Radio Controlled Soaring Digest

June 2005 — Vol. 22, No. 6

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Front Cover — John Derstine captured a large scale Pilatus B-4 flying by his camera position during the 2002 The International Gliderfestival in Fiss/Tirol, Austria. An annual affair, this event attracts RC soaring pilots from around the world. Scale and non-scale aircraft are in evidence at this event.

This issue of *RC Soaring Digest* features an invitation from 2005 Gliderfestival organizer Gerd Holzner, with additional text and photos courtesy of John Derstine, Endless Mountain Models.

R/C Soaring Digest

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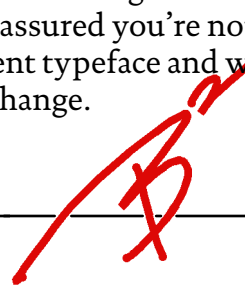
R/C Soaring Digest (*RCSD*) is a reader-written monthly publication for the R/C sailplane enthusiast and has been published since January 1984. It is dedicated to sharing technical and educational information. All material contributed must be exclusive and original and not infringe upon the copyrights 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 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.

In the Air!

Our local club, the Seattle Area Soaring Society, has for years scheduled Wednesday Fun-Fly evenings at 60 Acres while Daylight Savings Time is in effect. Loren Steel, SASS President, has been actively promoting club activities, particularly the Wednesday evening events, by way of the Yahoo SASS_club group.With the relative lack of rainfall during the latter part of the winter, the field is drying out quickly and a growing number of SASS members are arriving at the field after work and flying for several hours in the cool air of spring. This weekly event draws onlookers from the walking trail adjacent to the field and from the soccer facility across the street. Over the last few weeks, more than a few novice flyers have come out and been guided in their initial RC soaring adventures by experienced club members. SASS is bringing in new club members and at the same time making 60 Acres a safer flying field .

We got a message from Jim Prouty, JT Models <www.jtmodels.com>, letting us know he's successfully relocated to sunny (windy!) Kansas and has set up shop again. If you're interested in JTModels sailplane bags or covers, as seen in the April 2005 issue, please drop a a note to jimmy@jtmodels.com, 316-305-5835. JTModels will be offering the *OneFun* and BAE *Hawk* and Jim is currently working on a couple of other interesting designs as well — a 6M *Zero* and a Cessna *Citation*.

One final note: As you read this issue and begin to have the feeling that something looks different, be assured you're not imagining things. We've switched to a different typeface and would very much like to know if you like the change.



Flying Circus 10th Annual

The International Gliderfestival in Fiss/Tirol, Austria

by Gerd Holzner, with additional text and photos by John Derstine

RC-pilots from all over the world will come together on July 21. to 24.2005 in Fiss, the pictorial village on the sunny plateau of Tirol, in order to celebrate the 10-years anniversary. The anniversary of a meeting, which got world-wide interest like no second alone by the location.

Fiss became a Mekka for the alpine model pilots! On Europe´s highest model airfield... on 2500 m over sea level!

The mountain is named Schönjöchl, and offers big thermals apart from a fantastic panorama... 1000 m over the locality Fiss!

You will see there numerous scale gliders, the world best manufacturers show their novelties, and everything that has wings will go to be flown...

The meeting is open for all, beginners, progressings, and professionals. Free flying for all is called the slogan. Beside the flying at the slope there are numerous actions, which will provide for alternation and maintenance.

Apart from the nocturnal water flight competition for electrical models in Ladis on the village pond there will happen in the night a contest at the valley station near the Hexenalm:

Composite of two separate photos showing a launch of Ulei Nyfenegger's Duo during the 2002 event. Photos by John Derstine.

The pilots have to master most difficult tasks with their small electrical models under the rejoicing of the spectators. Only the best one wins? No, all, who are daring enough to make the fun will win! An open air concert and fireworks will end the happening this night.

Celebrate with us! Everyone, who was not ever there, missed something! Now the opportunity is... make a thick mark in your calendar, make your vacation reservation, and drive to Fiss: on July 21. - 24. 2005.

Room reservation under www.fiss.at or Best accommodation in Austria - check "Special Interest" - and "Events"

Organizer: TVB Fiss www.fiss.at <www.serfaus-fiss-ladis.at/sommer02/index.htm>

The program: www.flying-circus.de <www.flying-circus.de/html/fiss.html>

To make you hot, watch this video-clip: <http://www.flying-circus.de/fiss2004.mpg> by Enzo dé Nicolo

Organization: Gerd Holzner, Circus Director, Bear way 19, D-71296 home Tel. +49 (0) 7033-3069912 <info@flying-circus.de>

GH

This is one event that is not to be missed if you are in Europe or planning a trip this summer. Judy and I went in 2002 and it was a fun time for both of us.

To get there by car you have to drive up a winding switch back road to 1250 meters where the village of Fiss is located. To access the slope, you need to take a 25 minute cable car ride to the top of the mountain, and then walk about $^{1}/_{2}$ mile up to the slope site (2500 meters altitude or about 8200 feet).

If you are afraid of heights, this is not the place for you. The cable car ride, for those not used to skiing, is an experience in itself.

This is a very family oriented fun time with 6-8 hours of extreme Alpine soaring available every day, romantic alpine villages perched on the mountainsides, cows wandering the slopes with hikers of

all ages. Interestingly, the alpine culture is an outdoor one.

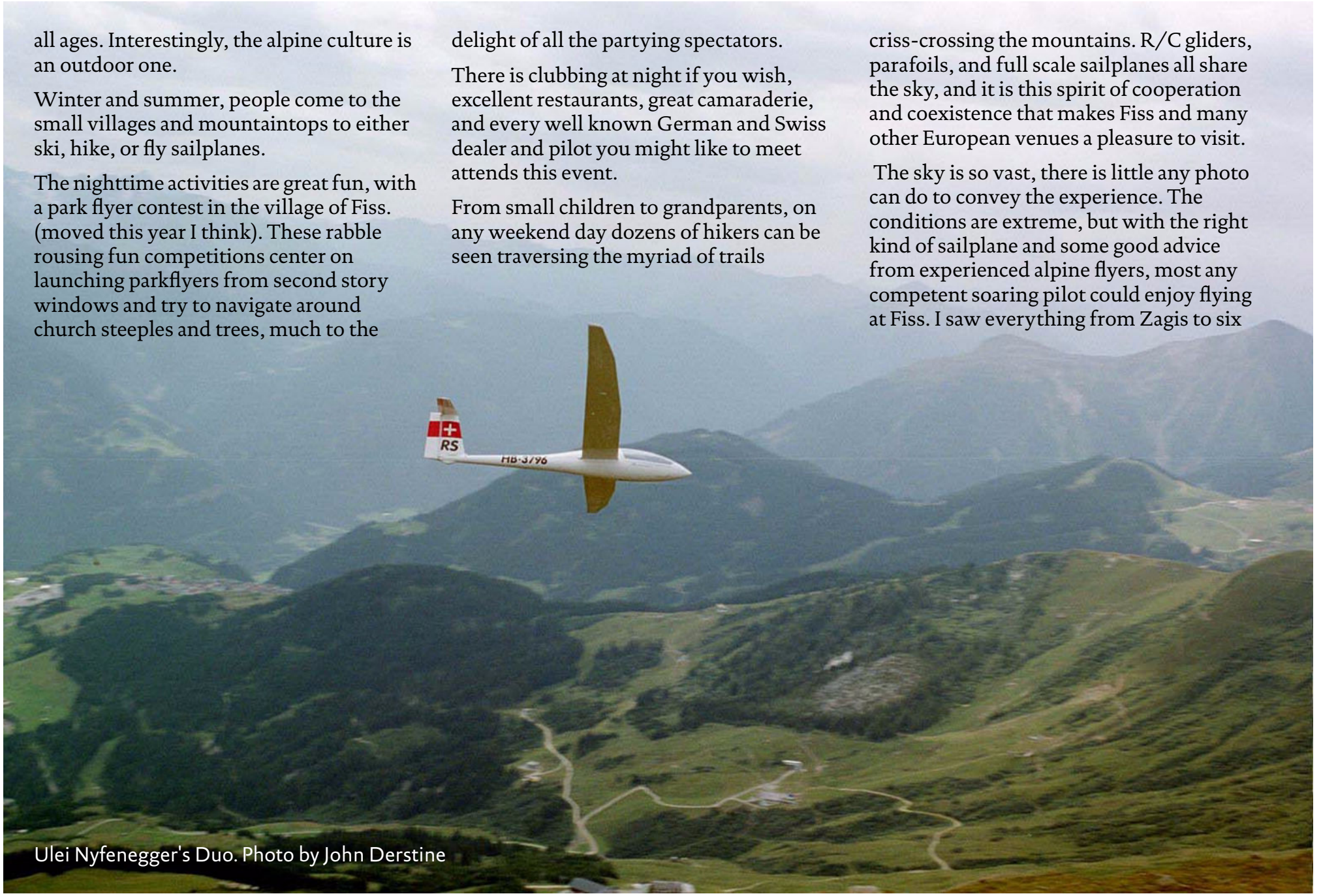
Winter and summer, people come to the small villages and mountaintops to either ski, hike, or fly sailplanes.

The nighttime activities are great fun, with a park flyer contest in the village of Fiss. (moved this year I think). These rabble rousing fun competitions center on launching parkflyers from second story windows and try to navigate around church steeples and trees, much to the delight of all the partying spectators.

There is clubbing at night if you wish, excellent restaurants, great camaraderie, and every well known German and Swiss dealer and pilot you might like to meet attends this event.

From small children to grandparents, on any weekend day dozens of hikers can be seen traversing the myriad of trails criss-crossing the mountains. R/C gliders, parafoils, and full scale sailplanes all share the sky, and it is this spirit of cooperation and coexistence that makes Fiss and many other European venues a pleasure to visit.

The sky is so vast, there is little any photo can do to convey the experience. The conditions are extreme, but with the right kind of sailplane and some good advice from experienced alpine flyers, most any competent soaring pilot could enjoy flying at Fiss. I saw everything from Zagis to six



Ulei Nyfenegger's Duo. Photo by John Derstine

meter molded scale ships ripping up the slope.

A good way to introduce yourself to alpine soaring would be to take an electric powered sailplane. This way if the tricky alpine air or thin atmosphere at 6,000 feet caught you off guard, you could power up to get home. Unlike flat land or American style slope soaring, with Alpine soaring often you are flying with the sailplane below the horizon. This can be daunting at first, but it adds a third dimension to the experience. I saw many pilots climb to high above the launch point then dive at tremendous speed through the launch altitude and down to the valley below. Then using the tremendous energy stored, literally zoom back up to eye level.

The accommodations are very reasonable from 20 euro to 100 euro per night for deluxe four star service. Your only expense after that is your lift ticket at about 25 Euro for the week end per person. Flying is free. My good friend Jan Kurt Hoffman runs a state of the art frequency control and transmitter impound, so sophisticated that he can tell when a pilot is about to deplete his transmitter battery. All computer controlled with real time frequency scanning all day long.

German and Austrian castles are within a day or less drive including Neuschwanstein the famous castle which Disney modeled for Disneyworld. This part of Europe is very compact and many German, Swiss, and Austrian points of interest are less than a days drive. Even if you do not intend to Alpine soar, there is plenty to do see and participate in.

Endless Mountain Models
http://www.scalesoaring.com
e-mail: johnders@npacc.net

JD

"Out over the edge." Photo by John Derstine

Concerns About *Heat*-Related Illnesses

Dr. Bob Perkins, Chair of the National Free Flight Society Competitions Committee

Reprinted from the April 2005 issue of *Free Flight,* The National Free Flight Society Digest

[The summer flying season is fast approaching, with its attendant dangers of problems resulting from excessive exposure to sun, humidity and heat. We will be fortunate if we don't hear of a fellow modeler who collapsed while retrieving a model.

The following article was written by Dr. Bob Perkins. He is well qualified to inform us on this subject: Bob retired as head of the Dept. of Infectious Diseases at Ohio State School of Medicine.

The article appeared in Digest a couple of years ago. But it does no harm to remind us all of the potential dangers we face to environmental exposure while following our sport of free flight.

Please read and heed.—Ed.]

Too much exposure to a hot sun and high humidity, combined with excessive physical exertion, can give modelers big trouble. But heat-related illnesses, ranging from muscle cramps to fatal heat stroke, can be guarded against with a little awareness of the causes and use of preventative measures. There are four distinct heat-related illnesses that will seem to overlap as you read the descriptions below.

Heat Cramps. These painful contractions of muscles follow exercise, such as after repeated long retrieval chases on foot. Most sufferers of cramps are in good physical condition but have noted excessive sweating and usually have normal body temperatures. Excessive sun exposure may not be involved and the environmental temperature may even be cold and lower than body temperature.

Loss of body water and sodium in the sweat leads to dehydration and lowered sodium chloride in the blood, with similar abnormalities probably occurring within muscle cells. Orally replacing water and sodium chloride usually results in cessation of the cramps.

Heat Exhaustion. Also known as heat collapse, this is all to common, especially in older persons who are not acclimatized and who take diuretics. It is important to note that heat exhaustion may occur in inactive persons exposed to adverse environmental conditions as well as those who are physically active.

The illness represents a failure of the cardiovascular system to adequately respond to high external temperatures. It is most often—but not invariably—precipitated by a lack of fluid intake and depletion of the body's water and salt in sweat.

The onset is often sudden and unexpected, but may be preceded by weakness, nausea and faintness, followed by a worrisome but usually temporary collapse. Blood pressure may be low and pulse increased, but sweating may be absent and the skin cool. Body temperature may be normal or subnormal, since exposure to heat has usually not been severe or prolonged.

Most instances of mild heat exhaustion resolve with rest in a recumbent position and oral

fluid replacement in a cool environment. Usually only severe prostration requires intravenous fluid replacement.

Exertional Heat Injury. This occurs most commonly with runners and involves injury to muscles and other organ systems. Excessive exercise in high temperatures and humidity with inadequate conditioning and acclimatization may lead to exertional heat injury. Profuse sweating and high but not extreme body temperatures lead to a host of gastrointestinal, cardiovascular or neurological signs and symptoms, including low blood pressure and loss of consciousness. Severe elevation of muscle and liver enzymes may be observed in laboratory tests. Evidence of organ failure may occur in severe cases. Prompt body cooling and appropriate IV fluid replacement are vital to recovery.

Heat injury is preventable by avoiding exercise in extreme heat and humidity, and by drinking large volumes of water before, during and after exertion.

Heat Stroke. Also called sunstroke, this is most common among elderly persons with underlying chronic diseases, many who take diuretics and other vaso-active drugs. The cause of heatstroke is unknown, but direct exposure to the sun, although commonly involved, is not required.

Sweating is often absent because constriction of vessels in the skin and extremities have shunted blood internally, thus preventing dissipation of heat from the body core. Rectal temperatures higher than 106 F and body core temperatures of 112 F are often observed.

Onset of heat stroke may be preceded with nausea, headache or faintness, but the individual may suddenly become stuporous or comatose. Shock usually intervenes. Severe laboratory abnormalities are noted. Death may occur within hours, associated with cardiac and multi-organ failure.

Heat stroke is an extreme emergency. Mechanisms that regulate body heat have failed, and the body has no means to dissipate core heat. You should immediately remove the patient's clothing and immerse the body in an ice-water bath or pack it in ice. Massage the body to increase skin circulation and heat dissipation. Vigorous re-hydration and other life-support measures may be required.

Acclimatization. This process allows our bodies to adapt to adverse climatic

Too much exposure to a hot sun
and high humidity,
combined with
excessive physical exertion,
can give modelers big trouble.

conditions. Integral to our body's capability of tolerating high temperatures is our ability to transfer body heat to the environment through heat evaporation. But to maintain the process we must regularly replace the water and salt lost in sweat. Otherwise, body temperature may rise precipitously.

Kidneys and the pituitary gland are stimulated to produce hormones that help to retain body water and salt, but potassium may be lost in the process. After full acclimatization, the cardiac output plus pulse and respiratory rates may be somewhat increased. This process takes four to seven days. Does this remind you of how you seemed to feel stronger toward the final days of AMA Nats week?

Caution Flags. These should be obvious. Be alert to these warning signals:

• Environmental temperatures greater that 90 F (inhibit normal transfer of excess body heat).

• Humidity greater than 60% (impedes evaporation of sweat and its related cooling effect).

• Poor conditioning and acclimatization.

• Occlusive clothing that insulates the body and impedes sweat evaporation.

• Pre-existing dehydration due to low fluid intake or medication.

• Diuretics leading to depleted body water (this doesn't imply discontinuing diuretics.)

• Overly strenuous physical activity (most are aware of this but tend to push on).

Summary. Common sense and good judgment are key words to prevention of heat illness. Observe the following rules, on and off the flying field:

• Heat-related illnesses usually occur on the first day or two of a heat wave or extended outing — before acclimatization has occurred.

• Know your physical limits — function with them.

• Drink more than adequate fluids, regularly and throughout the day.

• Model retrieval chases should be motorized — not on foot or alone, if at all possible.

• Ingest fluids freely while on chases.

• Use cell phones or 2-way radios to maintain communications with someone at the launch site; make certain others are aware of your location.

• Stay out of the sun when possible.

Warning Signal: When you are in the summer heat, keep a check on how often you are feeling the call of nature. If you go more than a couple of hours, you are likely behind on your water intake. — Ed.

Despite the free flight orientation of this article, the information it contains is definitely pertinent to our own RC soaring endeavors.

Our sincere thanks to Walter Rozelle, Editor of *Free Flight*, The National Free Flight Society Digest, for allowing *RC Soaring Digest* to reprint this important article.

Free Flight, The National Free Flight Society Digest, is published ten times per year. NFFS dues are $25/yr or $48 for two years.

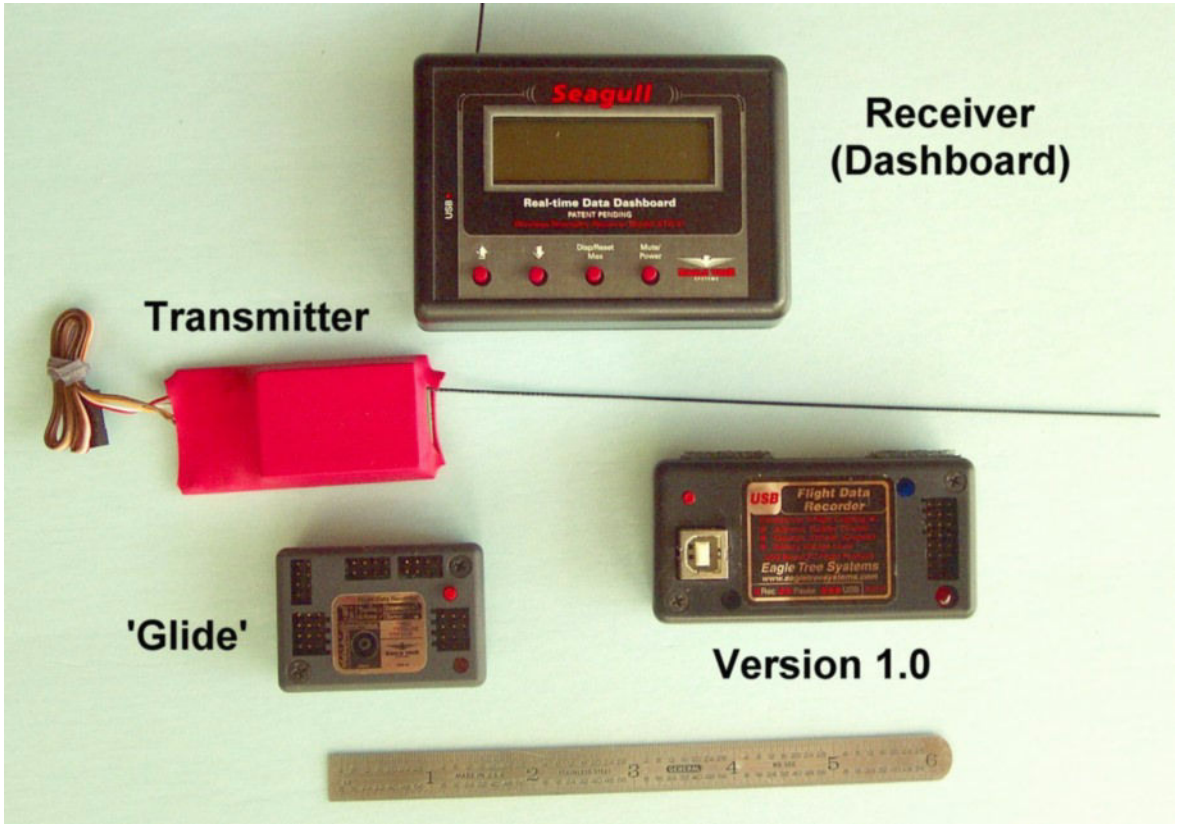
For membership information, contact J.P. Kish <catroper@tampabay.rr.com>.

Eagle Tree Systems Flight Recorder

Dave Register, <regdave@aol.com>

For several years now, Eagle Tree Systems has been producing a flight data recorder (FDR) for general purpose aircraft use. Last month we reported on a student project that used the original FDR (Version 1.0) for a sailplane performance evaluation. That led to an opportunity to evaluate a new unit from Eagle Tree which has been optimized for slow speed flight but retains impressive versatility for general applications. Although this unit is still in Beta testing, it has excellent capabilities for soaring flight and will soon be released for general purchase.

The new "Glide" system from Eagle Tree is a derivative of the current Version 2.0 data recorder but with optimized airspeed and altitude measurements. Airspeed can be read to "0" MPH with a resolution of 1 MPH (~ 1.5 fps) while altitude can be measured up to many thousands feet



Components of the various Eagle Tree telemetry systems. Besides real time air to ground communication with the airborne transmitter, the systems can be used alone to simply store data from several inputs for later downloading to a computer.

(>5000 ft) with a resolution of 1 ft and no preflight calibration.

In addition to the enhanced altitude and airspeed capabilities, the FDR can also record up to four servo channels, internal and external temperatures, engine RPM, motor current, G-forces and several other capabilities. It can be powered directly from a flight pack or from an auxiliary power pack installed by the user. There are capabilities here for both soaring and powered flight applications (electric and combustion).

In addition to this impressive list of capabilities, it also records more data than the original, has a footprint less than 50% of the V 1.0 unit, weighs 0.8oz in the case (0.3oz without the case) and, with the auxiliary Seagull/Dashboard capability, can broadcast real time data to a small display which can be hooked to a laptop for continuous data recording.

Of particular interest to me is the ability to record both altitude and airspeed at relatively high rates and with very good resolution. The FDR's size and weight are compatible with the space limitations of a discus launch glider. That enables a number of evaluations which heretofore have been difficult to obtain. In somewhat larger planes (2M and up) which can readily accommodate the telemetry capability, the "Dashboard" receiver has also been configured to respond to rate of climb with an audible tone for use as a variometer.

That's an awful lot of capability in a very small package. (And a GPS version of this system is under development!).

This month's summary looks at the installation of a "Glide" system in a DLG (XP3) and preliminary evaluation of launch conditions. Next month, we'll delve a little deeper into the telemetry and real time data functions.

The basic data recorder and telemetry system is shown in the "Components..." picture. For comparison, the original FDR (V 1.0) is included. A standard six inch machinists rule is also shown to better

visualize the physical dimensions of the flight pack.

The actual FDR dimensions are (approximately):
2 in x $1^3/_8$ in x $^2/_3$ in.
Weight (recorder only) ~ 0.8 oz.
Weight (without case) ~ 0.3 oz.

Without the case, reduce all dimensions by ~ 0.25". The pin connections at this time are perpendicular to the board so sufficient clearance must be allowed for the servo and other connectors (if used). Current draw is reported as <35mA.

Record time is up to several hours depending on flight conditions, sampling rate and number of functions recorded. In most of these evaluations, I have recorded two servo channels, internal temperature, battery voltage, altitude and airspeed. Sampling rate has been 10/sec. With these settings, approximately one hour of continuous DLG launching and flying has been routinely recorded without filling the data buffer.

Various data sampling rates are available with the fastest being 10 samples/sec. The analog to digital converter for the pressure sensors (altitude and airspeed) allows ~ 2.5 samples/sec for each of these functions, staggered 200 milliseconds from each other. Based on measured battery capacity at the end of the flight session, the 35mA current estimate seems very reasonable.

INSTALLATION IN AN XP3 DLG

As a first test of the new FDR, installation and flight data from a discus launch glider was evaluated. Although altimeters have been installed in DLGs, the capability to record altitude, airspeed and channel functions has not been routinely available. This capability was of interest for studying both launch and flight conditions, including the altitude to airspeed response in the discus launch and the effect of the initial yaw oscillation.

The lead picture shows the circuit board (without case) installed in the canopy area of an XP3 discus launch glider (Polecat Aeroplane Works). For this application, the receiver (FMA M5) and a piezogyro were installed under the wing. The FDR unit will fit snugly under the wing of both an XP3 and an XP4. The canopy area in the XP3 allowed easier installation for this evaluation.

The airspeed port was connected to a short piece of flexible tubing which was routed through a small cutout in the canopy. This tubing then connected to a short piece of hard plastic tubing which was secured as the pitot opening with tape and modeling clay. The circuit board was then covered with foam to minimize any air leakage to the altitude port (immediately adjacent to the airspeed port).

A Y-connector (supplied) monitored the servo output to the rudder. The servo output from the receiver ran to the piezogyro before going to the rudder servo. Normally, the gyro output was the channel being monitored. In a separate set of tests the rudder was driven directly from the receiver and both the rudder and gyro outputs were separately monitored. In this way, the launch efficiency with the gyro and with a manual preset (but while recording the gyro function) could be evaluated.

A good DLG thermal flight is noted in Figure 1. In this case, a normal launch to approximately 120 ft was followed by a rather nice thermal which reached an altitude of ~ 700 ft before bailing out and ending the flight. This session indicated that all systems were working as expected, the data resolution was consistent with the product literature and good airspeed and altitude information could be obtained.

Perhaps more illustrative of a low altitude thermal flight is shown in Figure 2 recorded recently at the same field. In this case, small, poorly organized "bubbles" were breaking loose throughout the morning. These thermals were very "tight" and appeared to be surrounded by generous intervals of sink. Upon exiting the first "bubble" in this flight, normal trim conditions were used to look for another area of lift. A second smaller

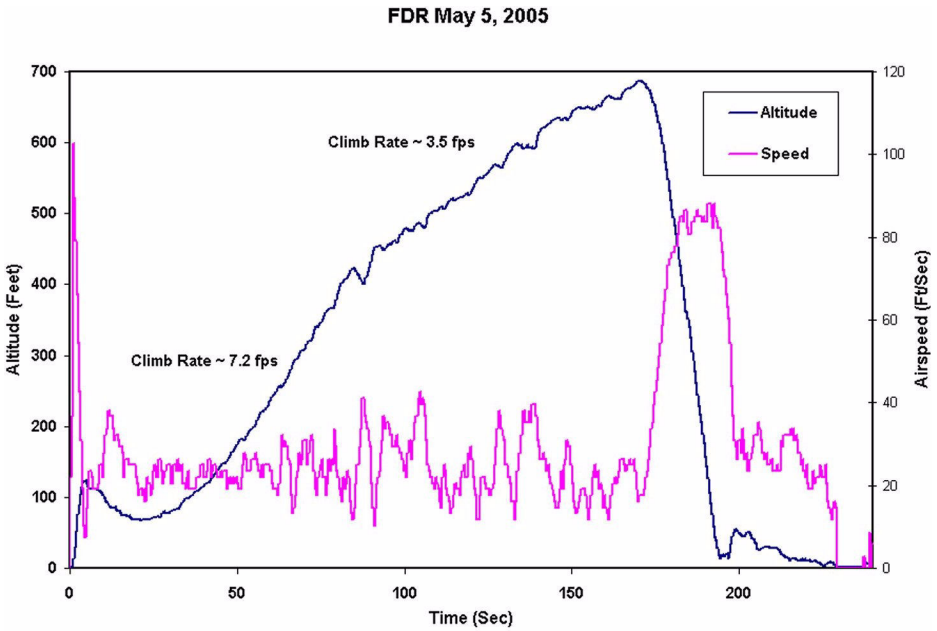


Figure 1

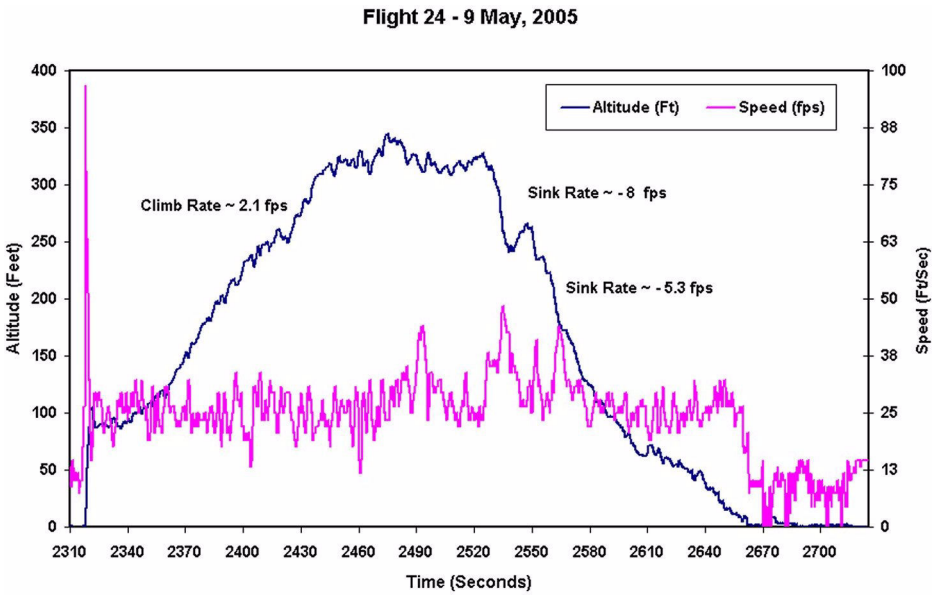


Figure 2

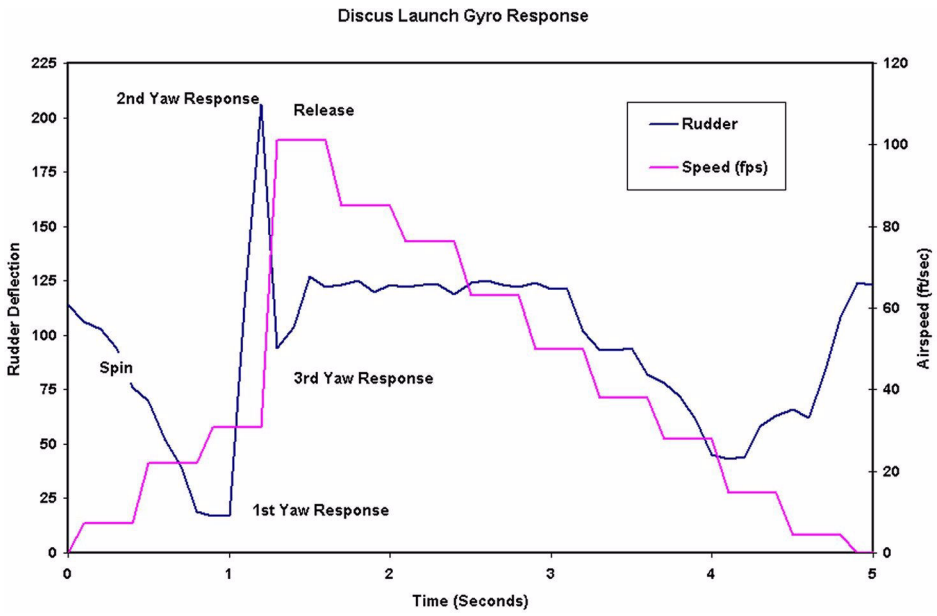


Figure 3

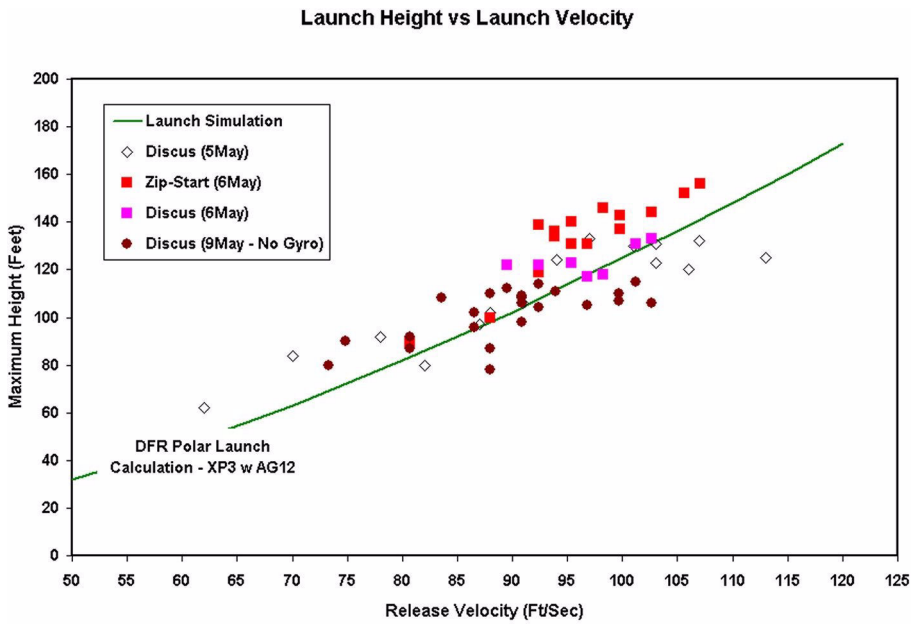


Figure 4

"bubble" was found nearby and worked for a few turns before coming in.

The notable feature, however, is the sink in between the two areas of lift. These two thermals were separated by ~ 200ft. Consequently, the feed for both bubbles was enhanced in the "between thermal" region. The sink rate here is appreciably higher than the initial climb rate and is almost twice the sink rate encountered when leaving the second thermal. That exit was chosen to be away from the "between thermal" region so as to avoid the high sink encountered there.

The lesson, perhaps, should be that when you leave a thermal, get out of town quick!

More detailed analysis of various launch conditions was carried out on three sets of data accumulated on each of three successive days. In these experiments, a preliminary assessment of launch height vs. launch speed was made with the data recorder for:

- normal configuration of the aircraft using a discus launch using the gyro,

- normal configuration of the aircraft using a "zip-start" launch (also with the gyro), and

- pilot control of rudder function with the gyro disconnected (but recorded) using a discus launch and manual preset.

It is frequently observed that the discus launch motion induces a series of yaw oscillations in the aircraft after launch. These flights were intended to evaluate typical launch height vs. launch velocity response (at least for a 60 year old geezer) under normal conditions, then with no yaw oscillation (zip launch), and then with the yaw oscillation as controlled by a manual preset (no gyro function).

My conclusion at this point is that the Eagle Tree "Glide" can be a significant asset for evaluating very demanding in-flight measurements.

A typical launch sequence (using the gyro) is shown in Figure 3. In this case, the velocity and rudder control are displayed. During the spin (CCW since I launch with my right hand) there is a strong yawing motion to the left (CCW) which the gyro detects causing the generation of a strong right rudder signal (CW yaw correction).

Immediately at, or slightly before release, this signal reverses and generates a left rudder command (in the direction of the spin!). This may be due to the acceleration in the final quarter turn of the spin which may momentarily push the left wing tip harder than the fuselage center line, causing the piezo to sense a brief CW yaw (CCW rudder command).

This yaw command persists for less than 0.2 seconds and is followed by another right rudder command (CW yaw correction) which finally aligns the trajectory for the remaining part of the launch. All of this occurs within ~ 0.4 seconds during the final quarter turn and release. The sailplane has traveled about 20 to 30 ft by the time the yaw oscillation is finished.

What is notable (to me) was the control reversal immediately prior to the release of the aircraft. This command helps to momentarily enhance the CCW yaw motion of the launch. Launch videos by other pilots will frequently show a serpentine trajectory during this part of the launch – left – right – left and then straight. This motion is consistent with the observed commands with the added insight that the initial left (CCW) yaw may be enhanced by the gyro response – at least in my particular launch motion. Presumably, any design or programming that can minimize the yaw excursions will enhance launch height.

To address that question, a series of launches were recorded under the conditions noted above. From the data files, the maximum recorded velocity and maximum achieved launch height were

tabulated. For each of the conditions noted, a minimum of 15 launches were evaluated. The launch data is displayed in Figure 4.

Taking a closer look at this information suggests that all launch styles are essentially equivalent at launch speeds up to 80 ft/sec. Beyond that point, the "zip" launches typically attain greater altitude (for the same initial velocity) than a gyro assisted discus launch. In this example, that difference may be as much as 15 to 20 feet. Similarly, the gyro assisted launches exceed the manual preset launches by about the same amount at the highest launch velocities.

Although these measurements are subject to a lot of operator variability (me, the launcher), the trend is consistent with what is generally believed to be the drag penalty from the yaw oscillation during a discus launch. I am sure others can do a better manual preset than I can. I'm also sure others can launch harder and higher than I can – in which case the divergence due to the yaw oscillation may become even greater.

So the lesson here is that the yaw oscillation is detrimental to launch height. Any developments that minimize this effect are likely to be advantageous. Various vertical stabilizer designs and airfoils are being used to address this condition and perhaps later tests will generate numerical data to support the good work being done in this arena by others.

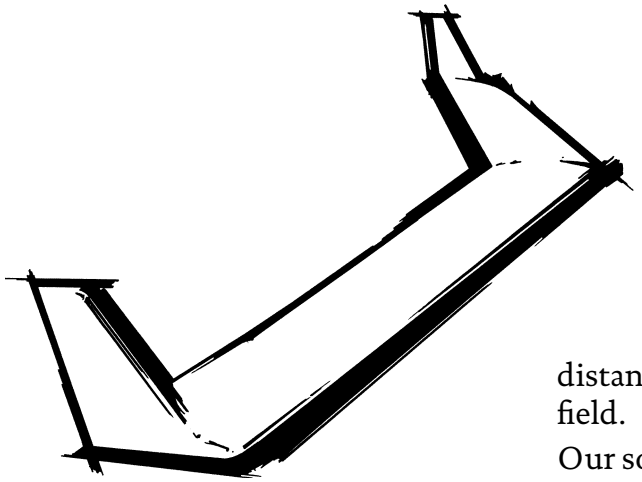
With regard to the new Eagle Tree unit, my conclusion at this point is that it can be a significant asset for evaluating very demanding in-flight measurements. I am not aware of any other commercial unit that packs as much functionality into such a small package as this.

The setup and software have been extremely easy to use. The calibration and resolution appear to be conservatively specified in the manuals and product literature, and the system has performed flawlessly to date. Bill Parry (Eagle Tree) has been exemplary in all aspects of support and communication as I've worked through these evaluations.

Given the very preliminary nature of this data, I am sure much more information can (and will) be extracted from flight testing such as this. My hat is off to Eagle Tree for developing and marketing equipment of this caliber. If you are interested in putting some hard numbers to your flight conditions, I haven't seen a better way to do it than with the new "Glide" unit.

And I also found that this old geezer can occasionally launch to 130ft. Thank you, Eagle Tree. That really made my day!

FAI has received the following Class F (Model Aircraft) record claim:
Claim number: 11487
Sub-class F5-COMB (Aeroplane, electric motor (all sources of current))
F5: Radio Controlled Flight Category
Type of record: N°193: Distance in a straight line
Course/location: Jacksonville, FL (USA)
Performance: 226.61 km
Pilot: Giorgio AZZALIN (USA)
Date: 24.04.2005
Current record: 109.00 km (19.06.1991 - Gian Maria AGHEM, Italy)
The details shown above are provisional. When all the evidence required has been received and checked, the exact figures will be established and the record ratified (if appropriate).



On the 'Wing...

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

Quite a bit of work has been accomplished on our second Richter RC *Alula* since our last column. We've even done some initial test flying, but that particular aspect of this project will be covered in detail in a future column.

This month we're going to concentrate on some of the solutions we worked out for the unique aspects of the basic construction and the control system linkages.

Fuselage One of the problems we had with our first *Alula* appeared during the first really hard launch - the fuselage fractured at the leading edge of the wing, carrying the battery pack and receiver in a long distance arc across the flying field.

Our solution to this problem started as temporary, but has been working well. We simply placed a piece of electrical tape along the left side of the fuselage. This is the inside of the throw during launch, and the small amount of additional strength has now held for a few hundred launches.

This *Alula* has two carbon fiber tows glued to the fuselage sides. We stretched the tow along the foam, held the ends down with masking tape, and used thin CA to bond the fiber to the EPP. (Photo 1)

Additionally, rather than attach the fuselage to the wing with hot melt glue around the fuselage perimeter, we stripped away some of the tape covering and then applied a very light coating of Goop to both the bare foam of the wing and the fuselage wing saddle areas. The fuselage was then slid onto the wing and the assembly was placed on a narrow elevated platform with a heavy metal weight placed over the glue joints. Left overnight, this created an exceptionally strong bond without adding excessive weight.

Control system hardware As mentioned in previous columns, this *Alula* incorporates separate ailerons, each driven by its own Hitec HS-50 servo, and coupled elevator halves connected to a single Hitec HS-55 servo.

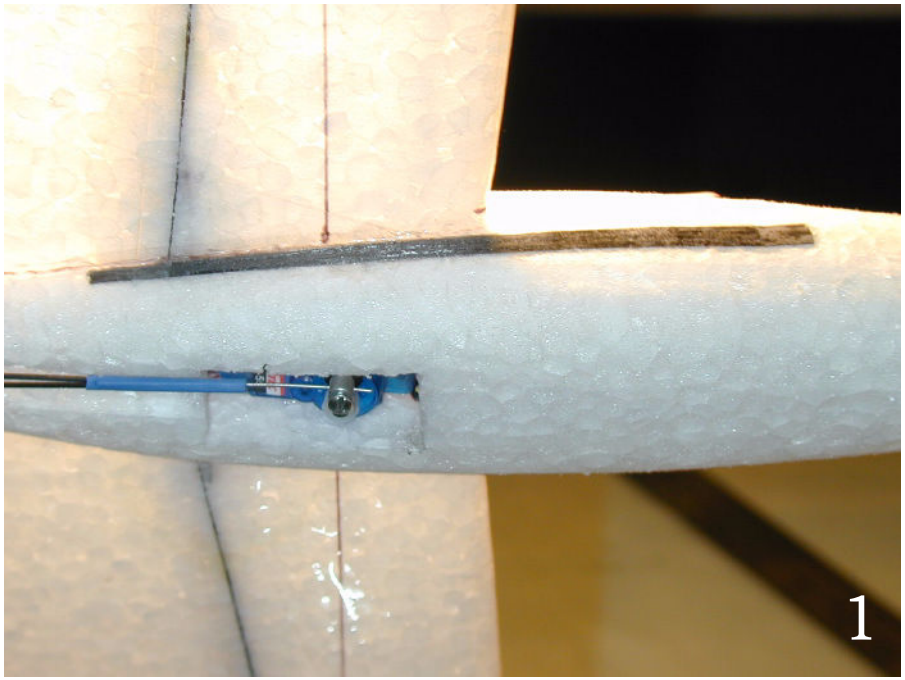
The aileron servos (Photo 2) were mounted in wells cut into the wings as close to the carbon rod spars as possible. To eliminate any binding or resistance, the pushrods are aligned parallel to the control surface hinge line. This has additional advantages - it moves the servo inboard somewhat, slightly reducing roll inertia, it provides just enough servo wire to allow connection with the receiver without having to splice in additional wiring, and it moves the servo to a slightly thicker part of the wing.

It should be noted that the *Alula* wing is very thin, but we checked the thickness in the area of the aileron servo and found the wing was just thick enough to house the servo without having any bulges.

An X-Acto blade was used to cut a vertical slot in the wing leading from the servo location to the root of the wing. The wiring for the aileron servo was then pushed into the slot to a point below the surface so the foam closed over at the surface.

A the wing root, the wiring was inserted into the foam sufficient for the elevator servo to clear.

The carbon fiber push rods which Michael supplies with the kits is strong enough for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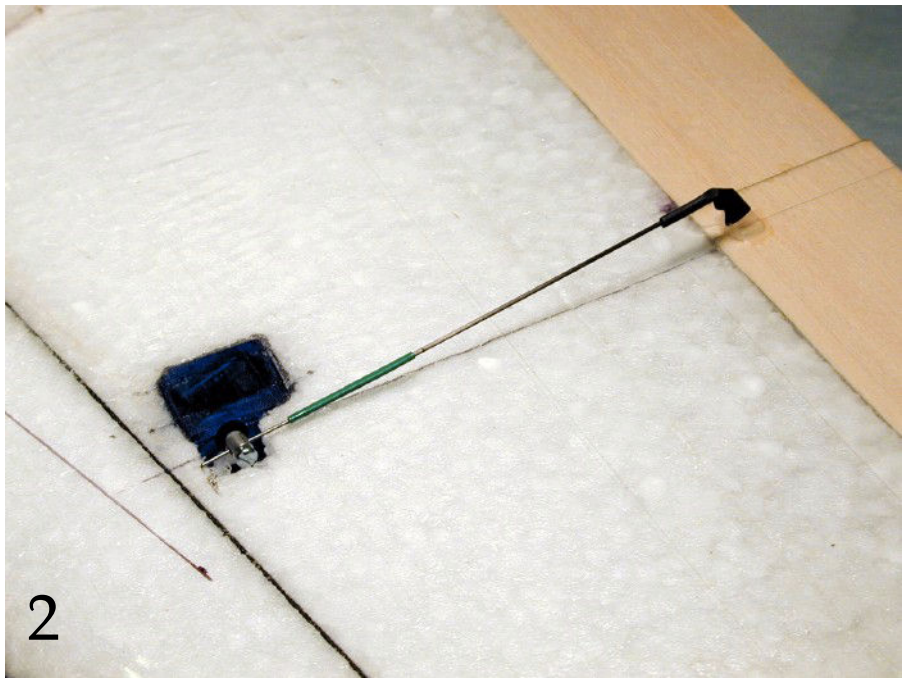
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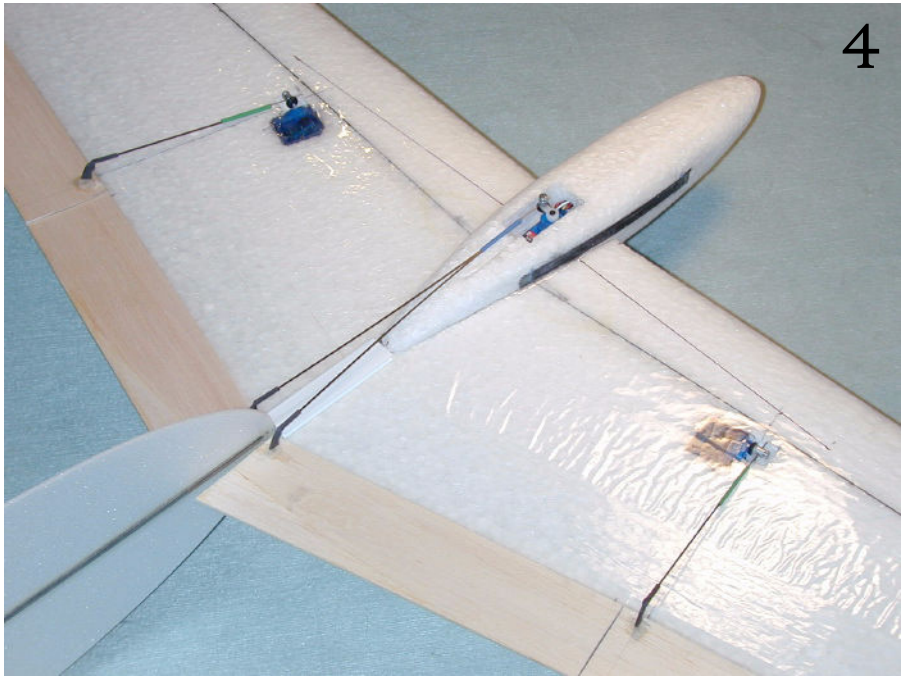
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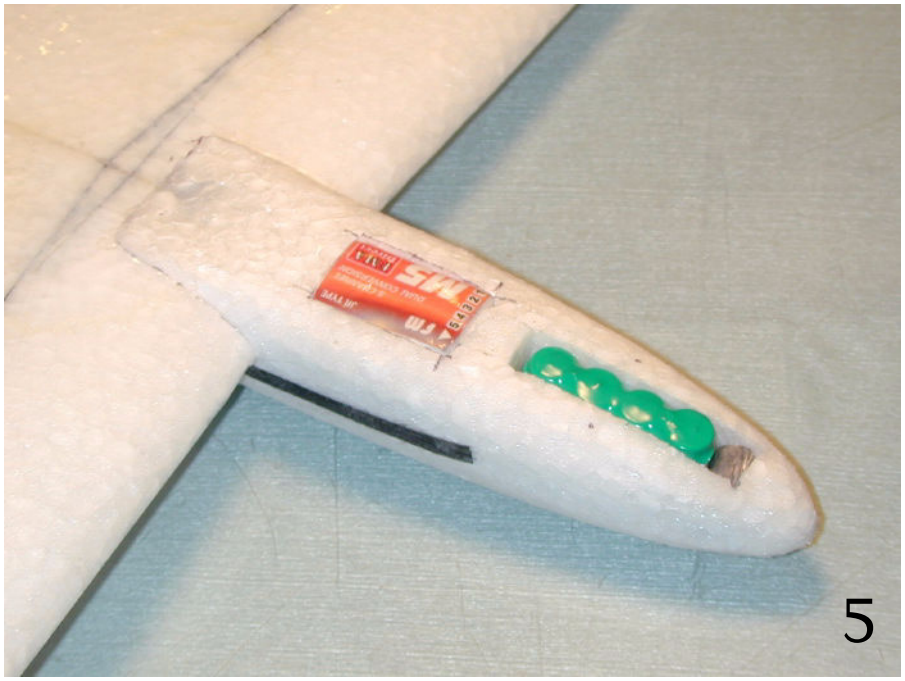

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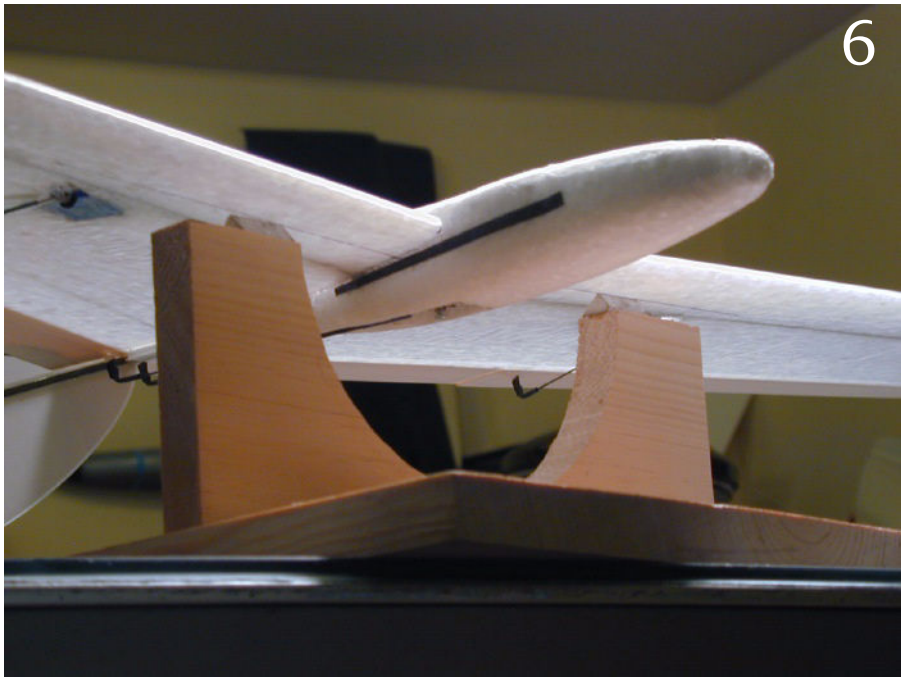


6

the servo and aerodynamic loads, but it does not withstand the crushing force of the connector set screw very well. The rods tend to fracture as the fixture is tightened.

We cut the carbon rods an inch short of their full length and attach small diameter music wire to the carbon rod using a piece of small diameter shrink tubing and thin CA.

The elevator servo (Photo 3) is located in the central cavity which is precut into the fuselage. The servo is mounted front to back and is set off to side of the cavity so the servo arm hole is close to the fuselage centerline. There is some elevator differential with this type of set-up, but as the elevator servo will be adjusted for a very small throw, the resulting differential is not at all noticeable in practice.

As with the aileron system, the carbon fiber pushrod is modified to have a music wire end. Because there are two carbon rods coming together, the shrink tubing must be of a slightly larger diameter than that used for the aileron linkage. (Photo 4)

Completed airframe Our faithful FMA Direct receiver was placed in the reconfigured slot, and one of Michael's 210 mAh NiMH battery packs was installed up front. (Photo 5)

On the balance stand (Photo 6) the completed airframe with all components installed required only 14 grams of lead to have the CG placed at the point recommended in the instructions. As our previous *Alula* required 8 grams of weight for the same balance point, this came as a pleasant surprise.

The overall weight, ready to fly, is 4.8 ounces (136 grams). This compares quite favorably with the original *Alula* which flies extremely well at 4.4 ounces.(124 grams).

Because we decided to not color the wing bottom surface after all, the included photographs have more recognizable detail than would otherwise have been in evidence. We're still working on getting some sort of fuselage covering put on.

Next month: Test flying and some flight comparisons with the standard *Alula*.

Compression Load at Spar or Joiner Bend

Fortunately, this compressive load can be accurately predicted...

Mark Drela, <drela@MIT.EDU>

Many wings have permanent dihedral bends with sparcaps carrying the load across each bend. Common examples are the center dihedral bend in a 1-piece DLG wing, and the outer dihedral bend in a 2-piece or 3-piece poly wing.

As shown in the figure, when such a spar bend is subjected to a bending load, the sparcaps try to mash together with compressive force C.

If the material between the sparcaps fails in compression, the wing will almost surely fold up.

Fortunately, this compressive load can be accurately predicted by the formulas on the figure.

Here's a sample calculation for the wing of a 10 oz DLG:

h = 0.45 in (6% airfoil on 7.5 in chord)
F = 6 lb (20g pull-up right after launch)
l = 12 in
theta = 6 deg
P = Fl/h = 160 lb
C = 2 P sin(theta) = 33 lb

The sparcaps require a vertical strut between them which is capable of withstanding this 33 lb vertical load.

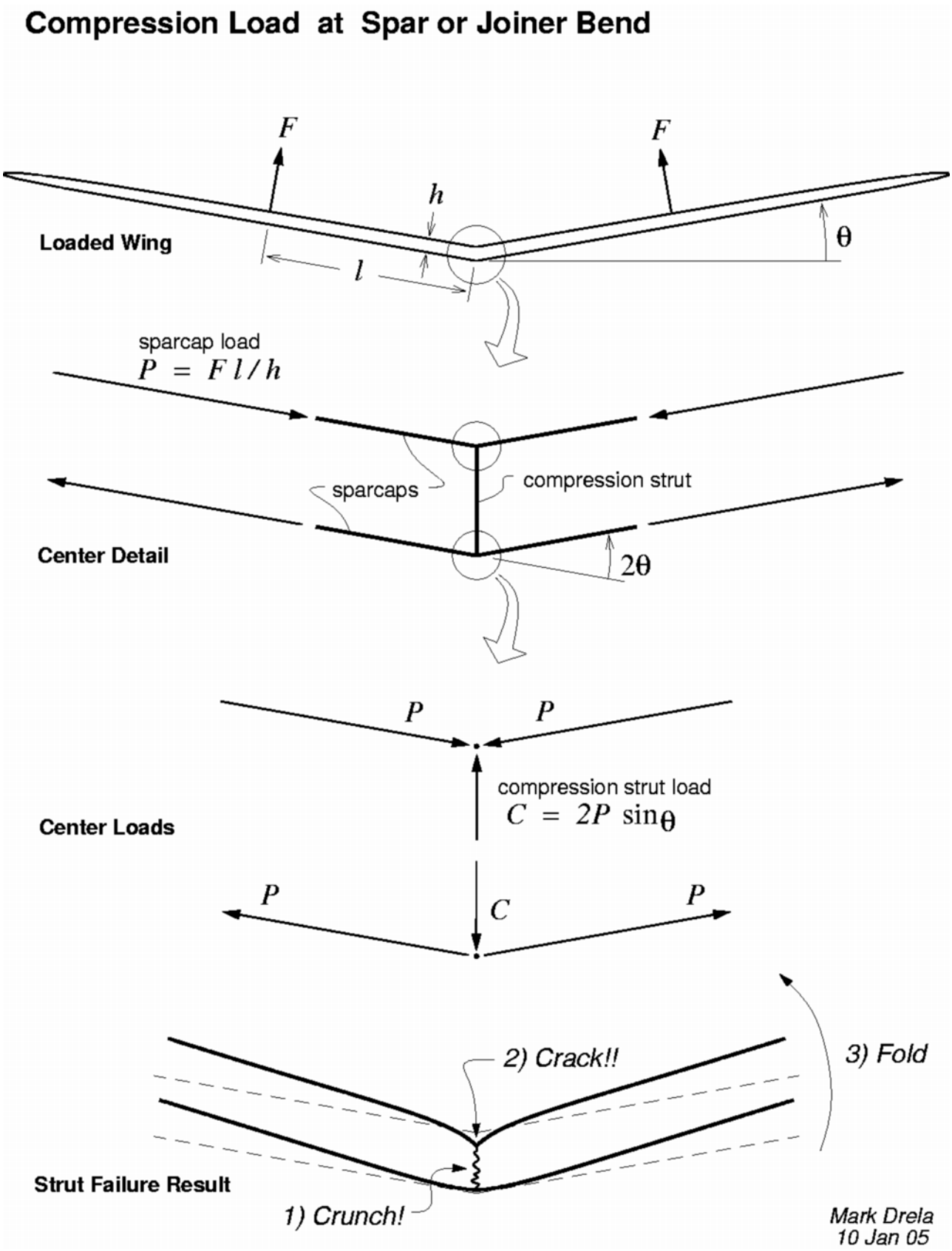
A vertical-grain 3/32" x 1/2" balsa piece will suffice, as will a blob of microballoons with epoxy, but plain foam will not. So resisting this compression load is easy, but ignoring it can be potentially expensive.

A similar load will occur in a bent rectangular joiner consisting of top and bottom sparcaps with a filler in between. Such joiners are popular on high-end molded gliders.

Here's a sample calculation for a 3-piece wing joiner on a 5 lbs. F3B glider in a 40g zoom pull-up:

h = 0.55 in
F = 45 lb (outer panel load)
l = 15 in
theta = 1.5 deg (half of 3 deg outer panel dihedral)
P = Fl/h = 1230 lb
C = 2 P sin(theta) = 65 lb

This load is concentrated at the bend, and hence requires a sufficiently strong filler between the joiner caps. Hard endgrain balsa, endgrain basswood, or just solid epoxy are appropriate here.


Compression Load at Spar or Joiner Bend
F
F
h
l
θ
Loaded Wing
sparcap load
P = F l / h
sparcaps
compression strut
Center Detail
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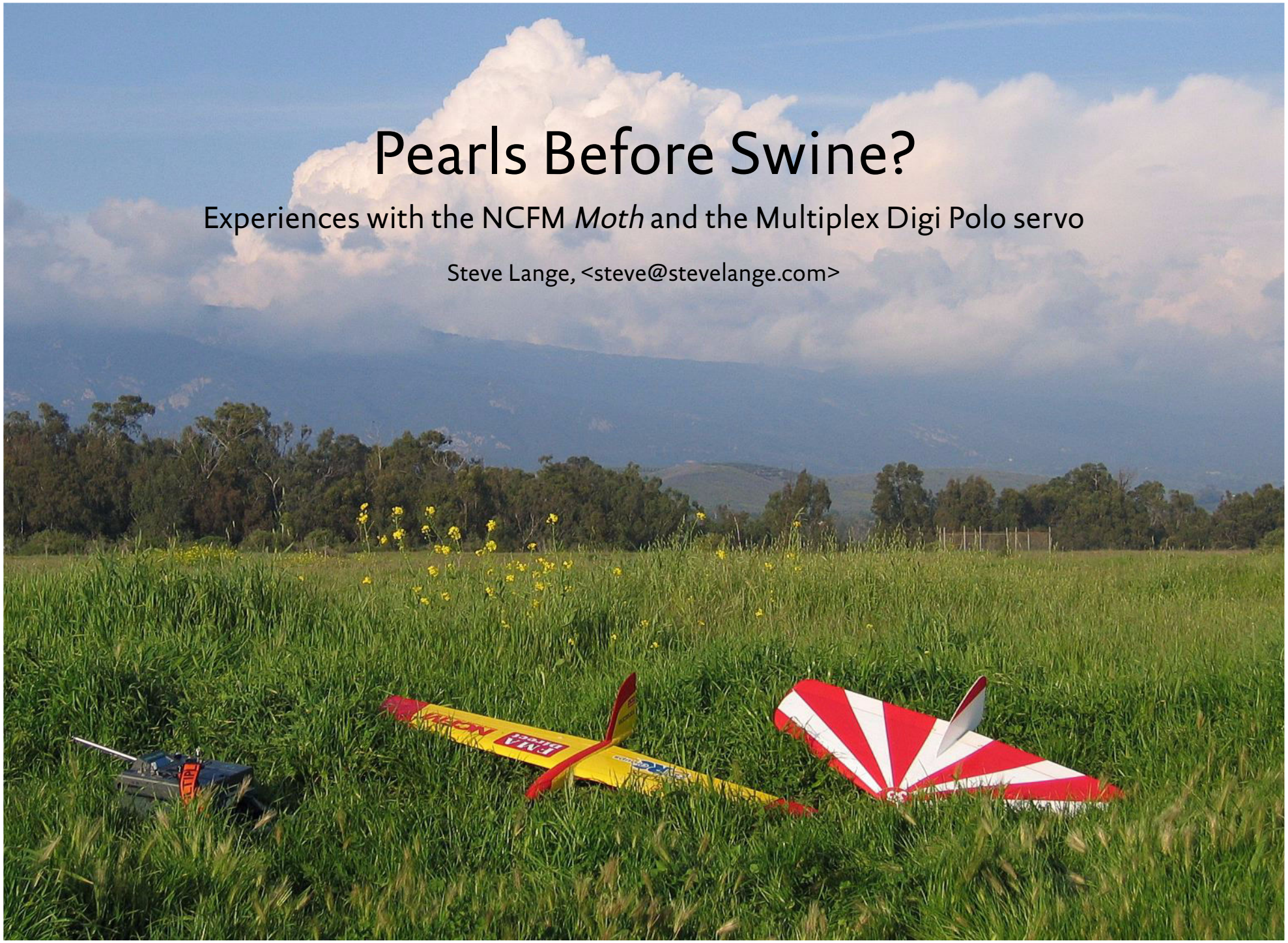
P
P
compression strut load
C = 2P sinθ
Center Loads
P
C
P
2) Crack!!
3) Fold
Strut Failure Result
1) Crunch!
Mark Drela
10 Jan 05

Pearls Before Swine?

Experiences with the NCFM *Moth* and the Multiplex Digi Polo servo

Steve Lange, <steve@stevelange.com>



A November 2004 thread in the Slope Forum on RCGroups asked for recommendations on servos for the North County Flying Machines 48" *Moth* EPP flying wing. Nathan Woods, a regular forum participant, mentioned that the then-new Multiplex Digi Polo servo (one of the first joint Hitec/Multiplex product releases) might make an interesting and suitable choice for the plane.

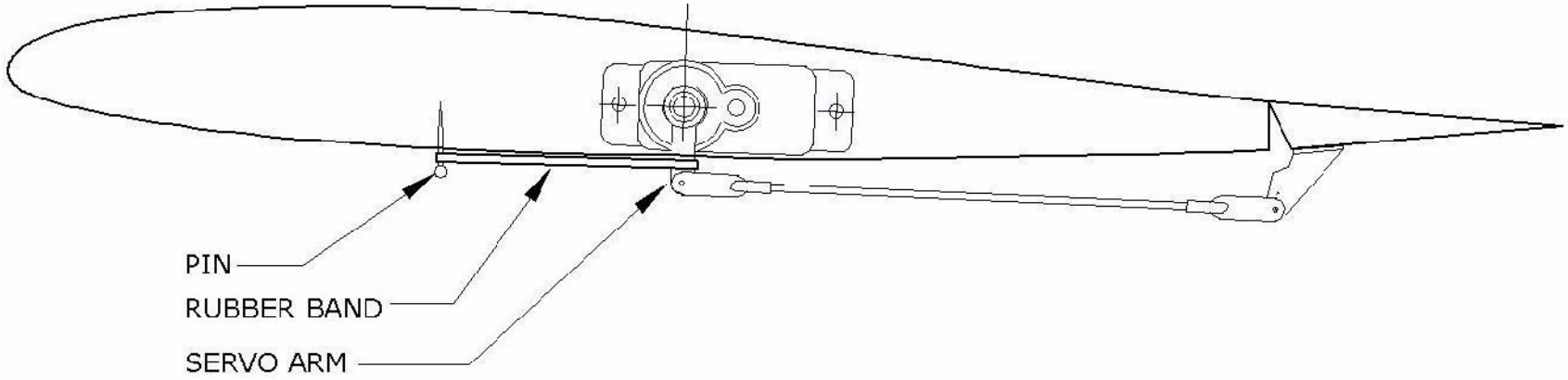
He theorized that the higher resolution and precision of the Digi Polo would allow the plane to fly with a more rearward CG than was possible with the Hitec HS-85MG, the servo NCFM recommended for use in the *Moth*.

The notion of putting digital servos into an EPP flying wing struck a number of thread respondents as a bit odd.

One poster in particular, BeeDee, mentioned that it seemed as though the old saw about "pearls before swine" was particularly applicable.

Though also skeptical, as I was preparing to build a *Moth* and deciding on servos for it, I ended up looking into the matter further.

Man and machine - Steve and his *Moth*



Drawing by Matin

The *Moth* by North County Flying Machines

Extensive testing by NCFM and *Moth* enthusiasts worldwide had shown that the *Moth* was capable of flying with a center of gravity (CG) quite a ways behind the factory recommended location. By moving the CG rearward, they found that the plane flew faster and more responsively, made better pylon turns, and flew inverted nearly hands off - all significant improvements to an already very high performance EPP flying wing.

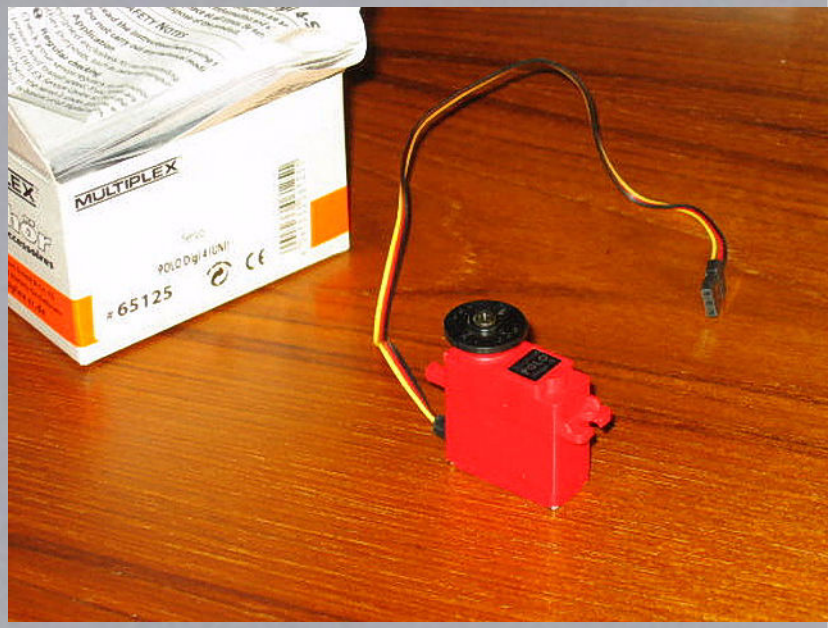
However, they also found that as the CG moved rearward, the amount of elevator throw used on the elevons needed to be drastically reduced in order to prevent excessive pitch sensitivity and hyperstalling (a rapid series of stalls and recoveries which destroy a flying wing's performance).

Eventually, testers determined that the main limitations on the *Moth's* rearward CG movement lay with the gear slop and relative lack of precision in the HS-85MG. Even though they reduced elevator throws to an absolute minimum, sometimes as little as 1/32" in each direction, they found it very difficult to surmount the pitch sensitivity of the rear CG location.

The HS-85MG's combination of analog circuitry and fairly significant gear slop simply could not maintain the elevons' position accurately enough to make for reliable pitch response and trim at the rearward CG location.

This analysis was confirmed empirically when one pilot, Matin on RCGroups, resorted to a rubber band installation (see drawing) which put a small pressure on the servo arm. This installation allowed him to achieve the most rearward CG to date with the HS-85MG, but the plane was still fairly pitch sensitive due to the limits of precision inherent to the analog servo.

Multiplex Digi Polo servo



The furthest rearward CG reported by Derek Choice of NCFM as of August 2004 was 1 9/16", with 3/64" of total up elevator travel. NCFM no longer recommended the 1 3/8" CG as of Fall 2004, preferring something between that and 1 1/2".

Based upon this research, and wanting to get the best possible performance out of my *Moth*, I decided to take a leap of faith and invest in the Digi Polos for my plane. On RCGroups, I volunteered to serve as the guinea pig and promised to report my findings. I've now flown my "digitized" *Moth* for approximately four and a half months, and am convinced that the digital servos have proven themselves worthwhile.

I have flown the plane in a wide variety of conditions around Southern California, from soft 8-10 mph at a small ocean bluff, to moderate 15-20 mph inland mountain flying, and even cranking 20+ mph high compression lift at a monster coastal site.

In decent lift, the plane flies nearly hands-off inverted, has an excellent roll rate, and is extremely controllable in pitch, maintaining whatever line it is set to with no "hunting" exhibited. It performs extremely well when compared side-by-side in the air with other *Moth*s built to a similar standard and weight.

My CG is located at 1 11/16", nearly a full 1/4" behind the most rearward CG achieved with the HS-85MG.

While that may not sound particularly significant to someone accustomed to conventional aircraft, on a relatively small plank flying wing such as the *Moth* - where CG changes as small as 1/16" forward or back can immediately be "felt" at the sticks - it is a huge change.

During construction, I took a great deal of care in attempting to get the servo linkages and elevon hinges as smooth, slop-free and unbinding as possible. I built the plane slightly heavier than average, coming in at a hair over 21 oz. As I intended the plane for moderate and better conditions, this did not bother me in the least.

One secondary concern was CG change with the addition of ballast. Older *Moth* kits like mine can exhibit some forward CG shift with the addition of ballast, due to the location of the ballast tube relative to more rearward CG positions.

I've measured my CG with full ballast (AUW 32oz. even), and it is at 1 9/16" - ironically, exactly the most rearward CG that had been attained previously with the HS-85MG. The 1/8" forward shift in CG is noticeable but not particularly bothersome. It can be alleviated altogether by inserting a tiny trim weight into the fiberglass longeron in the tailboom.

In conclusion I feel that the Multiplex Digi Polo servos have enabled me to wring a fairly significant and definitely noticeable performance improvement out of the *Moth*.

They are by no means critically essential, as the *Moth* can perform admirably with the HS-85MG. However, for getting the maximum performance out of the plane, I think that digital servos are definitely the way to go.

Pearls before swine? Hardly!

ARTICLES AND PHOTOS WANTED!

RC Soaring Digest is always on the lookout for articles and photographs which are related to RC soaring.

Submissions may be made at any time and should be sent via e-mail attachment to <rcsdigest@themacisp.net>.

N5710S
Schweizer 1-26C

St. Louis Soaring Association, Highland, Illinois <http://www.stlsoar.org>

The Schweizer 1-26C photographs on the following pages were taken by Mark Nankivil, St. Louis Missouri. The photographed aircraft was built from a kit and is currently the property of the St. Louis Soaring Association.

The glider can be equipped with either the open cockpit sport canopy, as shown here, or a fully enclosed canopy. Club members say the open cockpit, although not conducive to top performance, makes flying much more fun

From the SLSA web site:

"The St. Louis Soaring Association (SLSA) was formed over sixty years ago to foster and encourage motorless flight in the St. Louis area.

"SLSA currently has over ninety members, two tow planes, and eight club sailplanes.

"SLSA also owns, maintains, and operates the Highland-Winet Airport, located about thirty miles east of St. Louis on I-70 (immediately south [1/2 mile] of the Pierron exit).

"We also provide hangar space for member-owned gliders. Currently there are eight member-owned gliders based at the field, and one member-owned motorglider that makes frequent visits to the airport.

"The SLSA requires membership to use the equipment and facilities, but welcomes visitors and gives introductory rides to interested parties.

"The SLSA gliderport is a non-profit club operation. This means that our members are responsible for all phases of operation and administration of the runway, aircraft and facilities.

"Members bring with them unique and diverse talents, and are expected to employ their respective talents for the good of the club at large.

"SLSA generally operates on climate spring, summer, and fall weekends and holidays.

"The gliderport telephone number is (618) 654-3511.

"Further membership and general information about the SLSA can be obtained by contacting Don Kliethermes (Membership Director) at (314) 428-4907, or e-mail info@stlsoar.org."

While such presentations may not become a regular feature of *RC Soaring Digest*, we do hope to similarly cover other sailplanes in the future.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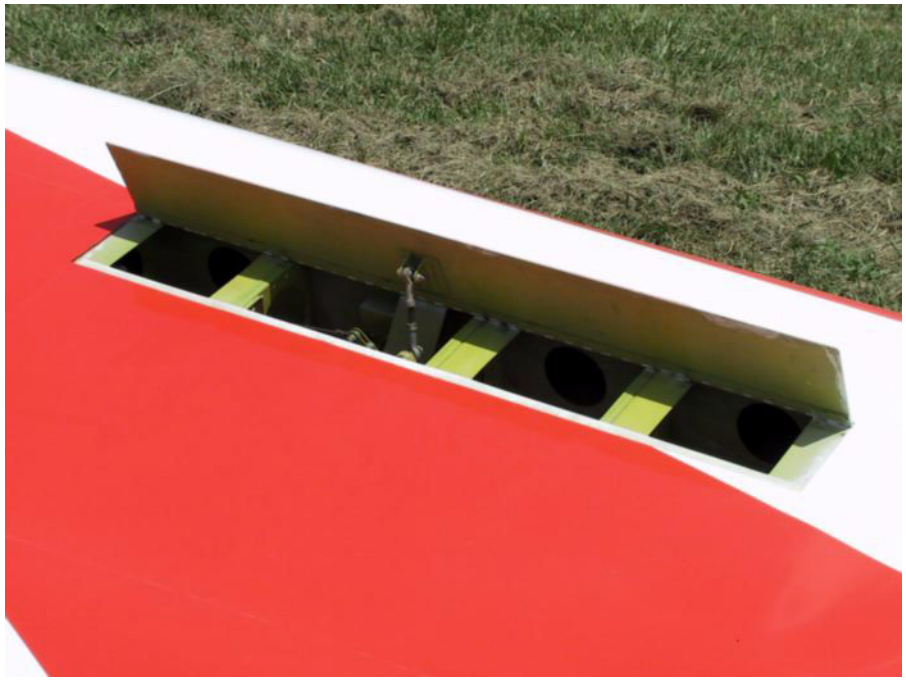
SECURE ALL LOOSE OBJECTS


SPOILERS
BRAKE
RELEASE


N5710S


N5710S




-N5710S-

An Enjoyable LSF Level V 8-hour Slope Flight?

by Jay Decker, <jdecker@monkeytumble.com>

Reprinted from *The Eagle,* newsletter of the Northwest Soaring Society, Amy Pool, Editor <www.northwestsoaringsociety.org>

It was Friday morning. After deleting the usual e-mail porn spam, Viagra ads and low mortgage offers, I decided to check the weekend weather forecast. There it was in Saturday's forecast, the perfect day to attempt an 8-hour slope flight, one of the most dreaded flight tasks required for LSF Level V. What is the perfect forecast? A wind direction straight into the slope, 15 to 20 m.p.h. wind at the slope, partly cloudy, and temperature in the low 70's. So, I called David Portwood, told him tomorrow would be perfect day and asked if he was up for it. Truthfully, neither of us were mentally psyched up to make an 8-hour flight, but neither of us had pressing plans and the forecast was ideal. After a call to Kirby Parker, who didn't have a good excuse on the tip of his tongue for not being there the next day, it was all settled – we where doing our 8-hour flight the next day at Eagle Butte.

Amy Pool with Jay Decker, left, and David Portwood, right, as they sit back and enjoy their LSF Level V 8-hour slope flights. Photo by Terry Coleman

Was that all there was to it? No, there was last fall when we got planes ready. David had a newly acquired SBXC and I borrowed David's Genie, which is a version of the Harley Michaelis designed equipped with a wing that was built with an RG-15 airfoil. I built a special flight pack battery for a one time use with four alkaline 'C' cells. David used large NiCad cells for his flight pack because he intended to get into cross country soaring and planned to use the large battery capacity regularly. I used two identical transmitters with that I swapped in flight as necessary for charging with a rapid charger. David used a transmitter battery built with seven alkaline 'D' cells.

Then there was our failed 8-hour attempt last fall. We launched into a very slight breeze one brisk morning late last fall. That breeze quickly disappeared and we were off to retrieve our planes from the foot of the slope within 20 minutes.

I had also made an 8-hour attempt about five years ago in southern California, which resulted in me crashing Greg Norsworthy's Aquila Grande due to an electrical failure five hours and twelve minutes into the flight. Greg, I still feel really bad about the Grande. . .

David traveled from Portland to Kennewick with Amy Pool

Jay's Harley Michaelis designed Genie arriving back on *terra firma* after being airborne for more than eight hours.
Photo by Amy Pool

Friday evening. We got up the next morning, the wind was blowing, we went to Denny's for breakfast, and then Safeway for water, food, and an important trip to bathroom to "drop the kids off at the lake" before heading up to Eagle Butte.

We arrived at Eagle Butte a little after 8 am, the wind was blowing 15 to 20 m.p.h. straight into the hill, and there was Kelly Johnson with a truck load of F3B and scale sailplanes. I had expected Kelly to attend the aerotow event in Yakima, so it was a pleasant surprise to see him there. Kirby Parker arrived soon afterward and we started assembling our planes.

After assembling my plane, situating food, water and other supplies, David was nearly ready to launch, so I launched my plane to check the trim just in case I need to land and change anything before "starting" the flight. The plane flew fine, so I decide to stick with the flight for my 8-hour attempt. It was about 8:55 am. David launched about five minutes later.

I had thought that I'd try to be smart and use my Walkman radio, but my transmitter signal seemed to disrupt the reception of my favorite radio station. Then I thought that I'd drink some coffee, but the plane had climbed out and I could not keep a good eye on it at that altitude while drinking coffee. So, I had a seat and just flew for a while.

From there the exact order and timing of events become pretty fuzzy. I do remember Kelly Johnson flying his Tragi, HP 18 and Nimbus 4, Doug and Terry Coleman arrived and stayed to the end, Amy Pool served us water, and I called Sharon, my wife, to tell her that we had started and if everything worked out we would finish flying around 5 pm. I also remember getting sleepy in the early afternoon, since I did not sleep well the previous night. But, all in all it went really well, until about 3:30 pm.

Starting sometime in the late morning, a thermal cycle started. By late afternoon, the periodic thermals would carry your plane to fantastic heights. But, the sink cycle would also put your plane at ridge level pretty quickly. Around

Stopwatches register Jay's 8-hour slope flight: 8:04:11.47 and 8:04:11.38
Photo by Amy Pool

3:30 pm we had a big sink cycle. Naturally, the cycle started while I was relieving my bladder. By the time I was through, my plane was below the ridge, sinking and there was no wind on the slope at all. I remember looking at my watch thinking that it would really suck to get six and half hours into this flight and land at the bottom of the hill. I looked over at David's plane, and he wasn't fairing much

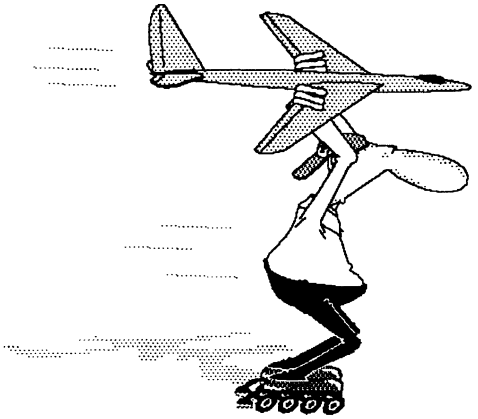
better. After scratching and getting uncomfortably low, we both found thermals and climbed out.

It turned out that the wind returned after we climbed above the ridge line with our savior thermals. But, we had been scared and continued to fly at a location on the slope way from our comfortable little camp of cars, chairs and coolers that would be better fly from in case another "save" was required. Fortunately, the wind did not cycle as dramatically again the rest of the afternoon.

Our story is not as dramatic as those who endured gale force winds, rain, freezing cold, or other extreme hardships throughout their 8-hour slope flight. Other than the one pucker factor event, I consider our 8-hour slope flight story to be one of success, due to our preparation and most importantly the help and encouragement by our good friends.

Thanks to Kirby Parker, Amy Pool, Kelly Johnson, David Portwood, and Doug and Terry Coleman, all of whom made what is often called the "8-hour kidney test" and enjoyable and beautiful day on the slope.

Dave Portwood and Jay Decker following the successful conclusion of their 8-hour slope flights.
Photo by Amy Pool



Gordy's Travels

Gordy Stahl, <Gordysoar@aol.com>

"Got Wing Tape?"

Gamma Dura Guard Transparent Racquet Head Protection Tape

I fly a lot! So wing tape is a subject that is constantly on my mind. I believe I have tried and used everything offered "in" the hobby and found some good stuff.

I prefer clear tape and don't want it to leave goo on my wing or pull off surface material like paint or resin. I want it to stick when it's cold, hot or damp...

I want it to stretch a little, but to hold without tearing all the time on a hard 100 point stab for wood.

My son lives in Denver and is an extreme sports kind of guy, snowboarding avalanches and sidewalk step railings, skateboards, mountain bikes and RC soaring... but recently he met a girl who likes to hit some tennis balls around so he asked me to tune up his racket and send it out there to him.

Being a good dad, I ran it over to Dick's Sporting Goods to get it restrung and re-gripped, and while I was waiting figured I'd get him some head abrasion protection tape... and there it was!

Gamma Dura Guard! Clear and sticky and strong... about as good at meeting the requirements above as any I had found, and it is available likely locally to your home.

You can find out more about this tape at <Gammasports.com>, but I think you will not a have a problem finding some locally at any larger sporting goods store or tennis facility's pro shop.

Give it a try! And keep flying!

See you on the...

Gordy

An *Electrifying* Experience

Jo Grini, <jo@grini.no>

The RCSE recently contained a contribution concerning a model destroyed by flying into high tension wires and the apparent effects this had on several receivers in the adjacent area. While the nearly explosive destruction of a model in power lines is spectacular, no one was hurt in this incident.

Of the contributions which followed, we found the one by Jo Grini of Norway to be of value to RCSD *readers as it points out one of the potential hazards of flying in unstable air — lightning!.*

The following is the message posted on the RCSE followed by some additional notes to RCSD by Jojo.

From: "Jo Grini" <jo@grini.no>
To: <Soaring@airage.com>
Subject: Re: [RCSE] Receiver Malfunctions after Contact with Power Lines
Date: Tue, 17 May 2005 20:16:59 +0200

Not the same but anyhow... I am lucky to be alive. After a F3F competition last weekend Helge Borchert (German pilot) flew his Crossfire (flew nice btw...) and suddenly shouted for no contact. He went down far behind and while I flew a prototype Taifun my friend Espen asked if I heard a strange sound?

I could not hear anything but a few minutes later while I was landing I heard the sparkling sound and it came from MY antenna on my JR 9303 radio (borrowed from Horizon Hobbies for Nats).

Holy macaroni it was a thunderstorm building up and it was lightning around us. The electricity made me and my antenna a good ground object to go for so I landed immediately.

Just after the landing a tornado formed after a big bang and Helge came back with his radio saying: "Modell 1 wurden verandert..." ("Modeldata model 1 have changed This one and the active model must thoroughly be checked for all settings before use")

It had gone crazy by the sparkling electricity. Crazy!!!! See <http://www.workflow.as/jogrini/diary/804open/mc24.jpg> for a photo of the transmitter message.

BTW The radio did not work at all after this.

Tornados (at least big enough to take some beach houses this one) is very rare in Norway...

At WC F3J in 2002 a Japanese plane caught some powerlines during practice flying. Check "day 3" <http://www.f3x.no/f3j/2002/> (yes a long way down).

Oh BTW I REALLY appreciate all the help I get for my trip to Nats. Gordy knows who that have contributed with cash and stuff so I don't know all the names or amounts yet.

Hopefully it will pay some of the airline ticket! But anyhow it looks like I will be picked up by Gordy, spend some quality time with Robert Burson that had a hotel room, my F3J team are Don Richmond, Larry Ruble and Rob Glover, I will bring F3J and TD planes myself while Gordy have a 2m and Barry Kennedy supplies a RES AVA, Horizon Hobbies sent me a JR9303 and Rx's (seems to work fine even in thunderstorms).

Probably forgot someone already but I can assure you I will make a full update on the web from the Nats. ;-)

Hilsen (Regards) Jojo <http://www.grini.no>

Jo Grini's photo of the tornado which disrupted a weekend F3F competition after lightning forced him to land.