Radio Controlled Soaring Digest

May 2005 — Vol. 22, No. 5

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Front Cover — Steve Lange's twin fuselage Weasel, appropriately named the Weasel Dub, soars in the slope lift above the "Ruins" (the Knapp castle) near Santa Barbara California.
Our thanks to Steve for providing high resolution versions of his Dub photos which appear on the Santa Barbara Silent Flyers web site <http://www.sbslopers.org/>.
Steve's article on the Weasel Dub genesis and performance starts on page 4 of this issue.

Back Cover — Loren Steel poses with his Tor-donated 'wing during his first slopin' adventure.
PHOTO BY PHILIP PATTON, COURTESY OF LOREN STEEL

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In the Air!

This issue of *RC Soaring Digest* is another eclectic collection of articles and information - technical articles, construction exposés, event coverage, announcements, and, as recently promised, an outline of "the rules" for submitting material to *RCSD*. And full color photographs are in abundance, as usual. We had more fun putting this issue together than we believe magazine editors are entitled to experience.

As you clicked on the link to download this issue of *RC Soaring Digest*, you more than likely noticed the newly added Donation button.

One of our goals has been to increase the number of back issues available for downloading, eventually having all printed issues converted to PDF and accessible from a single on-line archive. This project has been on hold for almost a year but is now being resurrected, due in major part to volunteer work by Jay Decker. In response to Jay's efforts, we've started working toward acquiring a domain name and establishing sufficient server space for archiving more than 250 PDFs with a vast space for future growth.

Rather than incorporating advertising within *RCSD* or on the *RCSD* web site, we've decided to simply ask readers to assist monetarily via the PayPal Donation button. Amounts as small as $1.00 are sincerely appreciated and will be used to obtain a domain name and acquire and maintain permanent server space.

That's about it for now. We're already started gathering material for the June issue, and it should be on-line on or about the 20th of May.

'Til then...

The Weasel Dub

by Steve Lange, steve@stevelange.net

This past summer found Michael Richter, Emil Richter and myself hiking the three mile trail to the summit of Mount Pinos (8831ft.) in the Los Padres National Forest. Michael and I brought our Weasel-pros along to the test lift at the Condor Observation Site a short distance from the summit. While we didn't see any condors that day, we did experience some very nice alpine soaring conditions with our Weasels, specking them out repeatedly in the large thermals rising off the valley floor far below.

On the way back down, Michael and I discussed the design requirements of a glider for this style of mountain flying. First off, it would need to be large enough to be seen at the often extreme vertical and horizontal distances inherent to alpine soaring. Second, it would have to be tough; while the Swiss may get to enjoy broad, grass-covered landing zones largely devoid of rocks and trees, such is most definitely not the case in the western United States. Expanded polypropylene (EPP) construction would be a given. Lastly, it would need to be portable and light enough to carry comfortably on the long hikes required to reach these often rather remote flying sites--to say nothing of the even more challenging hikes required to retrieve a plane after landing out!

In many ways, a tailless design seems ideally suited to the above requirements. Compared to a conventional of the same span, a tailless plane will tend to have a broader chord, making it more visible in the air. Tailless designs have far less parts to break off when the inevitable hard landings and land outs happen. What parts they do have can be built stronger with less total weight penalty than the same construction techniques on a conventional of identical wingspan. Most tailless planes can be comfortably carried under an arm in “ready to fly” configuration, with no need for bulky wing bags or the risk of breaking off a tailplane while squeezing through dense manzanita bushes. Finally, tailless designs are generally lighter than conventional planes of the same wingspan--and lighter is better for hiking!

The Weasel-pro meets all of the above requirements, except for size. At just under 36" in span, the plane gets very small, very quickly. A larger plane would be more efficient, better able to cover ground and escape sinking air. That said, the Weasel-pro is a proven design, one whose airfoils are quite versatile for a wide variety of applications, including mountain thermalling. Rather than start from a blank page, why not begin the experiments by enlarging the Weasel?

Michael and I agreed that the easiest way to do this would be to simply cut a straight center section using the root airfoil of the Weasel-pro, and gluing it in between two standard Weasel-pro wings. This center section would greatly increase the wing area of the plane as well as its aspect ratio, making the plane more efficient and easier to see at altitude. Hopefully it would also maintain at least some of the maneuverability and liveliness that makes the Weasel-pro such an entertaining and versatile aircraft.

Maybe it was the altitude, or the mountain air, or something else altogether, but somewhere in the course of this conversation, I had a vision. All this talk of straight center sections connecting standard Weasel-pro wings somehow got me thinking of the F-82 Twin Mustang, which featured two fuselages sharing one wing and horizontal stabilizer. Why not build a double Weasel, with two fuselage pods and two fins connected by a straight center section? It wouldn't be as efficient as a single pod airplane, but it would sure look cool and original. Oh, and it would allow us to test the straight center section idea, too!

And so it was that the Weasel Dub project was born that day on the slopes of Mount Pinos. I didn't move forward with it at that time, but the idea kept bouncing around in my head. Fast-forward to the following Spring: with the 2005 WeaselFest coming up and wanting to bring something novel and entertaining, I figured the time was ripe for the double Weasel to be born. Michael cut me a straight 18" center section from 1.9# EPP foam and a few days later the Dub (short for “double”) was ready for its maiden flight.

The Dub has a wingspan of 54" and 605 sq.in. of wing area. The all up weight came to 26.7oz., resulting in a wingloading of 6.4oz./sq.ft. Construction techniques were largely identical to the standard Weasel-pro: four spanwise carbon fiber spars were in installed into razor-cut slits in the wing surface and glued in place using thin CA. The wing and both pods were reinforced strategically, and perhaps somewhat excessively, with bidirectional strapping tape. The entire airframe was covered in colored packing tape. This construction has proven itself to be extremely durable, light weight, and low cost, and is the preferred method for finishing the Weasel and its derivatives.

Flight control is accomplished via three elevons of equal size and chord. A Hitec HS-85MG was used for the center elevon, with HS-81MGs used on the outboard elevons. A Hitec 555 receiver and a 600mAh square Nicad pack were used for guidance. The servos are installed in the wing vis-a-vis the standard Weasel-pro gear installation. The receiver and battery were installed in one pod, while the forward compartment of the other pod was filled with approximately 3.5oz. of lead in order to achieve appropriate longitudinal and lateral centers of gravity.

Flight performance is excellent and very similar to the Weasel-pro, though the plane is noticeably larger and heavier. Roll rate is good, inverted performance is good, and the Dub has excellent light lift capability. Yaw stability is about the same as the standard Weasel-pro; it will "wag" if not flown smoothly at low speed, but otherwise tracks true. As of this writing it has not been flown in alpine conditions, but I am confident that it will prove to be an excellent performer.

Beyond its novelty, the Dub is intended as a serious testbed for larger tailless alpine soaring designs. Three different control methods have been tried out with the triple elevon setup: The first uses all three elevons for pitch control and the two outboard elevons for roll control. The second uses the center elevon for pitch control and the two outboard elevons for roll control. The third uses only the outboard elevons for both pitch and roll control.

As of this writing, complete testing of each control method has not been completed, but preliminary findings indicate that full span pitch control provides the most effective elevator response on this aircraft.

Interestingly, this finding goes directly contrary to much of what has been written and recommended with regards to multiple elevon setups. Generally speaking, it's believed that for a plank design, the outboard elevons should control roll only and the inboard elevon(s) should control pitch only. Early testing with the Dub seems to prove otherwise; in order to achieve comparable pitch response with the center elevon, it must have significantly greater travel than is required for the full span elevon setup, and even then it does not "bang" turns as hard nor provide as positive pitch control as the full span arrangement. Furthermore, full span pitch control appears to be superior to using the tip elevons only for pitch control.

"Crow" mixing has also been tested on the Dub to great success, despite the fact that such a mix has been reported (on RCGroups and elsewhere) as not useful on planks by others who have experimented with it. On the Dub, it appears that a 1:3 ratio between the travel of the upward moving tip elevons and the travel of the downward moving center elevon is ideal. This results in approximately 20 degrees of reflex at the tip elevons and about 50-60 degrees of camber at the center elevon when full "crow" mixing is employed. When deployed from a level flight attitude, the Dub does not have any pitch response, but instead simply slows down to a very controllable and very slow speed. Removing the crow configuration results in instant acceleration, again with no pitch response. Combined with the inherent ability of the plank planform to control speed with pitch angle, crow mixing will make approaches to tight mountain LZs far easier on the pilot and the airframe.

Additional testing will be necessary to confirm or revise the above findings, but on an initial basis it would seem that the Dub is proving some "conventional" (if you'll pardon the term) wisdom about multiple elevon setups on planks to be inaccurate. Not bad for a novelty dreamed up one summer day on a mountain peak! Lessons learned from the Dub will be employed in the design and construction of a larger, purpose-built tailless EPP alpine soarer. Preliminary designs have the wingspan at around 90", with a forward swept planform being favored as of this writing. More to come!

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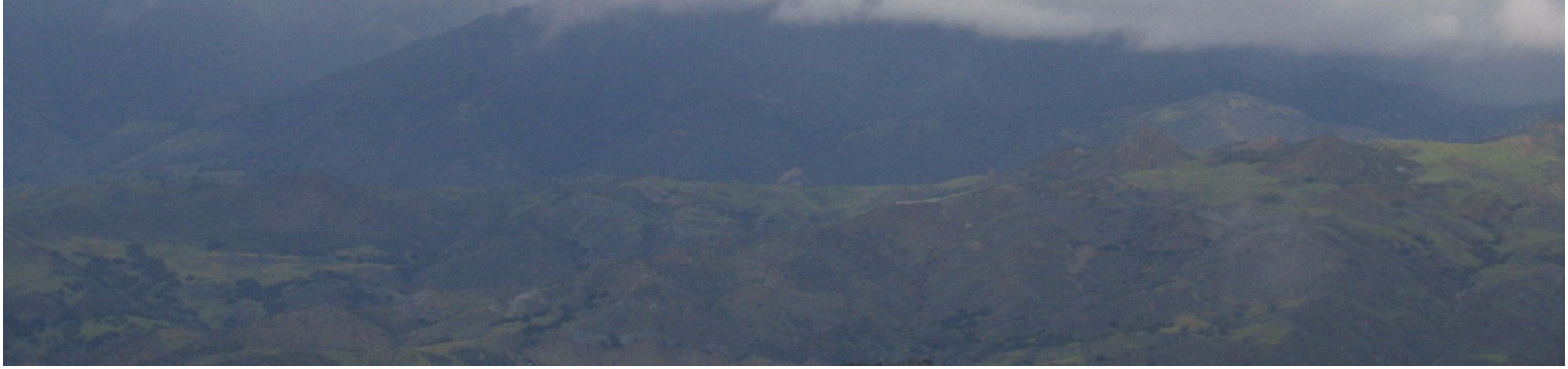
If you want to be notified of newly posted Weasel photos, share Weasel construction and flying information, find out about WeaselFest fly-ins and similar events, you really need to sign up for the flyWeasel group on Yahoo.com.



Gordy's Travels

Gordy Stahl, gordysoar@aol.com

Toledo Weak Signals Exposition 2005

It's over! And it was fun! I got to see a lot of old friends and some young ones too!

Easily I would guess about 2,000 R/C modelers and exhibitors.

I don't go every year, but this year everything was working out for me to make it. For instance, Barry Kennedy of Kennedy Composites was going to be showing off and selling the new amazing Shadow3 crystal-less synthesized RX.

Show and sell turned out to be an understatement, his booth was easily the busiest of the show, of course the flow wasn't only there for the Shadow3, Barry also offers the most popular RES and DLG molded sailplanes and lots of AVA's were carried away and a waiting list grew for the Blaster DLG.

But the Blaster wasn't the only list that was building in his booth, the new Supra 134" Unlimited Class molded sailplane had a waiting list that reads like a who's who of top contest sailplane pilots… its obviously got some interest. Like the Blaster, it uses Dr. Drela technology and foils… mixed in with Barry Kennedy's USA market savvy… the Supra is a hit without even being completed!

You can see some 3D renderings and the Supra, Blaster, AVA and the incredible Shadow3 specs too at <http://www.kennedycomposites.com/>.

One of the fun parts of the Toledo Show is the airplane contest… scale power planes taken to a level that seems impossible for

Tom Scully and his Big Bird Extreme, the Sport Sailplane Winner

Top: Gerald Macicki's Cara 2M
Bottom: Jerry Shape's Grand Esprit, from a DreamCatcher kit.

any modeler, but there are examples every year. Turbines to old timers… but along with all those is a class called "Sport Sailplanes" and this year it had a small but sweet group of built up sailplanes.

The winning ship, a Big Bird Extreme, built from a short kit sold by SkyBench and crafted by Tom Scully of Kentucky, is a Bird of Time variant approximately 130" with ailerons and flaps. There was a Legionair and a couple of Grand Esprits.

However, aside from the Shadow3 RX being the talk of all segments of R/C at the show (since it is programmable to 72mhz or 75mhz, the boat and car guys swarmed too!), the other big topic was the fact that JR and Futaba now offer a Spectra type synthesized TX module… so that leaves Airtronics as the only radio company that doesn't offer crystal-less channel selection in its transmitters… something a lot of sailplaners are not happy about since most of us use the Stylus. (Airtronics new 10 channel Tx won't be ready for introduction for about a year and a half!).

With about everyone having the ability to dial any channel and all

Cliff Redel's original design sailplane.

Below: Dave Corven's Legionair 140 casts a huge shadow across the sailplane display.

the companies with synthesized receivers too, suddenly it has made the need for a simple effective and cheap frequency scanner/monitor necessary for every single modeler…

Those dials are small and the numbers are smaller, so it is very likely that mistakes can be made in dialing in or remembering which frequency has been dialed... so it's an incredible co-incidence that Hobbico was showing just what the doctor ordered… a small, inexpensive scanner/monitor. Called the Hobbico Frequency Checker, it will sell for under $70, is about the size of a small digital camera, and has 50 LED lights on its face, each representing one of our channels on 72mhz.

It scans the full count constantly... what I call the Cylon Eye… but when a channel gets active, that light will remain lit, as will all that are active, while the eye continues its scan. This is a very important function, because once a modeler has one, it will be the first thing he turns on when he arrives at the field. At a glance he will be able to see what's on and what's not… and every single modeler will have his own Frequency Checker turned on also… and likely there will be one on every frequency board.

This is not only exciting and important because of the new ability for all modelers who can choose channels, but also to monitor the field for "hidden" R/C users such as the park flyer types who don't understand about frequency protocols.

You can look for a full review of the Hobbico Frequency Checker when I get mine near the end of April… they are not likely to be available till mid to late May.

Hobbico is also going to be offering a DLG priced ready for radio at about $90. Looks like it has the right stuff, called the Fling DL. Also not available till early May… worth looking at for an entry level DLG ship.

Hitec/MPX showed what I believe is going to be a one design electric candidate made of EPP type foam… a 71" Scale looking sailplane in an electric version or sailplane version called the Easy Glider. I am extremely excited about this plane becoming the replacement for club trainers. I'll also be reviewing it when it becomes available in May. A very pretty ship with amazing finish details. It is aileron, elevator, rudder and optional motor, fully molded foam, with servo pockets and wire runs. You can see photos and specs on this website, but they will be available direct from Hitec dealers in the USA. <http://www.modelspot.com/mpx/easyglider.htm>

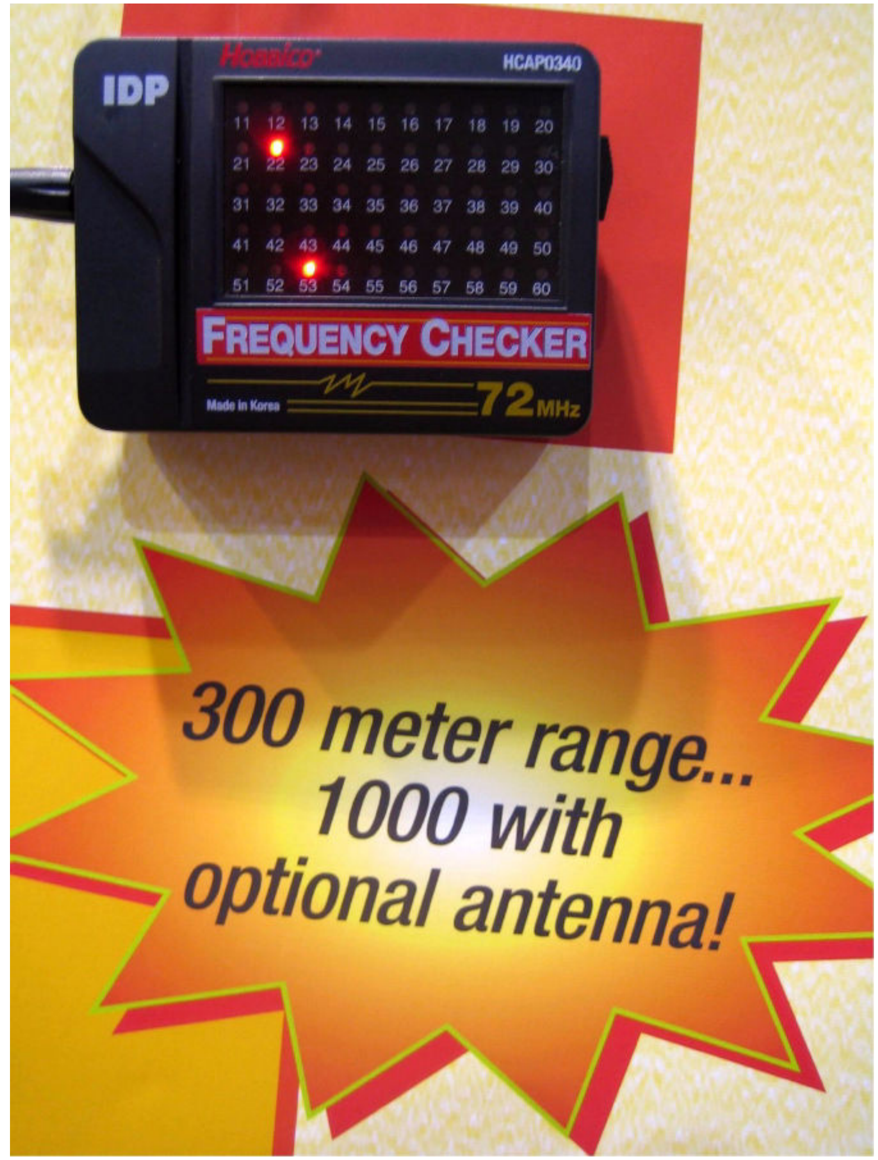
I'd guess I could ramble on for a long time but I don't want to forget about the LSF booth. It is manned every year by LSF officers and groupies (LSF 5's and the like).

Small aerobatic electrics are the fastest growing segment of the hobby as are small electric Helicopters. I even bought an electric helicopter for my motel room!

You really missed out by not attending this year, but at least you have some reviews to look forward to in the next few months. Don't even think about waiting to order your own Frequency Checker, the backorder situation is going to be terrible!

From Memphis Tennessee tonight.

Gordy



The new and inexpensive Hobbico Frequency Checker.
Gordy's promised a review for RC Soaring Digest - watch for it!

Tech Topics

Cody Papinchock, Megan Isenberg, and Dr. David Register <regdave@aol.com>

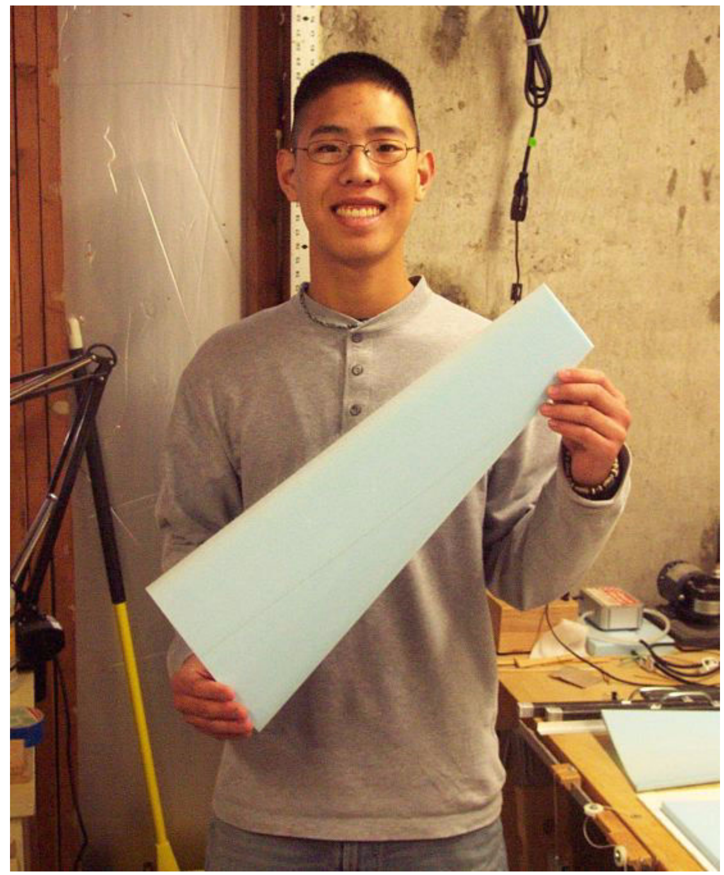
Sailplane Performance Measurements

I'd like to introduce Cody Papinchock and Megan Isenberg – two high school students in Mrs. Betty Henderson's Chemistry class at Bartlesville High School (OK). Cody and Megan have recently completed a science fair project to measure the in-flight performance of an R/C sailplane. For their efforts they received top honors at our regional fair and a special recognition award at our state fair.

This project started last October when the students sent out an e-mail to our local committee asking for help on a project related to aeronautics. One thing led to another and they were soon over at the house discussing ideas. An old fuselage, the EagleTree Systems flight data recorder and a bit of brainstorming led to a project – could you measure the in-flight performance of an R/C sailplane? If so, how would it stack up to the "expected" performance of that same plane?

The idea hinged on the ability to accurately record the time, altitude and flying speed of the airplane. From the altitude and time base data, the sink rate could be determined. Knowing the sink rate and the true velocity, the horizontal component of velocity could be calculated. Finally, plotting the horizontal velocity vs. sink rate would generate the "polar" performance of the sailplane.

Although in principle, this all made sense, the students could not find any readily available references showing that it HAD been done this way. Blaine



Cody Papinchock after cutting the first wing tip core.

First flight of the Kahuna2M. Note pitot tube below and ahead of the wing root.

Beron-Rowdon and the San Fernando Valley Silent Flyers had sponsored polar measurements many years ago. That effort was done by triangulation and required a large number of folks to complete the task. Since that time, no additional direct measurements of polars for R/C sailplanes have been published (to my knowledge – Dave R).

So with hope in their hearts and a smile on their faces, our students set out to bring a bit more science to the sport of R/C glider flying. Meanwhile, their mentor was roaming around in a state of panic wondering what to tell them if the project didn't work!

Some of the things needed for the project were:

- A rugged, simple aircraft that could easily accommodate different wings and weights,

- A good understanding of the capabilities and accuracy of the data recorder, and

- Some decent flying weather (not a sure thing during an Oklahoma winter).

The first challenge was met by making a polyhedral wing for an old Sleger's 2M fuselage that had been gathering dust in the basement. The planform had to be very simple but stout – something that could be vacuum bagged with a minimum number of pieces.

A double taper wing was designed with a constant chord through the center section. The center section used a spruce spar and carbon "darts" for stiffness and strength but was otherwise rather conventional. The tips were tapered, had 1 degree of washout and also used carbon darts for stiffness.

Next question – what airfoil(s) to use? Based on a number of considerations, the NACA0009 and NACA4409 were proposed as test cases. Neither of these airfoils are highly prized for R/C soaring. However, a great deal of test data is available for both sections and they represent very

Success! Kahuna2M coming in with a fresh set of flight data.

conventional airfoils from the early days of soaring. If the project goals were met, some of the newer Selig and Drela sections were on the "wish" list.

After making the templates, Cody spent time in my basement cutting cores and helping with wing bagging. Out of that effort emerged a pretty decent little wing that was matched (with generous amounts of Goop) to the Sleger's fuselage. A set of V-tails from another wrecked 2M ship was pressed into service and the "Kahuna-2M" was born.

Maiden flights indicated the Kahuna was by no means a soaring demon but it was a stable, flyable platform that responded well to trim settings and tracked in whatever direction it was pointed. Next step was fitting the data recorder to the ship.

The recorder used is the EagleTree Flight Data Recorder (FDR) 1.0 unit. The speed and altitude resolution, minimum airspeed, and altitude window were not ideal for this application but were more than sufficient to demonstrate the operating principles. Conversations with Bill Parry of EagleTree were very helpful for understanding the capabilities of the instrument.

Following Bill's advice, the FDR was mounted snugly in the fuselage under the wing. The pitot tube was fitted to the right side of the fuselage in the canopy area and one of the supplied Y-cables was used to provide power to the unit. Off to the field to see if it would work.

Our first field session was a late afternoon in January just before a snow storm. 34 degrees, 5 to 10 m.p.h. winds, low overcast and spitting nasty cold wet stuff. But science needed some answers so the Kahuna2M was sent into the gloaming on the winch – and it all worked! 7 flights were about all we could handle that evening. The students knew there was data in the buffer but we had to get to the PC to dump it out.

Back home for something warm and a USB port to see if anything good happened. Sure enough, the data dumped out as expected and plots of airspeed, altitude and other flight data were soon popping up in windows all over the screen. Success (so far) – see Figure 1.

This session demonstrated that the plane would fly well, the hardware all worked and good data could be obtained. However, there were still many sessions to go to see if the data could tell us anything meaningful. Specifically:

- A minimum speed of ~ 9mph was recorded. Was this the ambient wind speed that day, the minimum detection level of the unit or a baseline offset?

- The altitude baseline appeared to drift during the course of the flights. Was this due to weather changes or something inherent in the unit?

- How accurate were the airspeed and altitude readings? These preliminary results recorded airspeeds and sink rates that were higher than expected. Was this real or an artifact of the weather or instrumentation?

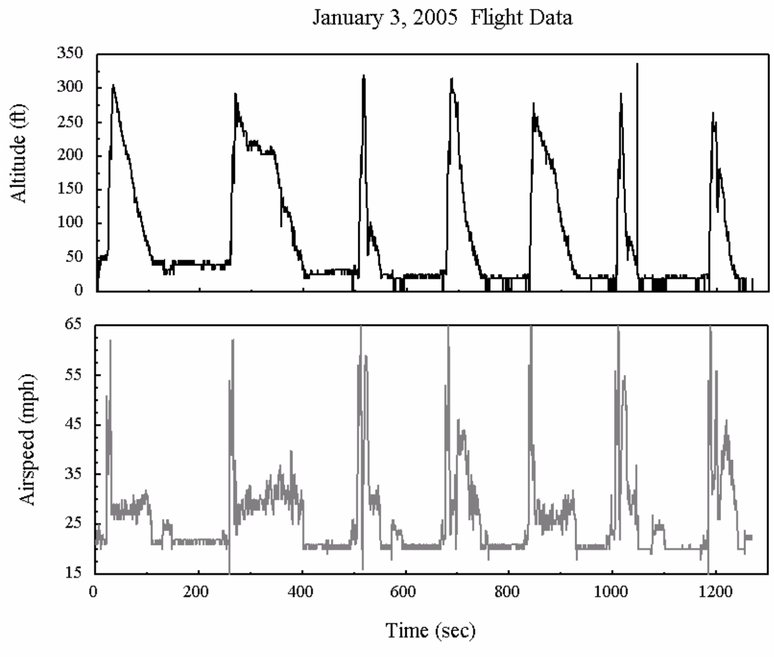


Figure 1: First flight data – January 3, 2005

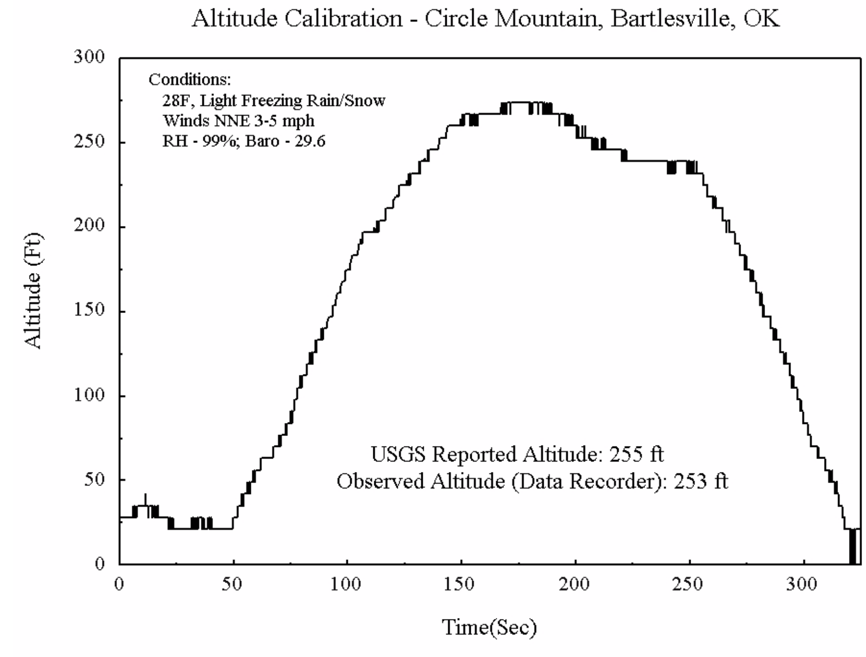


Figure 2: Altitude Calibration – Circle Mountain

- Finally, if the airspeed readings were correct, some of the flight speed variations may have been due to wind gusts – an observation that would significantly restrict the types of weather conditions allowed for these experiments.

After additional correspondence with Bill Parry and discussions with the students, they decided to tackle things one at a time. The first issue was the airspeed and altitude calibrations.

Not too far from town we have a small mountain that rises steeply from the floodplain. There is a paved road to the top and topographical maps indicate the altitude change is 255 ft. Since our initial flights were in the 300 ft. range, driving up the mountain with the fuselage seemed like a pretty good way to answer the altitude calibration question.

Driving with the fuselage inspired another thought – why not use the speedometer in the car to calibrate the pitot readings?

Megan researched the local county until she found a paved section line road that ran north-south and was very nearly flat for about 2 miles. Our prevailing winds are typically from the north in the winter so a north-south traverse at various speeds should average out the prevailing wind.

The next week, Megan and I drove up and down that section line road with the fuselage sticking out the driver side window for a couple of hours. 15mph up to 45 m.p.h. in 5mph increments. North, then south at the same speed. Timing out wind gusts when the occasional vehicle passed us (even a tractor goes faster than 15mph!). Just shrugging at the worried farmer and livestock who watched us cruise by their place MANY times at ever decreasing speeds. But Okies are generally a benevolent lot and the outing was uneventful – but cold!

On that same outing, we took off for the floodplain and drove up

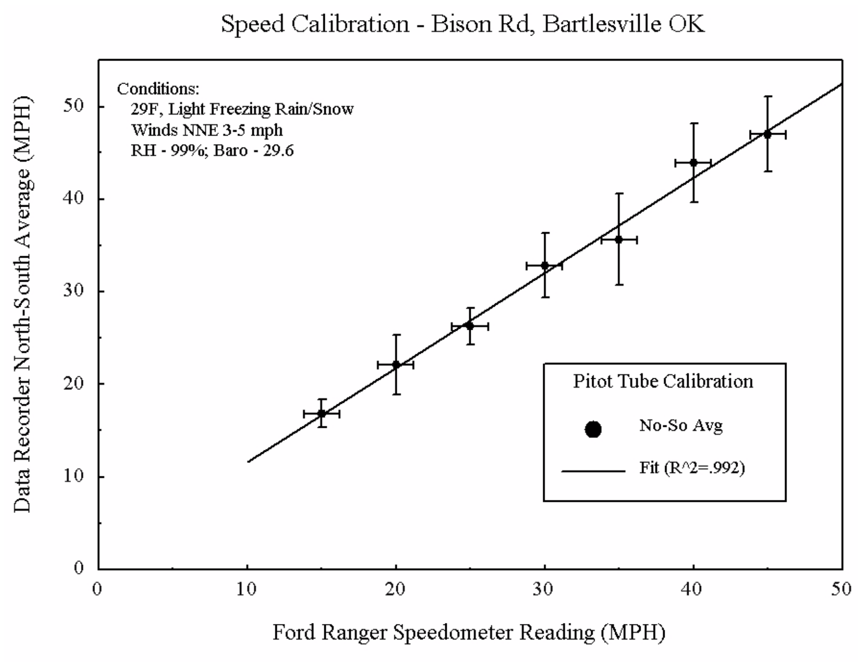


Figure 3: Velocity Calibration – Bison Road Results

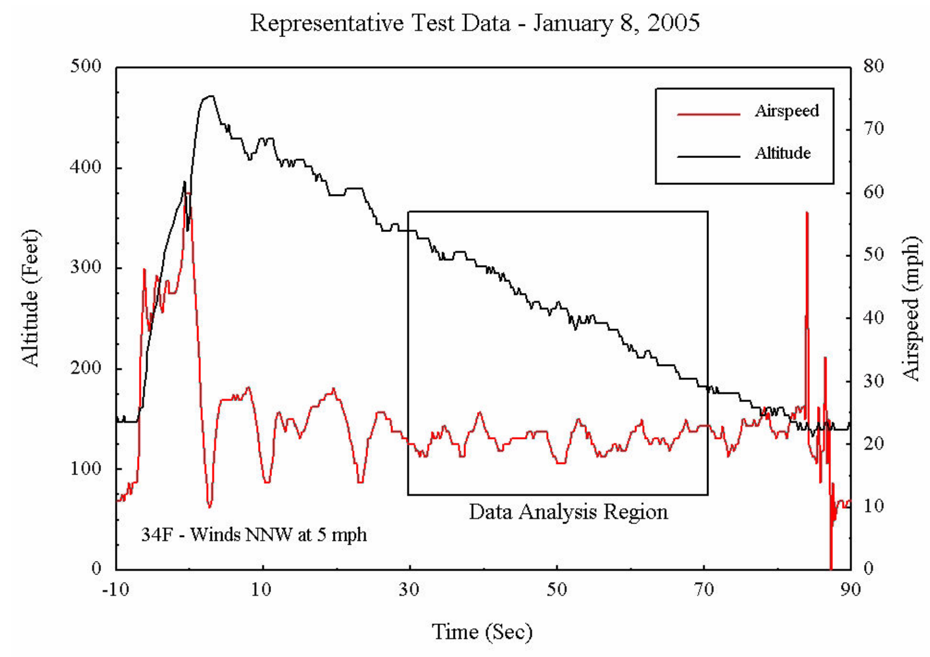


Figure 4: Representative data used for flight analysis

and down our calibrated mountain a couple of times. During the second traverse, the front that had been holding back came through. Barometric pressure and temperature changed quickly but this was a fortuitously good opportunity.

Dumping the data that evening indicated several things:

- The altimeter responded to the change in weather conditions when the front blew through (not unexpected) but the altitude difference from the bottom to the top of the hill remained constant and pretty much right on the money,

- The airspeed data exhibited about a 9mph minimum reading but even the 15mph data could be easily seen above this baseline.

Megan spent some time working the averages from the speed calibrations and the altitude data. Those results are shown in Figures 2 and 3. As can be seen, both the airspeed and altitude data from the FDR are about as good as could have been expected. More correspondence with EagleTree indicated the V1.0 unit was not specifically designed for very low speed measurements and the 6-9 m.p.h. reading was a minimum detectable result, not an offset.

Basically, the result of the calibrations indicated that both the altitude and airspeed data could be accepted from the FDR with no calibration correction. The limitations are: the minimum airspeed had to be greater than about 10mph (~ 15 ft./sec.) and data collection should be restricted during significant changes in barometric pressure. Alternatively we needed to check the altitude offset (if any) both before and after each flight to minimize atmospheric effects in the flight data.

With these results in hand, it was now time to start some serious data sessions at the field. Class schedules and weather limited those opportunities quite a bit but

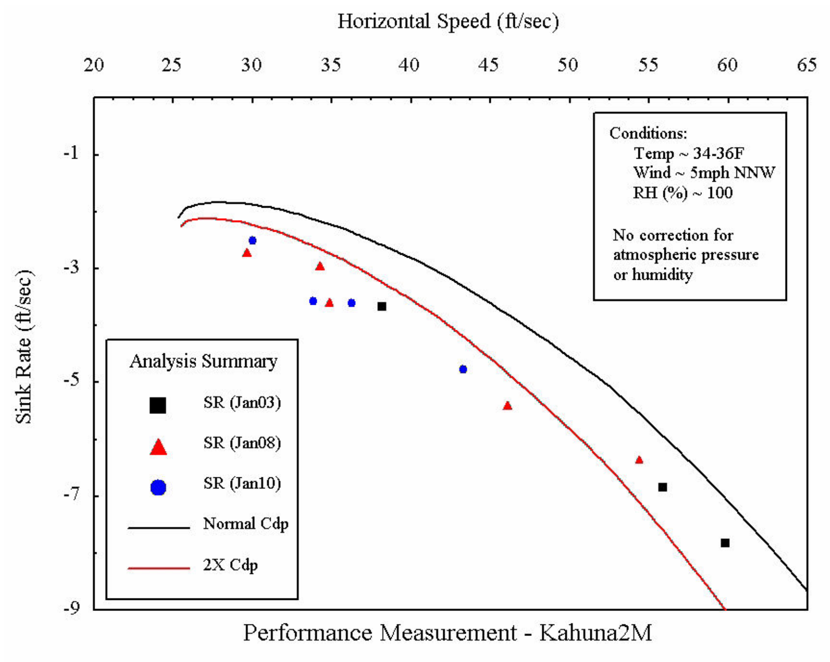


Figure 5: Summary of performance data

several successful outings were achieved and data analysis was soon underway.

Typical flight data for one of these experiments is shown in Figure 4. Each data collection flight was documented by recording the time (after launch) in which the plane was flying in a straight line under good trim conditions. A series of flights were made with each successive flight using a few more "clicks" of elevator trim. A "box" was then drawn around the time increment in the flight during which stable flight conditions were expected.

To analyze this data, the average airspeed in "the box" was found using the Excel "Average" function. The sink rate was then determined from the slope of the altitude vs. time plot – again using the appropriate Excel function. Once a suitable number of flights had been analyzed, the airspeed vs. sink rate data was graphed to generate the final "polar" plot.

The results of all this effort by Cody and Megan is summarized in the final plot in Figure 5. A lot of work went into generating this data so let's take a look at it.

First, the general trend is about what we expect. There is a flying speed at which our sink rate is minimized. Flying faster than this "minimum sink" condition increases the sink rate. In general, the ratio of the sink rate to the flying speed does not stay constant but increases as airspeed increases.

Next, the flight tests were never able to get down to the true minimum sink condition. This is probably due to turbulence at the field since we never had a completely calm flying day (Notice the small ups and downs in the airspeed plot even during the "stable" part of the flight). This field is ringed by trees and houses so even a small breeze will create turbulence.

The characteristics of the NACA0009 were not helpful for achieving minimum sink flight. This airfoil has a rather sudden stall onset. When coupled with even a small amount of turbulence, flights near minimum sink became challenging. Although the stall onset is not seen in the flight data, it was definitely observed during low speed flights.

Finally, two additional plots are shown in Figure 5. These are generated by a polar simulation program that used the Kahuna2M planform data and the UIUC wind tunnel results for the NACA0009. The upper plot uses a calculation for parasitic drag that appears to be optimistic. The lower curve increases the parasitic drag term by a factor of 2 with no other changes to the program. With that correction, it appears that the polar simulation replicates the flight data reasonably well.

Since the weather would not cooperate any longer, and the schedule demanded the students submit their report in a timely manner, experiments and data analysis stopped at this point. These students slugged their way through a lot of issues and at the end of the day came out with what appears to be a very interesting result (and the mentor no longer worries if the data would be any good!).

A great deal has been learned about the proper protocol for doing these experiments. Bill Parry at EagleTree is in the process of developing a new FDR that should be more applicable to the sailplane environment. The Kahuna2M is being overhauled for better stability and ease of accepting different airfoils. Templates have been made for looking at several airfoils beyond the NACA0009. And my old XP3 has been renovated for doing these same measurements for the DLG regime.

I hope you agree that Cody and Megan did a nice job. Although their project is now over, they've opened the door to a number of other evaluations which will be explored as better weather makes it more practical to do so. Hopefully those will be of sufficient value to publish in *RCSD* in the future.

In the meantime, grab an FDR and give this a try. The new unit from EagleTree should have a vario capability, real time readout and unlimited (for us) altitude range. You can use it to tune up your TD skills once the data gathering is done.

FAI has ratified the following Class F (Model Aircraft) records:

Claim number: 9931
Sub-class F3B (Glider)
F3: Radio controlled flight Category
Type of record: N°158: Distance to goal and return
Course/location: California Valley, CA (USA)
Performance: 10.71 km
Aeromodeller: Gary B. FOGEL (USA)
Date: 22.10.2004
Previous record: 7.14 km (17.07.2004 - Frédéric JACQUES, Monaco)

Claim number: 9927
Sub-class F3B (Glider)
F3: Radio controlled flight Category
Type of record: N°158: Distance to goal and return
Course/location: California Valley, CA (USA)
Performance: 25.7 km
Aeromodeller: Gary B. FOGEL (USA)
Date: 23.10.2004
Previous record: 10.71 km (22.10.2004 - Gary B. FOGEL, USA)

Note: Dr. Fogel's record attempts took place on consecutive days, but FAI accepted his record claims out of sequence. Thus the initial FAI announcements lead to confusion on the part of RCSD readers. The record books now show Dr. Fogel breaking Jacques' record on October 22, then breaking his own distance record the next day., October 23 2004.

Claim number: 9949
Sub-class F5-S (Aeroplane, electric motor (rechargeable sources of current))
F5: Radio Controlled Flight Category
Type of record: N°172: Distance in a straight line
Course/location: Jacksonville, FL (USA) - Scottsmoor, FL (USA)
Performance: 164.19 km
Aeromodeller: Giorgio AZZALIN (USA)
Date: 05.11.2004
Previous record: 102.40 km (25.08.1990 - Anatoly DUBINETSKY, Russia)

FAI congratulates the Aeromodellers on their splendid achievements.

Wing Shear Loads

Part 2/2: Composite wings

by Mark Drela <drela@MIT.EDU>

This month we continue our discussion of shear loads in wings, and look at spars with carbon sparcaps.

Figure 1 shows what happens when a foam-core wing with top and bottom sparcaps or carbon skins is loaded. The foam is deformed into parallelogram sections by the shear load, which is equivalent to compression/tension loads along the opposing diagonals. Composite wings which have carbon skins over most of the chord distribute this shear load over most of the wing foam, which is then more likely to withstand it without failure.

Figure 2a shows a wing with narrow carbon sparcaps and a 0/90 skin. As the sparcaps try to slide spanwise past each other, they cannot effectively drag the adjacent skin with them, since the 0/90 skin weave readily yields by shearing. Therefore, only the foam between the sparcaps is available to restrain the spanwise sliding of the caps, and this foam takes the full shear load. No commonly used foam is strong enough in this situation.

Figure 2b shows the same wing, but with a bias skin which cannot deform in shear significantly. As the sparcaps try to slide past each other, they now drag the adjacent skin with them very effectively, so that the skin spreads out the shear load over more of the foam core. This reduces the shear load enough so that the higher density foams are usually adequate to withstand all but the strongest winch launches. However, such wings are sensitive to delamination and buckling of the sparcap.

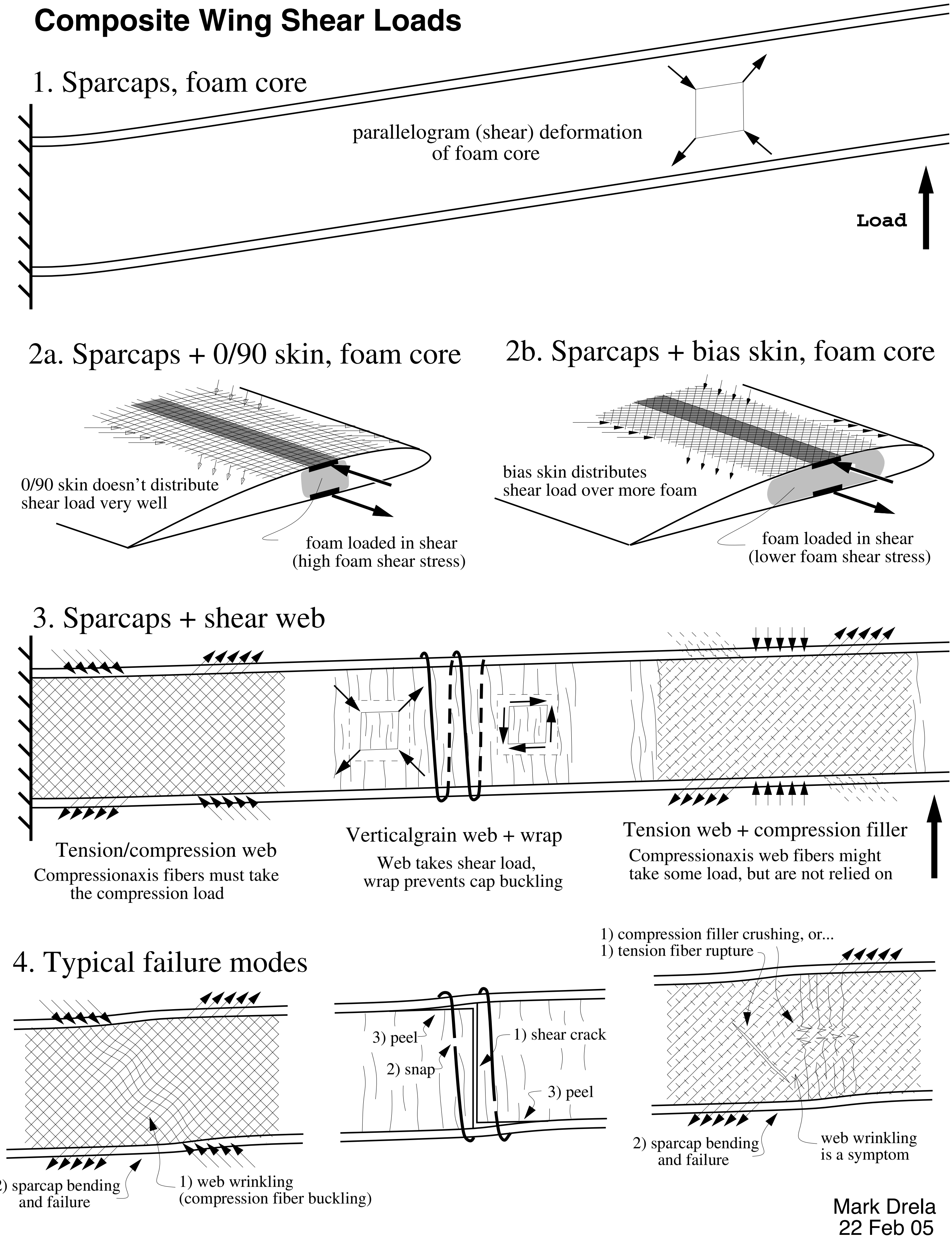
The strongest and stiffest wings are obtained with compact sparcaps near the maximum thickness point, joined by a shear web. Figure 3 shows several shear web concepts. The tension/compression web is readily made of bias fabric, but this may be subject to buckling of the compression fibers as shown in Figure 4.

The vertical-grain web in the middle Figure 3 is well suited to wood wing construction, but with carbon fiber replacing the spruce. Wrapping the spar with Kevlar thread makes the spar more resistant to the crack/peel failure shown in the middle Figure 4.

The strongest spar is obtained with a combination of a compression filler such as endgrain balsa or hard foam between the sparcaps, with a bias-cloth wrapping. Because the filler is available to take all compression loads, the spar wrap now only needs to withstand tension loads along one diagonal. Buckling of the compression-diagonal fibers is no longer a failure mode.

Next month: Dihedral bends, bending loads, and spar compressive loads.

Composite Wing Shear Loads



How to submit articles and

To reiterate, *R/C Soaring Digest* is a reader-written publication. There are no paid staff behind the scenes. All of the articles which have appeared in *RCSD* over the years were produced by authors who read an issue of the magazine and decided to sit down and share some of their knowledge with others having an interest in R/C soaring.

While the pages of *RCSD* have been graced with the words and images of professional writers and photographers, the vast majority of the published material has come from readers with no professional credentials.

RCSD welcomes submissions with an R/C soaring focus - articles, columns, reviews, and photos. Possible subjects include, but are not limited to: theory and practice, design, construction materials and methods, electronics, flying skills, trimming, event coverage, weather, launch equipment, radio gear, aircraft, airfoils, aerodynamics, people, books, photography, adhesives, flying sites, humor, software, new products, AMA and FAI rules.... For more ideas regarding subject matter, check out the *R/C Soaring Digest Index* which is available from the *RCSD* web site.

The decision to write for *R/C Soaring Digest* is for most people the most difficult part of the submission process. Keep in mind the *RCSD* editors and columnists stand ready to support the committed author, from assisting with topic development to helping with grammar and punctuation and reviewing technical aspects.

RCSD has no minimum or maximum article length.

(Articles of exceptional length may be published in parts.) As well, there are no restrictions on the number or the size of images.

Your completed article will likely consist of both text and images. When sending materials to *RCSD*, be sure to separate any images from the text. Do not embed images in a document or send material in EXE format.

Text may be created in Microsoft Word or whatever application you may be using, whether a simple text editor or a full blown desktop publishing program. Don’t worry about margins, line spacing, fonts or similar formatting issues. Save the completed article in “plain text” and forward that file to us. Sending the text portion of an article as an e-mail message, rather than as an attachment, is preferred. If the document has a number of superscripts or subscripts,

photos to R/C Soaring Digest

please let us know when the article is submitted.

Images are a bit more complicated, but by following a few simple rules things can be made easier.

Line drawings should be submitted in either TIFF or GIF format and have a published resolution of at least 300 dpi.

Grayscale images are best rendered in TIFF or JPG format. Again, at least 300 dpi for the published image.

Photos and other color mages submitted electronically should be in either TIFF or JPG formats. There is one simple rule for photo quality: The more pixels the better!

We need to have a resolution of at least 150 dpi for publishing, so a cover photo needs to be a minimum 1600 wide by 1200 pixels high. Print photos may be submitted as long as they are at least four by five inches and yes, they will be returned.

A word or two about JPG images... The less compression the better. Images which are 1600 by 1200 pixels should be 500K to 2.0MB or more in size, depending on coloration and detail. The best JPG images are those downloaded directly from your digital camera, as once you re-save a JPG image, there's an irretrievable loss of image quality - color and detail both deteriorate.

TIFF images can be compressed using any one of the CCITT processes available within certain graphics software, or by using file compression software (ZIP or SIT) prior to forwarding. JPG and GIF are image compression formats, so JPG and GIF images should not be compressed. Doing so nearly always makes the resulting file larger than the original.

Submitted materials may be forwarded to *RCSD* via e-mail to <rcsdigest@themacisp.net>. If the number or size of files is large, burning a CD is appropriate and desirable. Make sure the CD is created using a data files format which can be read by both Windows and Macintosh systems, ISO-9660 preferred. Floppies, either PC or Mac formatted, are still a viable medium for us as well.

The deadline for submissions is normally the 15th of the month prior to the cover date. That is, January 15th for the February issue, etc.

If a subject is of interest to you, there are sure to be other *R/C Soaring Digest* readers with a similar interest. If you can talk about R/C soaring you can certainly write about R/C soaring.

We look forward to your contribution!

Have Sailplane, Will ~~Travel~~ Recycle

Tom Nagel, tomnagel@iwaynet.net

PSS SpaceShipOne

An Adventure in Aeronautical Design and Recycling

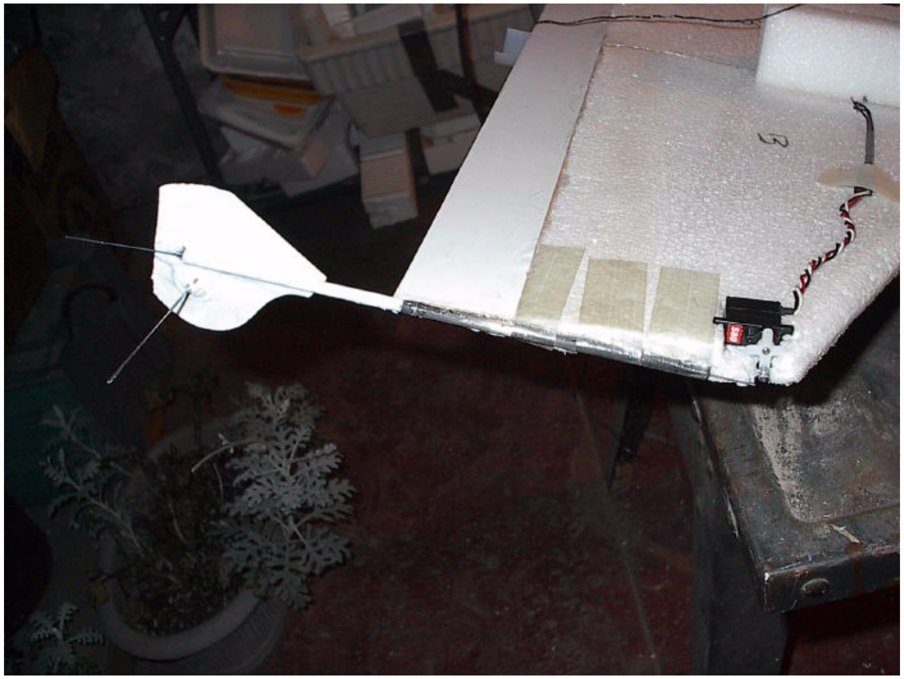
In the summer of 2004 Burt Rutan and his crew at Scaled Composites started a series of flights on their two newest aircraft, the White Knight and SpaceShipOne. The goal was to win the Ansari X-Prize, $10 million purse for the first private company to build and fly a spacecraft capable of lofting a person to space and back, twice in three weeks. Along with millions of others, I looked at pictures of the two planes on the internet: the gawky stork-like White Knight, the carrier ship, and the stubby lawn-dart of a space ship, SpaceShipOne.

When the actual attempts on the prize began, I watched live on the internet and saw SpaceShipOne go into a rapid and unplanned series of vertical rolls on its powered ascent. As a slope pilot I recognized that something was wrong on board, and was greatly relieved when I saw the tail surfaces kick up into “shuttlecock configuration” for re-entry. That meant there was a live pilot on board.

Rutan and SpaceShipOne quickly completed the flights outlined in the contest rules and won the X-Prize. By that time I had seen so many pictures of SpaceShipOne on the internet and in the news, that the idea of building a sorta-slope scale model of the plane became firmly lodged in my brain. I am not sure what other functions that obstruction interfered with, but the immediate response was that I began to download photos and drawings of SpaceShipOne, trying to figure out some dimensions and proportions. And I began to scrounge around in the basement, looking for parts and ideas.

Two problems cropped up. First, I didn’t have the foggiest idea what I was doing. And secondly, the obvious name for the sloper was PSS-SS1, which sounded more urinary than aeronautical. Too bad. As usual, I was going to have to deal with what was at hand, going to fly with the aircraft you have, not the aircraft you might wish to have, as Donald Rumsfeld would say.

The materials that I rounded up in the basement included the wing beds from an all EPP Boomerang sloper, a few clear three liter pop bottles, part of a carbon-fiber tube that I’d picked up at Toledo as a freebie years ago, an old 555 receiver, some 2" trailing edge stock, leftover Depron from a GWS Lady Bug and a tube of Household Goop. I decided to use a couple of old S-80 servos from my Zagi THL in the PSS-SS1. These were carefully selected on the basis that they were the only



Upper left: Some of the gathered materials - wing beds from an all EPP Boomerang sloper, a pop bottle, part of a carbon-fiber tube, some 2" trailing edge stock, and some leftover Depron foam.

Upper right: Tom's SpaceShipOne begins to take shape. A standard 600 mAh battery pack, an old Hitec 555 receiver, and a couple of used S-80 servos from a Zagi THL make up the onboard electronics package.

Lower left: A close-up photo of the wing tip. The servo is mounted at the extreme end of the wing and close to the leading edge. The pushrod goes through the hollow tail boom. The music wire extending outward from the plywood fin is the axle for the full flying stab.


N328KF

Opposite page:

Upper left: The basic completed airframe. The enlarged vertical fins are actually the Depron fins attached to the plywood panels to which the full flying stab axle is attached.

Upper right: Tom has now added some detailing, so the airframe looks more like the original SpaceShipOne. A few Avery labels and some striping tape make a big difference.

Lower left: Yeah, that's blue flames coming from the nose and adhering to the bottom surface of the fuselage. Not quite an accurate reproduction, but pretty cool nonetheless.

Lower right: Close-up of the full flying stabilizer. This aspect of the design concerned Tom the most, but hand tosses at the local cow pasture seem to indicate the system will work well.

This page:

Upper: The completed PSS SpaceShipOne and the Second Place trophy it collected at the Westerville (Ohio) Model Aviation Association static show and swap meet.

Lower: SpaceShipOne at touchdown, following its record breaking flight which garnered the $10 million Ansari X-prize, October 6th, 2004. Photo by Dave Beardsley, RCSD photographer, who traveled from the big Fall Fest in Visalia down to Mojave to photograph the prize winning flight. <http://www.beardsleys.net/dave/space-ship-one/images/Img0043.jpg>

two small servos I had in my junk box.

I started by selecting the thickest part of the left-over EPP wing beds, cutting them down to a 29" span and attacking them with a rasp until they sort of looked like an undercambered airfoil. I Gooped a piece of 2" TE onto the back end of the wing to taper it down to a trailing edge and stiffen it up a bit. I cut a wedge out of the root end of the boomerang wing beds to get the LE sweep pretty close to the sweep on the SS1 as far as I could tell, and the final proportions of my EPP wing, at least in planform, looked a lot like the SpaceShipOne.

I cut the bottom off a clear three liter Pepsi bottle and spray painted it white from the inside. Instant fuselage. I'd figure out how to get a pointy nose on it later. Maybe a white plastic prop spinner would do. I studied my SS1 photos to figure out how and where the wing intersected the fuse, and then cut out sections of the pop bottle so that it could slide over the wing. Eventually I grafted on parts of a peanut butter jar and a Crystal Light canister to complete the fuselage. The fuselage parts rode on a big block of EPP that I gooped onto the wing. I cut out holes for the receiver and battery later.

Against all odds, this contraption was beginning to look a little like Rutan's SpaceShipOne. Now, what to do about the tail booms, fins and control surfaces?

The SS1 looked like it had full-flying stabs, with moveable elevator parts as well. I decided to go with simple full flying stabs and skip rudders altogether. This was to be a sloper, after all.

Simple, except I'd never built full flying stabs before, and these were actually going to be full flying tailerons. I roughed out stabs from leftover pieces of the 2" TE material. The stabs are 6" in span, so the total span for the PSS-SS1 is about 41". The tail booms are short carbon fiber tubes, gooped to the outboard ends of the main wing. The servos are mounted at the wingtips and pushrods run though the carbon fiber tubes. The stabs have brass tubing inlet into them around 40% of the chord, and pivot on music wire rods that are mounted on little light ply "paddles" which I epoxied to the ends of the booms. The actual vertical fins would be sacrificial depron sheet parts mounted onto the paddles with double sided tape.

The design and construction of the full flying stab linkages from servo to control surface proved to be the hardest part of the project. I was not sure I had sufficient surface movement, but the only way to find out was to balance the PSS-SS1 and give it a toss. But balance it where? "Darn it, Jim, I'm a columnist, not an aeronautical engineer," to quote Dr. McCoy. So I did the obvious thing. I made a scale drawing and shipped it off to my unpaid consultants, Don Stackhouse and Bill Kuhlman. Their comments were:

1. A three liter pop bottle!?!!? (and)

2. What do you think I am, your unpaid aeronautical consultant?

Eventually I found a website called The Funk Works that showed a simple geometrical method of locating the mean aerodynamic chord of a wing. The site suggested that most planes are balanced at 25% of the MAC. That's more than I knew going in, and amazingly, with battery and receiver on board, the PSS-SS1 actually balanced out at that location. (If you need to locate a MAC, try <http://www.thefunkworks.com/calc_cg.htm>.)

As you know from previous columns, I like funkyness.

So far the project had been pretty much run on a shoestring. Now it was time to lay out the big bucks----$6.98 for a package of 3/4" round black Avery labels for the cockpit windows, and $3.50 at a swap shop for some pin striping decals.

I laid on some Ultracote to cover the wings, and made up a few decals and markings. After the first successful SpaceShipOne flight, Sir Richard Branson bought in as a sponsor, and plastered "Virgin Galactic" logos on the Space Ship One. My sloper version wasn't exactly made of "Virgin" materials, so I followed in Woody Allen's footsteps and made up decals that read "Semi-Virgin Galactic." Close enough for slope flying.

Almost time to fling foam and try to fly. First, however, I took PSS-SS1 to the Westerville (Ohio) Model Aviation Association static show and swap meet. I was pretty sure it would be the only sloper made out of recycled pop bottles at the show. Maybe there would be some sort of trophy for that. I entered it as a

PSS Sloper, meaning Pepsi Scale Sloper, or possibly, Piece of S*** Sloper.

As it turned out, I brought home a nice trophy for Second Place in the soaring aircraft division. Upon reflection I think this was because of the unique scale subject, my acute design talent and well honed building skills. It possibly may have also had something to do with the fact that only two planes were entered in the soaring category. The guy who got first place commented to me that he was disappointed in having come in second-to-last, so I guess it all depends on how you look at it.

On the first nice day after the static show I drove out to our little cow pasture slope at Linnville for test flights. Test flops as it turned out. The SS1 had way too much under-camber in the wing and was so short coupled that no amount of elevator could overcome the plane's tendency to sharply nose down and dork in. The PSS-SS1 did not soar so much as plummet, in the words of Monty Python.

The only damage was to the pop bottle fuse; I made another one in no time, which is a plus for the design, I think. Then I addressed the wing under-camber problem. The solution I decided on was to cut the balsa TE mostly loose and reflex it upward a bit. I used a straight edge and X-Acto knife to make the cut, and widened it a bit with a hobby saw. I spread in a layer of Goop and weighted the TE up in what I hoped was a sufficiently reflexed position. A little Ultracote covered up my sins the next morning.

And last weekend a few test tosses at the flat field demonstrated that PSS-SS1 had a decent glide and that landings were controllable. It even turned a little. It hasn't really sloped yet, but the deadline looms. I'll add a note to some later column about how it does on the slope. As Don Harris says, "On the slope, anything will fly."

P.S.: The PSS-SS1 made it out to the Newark Ohio slope and did just fine, verycontrollable. Photos and more details in a future issue!

Be sure to check out Dave Beardsley's SpaceShipOne photo album! Go to Dave's home page <http://www.beardsleys.net/dave> and click on the SpaceShipOne link.

FAI has received the following Class F (Model Aircraft) record claims:

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Claim number: 11328
Sub-class F5-P (Aeroplane, electric motor (non-rechargeable sources of current))
F5: Radio Controlled Flight Category
Type of record: N° 181: Distance to goal and return
Course/location: California Valley, CA (USA)
Performance: 2.25 km
Pilot: Gary B. FOGEL (USA)
Crew: Christopher SILVA (USA)
Date: 15.04.2005
Current record: none

==

Claim number: 11329
Sub-class F5-P (Aeroplane, electric motor (non-rechargeable sources of current))
F5: Radio Controlled Flight Category
Type of record: N° 181: Distance to goal and return
Course/location: California Valley, CA (USA)
Performance: 6 km
Pilot: Gary B. FOGEL (USA)
Crew: Christopher SILVA (USA)
Date: 16.04.2005
Current record: none

==

Claim number: 11330
Sub-class F3B (Glider)
F3: Radio controlled flight Category
Type of record: N° 158: Distance to goal and return
Course/location: California Valley, CA (USA)
Performance: 39.1 km
Pilot: Gary B. FOGEL (USA)
Crew: David L. HALL (USA)
Date: 16.04.2005
Current record: 25.7 km (23.10.2004 - Gary B. FOGEL, USA)

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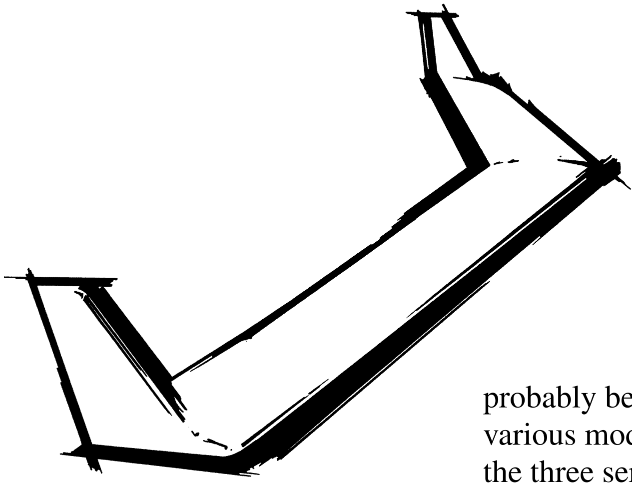
The details shown above are provisional. When all the evidence required has been received and checked, the exact figures will be established and the records ratified (if appropriate).



On the 'Wing...

Bill & Bunny Kuhlman, <bsquared@themacisp.net>

We've been working on our second Alula, alongside a few other projects, and wanted to keep *RCSD* readers apprised of our progress.

Our primary goal in building this Alula is to separate the elevon into outboard ailerons, each driven by Hitec HS-50 servos, and two central elevator halves to be driven by a single HS-55 through a divided pushrod.

Contrary to the construction of our first Alula, we decided early on to not spend a bunch of time "painting" the airframe. Rather, we're simply going to add black to the bottom wing surface by means of a large felt tip pen.

The time saved by using this simple color scheme will probably be used to complete various modifications and to get the three servo control system installed and set up.

Because the Alula construction manual is readily available on the internet, we're going to focus on "tips and techniques" which aid the construction process, and the specific modifications required to make this three servo version.

Figure 1 shows the rough shaped fuselage. Since the fuselage arrives as a simple contoured block, there is quite a bit of foam to be removed in order to obtain the desired ovoid shape. Rather than using large grit sandpaper, we opted to use a razor plane with a brand new double edged blade installed. As can be seen in the photo, this method removed a lot of material, and did so without tearing the foam. A small amount of finish work with 120 grit sandpaper completed the job in short order.

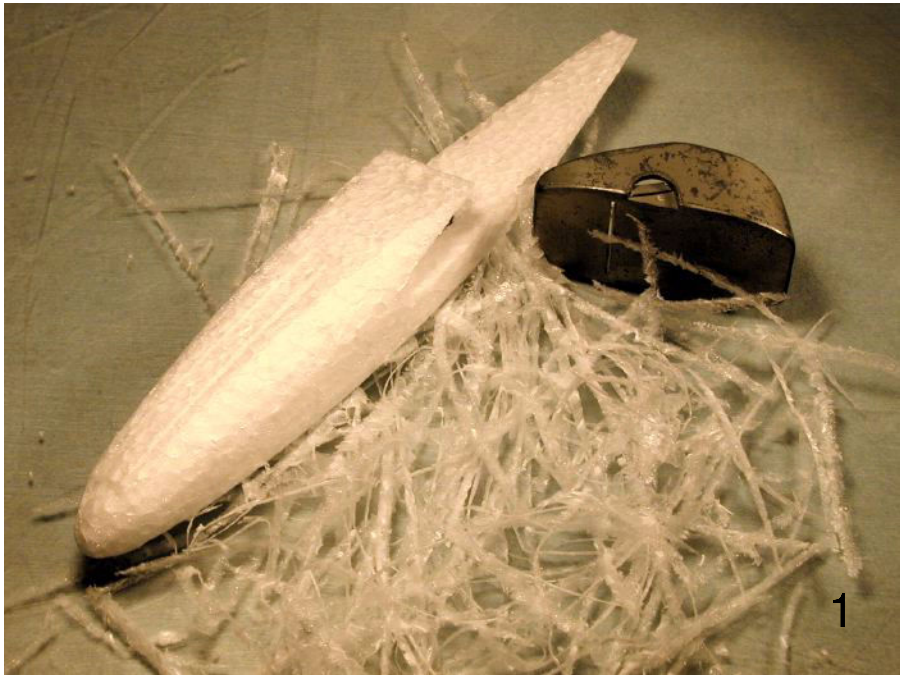
The original Alula places the two elevon servos side by side in a cavity in the fuselage. The wiring is then threaded straight through a precut hole into the receiver/battery compartment. As we'll eventually have a single servo in the fuselage to drive the elevators and two aileron servos in the wing panels, there will be three sets of leads (plus the antenna) which must be brought toward the conduit leading to the front compartment. The aileron servo wiring and antenna are in place in Figure 2, ready for the wings to be covered.

In preparation for the packing tape covering to be applied, starting with the bottom surface, we set up the wing beds to firmly hold the wing halves in place, avoiding the potential for warping. Figure 3 illustrates the fixture with both wing cores in place.

The core surface to be covered needs to be facing upward of course, and the second wing core is used to support the underside of the fixture while covering the wing bottoms.

Lastly, the elevons which come in the Alula kit have a precut outline which takes away from the area at the wing root. As this is going to be where the separate elevator halves are located, we needed to replace that area to maintain elevator effectiveness. We took some contest grade 1/16th inch balsa and, using the elevons as a template, carefully cut the glue line contour while leaving a bit of extraneous material to be trimmed off later. The completed elevons, with restored center area, are shown in Figure 4. The glue line has been enhanced to more clearly define the added material.

More next time!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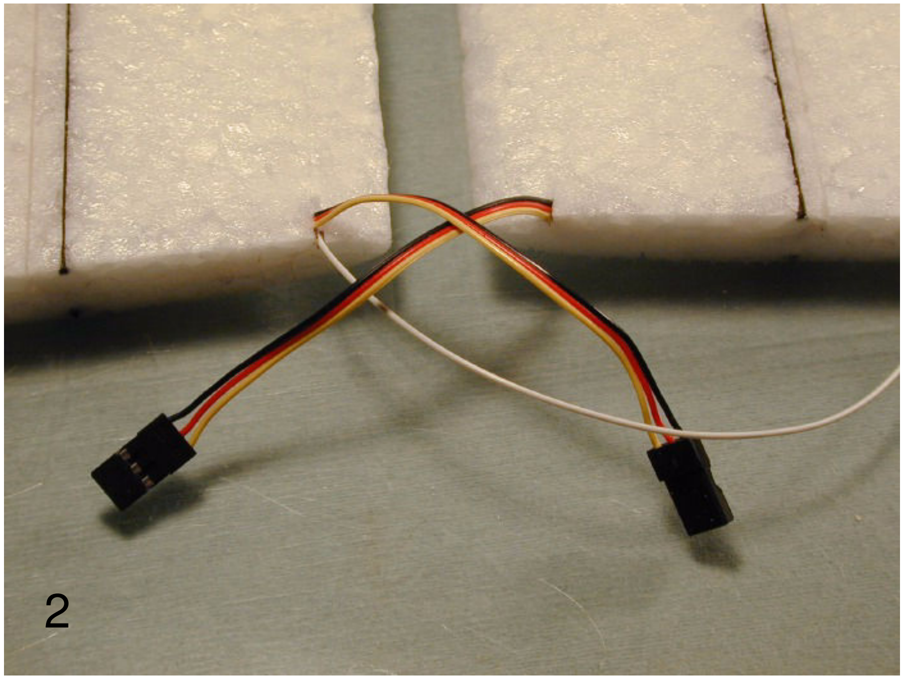
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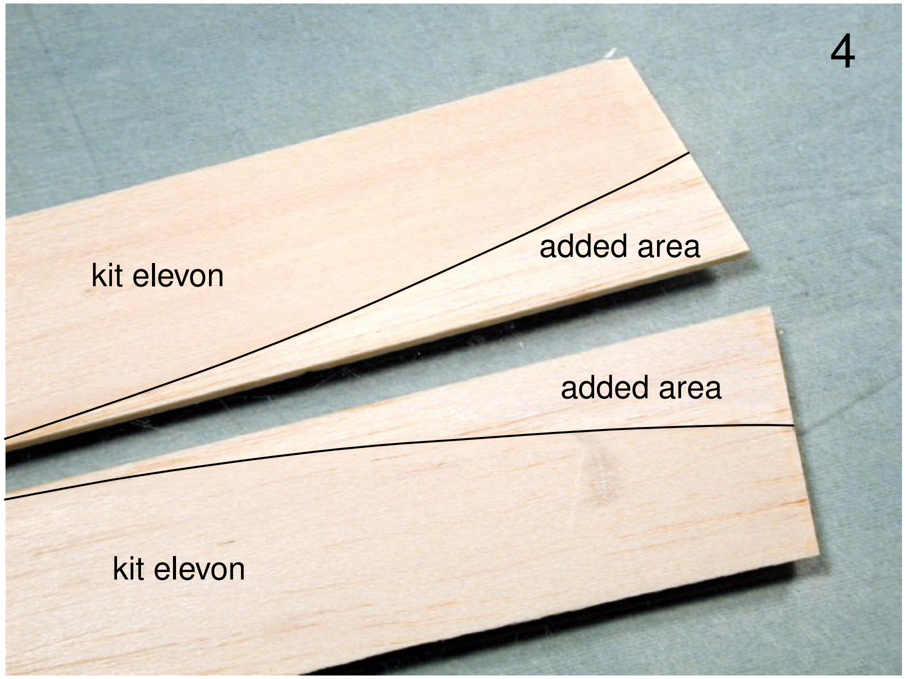
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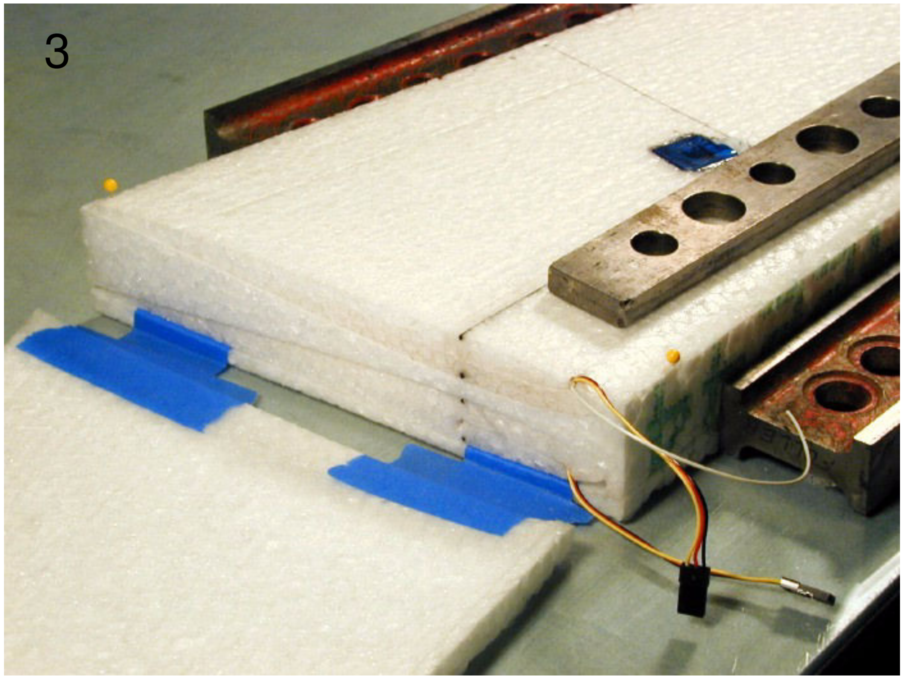
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The Eastern Soaring League (The ESL)

NEWS RELEASE

ESL Hand Launch Division

The Eastern Soaring League (The ESL) is proud to announce its new Hand Launch division. The ESL has been around since the mid 1970s promoting and supporting sailplane competition in the East. With the new Hand Launch division the ESL would like to expand its mission to promote growth and contest participation in the eastern United States. People interested in finding out more about the history of the ESL can visit the ESL website: <http://www.flyesl.com/News-y-Articles/featured_article.asp?FORUM_ID=7&TOPIC_ID=122>

Participation in the ESL series offers a number of benefits to pilots.

Beginners can improve on their flying skills and more advanced pilots can compete for top level ranking. Not only does the ESL offer one of the highest levels of competition in the country, but it also brings people together from different areas to a family oriented environment.

The ESL also gives pilots the opportunity to follow their individual performance and improvements via season standings. These are based on the competitor's top five (5) contest results. All ESL contests are based on a two day contest weekend. Each day is considered an individual contest. By attending three contest weekends pilots are able to accumulate enough points to compete for end of season standings. The top five pilots from each class, Sportsman and Expert, receive plaques at the end of the season. This is in addition to individual contest awards.

The ESL supports the unique culture each contest brings to the league. This season the ESL is opening with six contests and we hope to bring at least one more to the north east next year.

BASS (HLG) - Baltimore, MD

Polecat Challenge (HLG) - Bloserville, PA

CRRC Hand Launch Classic (HLG) - Sudbury, MA

CASA (HLG) - Rockville, MD

SJSF (HLG) - Marlton, NJ

East Coast HLG Festival - ESL HLG EOS - Wilson, NC

For more information, people can visit the ESL website <http://www.flyesl.com>, or go directly to the calendar section <http://www.flyesl.com/calendar.asp>, where members are able to find out more about individual contests and register online.

To find out more about the Hand Launch division or the Eastern Soaring League in general, contact any one of our officer <http://www.flyesl.com/about_esl/officers.asp>
or for questions about any specific contest please contact the corresponding contest director <http://www.flyesl.com/calendar.asp>

Thank you.

If you would like to learn more about the ESL and the new division please don't hesitate to contact me.

Jose E. Bruzual
ESL content editor
jebnet@bruzual.com
(518) 832 6726

A Slope Odyssey

by Loren Steel, Seattle Area Soaring Society, <lorensteel@hotmail.com>

In this true story about one flier's first slope flight, "he" is played by Philip Patten, the "band of believers" is played by Chris Erickson's Wild Arsed Mountain Slopers, "the man" is played by Loren Steel and Tor plays himself.

And he asked, "Who will provide this man with foam so he may face the wind on the mountain?"

And Tor answers, "I will provide foam and servos for a few ducats." The man responds and cultivates the foam into the appearance of a flying machine, trusting the words from those who have visited the mountain.

Then he said, "Travel through the valley of the great river, east of Matthew, and struggle up the four wheel drive to the mountain's peak. Don't forget the foam wing."

And the man struck out on his journey alone, through rain, wind and over relentless miles of pavement to reach his destiny with those already assembled on the mountain's shoulders.

Upon finding the meager and somewhat hung over band of believers of the slope, the man asked, "Got lift?" whereupon they broke camp and struck out on the final journey to the mountain's peak.

After traversing rock fields and high centered roads carved by glacial-like vehicles, the man arrived at the flying site and kissed his Civic for its loyalty and determination in the face of gas guzzling four wheelers with power beyond comprehension.

Then he said, "So, did you bring a plane?" Whereupon the man said, "Yes, but I am untested in the face of the uplifting wind and need courage only found within those branded by the mountain's elements." Responding with "Got lead?" he proceeded to assist the man to balance his plank of foam and build his courage to face the wind.

Forcing the man to look over the precipice with his foam wing in hand, he commanded, "Throw it off the edge and let's see if it'll fly," whereupon the man launched the foam as if it were his sacrifice to lift.

And then he said, "It's kind of goosy, but it's not coming down; here, you take the transmitter." And then the man took the stick and faced the wind on the mountain for the first time.

And he flew.

And he flew.

And then he needed to land, whereupon he learned about prayer and the forgiveness of foam in the face of the mountain's elements.

After several more flights, the man's elation turned to embarrassment as he was forced to land below his feet, far lower than the precipice, whereupon the man learned of the knee pain and respiratory agony associated with the walk of shame up the mountain's shoulders.

Nevertheless, the man persevered, endeavoring to earn the respect of the band of believers and the gift of the wind's lift shed by the mountain.

Then the man returned to his home near the Sound confident that he will travel again to meet the uplifting wind devoid of thermals and pay homage to the mountain and its brethren responsible for such lift wherever it may occur.

The end.

Loren Steel amongst the antennas (R/C and microwave) during his recent slope odyssey to Wahitas Peak in the Saddle Mountains of Washington. See page 31 for a near biblical rendition of Loren's first slope outing. Photo by Philip Patton, courtesy of Loren Steel.