals (if any) will start popping. It can also calculate at what height they will start to form, but I always program it for minimum height. Those who fly in their sailplanes are more interested in how high the thermal activity will take them. This wonderful device can be bought at any of the usual places for less than fifteen dollars!

The Trusty Auto Sniffer

I nudge my 34 a little lower and to the left. Whoops! I find nothing but sink. "You'd better fly somewhere else," I tell myself. I find sink again. I'm now at 150 meters and still in sink – let's see what the Auto Sniffer can do today! So I flip it on. The 34 makes an abrupt right turn and off she goes. Sure enough, less than two minutes later (and at 130 meters), we're in a thermal and climbing nicely. Soon I'm at 420 meters. That's really quite high enough, so I switch off the AS and, once again, try my hand at staying aloft.

A Perfect Day!

This is a particularly beautiful day with a wonderful sky; the deep blue contrasts with the brilliant white and gray beneath the clouds. I'm really glad I came out to the field to fly. Days this beautiful come all too rarely! It's usually too cold or too hot or too windy or I'm too busy! Today, it's just perfect!

Silent Power is Growing!

I might add that the silent flight and very quiet airtowing has opened up to us many new airfields. Now I only have to drive fifteen minutes to my local high school soccer field where they let me fly my towplanes and gliders. Safety used to be the other issue, but after a demo or two, most folks agree that these new computer programs for the onboard computers are just about full proof!

The other nice thing about this is that very often some kids are nearby and I let them try their hand at flying. Its super easy to give them a lesson, for all I need to do now, to recover from any mistake, is flip a switch and the glider flies itself again. I no longer need a trainer chord. I just keep my finger ready on that switch! If in doubt, let the airplane fly itself!

As you well know R/C clubs have sprung all over, and most of us hardly have to drive within an eye blink of distance to get to where we can fly.

Unfortunately, pilot error is still the biggest airplane killer, but the good thing is that these very large birds are so light, that they have very little chance of doing much damage. Quite a difference between this and a forty five pound bird coming straight at the ground with all the terror of that inertia hitting something!

Lots or Younger Pilots!

Forty percent of our club is now youngsters under sixteen, and the youngest pilot to go solo this year was only six years old! He's an exception, but he's going to be an exceptionally good pilot; I wouldn't be surprised if he went into aerobatics. His dad flies a 1:3 sized SuperStar 793, but he won't let his son fly that one yet! After all, the kid's only at the take off and landing stage!

Do It Yourself IS Fun!

While it's true that we can program the entire flight from start to finish and not have to touch our radios from takeoff to landing, it's still fun doing it the old way – with our thumbs. We still occasionally dig 'em in with our lousy landings, but luckily, with all the bells and whistles in the radios, accidents are now almost a thing of the past. Most of all, it's really great to be able to get towed up by a remote and silent tug – especially if the rest of the gang couldn't make it out! In the old days, all this was impossible!

We can thank the aerospace industry and especially NASA for developing the very computer programs we are now using. As you all know, NASA had to find ways of getting their research vehicles to fly and land themselves on Jupiter and Io. Remember those wonderful photographs we all saw in 2004? The RSP (Remote Space Program) is well known to all of you by now, but thanks to those wonderful inventions, I am now sitting in my lounge chair on this superb day, enjoying the fruits of the RSPs just a few short years ago.

What's Next

I can't imagine what they'll think of next. The onboard computer technology seems just about perfect now, and those virtual-reality computer cartridges are great to fly at home when the weather doesn't cooperate!

The Slow Flyers are in a class by themselves ever since the ventilated wings got perfected. I sometimes fly mine down the hallway and land on my pillow, trying to see just how slowly it will fly. With the wing vents blowing full blast, this tiny bird flies much slower than walking speed. By the way, don't sneeze: the other day I blew mine out of the air when I got a tickle in my nose! Luckily, I did little damage and I flew it again after just a few minutes of repair.

Silent Power is POWER!

There's no doubt that silent power in conjunction with today's wonderful new computer radios have really made R/C accessible to all. Don't you just love the holographic instruction manual, which comes with the XPS30064?

There are still one or two things they could improve on; how about a holographic R/C glider to fly inside the house? I would just love to get my hands on the new aerobatic Eagle XXIII simulator! I hear it's going to knock the socks off the rest of the flight sims we all now have...

I could go on and on but perhaps that's enough Hot Air for this year...

Have a wonderful and unique 2010! Have a blast! ENJOY! And don't forget to TAKE SOME KID FLYING THIS YEAR!

■

ZIKA

LAIMA: THE FIRST ATLANTIC CROSSING BY UNMANNED AIRCRAFT

By Tad McGeer © copyright 1999
The Insitu Group
401 Bingen Point Way
Bingen, Washington USA 98605
insitu@insitugroup.com
25 February 1999

(Thanks go to Air & Space Magazine and Tad McGeer for sharing this wonderful story. And, thanks also to Robin Lehman who coordinated its appearance in RCSD.)

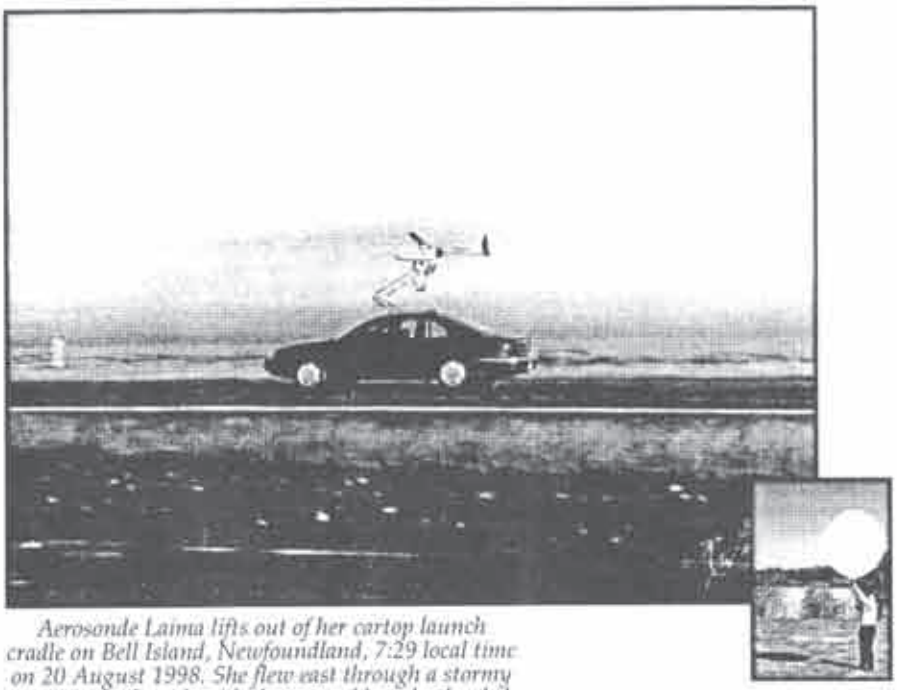
Newton's concept of gravity, it is said, was born under an apple tree. On the scale of history, the idea for the first robotic flight across the Atlantic must admittedly be assigned a rather lower rank, but at least it had a similar provenance. It came to mind one winter's evening amidst the sleeping orchards of the Hood River valley. I had dined with my old classmate Andy von Flotow, and being, it must be acknowledged, irremediable nerds, we talked as always about engineering. I had just returned from Western Australia, where a trial was then underway of the Aerosonde: a miniature weather-reconnaissance aircraft on which, by then, I had been working for six years. This trial was the most ambitious since my group's start of field work in 1995, particularly in our use of multiple communications sites to extend the domain of operations along the "cyclone alley" coast of the desolate northwestern Pilbara. But even so we could monitor aircraft over only a couple of hundred kilometres of coastline, and only a hundred or so out to sea - far short of the Aerosonde's long range, and of the over-the-horizon reach needed to realise our ultimate goal of routine reconnaissance in the open ocean. To go further we awaited (and still await) new satellite-telephone systems, which were then more than a year away from service. However Andy, characteristically undaunted and with globe in hand, pressed me about ocean crossings. He eyed the North Atlantic: "Maybe it's time for a stunt."

We joked about possibilities, but I, for my part, didn't take the idea very seriously. Not that it wasn't technically feasible: Newfoundland to Ireland, the obvious route for a transatlantic demonstration, was certainly within an Aerosonde's range. Moreover we didn't actually need the enroute communications for which we had been waiting. In a pinch, faith, hope, and charity could serve instead: we would simply dispatch an Aerosonde from Newfoundland along a stored transatlantic route, and wait, however uncomfortably, for it to materialise at the other side.

So it could be done, at least in principle. Whether it should be done was another question. Should we put our effort into yet more field work, which had already taken a great deal of our energy for many months, or instead into engineering, which had consequently suffered from neglect? We had been improvising answers to this question for years, and making the right choice was becoming acutely important.

The Aerosonde Concept

The Aerosonde idea began in 1991, as a response to the chronic shortage of weather data over the oceans. Although satellites generate much useful information, forecasters and their numerical models depend crucially on data which satellites cannot supply: soundings of temperature, pressure, humidity, and wind from the surface to high altitude. To take soundings, meteorologists use balloon-borne radiosondes or parachute-borne dropsondes. The sondes themselves are light and cheap - costing less than US$100, and weighing only tens of grams - but the ships and aircraft needed to launch them at sea are large and very expensive. Consequently weather services cannot afford to gather much data offshore.



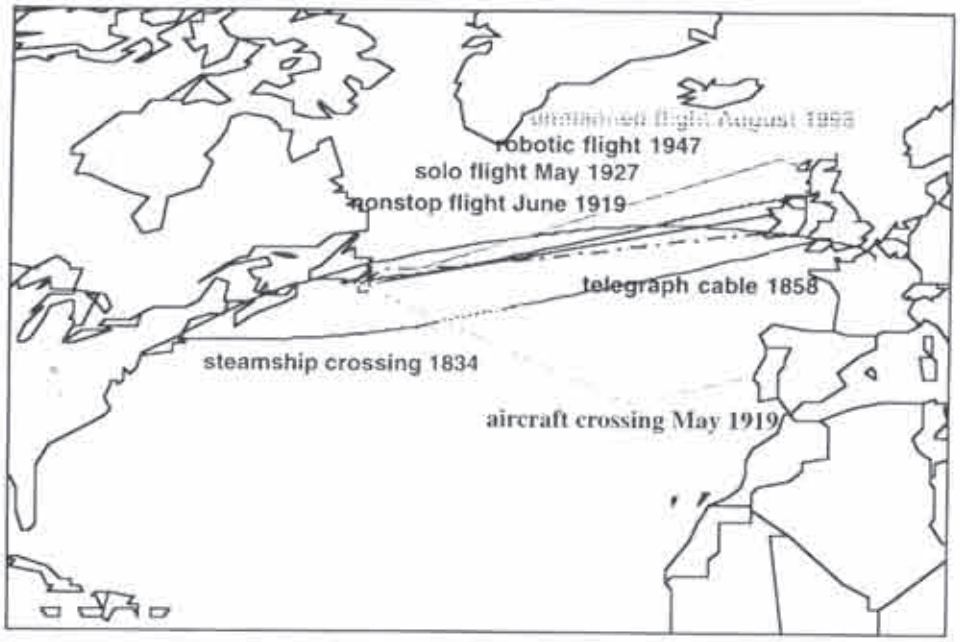
Aerosonde Laima lifts out of her cartop launch cradle on Bell Island, Newfoundland, 7:29 local time on 20 August 1998. She flew east through a stormy night, out of touch with the ground but shepherded by her namesake, the ancient Latvian deity of good fortune. After 26 hr 45 min she plopped down in a meadow on South Uist, off the Scottish coast, and so became the first unmanned aircraft - and, at only 13 kg gross weight, by far the smallest aircraft - ever to have crossed the Atlantic. Ron Bennett photo.

Laima owed her development to a chronic problem in meteorology. Balloon soundings of the atmosphere, made twice daily at about 1000 sites worldwide, supply the lifeblood of computational weather forecasting. However soundings over the ocean can at present only be taken by launching instruments from ships or aircraft, which are too expensive to operate in any numbers. Miniature Aerosondes like Laima promise to make oceanic data collection affordable on a much larger scale.

In 1991 it occurred to me that, in view of miniaturisation of the necessary components (including especially the then-new receivers for the Global Positioning System) it would be feasible to design a miniature long-range aircraft which would itself be the sounding instrument. Such an Aerosonde might be no more expensive than a balloon on a cost-per-sounding basis, but it would be able to reach almost anywhere over the oceans or remote lands areas. A substantial improvement in global weather forecasting would then be within reach. The idea was picked up with particular enthusiasm by Greg Holland of the Australian Bureau of Meteorology, and by Robert Abbey of the US Office of Naval Research. Together we began, slowly at first, to develop the concept and a philosophy of development.

From the start it was fairly obvious that sufficient engineering effort would yield a suitable aircraft. However a bigger uncertainty surrounded how the aircraft might be used. This made our job a bit different than that of, say, Boeing or Airbus in developing a new airliner. For an airliner, the "system-for-use" - airlines, passengers, airports, regulatory standards, air-traffic control, etc. - is well established, and the economics are well understood. Consequently the development effort can concentrate on engineering, and routine service can begin as soon as engineering is complete. But for Aerosondes the only thing well-established was the need. Beyond that, the idea of routine long-distance operations by tiny autonomous aircraft was entirely novel, and raised all kinds of new issues. How could an aircraft without a pilot avoid other traffic? How might regulations restrict where and how they could fly? What would their operating costs be in practice? Would weather services fund them? What routes would be best? To address these questions, we saw that the aircraft and the system-for-use would have to be developed in parallel. This called for a series of field trials expanding gradually in scope toward routine operations.

That philosophy - and limits on our funding - dictated the approach taken when my company, The Insitu Group, was



Inching skyward with an overload of fuel, John Alcock and Arthur Brown nurse their Vickers Vimy away from St John's on the afternoon of 14 June 1919. The next morning, after more than 16 hours flying with harrowing escapes from fog and icing, and blocked by bad weather to the east, they landed in a bog on the Irish coast. They had made the first nonstop flight across the Atlantic, won £10,000 from the London Daily Mail, and opened new frontiers in aviation.

Crossing the Atlantic has had a special cachet for centuries. The first steam crossing in the 1830s, the first Atlantic cable in 1858, and the first radio transmission in 1901 were all recognised as key milestones in technological advance. The first aircraft crossings, following on progress made during the first world war, generated great excitement about the potential of aviation. Lindbergh's solo flight in 1927 set a further milestone in range and reliability, and within a decade transatlantic flight had become routine. 1947 saw the first "robotic" flight, in which the crew of a special US Air Force C-54 refrained from touching the primary flight controls all the way from start in Stephenville to stop in Prestwick. It took another 51 years for the robot to throw out the transatlantic crew!

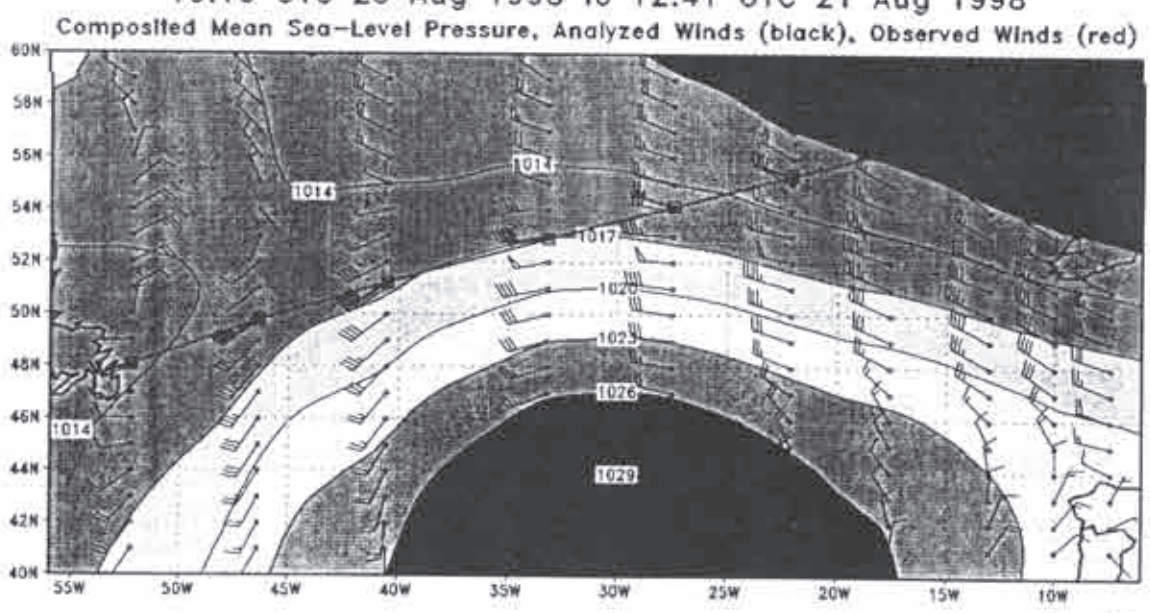
incorporated in mid-1994. We had a short-term focus: to produce prototype aircraft for initial trials off northern Australia at the end of 1995. That we did, and so set off, with only a handful of flight-test hours under our belts, to grapple in the steaming tropical bush with some of the most powerful thunderstorms on the planet. We managed to cope well enough to boost interest among prospective users, not to mention our own confidence. But while the "gee-whiz" elements - tiny fuel consumption, autonomous operation, penetration of rough weather, and so on - worked well the first time out, a lot of basic engineering was left to be done on reliability, particularly of the engine and fuel system.

By that winter's night in Hood River, thinking about the Atlantic, we could look back on two years of further results: demonstrations around the Pacific with some 20-odd aircraft; several flights exceeding 24 hours; more encounters with thunderstorms and rough weather. Reliability was better as well, but still not very good; aircraft in the field were requiring far too much support and suffering far too much attrition. This was due at least in part to ongoing trials taking time from engineering, which was a something of a vicious circle inasmuch as, without reliable aircraft, demonstrations were that much harder to mount, and so left even less time for us to make the aircraft better. Having just returned from yet more first-hand experience of this problem in Western Australia, nobody in my Group was particularly enthusiastic about a new transatlantic effort.

The siren song

On the other hand, while our field exercises had gone some way toward generating interest in the Aerosonde, awareness was still limited mainly to small groups of meteorologists and people in aviation. So all of the reasons for doing demonstration flights still applied, and to an Atlantic crossing they applied in spades. To link the Old World and the New, to cross the Ocean steeped in its legacy of the Vikings, Brunel, and Lindbergh: that would raise awareness like nothing else could possibly do. And not least among our own group of engineers. I already knew, as well as anyone, what these aircraft could do, yet I was quite taken aback by the thought of actually trying to cross an ocean. That attitude had to change if we were ever to reach the point of routine service.

Thinking this over for a few days, I came to think that, maybe, it was indeed time for a stunt. We discussed the idea at Insitu, and with our colleagues Juris Vagners at the University of Washington and Greg Holland in Australia. The consensus was that an Atlantic attempt might offer much to gain, and relatively little to lose: a few Aerosondes and our time against a



Aerosondes are slow, with a cruise speed of only 40 kt or so, and winds can therefore make a big difference in range. We were looking for tailwinds averaging about 15 kt to cross the Atlantic with a comfortable fuel reserve. For flight planning, the US National Weather Service provided us with wind estimates from its Aviation model; here these estimates are shown by black barbs. On the day of Laima's flight, the model was so accurate that arrival time in Scotland was within 3 minutes of estimate, and Laima's logged winds - in red - matched the estimates all the way across. If the situation were this good all the time then weather services wouldn't need Aerosondes at all! However we had been careful to choose our launch day, and our route, so that conditions would be very predictable.

potentially big boost for the miniature-aircraft concept. We decided to pencil it in for the summer, to be reviewed in light of (still more) field exercises upcoming off Vancouver Island and in the South China Sea. Meanwhile we agreed to keep the thing quiet to avoid raising expectations.

The pact of secrecy was put to the test a few weeks later. We had been working for some time with meteorologists in British Columbia and Washington state on concepts for Aerosonde reconnaissance in the northeast Pacific, and had convened a meeting at the University of Washington to consider options. As we discussed how to generate interest, Cliff Mass - a meteorologist from UW who was later to do our transatlantic forecasting - proclaimed, "You need to do a demonstration! Something dramatic! Newfoundland to Ireland!" Mert Horita of Environment Canada quickly joined the refrain. Juris Vagners and I mumbled something about giving it a bit of thought and steered conversation into less sensitive territory. But the value of a demonstration could hardly have been made more clear.

On we went through the spring, flying in rain and icing off the west coast, and in yet more thunderstorms and wilting humidity in the tropics. We chalked up 400 flight-hours in the first 5 months of the year, including 4 flights exceeding 24 hours - long enough, given favourable winds, to make the Irish coast. Pieces were still breaking far too often, and we had lost a few aircraft to one or another poorly-developed part failing or falling off. However the score was just good enough to make the Atlantic worth a shot.

The plan takes shape

So it was that early in May I started seriously to check feasibility. Weather was the first issue, since to make the flight with a comfortable fuel reserve we would need a healthy tailwind. Steve Lord, a computational meteorologist at the US National Centers for Environmental Prediction, and an Aerosonde advocate of long standing, was let in on the Atlantic plan and soon looked up the climatology. The news, as expected, turned out to be good: average winds in July and August blow at about 15 kt straight from Newfoundland to Ireland. Cliff Mass, also now in-the-know, then checked further into several years' worth of records for altitudes around 5,000 and 10,000 ft. He came back full of enthusiasm about several opportunities per week with good winds below the freezing level (which we would not cross for fear of icing). Soon afterward, Steve arranged for wind excerpts from the US aviation-forecasting model to be posted regularly on the Web. These became vital for flight planning.

So the crossing would indeed be feasible. Would it be safe? One could think of various hazards: hitting another aircraft; hitting a ship if the aircraft went down; or hitting something on land if the aircraft went off course. We weren't concerned about the last problem: Aerosondes have range-safety provisions to cut the engine if they can't maintain track, and in any case we had never had an aircraft wander off course. For aircraft and ship collision, on the other hand, we couldn't do much better than random chance, which I estimated to be less than 1 in 100,000. In routine service we might be able to make the risk lower that that, but, as it was, we thought the number acceptably small for a one-off demonstration. Still, our opinion was neither here nor there; it was the opinion of the aviation regulators that mattered.

On the Canadian side, we had established good relations with regulatory and air-traffic services through our trials in British Columbia. We had been impressed by their handling of those programs, which was conscientious, critical, but at the same time positive and interested to find practical ways to accommodate this new-fangled gadget. They applied the same approach to the North Atlantic, and over the next couple of months we worked through the issues with David Wall of Transport Canada and with the staff of Gander oceanic control (which is responsible for the western half of the North Atlantic). The obligatory Special Flight Operations Certificate was issued in latter part of July.

On the other side of the Atlantic we had to start from scratch. Fortunately we soon made good contacts, notably with Mike Ankers at Prestwick Centre in Scotland (which handles the eastern half of the North Atlantic). Mike quickly understood exactly what we wanted to do, and asked a few very pointed questions about safety and position estimation. Once satisfied, however, he concluded that we could be handled without difficulty. We planned to use forecast winds to estimate position while enroute, and although the uncertainty band (based on possible wind error) would grow to perhaps 200 miles along-track at the end of the flight, a large box of "protected" airspace could be put around it. Both Prestwick and Gander agreed that such generous protection, while profligate, would not be a problem for a one-off exercise in view of the sparsity of low-altitude traffic over the sea.

That was fine until someone checked the rules: it turned out that international standards call for aircraft crossing the ocean in controlled airspace to make hourly position reports. But of course we couldn't supply anything but estimates - we were, after all, crossing on the faith-hope-and-charity plan. In the end this left no choice but to stay below the floor of controlled airspace at 5500 ft, and live with weaker tailwinds.

That, however, was only a minor inconvenience. Bigger problems loomed with the Irish Aviation Authority. Initial contact was made in May, and discussion proceeded fitfully as our proposal did the rounds of Aviation House in Dublin. As June and July wore on I had a number of encouraging conversations, but ultimately on 28 July - only a week before our planned departure - we received a fax advising that we must not enter Irish airspace. But in May that was all in the future.

After starting discussion with the air-traffic and regulatory authorities, I started looking for takeoff and landing sites. Our initial thought was to retrace the first nonstop flight by Alcock & Brown in 1919, from St John's to Clifden in Galway.

Aerosondes were launched from Bell Island in Conception Bay. Trumper, Laima, and Millionaire in turn flew down the Bay beneath the control zone for St John's airport, rounded Cape St Francis, and headed northeast for Scotland. Bell Island, now a slow-paced scion of a once-huge iron ore operation, proved to be a superlative base, not only because of its fine location and facilities, but above all because of the welcome and support given us by the cheerfully enthusiastic Islanders.

However that plan was a non-starter; the launch site is now overrun with roads and buildings, and the landing site remains the same hill-ringed bog that nobbled their Vickers Vimy, nose-in-the-mud, in a comic finale to their triumphant achievement. We had to go elsewhere.

David Wall of Transport Canada suggested flying from Harbour Grace, west of St John's on Conception Bay. The disused strip there was actually built for Atlantic crossings, and made famous by Amelia Earhart in 1932. On receiving the topographical map, however, we saw that departure would take us first over some houses, and then down a narrow harbour for a couple of kilometres. That gave us pause: crossing 3000 km of open ocean might be safe enough, but we wanted to give built-up areas as wide a berth as possible. So out came the local aviation chart, and a ready alternative presented itself in the form of the airport on Bell Island. (Although we didn't actually need an airport, they are much easier than roads or meadows to assess from the end of a telephone line.) A check of documents and a chat with the local mayor made it clear that this was the ideal spot: on a cliff hard by the sea, looking down Conception Bay into the Atlantic, and with a nice building adjacent for aircraft and gear. It did indeed turn out to be a superb site, and made all the more so by the warm welcome and wonderful hospitality given us by the Bell Islanders.

For landing, a search of the Web turned up the informative Irish Aviation page. This gave us contacts for all of the airports on the west coast, and after many messages and phone calls back and forth we converged by mid-June on Belmullet in County Mayo.

Crossing the easy way

Any sort of novel flying with unmanned aircraft is best preceded by simulation, including "hardware-in-loop" simulation where, in effect, the aircraft is made to think that it is actually flying. Eventually we accumulated about 900 such "flight-hours", and meanwhile we did itinerary calculations using each day's winds to get statistics on likely flight times. It transpired that, on a good day, we might use only 3 kg of fuel for the crossing (out of 5 kg in total), and in any case the frequency of better-than-4 kg days was such that we could turn up our noses at anything worse.

The route and altitudes had to be selected to account for winds, icing, weather for takeoff and landing, and moreover for predictability: since the flight plan would be cast in onboard memory once the aircraft set out, it was important that we be

Bill Vaglienti talks with a BBC crew at the South Uist ground station. The red display behind him summarised the sad story: Trumper, expected early on the afternoon of 18 August, had not made contact and was by this time long overdue. Bill, a development engineer and the pilot for landing in Scotland, shared a tense and fruitless vigil with a crowd of visitors and his two crewmates from the University of Washington. The media were anxious to herald the story of Trumper's successful flight, but had to go home disappointed. Only a few locals were on hand for Laima's arrival three days later. Peer Frank photo.

able to rely on the forecast. Our planning drills culminated in a dry run during the first week of August, in which we coordinated launch, landing, and flight-planning groups through a complete flight plan and mission simulation. We still wound up improvising in the field, but the preparation showed through: Laima's arrival time was within three minutes of estimate, and the fuel burn within 5 percent.

The media

Sooner or later our preference for quiet preparation had to conflict with the idea that this was, at root, a media event: publicity was the object of the exercise. By early July, with only a month to go, we decided that an announcement was in order to give reporters time to prepare. But we certainly weren't prepared ourselves for what happened next.

Eric Sorensen of the Seattle Times phoned instantly for a story. This wasn't what we had in mind: still chary of raising expectations, our thought was just to pass word that there might be a story in a month's time. Eric had already done a full-page piece during our Vancouver Island program in April, and I tried to explain that for now there really wasn't anything new to report. But I soon realised that we had been awfully naive about the news business: a bird in hand is worth two in the bush, and the name of the game is to print a story NOW. So the Seattle Times went to press with a big spread on July 11, including, for spice, some play about us being in a David-and-Goliath competition with Teledyne's enormous, and enormously expensive, Global Hawk. I had told Eric in passing about an Air Force idea of flying Global Hawk to the Paris Airshow in 1999; now, it seemed, the race was on to make the first unmanned Atlantic crossing.

With the floodgates parted by the Times' initial report, there was nothing to do but go with the flow. Calls, messages, and stories appeared steadily during July and on through and after the expedition, with welcome interest coming from lay and technical media worldwide. Accuracy was sometimes a bit weak, but enthusiasm was total, and we were indeed grateful for the stories that they produced.

The theme of "crossing the Atlantic on two gallons of gasoline" seemed to be especially popular. I was a bit surprised by this, as I explained to one reporter who rang a couple of days after a visit to our shop. She had most of her story, she said, but there was something she needed to clarify:

"How can it cross the Atlantic on such a small amount of fuel?"
"It's a small aeroplane."
"Is it that simple?"
"I don't know what else to tell you..."

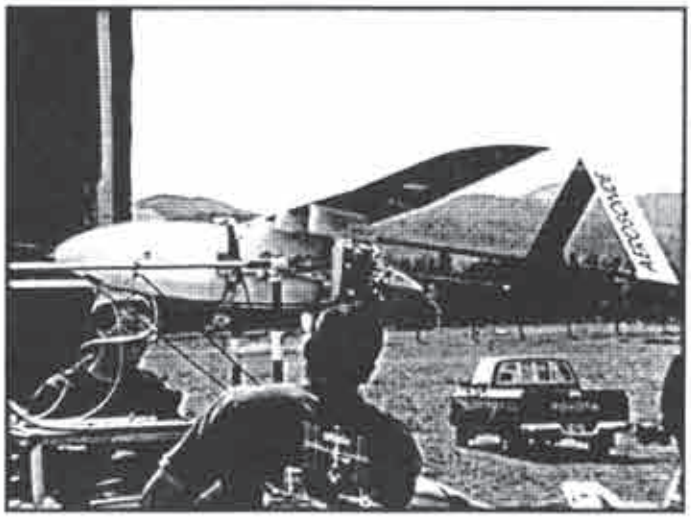
The fuel burn actually turned out to be about 4 kg, or 1.5 US gallons. Really this was no impressive feat of efficiency. In terms of the relevant engineering measure (the "range equation") Laima's efficiency is less than half that of an airliner. We've left a lot of room for improvement.

Putting out just one horsepower even when wide-open for climb, Laima's single-cylinder engine used three dollars' worth of gasoline to make the Atlantic crossing. The engine, highly modified from a model aircraft core, was quite efficient for its size, but still left a lot of room for improvement. Purpose-built engines in Laima's eventual successors will allow much longer range, and much better reliability.

The Atlantic Aerosondes

Our reckoning that we had more to gain than to lose in an Atlantic attempt was, perhaps, somewhat coloured by the fact that much of the risk involved someone else's money. The cost of the aircraft - about $25,000 apiece - was generously underwritten by the Aerosonde's long-standing sponsors at the Office of Naval Research, through a grant to the University of Washington. Given the reliability seen in the spring field exercises, I had put the chance of success with any one aircraft at only about 50%. We would be wasting our time if we didn't take enough aircraft to make better odds than that. We decided on three, which, by the same shaky calculation, would reduce the chance of coming back empty-handed to only 1 in 10. The plan was to launch two on the first promising day, and the third if neither of those made it across.

Three new aircraft were selected from a batch assembled by our colleagues at Environmental Systems & Services in Melbourne. They arrived at our shop for finishing work in mid-July. Time was short, and became shorter still when we checked their fuel consumption data. Among the unfortunate features of the current Aerosonde engine is a finicky carburetor, which, despite painstakingly adjustment during assembly, still shows lot of variation in fuel flow from one engine to the next. Two of the new aircraft proved to sit on the high end of the distribution, to the point that they would need hundreds of



A second, and rather more important, component of media interest involved the meteorological aspect of the program. Most reporters were careful to ask how weather forecasting was currently done; why lack of data over the oceans was a problem; and what the limitations were with existing observation techniques. This of course was as much a part of the message as anything about the aircraft itself.

grams more fuel to complete the Atlantic flight. That was unacceptable, so our Australian friends had to scramble through data on their stock of engines to choose satisfactory replacements. New engines arrived in the last week of July, and we rushed to get the aircraft ground- and flight-tested in time for departure early in August.

Bernie Elsner, an airline-captain friend, put his airfield in the White Salmon valley at our disposal, and for a couple of weeks we rose early to fly in the morning calm. On many a summer day the Columbia Gorge is already gusty by 8 am, and we did not want to take any chances - at least not until we reached Bell Island. One day we tarried until after the wind started to blow, and had a hair-raising moment as Millionaire, Insitu's long-serving test Aerosonde, rolled to knife-edge on exiting the launch cradle. (Our first-generation cradle is a bit sensitive to crosswinds!) We had damaged several aircraft in such incidents before, but Kip Jackson, who was flying the takeoff manually, had learned to recover with rudder. He got out of it, and we were much relieved when all of the Aerosondes had passed their hour's flight check and were safely boxed for Newfoundland.

The Flying Scotsman

While we were doing all this - struggling out of bed to fly at dawn; frenetically composing our equipment; practicing the flight-plan drill; responding to media; arranging for travel - the Irish Aviation Authority faxed its decision. I was out flying at the time, and the report phoned from the office didn't sound all that serious. I took it to mean only that we would have to fly below controlled airspace, as by then we had anyway learned from Prestwick Centre. But when I read the fax itself, that afternoon, I realised that we had a serious problem: total exclusion from Irish airspace. The IAA couldn't accept the lack of enroute position reporting, nor the idea that one of our aircraft might come into the coast unannounced. We were facing our first ban in three years of flying.

This quite took the wind out of my sails for a bit, but that evening, back at Andy von Flotow's orchard, we planned a recovery. Our first priority was to try to get the IAA to change its decision, and toward that end we modified our proposal to allay some concerns. Th. key new idea was to send the aircraft not to the final destination, but rather to a holding circuit a few miles offshore. The command to come onshore would then have to be sent from the ground station, and so unannounced arrival (in the event of radio failure) could reliably be excluded. That proposal went back on 30 July, and meanwhile I asked the Irish meteorological service to put in a word on our behalf - as did Steve Lord and Cliff Mass. Met Eireann, which had been following our plans, responded with speed and enthusiasm. But its appeal was to no avail; over the next few days that IAA showed little interest in reconsidering.

However we meanwhile had started on the backup option: Scotland. Certainly the extra 200 km to the Western Isles was manageable, but more uncertain was whether, from a cold start, we could possibly get a plan together for an attempt in the 1998 season. My first inquiries were made tentatively and with much trepidation. However they led quickly to an exhilarating few days of dealing with quite the most able and helpful group of officials that one might ever hope to meet (as indeed I still do; it was not necessary even to visit). Within two weeks everything was arranged: the landing site in the Hebrides; facilities on the ground; arrival procedures; authorisation from the Civil Aviation Authority; Notices to Airmen; clearance for our telemetry frequency; terminal weather forecasting from Royal Air Force Strike Command. It was a magnificent tour de force.

I had started on 30 July by calling Mike Ankers at Prestwick air-traffic control. Mike was, I think, a bit disappointed about having had to block us from his airspace, and he was only too happy to help in other ways. He immediately suggested the possibility of Benbecula in the Hebrides, a desolate and lightly-used place with special-use airspace conveniently covering the whole area. Taking it upon himself to make the necessary introductions, Mike rang back after a few minutes to say that Lt Cdr Ian Davies RN of the Airspace Policy Directorate was "ready to open negotiations." Ian in turn came straight to the point with a series of very sharp questions about technical details and safety provisions. (One of these, we were impressed to see, concerned the possibility of a "stop barrier" beyond which we would not proceed until establishing communications - i.e. exactly the new idea that we had just proposed to the Irish authorities.) Those questions having been satisfactorily answered, the proposal was put through the CAA. Meanwhile we worked on the landing site. Ian put us in touch with Major Scottie Garner of the Defense Evaluation and Research Agency, which ran the military range near Benbecula, on South Uist island. Scottie also moved quickly, and we soon satisfied each other that the landing site would be eminently workable. The DERA staff proved to be excellent hosts, offering hospitality and every support not only to our crew but also to the media and visitors who invaded for the event.

Thus the plan was complete in the first week of August. It called for a holding circuit 10 miles offshore, with the ground station on South Uist responsible for bringing the aircraft in from there. It also required us to enter UK domestic airspace at 58(N/10(W - a bit north of the direct route from Newfoundland - and to fly the 100 miles or so from there to South Uist at only 400 ft altitude. We were not entirely comfortable with 400 ft, since it called for very careful altimetry - and so an equally good weather forecast - to stay above the water (not to mention any ship masts). However it made all the difference. The UK, like many another country, has various exemptions in place for model aircraft so long as they keep below a certain ceiling - i.e. 400 ft. These rules were hardly written with ocean crossings in mind, but they could nevertheless be made to fit - and so obviate the need for a lengthy technical review. In flight as in song, the low road was the fast route to Scotland.

The original transatlantic plan was to land on the west coast of Ireland, but the Irish authorities decided in late July not to admit Aerosondes to their airspace. We scrambled to arrange landing in Scotland instead, an alternative that was made possible only through the superb support and extraordinary speed of officials in the United Kingdom. Laima came in from the northwest at low altitude, and sent its first brief, teasing call to the South Uist ground station from a range of 57 km. Five minutes of breathless silence followed until firm contact was finally established, 26 hr into the flight and 44 km from landing.

To be continued next month, as "The Adventure Begins!"

The author glances out from the ground-station van while completing Trumper's logbook, a few minutes before the first Atlantic launch on 17 August. Two laptop PCs display telemetry, relayed through an antenna on the tripod outside. Keith Gosse Photo.

SCHEDULE OF SPECIAL EVENTS

February 11-13, 2000
Pensacola 2000 — Pensacola, FL
Asher Carmichael, (334) 626-9141
Acarmic985@aol.com
Rusty Rood, (850) 432-3743, fishon@aol.com

May 5-7, 2000
Texas National Tournament — Dallas, TX
Jay Schultz, jkschul@juno.com
Henry Bostick, (972) 279-8337

May 19-21, 2000
Midwest Slope Challenge — Lake Wilson, KS
Loren Blinde, (402) 467-4765
mwsc@alltel.net

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

June 9-11, 2000
Montague Cross Country Challenge — Montague, CA
3rd Annual, Practice June 9th
DG Airparts, Inc., dgair@cdsnet.net
(541) 899-8215

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

August 3-6, 2000
International Electric Flight Festival — San Diego, CA
Ron Scharck, (858) 454-4900
Scharck@aol.com

August 6-12, 2000
F5 World Championships — San Diego, CA
Ron Scharck, (858) 454-4900
Scharck@aol.com

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

Please send in your scheduled events as they become available!

Hobby Shops that Carry RCSD

Gunnings Hobbies
538 San Anselmo Ave.
San Anselmo, CA 94960
(415) 454-3087

Gyro Hobbies
23052 Lake Forrest Dr.
Unit C2
Laguna Hills, CA
(714) 583-1775

Gyro Hobbies 2
17431 Brookhurst Unit H
Fountain Valley, CA 92708
(714) 378-8924

Hobbies"N Stuff
9577-L Osuna Rd. NE
Albuquerque, NM 87111
(505) 293-1217

Hobby Town U.S.A.
8060 S. 84th St.
La Vista, NE 68128
(402) 597-1888

Hobby Warehouse
4105 South Street
Lakewood, CA 90712
(562) 531-8383

King R/C
Five Forks Village
King, NC 27021

Tim's Bike & Hobby
2507 Broadway
Everett, WA 98201
(206) 259-0912

Closet Scale Stuff
At Sailplanes Unlimited. Ltd.

1/3 Pribek ASW 27 - 5 meter span (196"), wing profile HQ 2.5/12, ca. 20 lbs.

1/4.2 FiberClassics Nimbus 4 - 6.28 meter span (246"), wing profile E 68-66, ca. 18 lbs.

1/3.6 Roedelmodell DG 800 - 4.15 meter span (163"), wing profile E 207, ca. 11 lbs.

1/3.75 Roedelmodell Fox MDM-1 - 3.8 meter span (149"), wing profile RG 12, ca. 15 lbs.

1/2.77 PriBek ASW 19 - 5.4 meter span (212"), wing profile Ritz 3 mod., ca. 20 lbs.

Please call for additional info: (212) 879-1634.

Classified Advertising Policy

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

For Sale - Business

PC-Soar Version 3.7 Sailplane Performance Evaluation Program with Airfoil and Sailplane Library expanded to 60 models including Chrysalis, Anthem, Genesis, Peregrine, Probe, Thermal Eagle, and Spectrum. Airfoil library includes 322 polars with 56 UIUC polars. PC-Soar with Libraries of Sailplanes and Airfoil Polars plus a new Excel utility for working with multi taper wing areas and aerodynamic centers. Reduced Cost: $50 + $3 P&H. PC-Soar library and software Upgrade to Ver. 3.7: $10 + $3 P&H. J.M Associates, 1300 Bay Ridge Rd., Appleton, WI 54915, ph: (920) 731-4848 after 5:30 p.m. weekdays or on weekends. E-mail: lmurray@athenet.net. PC-Soar Web Page: <http://www.athenet.net/~atkron95/pcsoar.htm>.

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

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

For Sale - Personal

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

Futaba 7CH, PPM/PCM, FP-T7UAF computer based radio smitter, FM, CH 40. In very good condition. Futaba receiver, 7 CH, FP-R128DF, FM, NO X TAL. Tower Hobbies plastic carrying case. $125.00 for all. You pay shipping. Bill Maserang, (817) 838-2069 (day or eve.), Texas.

R/C Soaring Resources

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

Contacts & Soaring Groups - U.S.A.

Alabama - North Alabama Silent Flyers (NASF), Ron Swinehart, (256) 722-4311, <ron.swinehart@lmco.com>, or Rob Glover at AMA3655@aol.com, http://sh1.ro.com/~samfara/

Alabama - Central Alabama Soaring Society, Ron Richardson (Tres.), 141 Broadmoor Ln., Alabaster, AL 35007, <ron_mail@bellsouth.net>.

Alabama - Southern Alabama & NW Florida Aerotow, Asher Carmichael, (334) 626-9141, or Rusty Rood, (904) 432-3743.

Arizona - Aerotowing, slopesites in AZ (rugged), Arizona Flying Eagles R/C Demo. Show Team, Dave Wenzlick, (602) 345-9232, <azdw@uswest.net, or visit CASL at <http://www.public.asu.edu/~vansanfo/casl>.

Arizona - Central Arizona Soaring League, Iain Glithero, (602) 839-1733.

Arizona - Southern Arizona Glider & Electric (Tucson area), Philip Brister (contact), (520) 394-2121, pbrister@juno.com. SAGE welcomes all level of flyers!

Arkansas - Northwest Arkansas Soaring Society, Tom Tapp (President), RT 2 Box 306, Huntsville, AR 72740; (501) 665-2201, eve.

California - DUST, Buzz Waltz, 68-320 Concepcion, Cathedral City, CA 92234, (760) 327-1775.

California - High Desert Dust Devils, Stan Sadorf, 14483 Camrose Ct., Victorville, CA 92392; (760) 245-6630, <Soareyes@aol.com>.

California - Inland Soaring Society, Robert Cavazos, 12901 Forman Ave., Moreno Valley, CA 92553, RCAV@aol.com.

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

California - Sacramento Valley Soaring Society, Dudley Dufort, 225 30th St., Suite 301, Sacramento, CA 95816, (916) 448-1266, <www.svss.org>.

California - Soaring Union of Los Angeles, John Bruce, 908 W 245th St., Harbor City, CA 90710, (310) 534-0948, <rcflyinman@aol.com>.

California - South Bay Soaring Society, Mike Gervais, P.O. Box 2012, Sunnyvale, CA 94087; (408) 683-4140 (H), (650) 354-5469 (W).

California - Southern Calif. Electric Flyers, John Raley (President), 1375 Logan Ave., Costa Mesa, CA 92626; (714) 641-1776 (D), (714) 962-4961 (E), e-mail: E-Flyer@ix.netcom.com.

California - Torrey Pines Gulls, Ron Scharck, 7319 Olivetas Ave., La Jolla, CA 92037; (619) 454-4900.

Colorado - Rocky Mountain Soaring Assn., Phil Weigle, 1290 Salem St., Aurora, CO 80011; (303) 341-9256 eve.

Eastern Soaring League (VA, MD, DE, PA, NJ, NY, CT, RI, MA), Tom Keisling (Pres./Editor), (814) 255-7418, kiesling@ctc.com; Ben Lawless (Sec./Tres.), LawlessB@ang.af.mil; Anker Berg-Sonne (Scorekeeper), (508) 897-1750, anker@ultranet.com; Josh Glaab (Contest Coordinator), (757) 850-3971, ljglaab@pinn.net. <http://www.eclipse.net/~mikel/esl/esl.htm>.

Florida - Florida Soaring Society, Mark Atzel (President), 1810 SW Terrace, Ft. Lauderdale, FL 33312, (954) 792-4918.

Florida (Central) - Orlando Buzzards Soaring Society (www.specs-usa.com/~ingo/OrlandoBuzzards), Jerre K. Ferguson (Pres.), 4511 Pageant Way, Orlando, FL 32808, (407) 295-0956, <jerre@bellsouth.net>.

Georgia - North Atlanta Soaring Association, Tim Foster, (770) 446-5938 or Tom Long, (770) 449-1968 (anytime).

Hawaii - Maui Island Slope Soaring Operation (MISO), Duane A.K. Asami, 262 Kamila St., Kula, HI 96790, pgr. (888) 932-6247, <dasami@mauigateway.com>.

Illinois (Chicago Area) - Silent Order of Aeromodeling by Radio, Jim McIntyre, 23546 W. Fern St., Plainfield, IL 60544-2324; (815) 436-2744. Bill Christian, 1604 N. Chestnut Ave., Arlington Heights, IL 60004; (847) 259-4617.

Illinois (Northwest) - Valley Hawks R/C Soaring Club, Jeff Kennedy (President), 414 Webster St., Algonquin, IL 60102, (708) 658-0755, eve. or msg.

Indiana (NE Indiana and NW Ohio) - League Of Flight by Thermal (LOFT), Ft. Wayne, Marc Gellart, (419) 229-3384, <isoar2@wcoil.com>, <www.rc-aero.com/LOFT>.

Indiana - Bob Steele, 10173 ST Joe Rd., Fort Wayne, IN 46835; (219) 485-1145.

Iowa - Eastern Iowa Soaring Society (IA, IL, IN, KS, NE, WI), Ed Harris (editor), 2000 NW 84th Ave., Ankeny, IA 50021; (515) 965-5942, <harris.edwin@mcleodusa.net>, <http://eiss.cnde.iastate.edu>.

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

Kansas - Aerotowing, Jim Frickey, (913) 585-3714.

Kentucky - Bluegrass Soaring Society, Frank Foster (President), 4939 Hartland Pkwy., Lexington, KY 40515; (606) 273-1817.

Kentucky - Louisville Area Soaring Society, Ed Wilson (Contact), 5308 Sprucewood Dr., Louisville, KY 40291; (502) 239-3150 (eve), e-mail <ewilson1@bellsouth.net>.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

New York, aerotowing Rochester area, Jim Blum and Robin Lehman, (716) 335-6515.

New York - Elmira - Harris Hill L/D R/C, aerotowing & slope, John Derstine, (717) 596-2392, e-mail johnders@postoffice.ptd.net.

New York, aerotowing Long Island Area, Robin Lehman, (212) 744-0405.

New York - (Buffalo/Niagara Falls area) - Clarence Sailplane Society: www.paradox.net/homepages/mtimm/css.html or Lyn Perry, President (716-655-0775; perryl@ecc.edu); Jim Roller, Competition Coordinator (716-937-6427; Rolj98@aol.com).

New York - Long Island Silent Flyers, Stillwell Nature Preserve, Syosset, NY, Ze'ev Alabaster (President), (718) 224-0585, or Peter DeStefano (VP), (516) 586-1731.

New York - Syracuse area, Central NY Sailplane Group, Dave Zinteck, Minoa, NY, (315) 656-7103, e-mail Zinteck@aol.com.

North Carolina - Aerotowing, Wayne Parrish, (919) 362-7150.

Northwest Soaring Society (Oregon, Washington, Idaho, Montana, Alaska, British Columbia, Alberta), Sandie Pugh (Editor - NWSS Eagle), 1119 SW 333rd St., Federal Way, WA 98023, e-mail: parrot2luv@aol.com, (253) 874-2429 (H), (206) 655-1167 (W).

Ohio - Cincinnati Soaring Society, Ed Franz, 7362 Ironwood Way, Burlington, KY 41005; (606) 586-0177, <ejfranz@fuse.net>.

Ohio - Dayton Area Thermal Soarers (D.A.R.T.S.), Walt Schmoll, 3513 Pobst Dr., Kettering, OH 45420, (513) 299-1758.

Ohio - Mid Ohio Soaring Society (MOSS), Hugh Rogers, 888 Kennet Ct., Columbus, OH 43220; (614) 451-5189, e-mail <tomnagel@iwaynet.net>.

Ohio, Kentucky & Indiana - Ohio Valley Soaring Series, Marc Gellart, (419) 229-3384, <isoar2@wcoil.com>, <www.dma.org/DARTS/ovss/ovss.html>.

Oklahoma - Central Oklahoma Soaring, George Voss, (405) 692-1122.

Oklahoma - Tulsa R/C Soaring Club (TULSOAR), http://www.mccserv.com/tulsoar

Oregon - Bay Area R/C Fliers, Mike Shaw, <grizzy2@gte.net, (541) 269-2423.

Oregon - Portland Area Soaring Society (PASS), Pat Chewning (Secretary), 16766 NW Yorktown Dr., Beaverton, OR 97006, (503) 645-0323, e-mail: patch@sequent.com, www.europa.com/~patch/

Oregon - Salem Soaring Society, Al Szymanski, CD, (503) 585-0461, http://home.att.net/~aszy/sss/>.

Oregon - Southern Oregon Soaring Society, Jerry Miller, 3431 S. Pacific Hwy. TRLR 64, Medford, OR 97501, e-mail Milljer@aol.com, ph/fax (541) 535-4410.

Tennessee - Memphis Area Soaring Society, Bob Sowder, 1610 Saddle Glen Cove, Cordova, TN 38018, (901) 751-7252, FAX (901) 758-1842.

Tennessee - Tullahoma (Southern Middle Area), Coffee Airfoilers, Herb Rindfleisch, 106 Inglewood Circle, Tullahoma, TN 37388, (931) 455-1836, <herb@cafes.net>.

Tennessee - Soaring Union of Nashville, Terry Silberman, PO Box 17946, Nashville, TN 37217-0946, (615) 399-0846.

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

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

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

Virginia - Blue Ridge Area Soaring Society (Central Virginia - Waynesboro), Tom Broeski, (540) 943-3356, <tjb@rica.net>.

Virginia - Tidewater Model Soaring Society, Herk Stokely, (757) 428-8064, herkstok@aol.com.

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

West Virginia & Pennsylvania - Tri-State Soaring, Chip Vignolini, 2784 Mill St., Aliquippa, PA 15001; (724) 857-0186, Voice mail (412) 560-8922, <ydne30a@prodigy.com>.

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

Wisconsin - Valley Aero Modelers, Lee Murray, 1300 Bay Ridge Rd., Appleton, WI 54915; (920) 731-4848, <lmurray@athenet.net>.

Outside U.S.A.

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

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

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

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

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

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

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

England (southwest) - Sean Walbank, Woolcombe Hays, Melbury Bubb, Dorchester, Dorset, DT2 0NJ, phone 01935-83316.

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

Japan - Dr. Paul "Sky Pilot" Clark, 2 - 35 Suikoen Cho, Hirakata Shi 573, Osaka Fu, Japan; IAC+(81) 720-41-2934, <pclark@osk3.3web.ne.jp> http://www3.osk.3web.ne.jp/~pclark/skypilot/

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

RCSD Index/Database

Available from: <http://www.athenet.net/~atkron95/pcsoar.htm>. Or, send 3.5" high density disks & SASE with stamps for 2 oz. Lee Murray, 1300 Bay Ridge Rd., Appleton, WI 54915; (920) 731-4848 after 5:30 pm weekdays or on weekends, <lmurray@athenet.net>.

Reference Material

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

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

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

Seminars & Workshops

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

BBS/Internet

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

Sailplane Homebuilders Association (SHA)

A Division of the Soaring Society of America

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

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

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

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

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

Send for your aspirant form, today:

League of Silent Flight
c/o AMA
P.O. Box 3028
Muncie, IN 47302-1028 U.S.A.

The Vintage Sailplane Association

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

Vintage Sailplane Association
13312 Scotsmore Way
Herndon, VA 22071 USA

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

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

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

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

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

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

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

Advertiser Index

Subscription Costs
USA: $30 First Class
(Texas res., please add $1.52 tax.)
Canada & Mexico: $30 Air
Europe/U.K.: $45 Air
Asia/Pacific/Middle East: $52 Air

Back Issue Cost
Back issues are available for the current year. All are mailed via first class or airmail.
U.S.A., Canada, Mexico: $2.50 Per Issue + Tax (Texas Only: 7.25%)
United Kingdom/Europe: $3.75 Per Issue
Asia/Africa/Middle East: $4.35 Per Issue

❑ Please renew my current subscription.
❑ Please enter my new subscription to *RCSD*.
❑ Please send the back issues I have selected.

(Check or Money Order, only, please. U.S. funds.)

Name_____
Address_____

Please return to R/C Soaring Digest,
P.O. Box 2108, Wylie, TX 75098-2108

SAILPLANES UNLIMITED, LTD.

IN STOCK

Krause

1/3.75	Discus	HQ2.5/12	158" (4m)
1/3	Salto	HQ3/14	179" (4.53m)

Roedelmodell

1/4.5	ASK 21	E395	165" (4.2m)
1/3.8	Ka6E	E392	165" (4.2m)
1/3.75	Fox	RG12	149" (3.77m)

PriBeck

1/3	ASW27	HQ2.5/12	196" (5m)
1/2.7	ASK18	E203-201-193	209" (5.53m)
1/3	Ka6E	E207-205-205	196" (5m)
1/2.7	ASW19	Ritz3 mod.	212" (5.4m)

Schueler & Fleckstein

1/3 all glass	ASW24	E203	196" (5m)

Bruckmann

1/3	Salto	Ritz 2	176-203" (4.5-5.2m)
1/3.8	ASK 18	E 203	165" (4.2m)
1/3	Fox	E 374 SD 6060-6062	183" (4.66m)

Czech these out!

All completely finished with retracts installed:

1/3 all glass Ventus 2C	HQ 3/15, 13, 12, 10, 8	237" (6m)
1/3.75 all glass ASW 27	HQ 3/12	158" (4m)

And more

TOWPLANES in stock

Frisch: 1/4 Wilga 109" (2,78m)
Bruckmann: 1/4 Piper Pawnee
Roedelmodell: 1/4 Jodel Robin 86" (2.18m)

SPECIAL ORDER

PriBek

1/3	ASW24	E203-201-193	196" (5m)
1/2	ASW27	HQ2.5/15	294" (7.5m)
1/3	Fox	E374	183" (4.66m)

Bruckmann

1/2.5	Fox	222" (5.65m)

Frisch

1/3	Wilga	147" (3.73m)

Schueler & Fleckstein

1/3 all glass	Fox	RG12	183" (4.66m)
1/2 all glass	ASH 26	HQ3/14-10	235" (6m)
1/2.5 all glass	ASW15B	HQ3/14	235" (6m)

very realistic **PILOTS** from 1/4 to 1/2.5

For Price information, Scale flying news, Message board, Classified and much more...Visit our website @ http://www.sailplanes.com

Sailplanes Unlimited, Ltd. **63 East 82nd Street, NYC, NY 10028 Phone: (212) 879-1654 Fax: (212) 535-5295**

INTERNATIONAL HAND LAUNCH GLIDER FESTIVAL COMPETITORS

Photography by Tom Gressman
Littleton, Colorado

Bludartar team left to right: designer and manufacturer Carl McBurnett, Tom Meeks and Chris Oster. All three of these hand launch enthusiasts are from San Antonio, Texas. As a result of experience at Poway, a new Dartar design was created which took first and third at the 1999 TNT.

Paul Anderson with Leza. Stock NSP Psycho wing with own design fuselage and tail. Weight is 9 oz. with four servos. Regarded by many at the '99 IHLGF as the highest launching man-machine combination.

Paul Siegel &Rudy Siegel with NSP Logic. Paul + Logic have been a hot combination on the HLG circuit. First in the 2 day east coast BASS event, first overall in the Midwest HLG Series in 1998 and 1999, first in the 1999 Midsouth & eighth at the 1999 IHLGF! Paul's Logic is 8.9 oz. dry with one ounce of ballast when the wind comes up.

Sam Siegel with Thermal Hawk, S-4083, 10 oz., finished 4th in Juniors division.

Mike Fox who won 1998 NATS hand launch flying a NSP Logic, came to Poway with his own design named Focus. Mike finished 40th and is continuing to refine this bird. The Focus has a pylon mounted wing that has 340 square inches in area. The Focus has an 8.5 oz. flying weight, four servos and 7% thick SA-7035. Watch for a possible kit release from NSP.

Ralph Mittelbach with his hollow molded design. Two channel poly with constant chord wing, tripped SD-7037, molded finger hole, balsa tail surfaces and curved up tips as often seen on current F3J designs.

Raptor Aerosports Feather poly with three servos driving the v-tail and single flap. The wing is pylon mounted, flying weight is 9.5 oz., airfoil is a 7.5% SA-7038. [www.rcraptor.com]

(R) Thermal-Gromit Works Meteor flown by Adam Weston (19th in open class). 6 oz. flying weight, SD-7003, Kevlar pod, CF boom, glass bagged wings. The Meteor is launched by a wing tip side arm throw which results in a very competitive launch. The Meteor may be released as a kit. [www.tgworks.com]

Joe Wurts' winning 8.8 oz. Maple Leaf Encore, S-6063, four HS-50's, Berg receiver, 110 ma. Nicad, carried one ounce of ballast during the windy fly-offs. Joe also won the 1998 IHLGF with an Encore. Maple Leaf designs have won the last three IHLGF's.

Daryl Perkin's NSP Psykologic. Note lack of turbulator and winglet found on Logic.

(L) Raptor Aerosports new prototype with a S-6063 flown by Brian Buaas, its designer, and Sam Girardi (1st in the Junior class). 8.5 oz. flying weight, Kevlar pod, CF boom and four servos.