Radio Controlled Soaring Digest

June 2007 Vol. 24, No. 6

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Front cover: Connor Laurel launches his Pike Perfect during the first Seattle Area Soaring Society Thermal Duration Contest of the year. Connor's father, Jim, handles the stopwatch. Photo taken April 28 at 60 Acres by Karin Laurel. Canon EOS 20D, ISO 400, 1/250 sec., f8.6, 17.0 mm

Back cover: Partial first round scores (Duration and Speed) on the board at the 1987 F3B World Championships. Photo courtesy of Jerry Slates (fourth from left and wearing a cowboy hat).

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 each article is 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

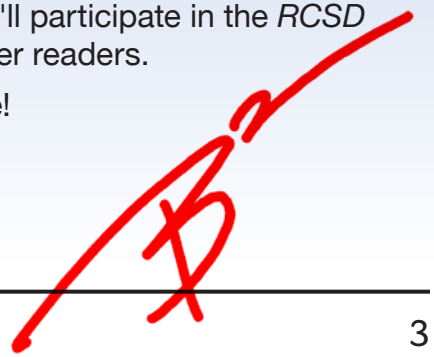
This issue of *RCSD*, at 70 pages, is the largest published in some time, certainly since the shift to PDF in March of 2004. This issue is also rich with full color photos. The lists of contributors and photographers in the adjacent column quickly shows a large count of new names. The increasing number of readers submitting material for future issues is tremendously gratifying and most appreciated.

Additionally, as of this morning, 1,004 readers are members of the RCSoaringDigest Yahoo! Group. Membership gives access to compressed versions of the larger *RCSD* PDFs and also allows you to receive e-mail notification when new issues are placed on-line. And signing up is free.

The weather here in the Northwest is finally becoming more conducive to outdoor flying. Large flat-bottomed clouds are in abundance, the temperature is well above 60 degrees for most of the day, and the winds are settling down to the typical summer 5-15 mph breezes which are symbiotic with thermal production. Flying a HLG during a mid-day break is definitely high on the priority list!

The deadline for submitting materials for the July issue is the 15th of June. We hope you'll participate in the *RCSD* experience and share with other readers.

Time to build another sailplane!



MIBO Modeli

Xperience Pro-X

Part II - Flight Impressions

My flight trimming Xperience by David Jensen, david.jensen@comcast.net

If you read Part I in the December issue you know I have a lot of RC flight experience over the past 18 years. Although I consider myself a semi-rookie to F3J TD style flying, I do have good flight trimming skills learned from six years flying pattern, seven years flying heli's and six years of slope soaring.

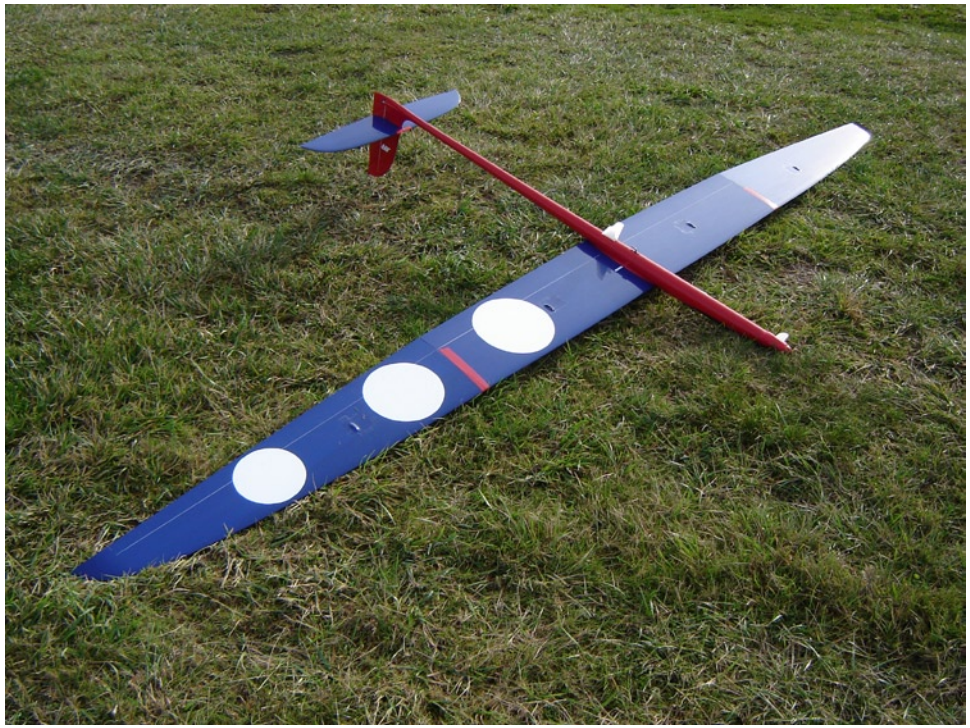
Over the past two years at my home flat field, I have been able to fly two Esprits, a Victor F3B (fun), an Onyx (older version), a Pike Superior V-tail, a Pike Perfect (for about two minutes - WOW), a Starlight 3000 (a landing machine), a Hera, a 2m Nova, a 2m Whisper, a handful of DLG's and other lesser models.

Oops, I forgot to mention the Redwing that the Editor in Chief of this magazine entrusted me with the maiden winch launch. The only one of these I really got to KNOW was my trusty Esprit. I mention this so you can understand where I'm coming from with my somewhat limited Xperience with 3m TD ships.

Three long agonizing weeks after completing the assembly of my Xperience Pro X, the clouds finally parted in the NW and I awoke to clear skies and dead calm air and the need to rake both my front and back lawns. The temperature was predicted to be in the upper 40's, so while I was raking I charged up the ship and radio and then went out to 60 Acres for the first test flights. The AUW was 80.8 oz., the CG was measured at 102 to 103mm (manufacturer's range 100 to 104), and all control surfaces were moving in all the right directions.

No one at the field had a winch, so I strung out my high start and went through an extended preflight check. I had a friend give it the first hand toss and it flew directly out of his hands and felt good except for needing a little up and more elevator throw. I made the elevator adjustments and we gave it another toss and I was able to fly it out and even turn it around and land it on the way back. The elevator still felt a little weak.

The time had come for my first flight Xperience, so I stretched out the high start and got everything ready for launch. I put in less than half the launch flaps that I assumed I would be using for a winch launch based on my xperience with my Esprit on the high start. I pulled the high start just as far as I usually stretch it for my Esprit and called out my



The completed and ready to fly Xperience Pro-X. The white dots on the bottom of the left wing are there so the aircraft is balanced laterally. The top view shows the tall tail and slightly upturned wing tips. It's well designed and aerodynamically clean.

channel and let her rip with a hard toss. What a non-event!

As I stated in Part 1, some of my launches are often very exciting. However, the Xperience just made a good transition to almost vertical and stayed nice and straight and kept on going up with few corrections needed.

There was no zoom and the ship flew off the string and started to really fly for the first time.

I switched to thermal mode that centered the trailing edge and I had to put a few clicks of up elevator and two clicks of right aileron for a good trim level flight. I love it when so little trim changes are needed after initial setup.

The first flight lasted just over three minutes and everything felt OK until I deployed the flaps and made the landing approach. There was not enough elevator to hold up the nose as well as I like on approach, but it landed just fine anyway. One of the pilots there remarked that was one of the prettiest maidens he has ever seen.

I increased the elevator throw to the maximum available and went through another eight launches. I added more launch flaps on a couple of launches and that stalled the ship 150'+/- up, but the rudder and ailerons seemed to make good corrections.

The dead calm air showed the Xperience to be nose heavy (dive tests confirmed this) but still quite responsive to inputs except for the elevator. I fine trimmed the flap to elevator compensation and it ended up needing less than I expected.

Above: Dave readying for a southwest winch launch at 60 Acres.

Right: The immediate steep climb from a winch launch is in evidence here. No wandering. Good carry-through on the zoom, too.

I was quite pleased with the feel of the ship so far and knew that moving the CG back would help with the heavy nose feeling especially during landings.

I took her home and removed about 1/2 oz. of lead from the nose which moved the CG to 104 to 105mm and checked out all the moving parts for anything wrong. All looked OK.

The following Saturday also had acceptable flying weather, so back to the field for some more Xperience.

The weather was nice and cold with temps in the low 40's and a 5 to 10 mph smooth cold wind. Again no winch was available, so the high start was stretched into service.

Dive testing showed a very large radius pull out that seemed just about right, however the landings were still somewhat not confidence inspiring.

Loops showed more than enough elevator to pull very tight radii in any attitude or speed, and the down elevator response also proved adequate.

I also had my first exciting launch.

When I high-start my big ships I do a skip step and then throw. Well, the grass at the field was wet and slippery and when I planted my front foot and tossed the ship I slipped and fell on my ass. I rolled when I hit the ground and held the radio up to protect it and had to take my eye off of the ship.

I heard it pop off the high-start, and when I rolled back over and looked up it was 100+ feet straight above me and pointed straight up, just hanging there. I was able to flop it over the top and pick myself up and land the ship.

The next flight made up for this, as I found my first thermal. It did not last very long, but I gained about 100 feet and had a nice relaxing 10 minute flight in very light lift.

This ship floats OK with camber, but the flight window narrows quickly when slowing down. Wing tip stalls happened predictably when turning off the wind while moving too slowly, but were easily controlled and were gentile enough to recover from without losing much altitude.

This ship pivots on the inboard wing tip quite nicely turning off wind. Compared to my Esprit, this was a pleasant surprise. The Esprit tends to drop the inboard wing much more, does not pivot as well and loses twice the altitude when recovering. One thing I did expect to find out about this ship is IT'S FAST and has a nice unique hollow molded scream. I made a 400' dive while in speed mode (reflex) and the ship felt very solid while going 75+ mph. I was even able to pull off a stall turn with some serious slapping of the rudder. I was quite pleased with the day's flights.

Sunday morning, a friend called me and told me there was a winch set up at the field so I new I had to get my first winch Xperience.

I pulled out another 1/3 oz. from the nose that set the CG to 107 to 108mm and went to the field.

I quickly set up the ship and hooked it up to the winch and tested the stretch of the line. I put in all the launch flaps and stepped on the pedal and tossed the Xperience and off she went straight up.

I'm smiling from ear to ear when I noticed the battery for the winch was almost dead. I backed off the pedal so as not to stall the winch motor and got no zoom at all.

Dive tests showed no pull out and she gained considerable sensitivity to elevator when moving fast, so I'll reinstall some lead back into the nose to set the CG at 106mm. The second launch I pedaled it nicely to save the battery and then stepped on it to get a zoom that surprised me. The Xperience accelerated hard and this was with a weak winch.

The rudder feel on the Xpro is different from the V-tails I'm used to. There is less initial roll coupling and more pure yawing with rudder input. Coordinated rudder and aileron input is required and aileron to rudder mixing helps a lot. However, this mix cannot react to varying wind conditions to achieve a perfect turn entry,

so eye-to-both-thumbs response is a must.

With the Esprit I could induce the turn with rudder and the ship would roll into the turn nicely. I would have to breathe on the ailerons to help, but then I would have to use varying amounts of opposite aileron to hold the bank angle through the turn.

The Xpro needs less than half the opposite aileron input and pure rudder does not always induce a good roll into the turn. Rudder inputs during the aileron induced roll and through the turn works better.

In late February I had my true winch Xperience with a nice strong battery. The XPro does accelerate very hard into the zoom and it holds its energy well topping out from the zoom. I and other pilots present did not see much if any wing flex during the full pedal launches or the zooms, so the wing officially passes the winch test.

The air was active but few thermals were forming, so I got some quality stick time playing with the camber and reflex.

In the turbulent air the ship needs to fly faster to maintain its poise. Using camber seems to defeat this, so I flew without camber and the ship was happier.

I am very happy with the ability of the Xperience to recover from tip stalls. They give plenty of warning and if you respond with a quick jab of opposite aileron the Xpro settles out nicely.

I let one of the more experienced pilots fly her and of course he found a thermal way out to the northwest and took the ship up a couple hundred feet while in full camber all the way. He said it was a smooth flying ship. All my previous flights were anything but smooth with the active air. After his flight I took a couple more and found the air had indeed smoothed out a lot, but I could not find any thermals even way out to the NW.

I am getting more comfortable with landings. I have learned the large flaps need to be feathered to control the air speed and flight path to the landing spot. It's a lot like using the brakes in your car. When you stand on the brakes your control is limited. With 45 degrees (or less) of flap the ship slows nicely and is controllable and the elevator works fine. Only when you get to the final commit point (20 to 40' out) do I deploy full flaps and then only if needed. I do not think this ship at 80 oz. is a landing machine like most of the other high end lighter ships, but it's better than my Esprit which needs full flaps way out as well as a nose high attitude to control flight speed. I do think the XPro has good landing potential in heavy weather.

I now have over 30 hi-start launches with the XPro and I have learned something that gets me 30 to 50' higher launches. My launch camber is set with the left slider, just like camber, only in the launch mode I can set 30+ degrees of launch camber with the slider. This is handy on a winch also when the wind increases and you want to back off the camber for launch. I set the amount of launch flaps at the start of the hi-start at just a little more than what I use for normal cambered flight (about four to five degrees). If there is too much flap at launch the ship tends to stall at the 150' mark (more so in calm winds). As soon as the ship get past this transition I start adding more launch flaps until they are fully deployed (about two seconds) and it increases the tension on the line resulting in a higher launch. With the additional tension on the line I can actually get a decent zoom (for a hi-start) especially with some head wind.

March 23rd to the 25th was the XPro's indoctrination to the slope with winds from 10 to 30 mph. Eagle Butte was the location and the XPro did not disappoint anyone with its agility and flight characteristics.

I thought it would be faster, but its size and the huge lift area that is Eagle may have masked its real speed. The ship did cover a lot of ground and held its momentum well.

The XPro is not applicable to F3F but it is fun for "slermaling." I had over 16 oz. in the belly during the heavier winds and

the wing did not flex appreciably even during hard high-g turns. The XPro can turn hard and tracks well while doing it.

Inverted flight was much better than I expected and knife-edge flight was, well, as expected.

Using aileron-to-flap mixing at 40% the roll rate was near 300 deg/sec and there is some drag created during a full roll, reducing speed almost 20%. With ailerons only, the roll rate was over 200 deg/sec with a noticeable reduction in drag.

The snap flaps (elevator to flaperons) seem to work well. I made several high speed passes starting from over 500' and diving straight down over 400' before pulling out for the speed run and the ship was smooth and tracked well at near terminal velocity.

With reflex in the wing, the very slight pitch up present in the uncambered wing at really high speed was eliminated so I did not need to re-trim the elevator in fast flight conditions.

With its size and crisp aileron response 12 point rolls (or were they 16 point) were easy. I am also happy to report the Xpro does a great snap roll, with an automatic spin entry right after if you lock the sticks in the corner. I was able to flatten the spin (push elevator) and hold a very slow flat rotation.

Stall turns were easily done as long as you influenced the ships attitude to the proper angle at the proper time on the up line.

The following Saturday we went back to Eagle Butte and had winds of 20 to 40 mph. I stuffed all the lead the ballast tube would hold (26+oz.) for an AUW of 106+ oz. and I must say I had my best Xperience to date. The ship handled the weight just fine and its speed improved and it flew great without any bad habits.

Trying to launch a 132" F3J ship off a slope in 30 mph winds proved a little difficult. The wind was, how you say, greatly influencing my ability to hold onto the ship and walk and carry a transmitter all at the same time. Some there must have thought I was crazy and they would have been correct. However, right after I tossed it, the difficulties went away and I was having TOO MUCH FUN.

I was able to flex the wing with the extra ballast, especially with negative g's. I was using the two degree wing jointers and together with the two degrees in the center panel there is was a total of six degrees of dihedral in the wing. Twice I removed the dihedral from the wing while pushing over the top on some maneuvers. The wing appears to be much stronger in positive g loading than in negative G loading.

Overall it was a great day and I (and many who were there) came away with a very good impression of this ship and its capabilities as a slermaler.

Two weeks later I had another educational Xperience. A newly rebuilt strong winch and winds from 15 to 25+ mph gave me some problems.

The wing was flexing, but no more than I saw at Eagle Butte. However, later in the day the Xpro kept popping off the line. I found I had bent the tow hook on one of the really hard launches earlier in the afternoon when the winds were at their peak. This was due to my inXperience with launching into stiff winds. I held onto the climb too long and did not enter the zoom sooner due to the high wind. I can now say that the Xpro wing has passed all the stress tests I can give it. The wing is strong enough for anything you can put it through.

Breaking News. "Xperience Pro X earns first place in class in its first competition." What a fun day. The weather was nice with active thermals cycling through the area with 5 to 15 mph winds. Perfect for the Xperience.

I pulled out some more lead from the nose to bump the CG back to 107mm and she is happy there.

Up until now I have not had the Xpro in a real thermal and I was beginning to wonder how it would stack up. I have had a few brief moments and gained a couple hundred feet on a few occasions

but I have not Xperienced the "feel" of mapping out rising airspace.

I specked her out three times during the competition and the feel (visual) of the ship entering lift was there and I could read the air with it.

The Xpro's penetration is very good and the ability to move from one side of the field to the other using reflex in search of lift is also very good.

During two different flights I was able to climb on top of most of the other ships in nice large thermals. The competition did show I need more Xperience with landings, but that will only come with more stick time.

My setup

I like a lively ship, so when I set it up I usually make sure I can move all the control surfaces to their max limits (within reason).

I try to get the servo ATV near 110% to 120% each direction and I also put the DR (in high rate mode) in the same range to maximize the servo resolution.

Computer radios are great, but you have to adjust the geometry of the mechanical linkages to maximize servo resolution.

The chart below shows my settings after tweaking them over 50+ flights. You can view the manufacturer recommended setup at the MIBO web site, http://www.mibomodeli.si/.

I use a simple triple rate setup all accessed by the left 3-position mode switch.

Launch mode has control throws toned down with lots of aileron-to-rudder mix,

	Launch	Cruise	Thermal
Aileron	9mm up & 4mm dn	13mm up & 11mm dn	11mm up & 8mm dn
Elevator	10mm up & 12mm dn	18mm up & dn	13mm up & 14mm dn
Rudder	20mm each way	24mm each way	22mm each way
Camber/Reflex	16mm dn & 3mm up	3mm up & dn	5mm dn & 3mm up
Differential	60	15	25
Ail to rud mix	70	20	35

The ailerons were measured at the wing tips.
The elevator was measured at the trailing edge nearest the rudder.
The rudder was measured at the bottom trailing edge.
The neutral position for the elevator is 68mm above the bottom of the rudder with the CG at 106mm
Camber/reflex was measured at the flaps at the root of the wing.
Final CG is at 107mm and the tow hook is at 98mm from the leading edge of the wing.

differential, and the launch flaps are on the left slider so I can easily adjust them for wind conditions.

Cruise mode is full on 120% throws and is used for fast flight conditions and on the slope. This mode has expo rates set to make the center stick area feel very much like the thermal mode. Cruise also has 40% aileron-to-flap mixing allowing a higher roll rate and snap flaps (elevator-to-flaps) which unweighs the wing a little and gives a nice groove feeling while pulling around in a turn. This mode also has camber and reflex on the left slider, but the movement is 25% less than in thermal mode.

Thermal mode is also toned down but has different settings and mixes for thermal seeking and less expo to give a better response when flying slowly.

I don't use a landing mode. My flaps can deploy in any mode from the throttle stick, and I have enough elevator available in all modes for landing.

Final conclusions

The XPro now has over 65 sorties and one win under its wings. To date, other than the tow hook, there have been no problems at all.

The fit and finish, wing joiners and tail feathers are still like new.

Almost every landing I've made with her so far has been lawn dart style and the nose, nose skeg, and entire airframe is holding up very well.

My only complaint (other than the AUW weight) is with the canopy. It slides around its seat too easily and when prepping for launch I always seem to grab the nose and touch the canopy and move it off center. Hey, a TD pilot has to have something to whine about.

So the final answer to the original question from part one, "Did I get what I paid for"?

Heck Yah, I think so.

The Xpro launches well, flies great, has no bad habits, is quite forgiving, and even for its weight, it gets the job done.

My total investment for the XPro (including shipping, taxes, title and dealer prep) is just over $1,600 and that includes the travel bag (Jim Bag from Skip Miller Models). This is almost equal to some of the other high end F3J airframes (including shipping) alone.

The Xpro is advertised as a great all around ship and I wholeheartedly agree.

I also believe the Xperience Pro X represents one of the best values in the F3J/B market, and anyone can feel as good as I do with the dollar-to-fun ratio.

I specked her out three times during the competition and the feel (visual) of the ship entering lift was there and I could read the air with it.

The Xpro's penetration is very good and the ability to move from one side of the field to the other using reflex in search of lift is also very good.

During two different flights I was able to climb on top of most of the other ships in nice large thermals. The competition did show I need more Xperience with landings, but that will only come with more stick time.

Pilot: Gregory Luck
Lift assistant: Glenn Foster
Photographer: Gregory Luck and his tripod
Glider: Seeker / www.liftworx.com
Builder: Gregory Luck

The Thermal Computer
- a smart vario -

Staffan Kjerrström, skj@bredband.net

...with thermal computer!

RC-Soaring pilots sometimes use a variometer, like the full-scale pilots, but they also need an extra receiver, a separate frequency and headphones.

If you instead leave it to the vario to decide when the climb is good enough and also to handle the centring in the thermal, then the system is easier to use. First you get rid of the extra equipment and secondly you get help in interpreting the vario signals.

When climb is found you normally take over and fly manually.

The thermal computer (TC) is connected between the receiver and the servos and takes over the steering upon pilot request. Like an autopilot, the TC flies straight on until it finds climb good enough. Then automatic centring and climb is performed until the pilot takes over.

For the automatic flight a roll stabilization is needed. One alternative is to use an FMA Copilot which uses the temperature of the sky, over and under the horizon, to stabilize the attitude. See Photo 1.

A cheaper alternative is to connect a simple RC-gyro to the TC. Here some testing and tuning can be needed for a good result.

The thermals contain free energy. NASA has done experiments with an UAV (unmanned aerial vehicle) which automatically uses the updrafts to prolong the flight time. Apart from this, nothing similar to the TC exists, as far as I know.

Development phases

My interest in variometers started with a book describing a thermal computer for RC-gliders. The title was ”Das Thermikbuch für Modellflieger” and it describes, in general terms, a computer capable of controlling an RC glider with inherent stability.

In 1996 I decided to build a TC. Already in 1993 I started with RC-Electronics and developed a glitch monitor and an active voltage monitor. The experience gained was now useful.

Photo 1: FMA Copilot sensor for IR-radiation. The FMA Copilot uses the temperature of the sky, over and under the horizon, to stabilize the attitude.

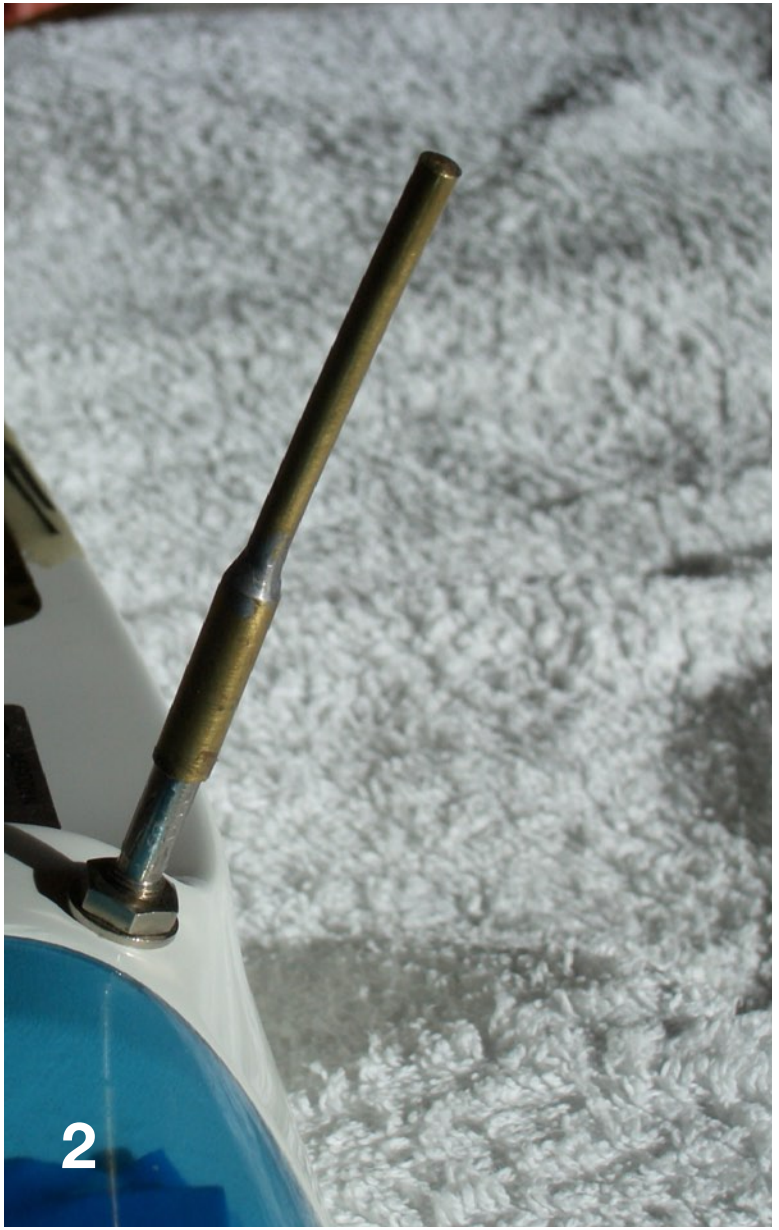


Photo 2: A total energy probe made of brass tubing. A total energy probe compensates for speed changes and therefore gives more correct results. The total energy probe consists of a nozzle connected to the pressure sensor with a tube.

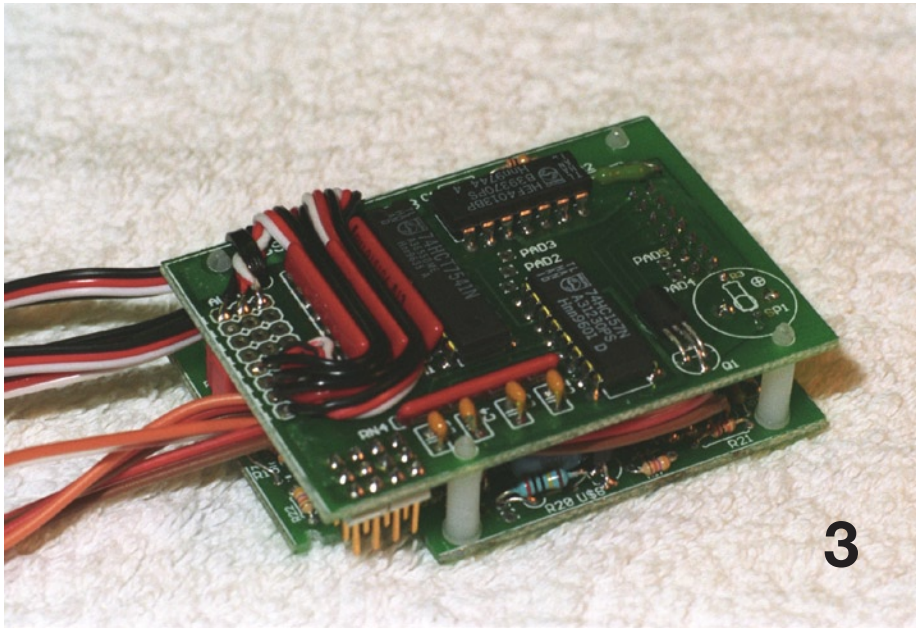


Photo 3: RC-Climb 6 before packaging

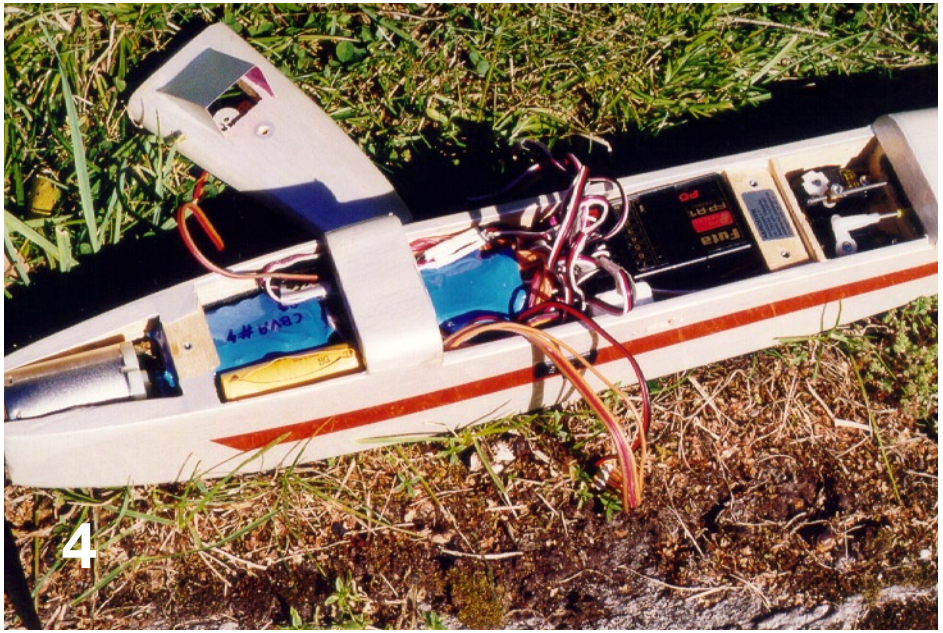


Photo 4: RC-Climb installed in 2-meter electrical glider ”Elegant.”

My first TC, RC-Climb 1, was made for planes with inherent spiral stability, i.e. planes which can stay in a steady state turn, with rudder deviations in the direction of the turn, without spiralling down.

RC-Climb 2 was equipped with a yaw rate gyro to handle non-stable planes also.

Later adjustment possibilities for thermal strength and elevator delay as well as a total energy probe for the vario were added.

A total energy probe (see Photo 2) compensates for speed changes and therefore gives more correct results in this context. It consists of a nozzle connected to the pressure sensor with a tube.

RC-Climb 6

The current version, RC-Climb 6 (Photo 3), has the functions:
Automatic thermalling
Voltage meter
Voltage alarm
Transmitter off alarm (Model finder)
Radio disturbance alarm

And the specifications:

Weight	80 gram
Dimensions	68x48x24 mm
Power supply	4,8V, from the receiver battery
Current	40 mA

Photo 4 shows the RC-Climb installed in a 2-meter ”Elegant” electrical glider.

Flying experiences

Airplanes used for flight tests:
- Electrical glider Elegant, Span 2,04 m, designer Jan Levenstam 1989. Car motor
- Electrical glider Sun-Wind, Span 3,1 m, from CHK-Modelle. HP 200/25/4 with gear 4,4:1
- Teddy RC Trainer, Span 1,32 m, Hegi Modellbau. OS FP25 glow plug

When looking for climb, RC-Climb has often helped me to find and center in thermals.

Especially in dry thermals (without clouds) it has shown its strength.

The thermal sensitivity can normally be set to 0 m/s or up to +0.5 m/s for strong thermals.

For weak thermals you can go down to -0,2 m/s.

The elevator delay, for my airplanes, is set to 2.5 to 3 seconds.

Observing when the plane enters a turn you can clearly see if the elevator comes to early or too late.

Elegant (with ailerons)

Needs outside aileron deflections to stay in the turn. Thus you need a gyro.

Suitable for windy weather. Flies well with RC-Climb.

Sun-Wind (without ailerons)

I bought this plane to get a spirally stable one which could be flown without a gyro.

Dihedral wing tips and no ailerons.
It turned out that the plane was only marginally stable. For banking angles of more than about 15 degrees it takes too much time to straighten out by itself. The reason is probably that the tail is too short compared with the span.

Therefore I recommend a gyro also for Sun-Wind. Generally it is a wonderful plane for light winds.

Teddy (without ailerons)

Needs counter rudder to stay in the turn. Teddy flies close to the stall limit due to the weight of the test equipment. Therefore this plane is a specially interesting and difficult case for the attitude control.

Data logging

To get more information for tuning RC-Climb, the RC-Climb 5 prototypes were equipped with data logging and a GPS receiver.

Logged data are saved in a serial EPROM memory for later evaluation after landing.

Currently the following measurements are included:

Barometer altitude - a rough value with 8 bits resolution
Variometer - with 0.05 m/s resolution
GPS position
GPS altitude
GPS ground speed
GPS ground track
Autopilot state

Data are transferred to a PC and imported to Excel for curve presentation and calculations.

To visualize the GPS flight path together with the other measurements I use the (free) programs “Loggerleser” and “Skyplot” for Dietrich Meissner’s Datenlogger.

RC-Climb 5 can now export data direct to ”Loggerleser”.

A sample from one of my GPS flights displayed with Skyplot is shown here.

The future

Improvement ideas exist of course:
- Better tactics for searching thermals
- Speed measurement and control for flying in stronger winds
- GPS navigation for systematic searching within an area

RC-Climb 6 is an advanced product with high demands on both the system integrator and the user.

If you want to build a TC I can offer you a good start, including printed circuit boards (without components) and a pre-programmed controller chip.

Experience from building electronic circuits is needed and you will take over the designer’s responsibility for the completed system.

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Phone: +46 21 125567

Photo 5: The Sun-Wind. Span 3,1 m, from CHK-Modelle. The motor is an HP 200/25/4 with gear 4,4:1. Notice the total energy probe mounted between the blue tinted camnopy and the leading edge of the wing.


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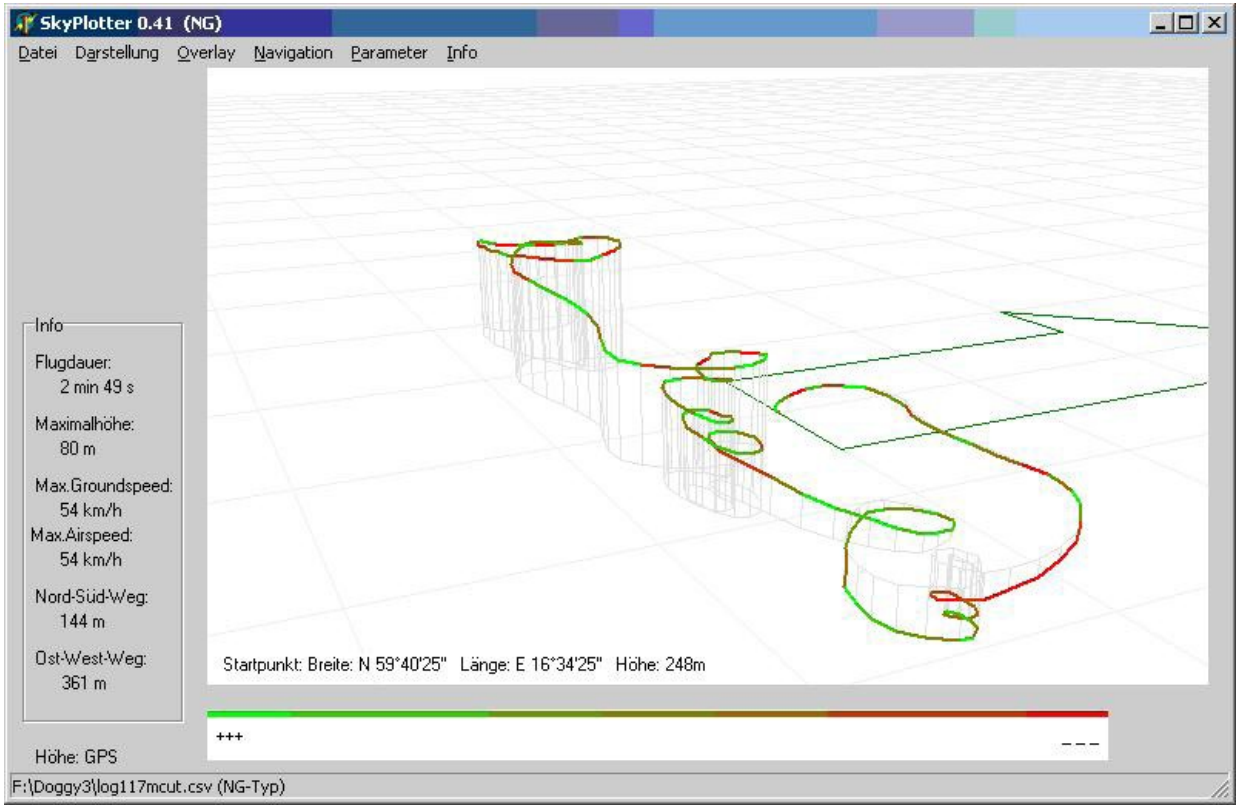

A sample from one of my GPS flights displayed with Skyplot.

References:

Staffan Kjerrström's website with RC-Climb etc.
http://hem.passagen.se/skj/home.htm

Der TC1, ein Thermikcomputer, Chapter from:
Markus Lisken und Ulf Gerber: Das Thermikbuch für Modellflieger
vth-Fachbuch Nr.: FB 2044, ISBN: 3-88180-044-1
http://www.vth.de/shop/shopfiles/product.asp?TID=N8FP2RFNN3WE&PS=1&PID=2620

Free programs for reading and 3D presentation of logged data "Loggerleser" and "Skyplot" for Dietrich Meissner's Datenlogger.
http://www.sprut.de/electronic/soft/index.htm

Dan Edwards initial thermal computer experiments
Autonomous Soaring Computer
http://www4.ncsu.edu/%7Edjedward/auto_soaring/index.html

NASA's experiment with a thermal computer
Catching Heat Waves
http://www.nasa.gov/missions/research/thermal_soaring.html

KCSE Aerotow '07

Mark Nankivil, nankivil@covad.net

The weather in the Midwest this Spring has been a wee bit wet this year and the weeks leading up to the 2007 edition of the KCSE Aerotow saw plenty of rain and tornadoes in other parts of Kansas and the surrounding states. Thankfully the week leading up to the event moderated and stayed reasonably dry. As I drove west from St. Louis on Friday, May 11th, The skies were crystal clear blue and beautiful but the rivers, creeks and drainage ditches were running over.

Upon arrival at the sod farm located west of Gardner, Kansas (just under an hour southwest of Kansas City), the field itself was a little soft but quite flyable and the turkey buzzards were busy showing everyone how thermal soaring is done.

CD Bernie Wolford handled sign up and made sure we all filled out the sanction forms while one of the club members kindly supplied some very good sandwiches from one of the local eateries so we did not have to venture far from the field and could focus on flying and socializing. Jim Frickey and Tim Gastinger, KCSE club members, were busy handling the towing duties with their models and also helped trim out and tune in Andrew Jamieson's sharp looking Pawnee towplane.

Saturday was more of the same excellent weather with just a slight change in wind direction and with others showing up that morning, the head count on the sanction forms showed 17 pilots in attendance. Flying was such that many put in multiple flights throughout the day - there was no real waiting in line to put one's model in the air behind the busy towplanes. The "Hot Dog Man" brought his stand out from Gardner and the food was quite good and very convenient for everyone.

Many of us headed for home early on Sunday so we would make it back home for part of Mother's Day. For those who hung around, a bit more flying took place with tows and a winch being available. Besides the scale sailplanes, a few were also able to air out their TD ships in the buoyant air. All in all, an excellent weekend to get out and get away to fly with old friends and make new ones as well. Thanks to the KCSE members for the excellent hospitality!

Title page: Jim Frickey's Pegasus II makes another tow. This is a former John Derstine built airframe that Jim has massaged and strengthened into a real brute of a tow plane, weighing in at 35 lbs. Powered by a 3W-120 twin turning a Mezjlick 28x12 3 blade prop, this set up also uses twin cannister type mufflers which makes for a very quiet set up. The added cowling makes this a pretty decent looking model too!

Above: A few of the models stand ready to fly.

Opposite:
- Upper left: Mickey Sullivan and his scratch built 1/4 scale 1-26. Sported a full body pilot and a fiberglass nose section as per the full scale version. This is the seventh of eight 1-26 models that Mickey has built.
- Upper right: D.O. Darnell (Tulsa, OK) with his "vintage" 10 year old Krauss Discus. 1/3.75 scale and weighs in at 12 lbs. Graphics make a unique change for an all white model and were airbrushed on using a water based urethane with One Shot sign enamel used to make the pinstriping.
- Lower left: Jim Porter and his beautiful 1/4 scale, 6.6 meter Nimbus 4 from the HKM kit.
- Lower right: Andrew Jamieson (Dallas, TX) brought along this 1/4 scale HKM ASW-27. Span is 3.75 meters and it's fully molded.


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Opposite: Don Harban's (Tulsa, OK) 1/3rd scale Ka-6E from the CNC-Modelbautechnik Bayer kit available thru Shredair. 5 meter span, 9 Kg weight and uses an Eagletree Data System vario. The model's maiden flight was made on Saturday.

This page: Mike Fox (Davenport, IA) brought along his new HF Modell Ventus 2ax. 1/3rd scale, 5 meter span and 22 lbs, its maiden flight was over the weekend and Mike put in a number of excellent flights with the model.

Pilatus Turbo Porter - Owned by Tim Gastinger (Gardner, KS), this is a big one with a 140 inch wing span and weighing in at 41 lbs. Built from the Brauer kit (originally imported into the U.S. by Robin Lehman in the late '90s), motive power is a BME 110 Extreme quieted down by a pair of Dalton carbon fiber cannister type mufflers.

Piper Pawnee towplane owned by Andrew Jamieson (Dallas, TX). 1/3.5 scale, 3.1 meter span model manufactured by Bruckmann. The model weighs approximately 32 lbs. and is powered by a BME 110 cc twin petrol engine. Performance is excellent with the ability to tow up to 1/2 scale models.

Don Harban's 1/3rd scale Ka-6E in flight.

D.O. Darnell's Krauss Discus on tow.

Dale King (Wylie, TX) and Andrew Jamieson (Dallas, TX) put Andrew's trailer to good use making the trip up from Texas. The trailer was converted for sailplane use from its intended design for go kart hauling. Manufactured by Gaines Composites of Atlanta, GA, the trailer is wired for external power which in turn feeds a charging station for the models stored in the trailer. Nice!

Opposite page:

Upper left: Don Harban's (Tulsa, OK) 1/3rd scale Ka-6E from the CNC-Modelbautechnik Bayer kit available thru Shredair. 5 meter span, 9 Kg weight and uses an Eagletree Data System vario. The model's maiden flight was made on Saturday.

Upper right: Mickey Sullivan (Arkansas City, KS) brought along this 17 year old, scratch built 1/4 scale 1-26 based loosely on the Steve Moskal plans - changes made allowed for a full body pilot and a fiberglass nose section as per the full scale version. This was a very fine flier with a number of long flights throughout the weekend.

Lower left: Jim Frickey (Desoto, KS) flew this Ventus 2ax when he wasn't towing everyone behind his Pegasus II. The Ventus is from the HF Modell kit, spans 5 meters and weighs in at 23 lbs.

Lower right: Andrew Jamieson (Dallas, TX) has been flying this 1/4 scale Graupner G103 Twin Acro for a number of years now. The kit dates back to 1991 and has a gel-coated GRP fuselage and foam wings with 'glass reinforced balsa skins. He also has made numerous flights with a digital video camera taped on the top of the fuselage - the video is quite good and really shows to good effect what the model is doing throughout the flight.


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Nimbus 4

Left: Jim Porter also brought this cute 1-26 built from the TMRC kit. The finish was superb!

Below: A couple of winglet-equipped glass slippers await a tow.

Opposite upper: Rick Wilkinson (Wichita Falls, TX) flew this 2.5 meter span, scratchbuilt sailplane. The wings are use the HN003 airfoil and are 1/64 ply sheeted foam.

Opposite lower: Jim Porter flew this beautiful 1/4 scale, 6.6 meter Nimbus 4 from the HKM kit. Truly majestic in the air.

Andrew Jamieson's 1/4 scale HKM ASW-27 heads off in search of lift.

A Slope Soaring ACTION! Photo Technique

By Dave Garwood, DGarwood@nycap.rr.com

We like action flying shots of our slope soaring escapades, and we try to get better and better at making these photos. Here's how a change of camera position can give a different point of view of the action and record a different kind of photograph.

Begin with the basics that we already know. Have the pilot and photographer work closely with each other to set up the shot. One cool thing about slope soaring is we can generally fly the pattern repeatedly until we get the shot the photographer had in his mind's eye. Great shots are often made in the mind of the photographer before the camera comes out of its case.

Work with the sun behind the photographer when you can, as this prevents the plane and the pilot from being photographed in their own shadow. Yes, it adds to the burdens of the pilot who will now be flying while looking toward the sun, but that's why we have sun glasses.

Select a focal length that includes enough landscape in the background that the photo gives a feel for the location. In recent months I've been using a wide angle lens more and more, and working closer to the soaring subjects.

Consider setting a slower shutter speed to allow a little motion blur of the glider to convey motion. The Bowman Comanche shot was made at 1/250 second, while the shot of Dave's Reese's DS Model Ocelot was made at 1/125 second.

Select your camera position carefully, and try putting the plane in the foreground, the pilot in the middleground, and the landscape in the background. This lets us capture a larger image of the plane in flight, show the front of the pilot, and still show the venue.

Asking a pilot to fly between himself and the photographer puts extra pressure on him, but some of my photographic subjects say they like it because it gives them a "mission" for the flight. You may ask the pilot to fly the pattern repeatedly to give yourself more chances to get the money shot. If wind and hill conditions allow, you might ask for passes in both directions for variety. It's good to practice with EPP foam planes because this mission increases the chances of sudden contact with terra firma.

Using the same planes, same pilots, and same flying sites we can change the lineup and get a different kind of slope soaring action shot. Just shift your camera position.

Check out the photos on the next pages! A list of mentioned manufacturers is on page 44.

Dave Garwood flies a Pat Bowman Comanche on a February slope safari trip. Photo by Dave Reese. First reader to identify the flying site wins a square foot of fiberglass cloth. Hint: you've seen this venue in photos before, but we were not there on a race day. Photo by Dave Reese.

Jim Harrigan flies a Dave Sanders Schweizer 1-26 at Goat Rock State Park. This shot has the three main elements we like to see in a slope flying action shot: plane, pilot, and landscape. Is there a way to set up the photograph so that we can better recognize the pilot? How about a larger image of the sailplane?

Jim Harrigan flies a Dream Flight Weasel Pro down on the beach at Goat Rock State Park. We've shifted the camera position to in front of the pilot and asked Jim to fly between himself and the photographer. Now we have a front view of Jim and a larger image of the glider because it's closer to the camera. Because of the low camera position, we have only sky as background, but we have some interesting foreground.

Dave Reese flies a DS Model Ocelot at Fort Ord Dunes. This guy's got some thumbs and can confidently fly the maneuver over and over with a crunchy plane, making it easy on the photographer. Again, we have the three desirable elements of an action flying photo: plane, pilot, and landscape.

Here's a side view of the setup showing making passes with the plane between the photographer (Dave Reese) and the pilot (Dave Garwood). Reese knows what he's doing behind a camera and has set up the shot with the sun behind himself, and has even light on the plane, the pilot, and the background. This photo by Jim Harrigan.

Bad pass. Flying close in, low, and sometimes through the rotor, can lead to sudden contact with the ground. It's good to have bounceable EPP foam planes for this work.

Good pass. On this approach, the pilot has found a good line and made a clean pass. We still like rubber planes, as they give us more confidence for demanding flying routines.

A money shot. Garwood makes a decent pass and Reese nails the shot. The shot of Jim on the ridge from behind is technically acceptable, but one taken from this angle may be more of a keeper because it shows the front of the pilot, a larger image of the plane, and it still records the flying venue.

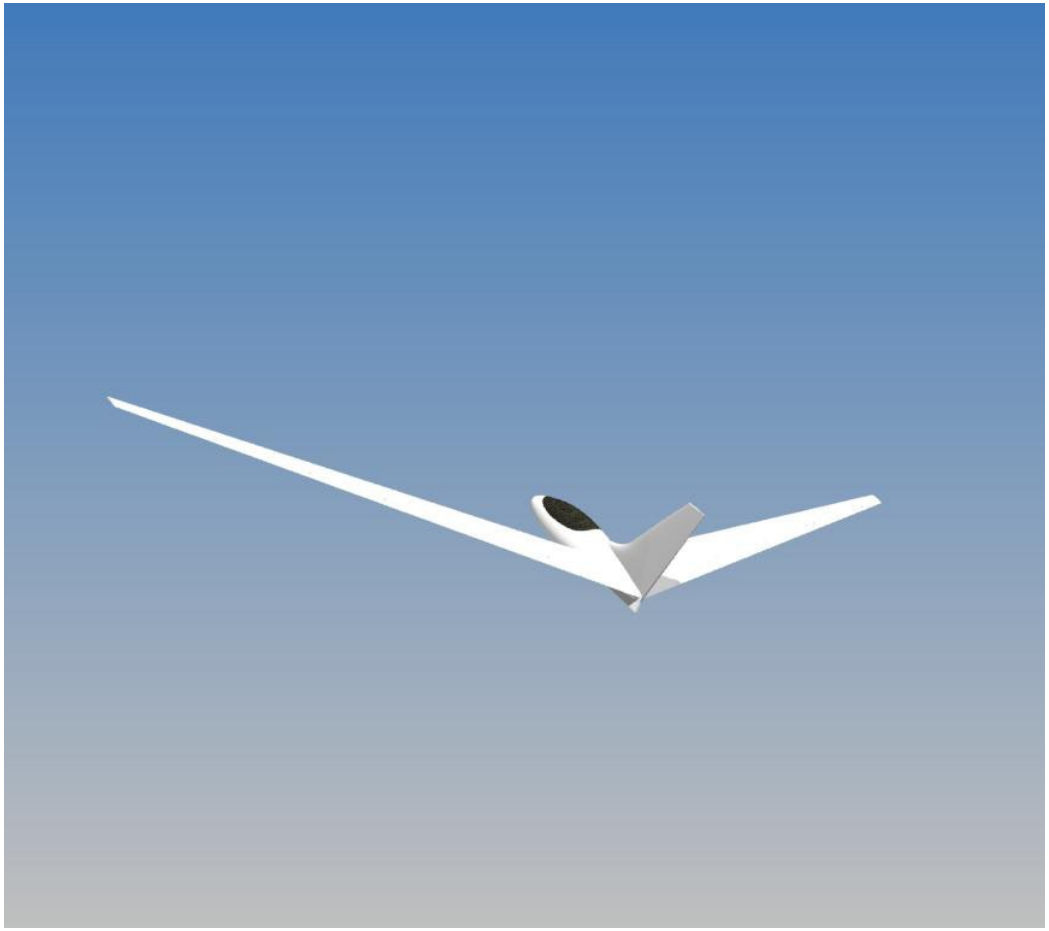
MANUFACTURERS MENTIONED:

Dave Sanders Schweizer 1-26
Sky King R/C Products
www.skykingrcproducts.com

Dream Flight Weasel Pro
www.dream-flight.com

DS Model Ocelot
www.dsmodel.cz/english/index.htm
Imported by Soaring USA
www.soaringusa.com

Pat Bowman Comanche
www.bowmanshobbies.com



Giuseppe “Beppe“ Ghisleri sent in the above image, generated by a 3D modelling program. The model is of the B-11, a full size sailplane with 18 meter span, designed by Akaflieg Berlin in the early 60’s. The original, although completed, never flew because of CG problems. While we’re still working up a large scale model for aerotow, Beppe’s smaller scale rendition will be at home on the slope.

Beppe is currently running the planform through the Nurflügel and XFLR5 computer applications and says he’s close to cutting foam and wood and laying glass. He’s promised to keep us informed of his progress.

Eish!

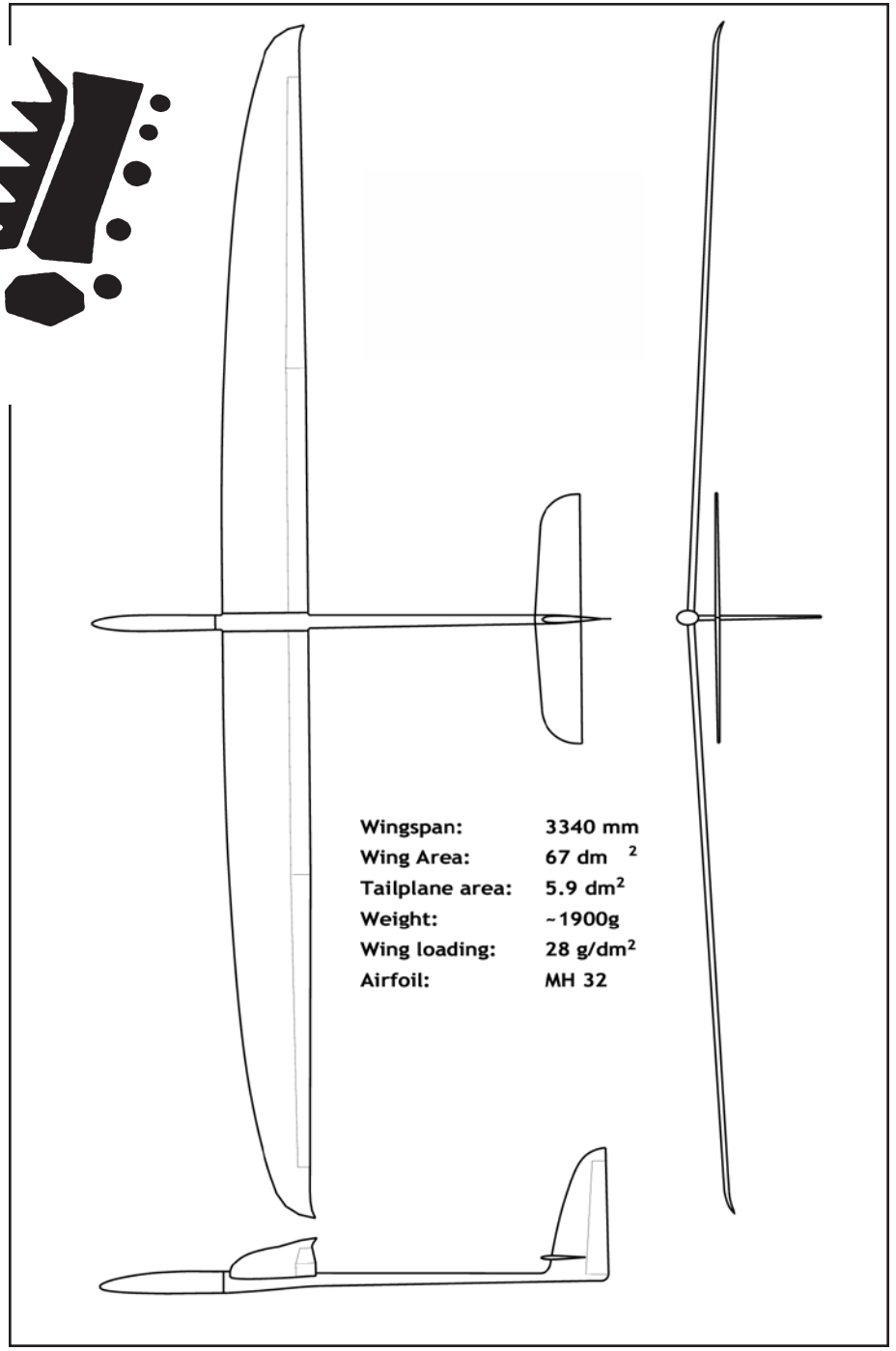
By Mark Stockton, mark@linuxworx.co.za

The Eish! was designed by Craig Goodrum somewhere between the 2000 (Corfu) and the 2002 (Finland) F3J Championships.

It was developed after the Shongololo (a South African derivative of the Swedish Race Machine) and the Sangona (flown by the South African F3B and F3J teams in 1999 and 2000).

It was intended to create a slightly “safer” platform for thermal duration and sportsman F3B as these are the main classes in South Africa.

Craig personally had little interest in creating the model, but Rodney (his father) had the design in his head and wanted to transfer that into moulds. The Goodrums later joined forces with myself to assist with funding the project. Thus the model was an exclusive initiative of the Midrand Model Soarers gliding club. This was done as a previous initiative (the Shongololo) had resulted in the loss of intellectual property and investment due to the general public getting access to the moulds and destroying sales of Murdoog’s Flying Machines’ <http://www.murdoog.co.za/> model in the local market.

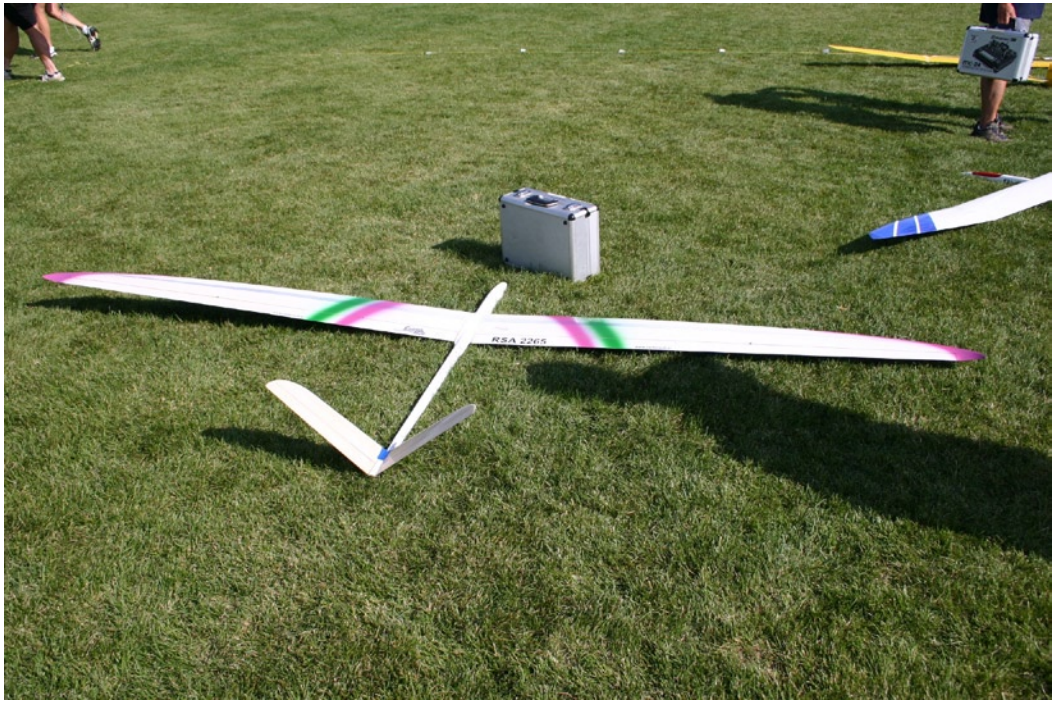


Kurt Stockton's (South African Junior 2006) model being assembled for the first time. Molds visible in the background with another Eish! inside.

The model performed well from the start, but construction was a problem. Craig was faced with a career change due to the earlier local market demand dissipating and a pull from the family door manufacturing business. Sadly, this career change sounded the dawning of a sad era for Murdoog's, with the models being built by Murdoog's suffering from varying and often poor workmanship, as the local workforce can be very inconsistent in its quality.

Models flown internationally where often built by the pilots themselves, or under their supervision, to insure consistent quality. The model itself excelled. It certainly out thermalled the Sangoma and Shongololo easily.

If memory serves correctly, Craig came second with the model on debut at it's first National Championships. Round One was the first trim flight. Since then the Eish! has been a force to be reckoned with in South African gliding circles.



Above: Craig Goodrum's model that came 4th in Red Deer.

Right: South African team Eish!s next to the ready box in Slovakia (2006 F3J World Championships). In the background is Arend Borst with his and some South African Supras.

Internationally, the Eish! was the mainstay of the South African F3J gliding team in 2002 (Finland), 2004 (Canada), and was still seen in 2006 in Slovakia. The model helped Craig Goodrum to his 4th place in the Canadian event and also saw Ian Lessem make his way into the junior fly-offs in 2002.

It was more than a match for the Sharons, Pike Pros and Superiors being flown internationally at the time and is still very competitive in thermal and surprisingly (to Craig) very competitive in F3B, especially at our high altitude.

To this day, I still compete in the Highveld Thermal League using my "Mad Cow," 2.4kg full carbon Eish!

"Definitely one of my favorites, thanks Dad (Rodney Goodrum)." - Craig Goodrum.

Over time the Eish! has evolved. The glider lost it's nose cone and now sports a canopy on the underside of the nose. It has also been converted into an excellent

South African team at Red Deer Canada

Craig Goodrum with the model

The story of the E-Eish!

By Dion Liebenberg

F5J electric glider. (See the following article and photos from Dion Liebenberg.)

BTW - Eish! (aysh) is a South African slang for amazement, shock, or surprise. The name was conceived as being the term used by competitors when they see the performance of the model.

I acquired a Kontronic Fun480/33 with 4.2 gearbox cheaply from a flier who had this combo on a 2m gasbag. At first tryout it blew his tail off, so he got scared and let me have it. I had a worn fuselage lying around and this motor looked like a nice fit, so I sawed off the nose freehand with a hacksaw with a little bit of down thrust and installed the motor. At this time LiPo was still experimental technology and I had to use NiCd's, so the servos had to move to under the wing to at least give me some battery space.

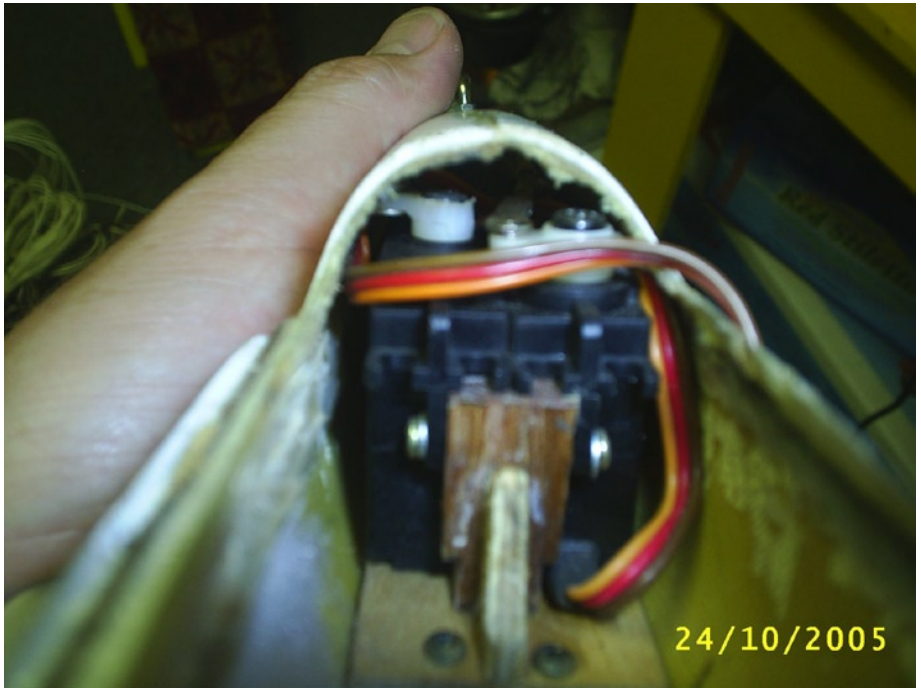
The servos sit on a clip-in tray with one hold down screw in front, and to get them connected requires a very specific

procedure of servo horn position, control surface deflection, and connection sequence – Tricky!

The model was always adequately powered with 10 cells and 14x9.5 CAM prop. It had an eventful first F5J competition, getting lost & damaged and subsequently getting a new set of light glass wings.

At the 2006 Nationals I wanted to push the limits a little and decided to purchase a LiPo pack. The motor runs best at 14V, so I took a 4S2100 20C continuous, stuck it in and fired up. As the controller got to about 80% of maximum power it cut.

Seemed strange, so I did it a couple of times, as is normal for a modeler. (Why don't you just stop when something is not quite right) This must have dropped the voltage a little because it got going with huge impressive power – for about five seconds - after which the controller literally exploded. So maybe the current draw was too high.



I had a VA meter for some time, but never used it. I got a bigger ESC (60A) and hooked it all up again. This time I saw the current go to 56A before the VA meter blew up.

Now I changed the prop down to a 13x7 and gave it another go. No issues with full power setting, ESC OK, but motor getting a littler hot. No problem. Took it to the field and had a test fly. Some climb-outs, and quite a bit of zooming around at low level under power, until motor power became intermittent. After landing the motor was very hot – so hot in fact that the rotor had demagnetized!

So now it was two days before the Nats, and instead of spending the time leading up to perhaps clean the grime off a F3B model or change a winch line, I had caused very expensive damage on a daily basis. On relating my sad story to the Kontronic representative, he offered me a FUN500 with a 5.2 box as a loaner while my 480 went for repair. (Yes, agents do give good service, and Yes, it's worth buying a decent motor with real after-sales service.)

Test flew the E-Eish! on the morning of the Nats and subsequently blew away all other competitors in the competition. The FUN500 has since returned to its owner and I am now going to try a Kontronic 600/1500 with 3.7 box and 20 x 12 prop & 4S2100 as soon as the prop arrives.

L to R: Brendan Beardsley (Starlight 3000), Connor Laurel (Pike Perfect), Michael Knight (Sharon Pro). These three boys are already great thermal duration pilots and will be making a try for the US national F3J team this year. Hopefully, they will all be flying in the Worlds in Istanbul next year! Photo taken April 23 at Mission, B.C., by Jim Laurel.

Cartoon by Pamela Spell

Adding spoilers to the AEROSPHERE™ OLYMPIC 650

Jim Spell, jspell@vailgov.com

For the May issue of RCSD I agreed to build and review the Olympic 650. For the review, it was decided that building the Olympic 650 per the instructions with no modifications was the best way to accurately reflect the quality of the model and the original intent of the designers.

The Aerosphere Company did, however, give me permission to add spoiler bays as long as the original design was kept intact with the wing covered completely and the glider flown as the Renaud brothers intended.

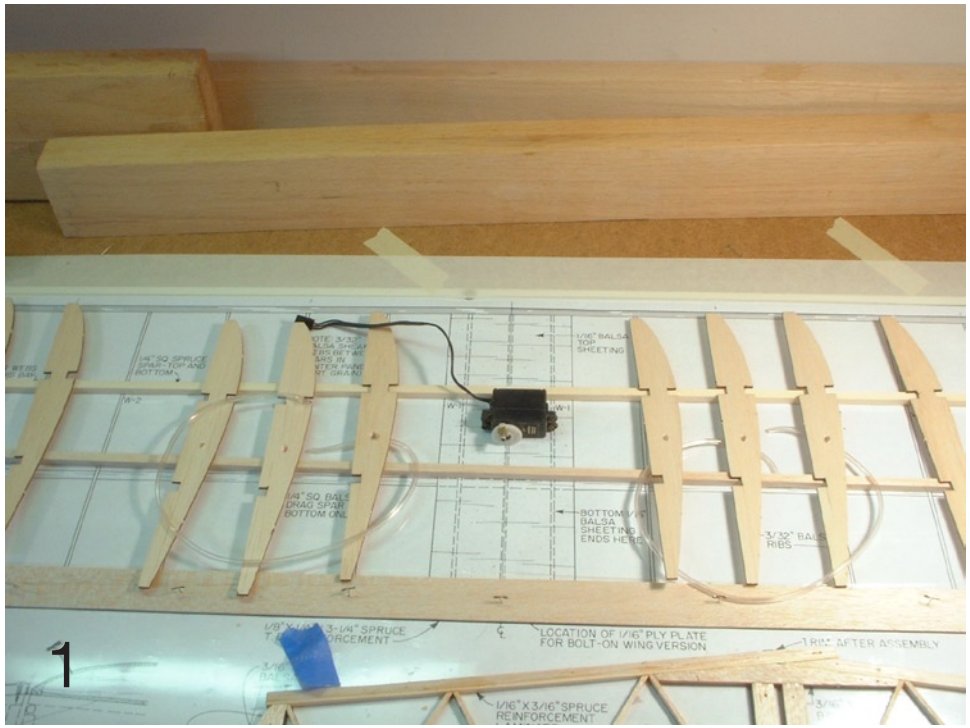
For this article, I am going to outline the original installation of spoiler bays prior to covering the Olympic 650 and the final installation of working spoilers.

Of interest to all stick-builders is that the design and build of these spoilers follow a simple add-on formula that is compatible with most rib, web and spar wing designs.

The Olympic 650 is especially suited to spoilers because there is no dihedral (center angle) in the wing design. Most wings can be modified to make this construction method workable, but the benefits of a flat center wing section are apparent.

In flying gliders, I use spoilers for two reasons. First is to assist in landings by changing the angle of descent, and secondly to drop out of severe updrafts.

The full deployment of spoilers coupled with a slight up elevator allows the L/D (Lift/Drag) angle to change without affecting the overall pitch of the glider, resulting in shorter landings and easier descents in strong thermals.



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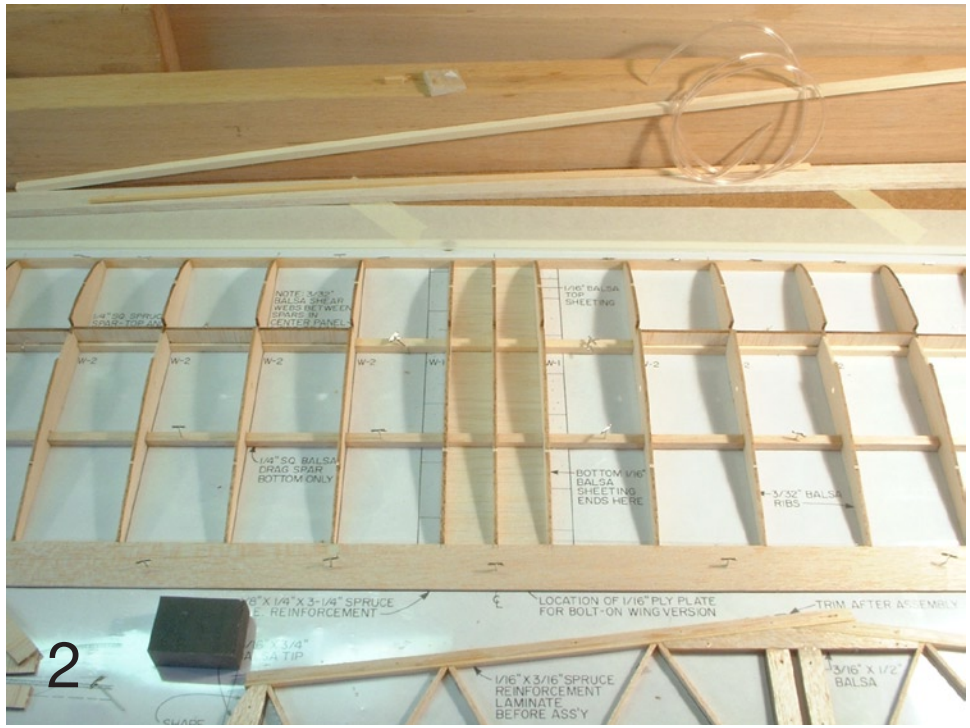

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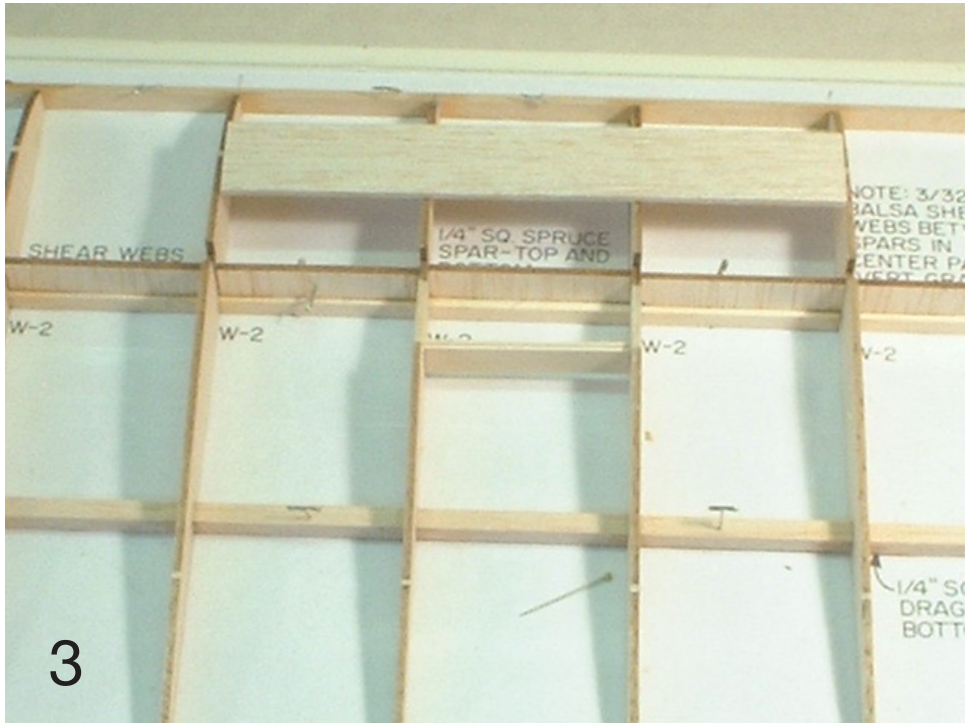
When it comes to spoilers, the key to a successful build is planning. Even before the wing is begun, you must know exactly what you want to do and when you want to do it. For example, drilling the holes in the ribs for the tubing and trimming the center spoiler ribs to accommodate the actual spoilers prior to gluing is preferable to sloppy cuts and broken ribs after the wing is built. (Photos 1 and 2)

Without gluing any ribs or center section assemblies, look at where you want the spoilers. Most homemade spoilers are built larger than needed. My first spoilers were on a Gentle Lady wing and they were five bays wide and two inches deep. Three bays and a one inch spoiler is more than enough to disrupt the laminar flow efficiency of a two meter wing. Pick an odd number of bays as this will allow you to put the working parts in the center bay and will balance the entire assembly.

It is imperative that you locate this center bay prior to the rib and web assembly as this “middle web” must be offset slightly forward to accommodate the spoiler pull horn. (Photo 3) Make sure the bays are the same on each side and mark them. Mark the outside ribs that will NOT be touched, the two center ribs that will be cut to accommodate the spoiler and the actual dimensions of the spoilers. I trace the actual spoiler outline on each rib both from the top and sides. The top chord spar will be the front of the spoiler bay and the outside ribs will be the sides. The spoiler itself is made from 1 inch aileron stock. After the spoiler is measured and cut into the ribs and spar, the rear spoiler bay spar can be glued between the outside ribs of the bay and inset into the inside ribs. Leave room for spoiler movement and make sure everything is flush before removing the spoiler and gluing the bay frame. I use a light but strong



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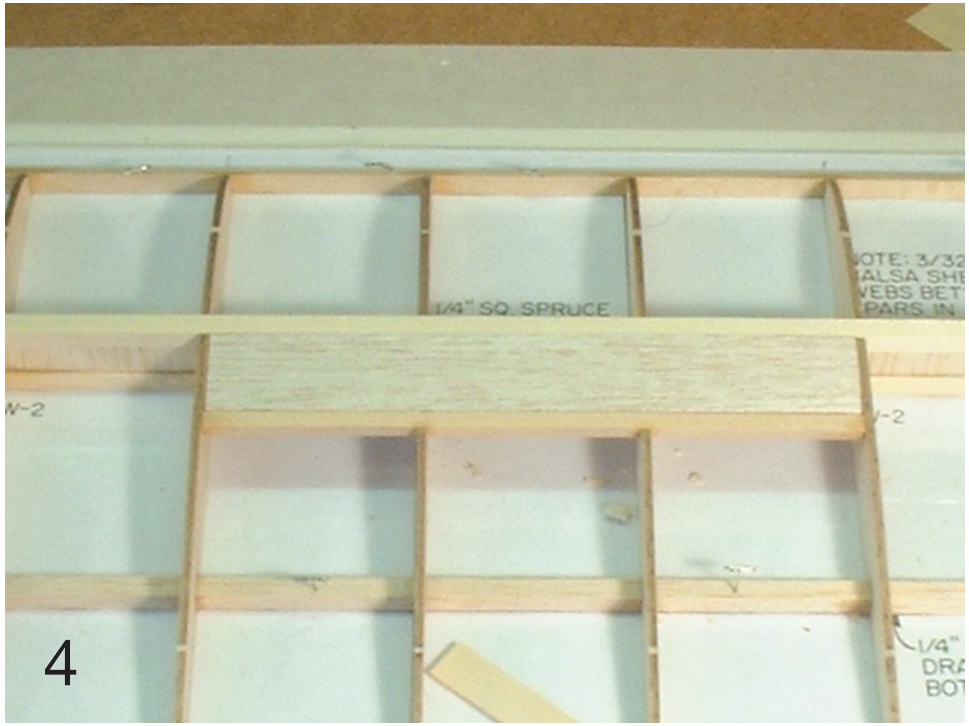

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spar material for the rear of the bay as this insures a strong bay and minimizes the chances of putting your thumb through the wing during final assembly. (Photo 4)

The next piece to be built and installed is the cross member that holds the tubing for the string that connects to the spoiler pull horn. Aviation ply is a good choice as balsa can break under the stress of the string being pulled. This piece will be located under the rear spoiler spar and can bridge the entire gap between center ribs or be a small square capable of supporting the tube. The location of this piece and its corresponding tubing hole is dependant on where you drill the tube holes through the rest of the ribs. One technique is to create a long circle arc through all of the ribs. (Photo 5)


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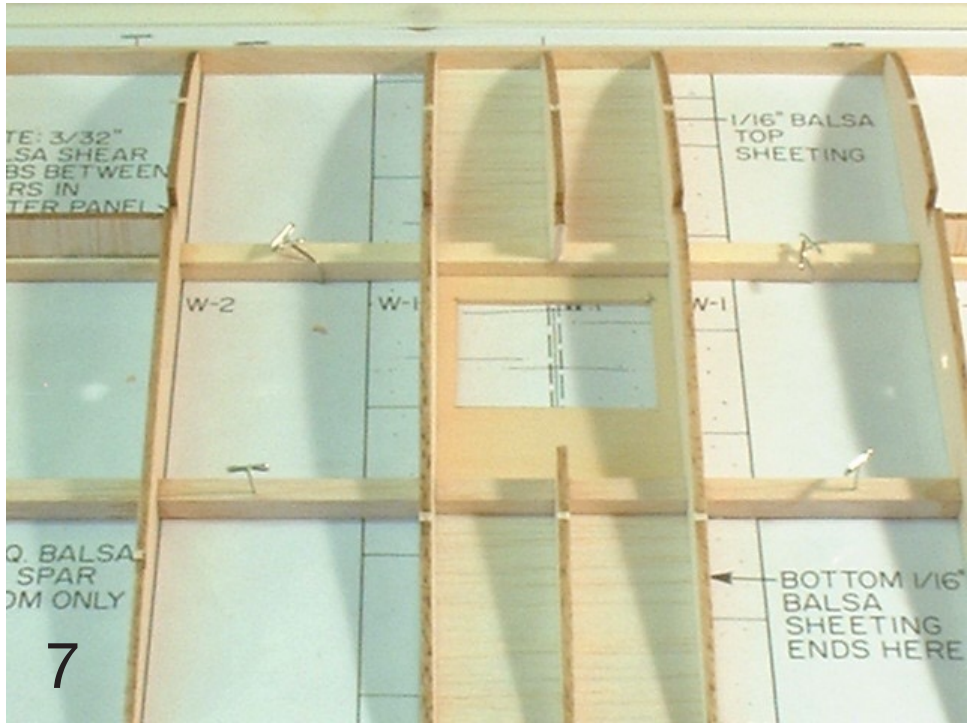
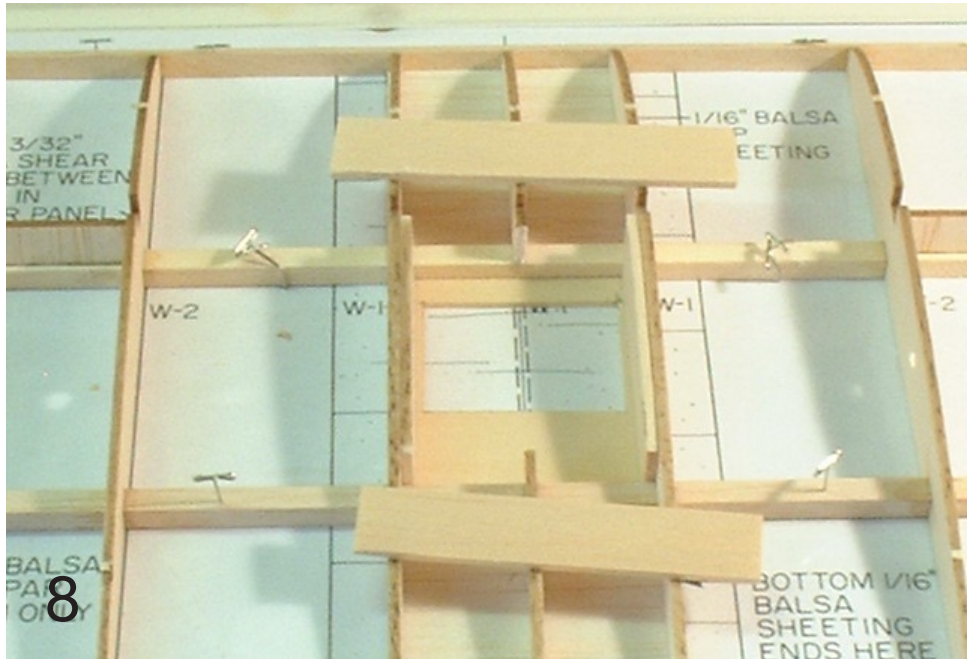
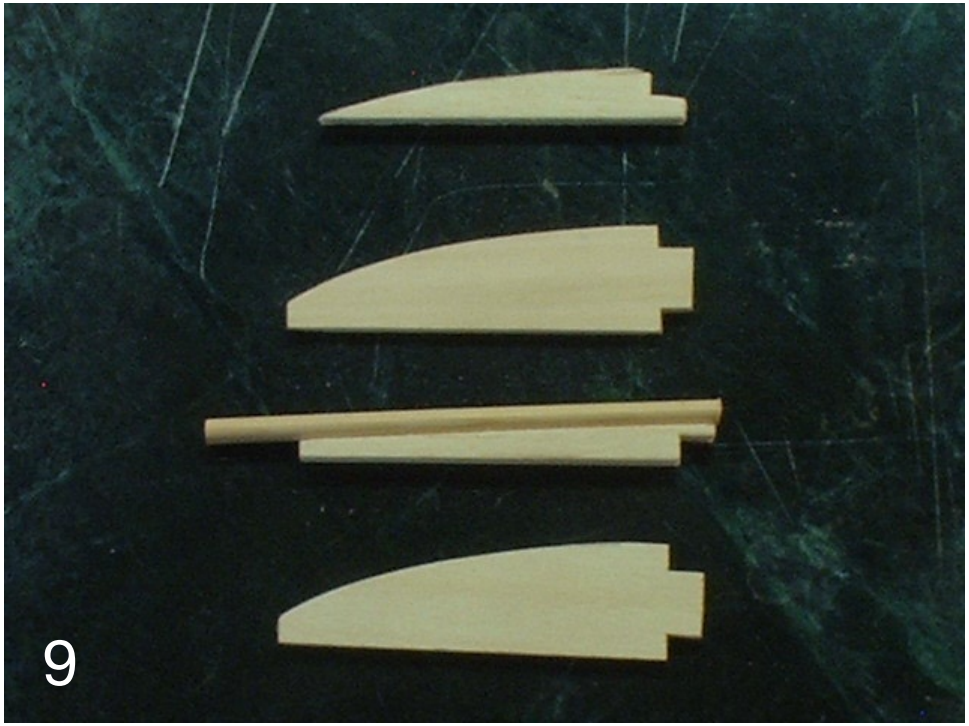




Another one is a straight tube pull ending in a full but tight arc in the last bay. Either way, failure to allow for a gentle bend in the right angle will result in a hard pull and undue stress on the entire spoiler assembly. The tubing comes from any hardware or hospital supply store and is very inexpensive. Now that the tubing has been planned but NOT glued, it is time to install the servo bay.

Today servos can be mounted anywhere. Theoretically, you could have two mini-micro servos, one in each bay, but let's save that for another article. For our spoilers we are going to center a servo between the spoilers and use a simple string pull on a long servo arm for activation. For this you must modify the center rib section of the wing. For the Olympic 650, the ribs W-1 are modified to accommodate a servo of choice.

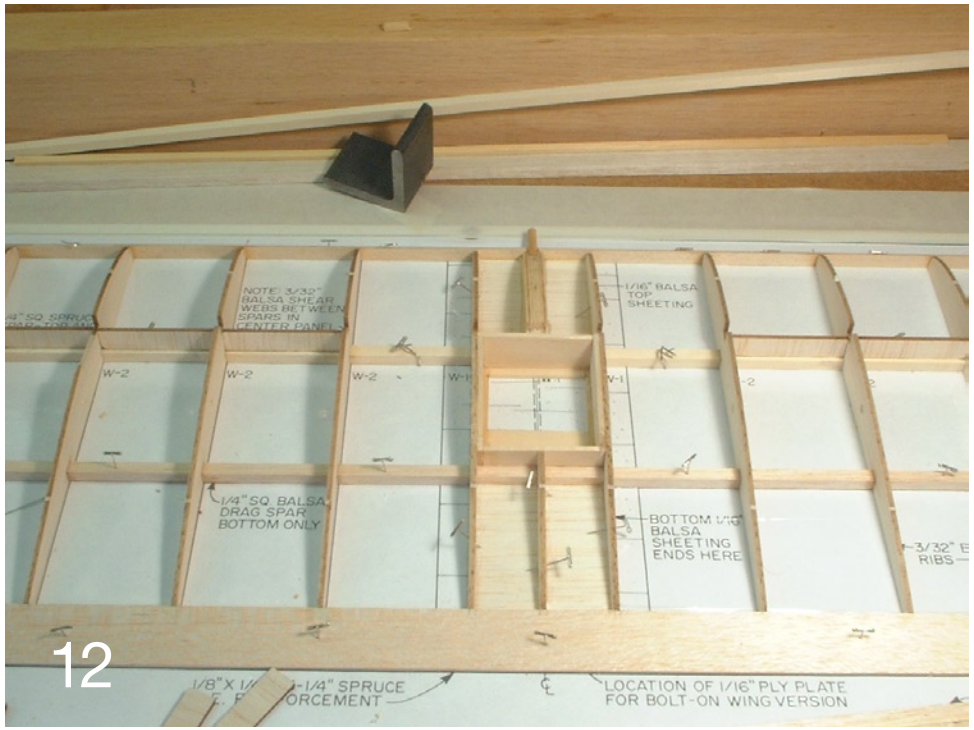


First you will need to plan and cut a hole in the center bay area just in back of the main spar assembly. (Photo 6)

I use 1/16th inch aviation ply to support the additional structure to be built around the hole. The “box is simply balsa doublers around the natural opening created by the hole you just cut in the bottom covering and the original rib and spar assembly. (Photo 7) Further planning will allow tubing holes to be drilled in both the ribs and doublers as well as placing them where they will most effectively meet the servo arm. Remember, planning is the key to success.

By now it is apparent that the center rib is cut to make room for the servo “box” assembly. By carefully cutting the rib you can locate it right up against the spars and box. (Photo 8) If you choose the rubber band method of wing attachment, simply cut the original rib to fit before finishing the wing. If you choose to finish the wing with the dowel insert on the center rib the following description will apply.

The following method of dowel placement is a simple sandwich comprised of 3/16ths balsa cut to the plans with the dowel sandwiched between the two balsa pieces and two 1/16th inch aviation ply outer pieces cut to the exact dimensions of the original interior rib. (Photo 9) Once built and measured to fit, glue together; and once dry, glue into place. Don’t forget to account for the indentation in the leading edge. When finished, the dowel, leading edge, center spars and the entire servo box; make for a bulletproof center section. (Photos 10, 11 and 12)



12

13

All that is left prior to finishing the wing is loading the tubing from the box to each spoiler bay as shown. Pulling slight tension on the tubing and taping it before gluing makes for a smooth sleeve. Remember to account for the 90 degree angle either throughout all the ribs or right at the end of the “pull.” (Photo 13)

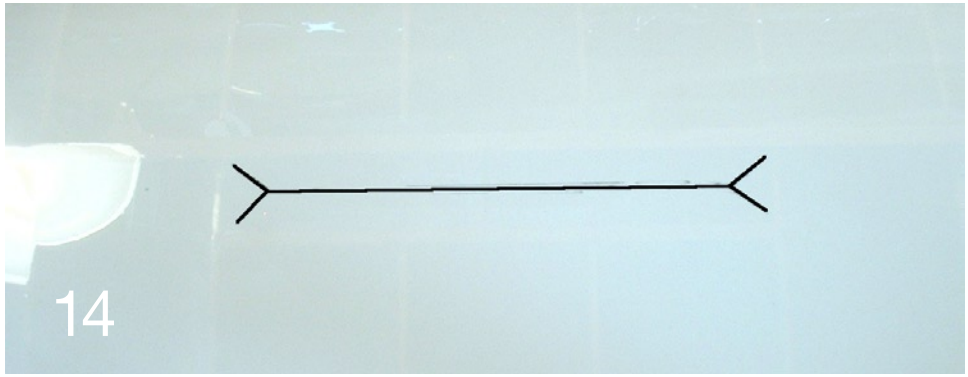
Let the epoxy dry thoroughly, cut the tubing and finish the wing as described in the instructions.

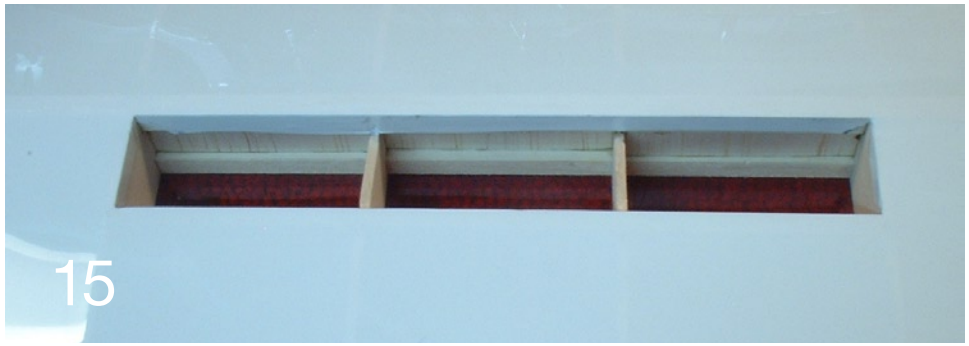
With the bays and servo box open you can cover the wing normally. You will simply install the spoilers and servo before you finalize the shrinking of the covering you have selected.

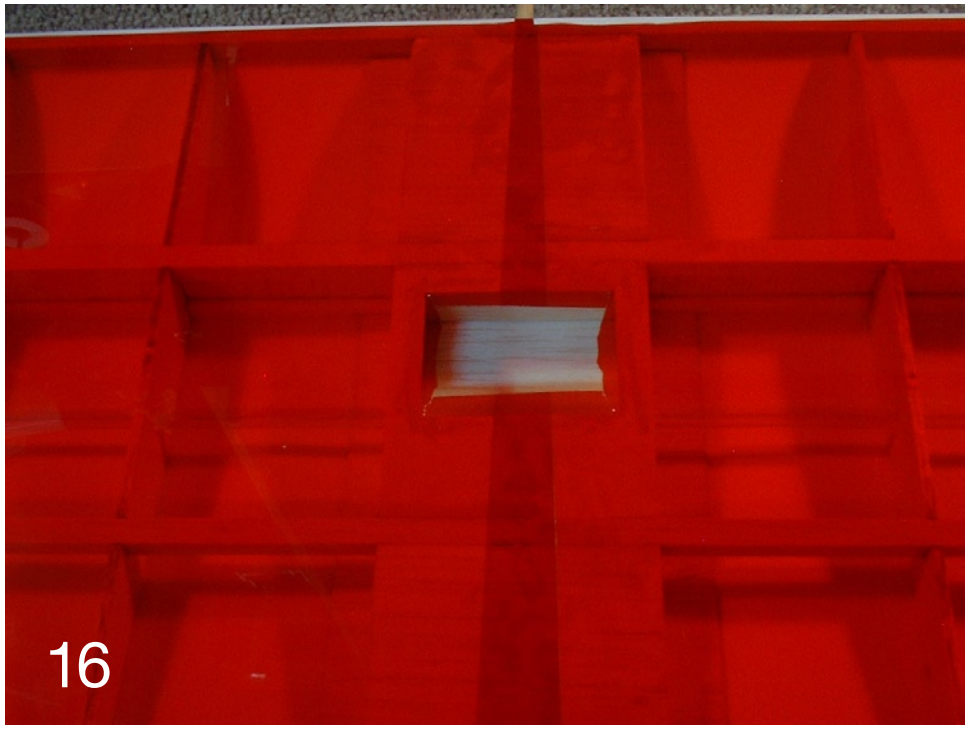
So now the wing is completely covered and in my case it has been flown several times. Obviously, if you do this before your first flights, cutting the MonoKote under less tension will be easier, but other than that, the following building process is identical. To install the spoilers I simply detach the wing tips for ease of construction and begin the final spoiler installation.

To open the holes in the covering where the spoilers and servo are installed, it is necessary to seal the covering onto the frame pieces before cutting and folding it around the opening. Cut to fit and wrap and seal as you go. A good way to start is by cutting outward and shallow from the corners and connecting the four shallow cuts with one long connecting slice. (Photo 14)

Be careful not to puncture the bottom of the wing covering both when cutting and when molding the covering around the frame. (Photo 15) Do the same with



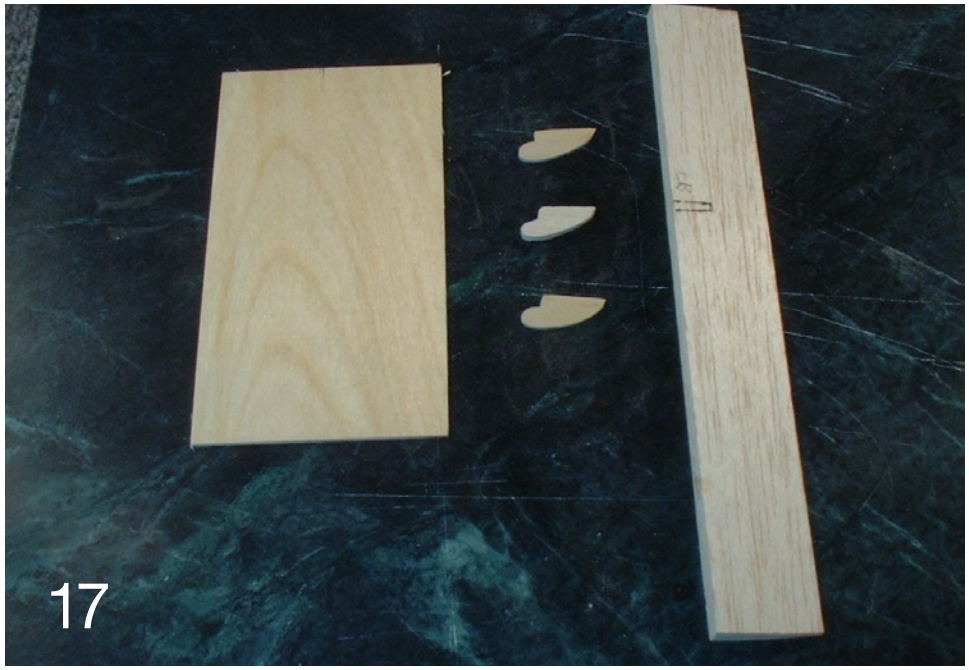




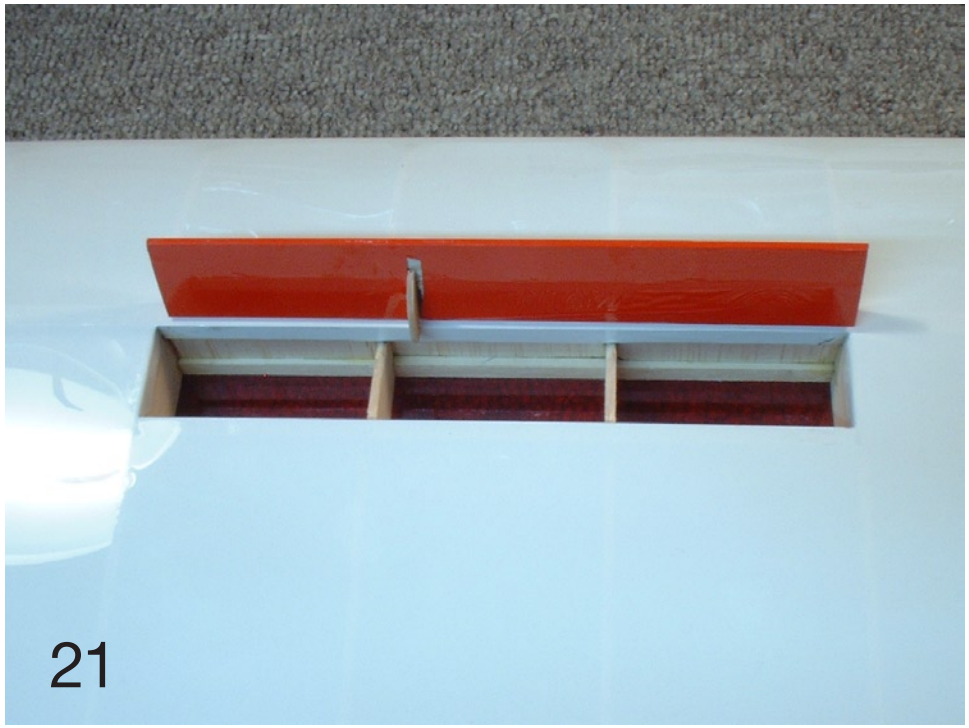
the servo opening and lightly shrink the covering around the openings to tightening up any imperfections that may be lingering around the holes. (Photo 16)

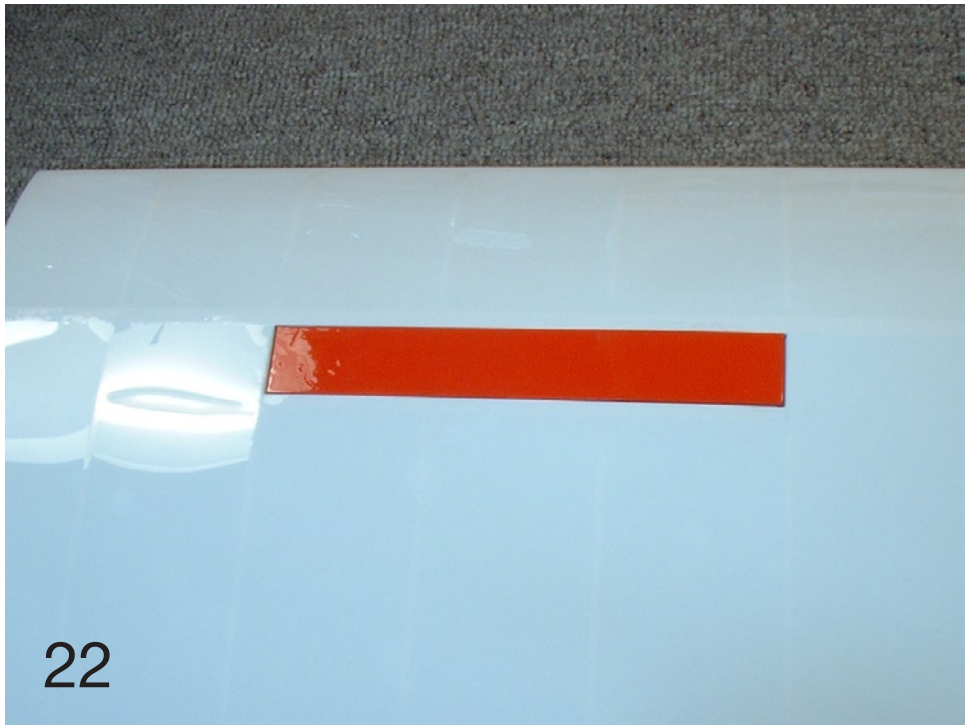
Now you are ready to install the spoilers, strings and servo.

Each spoiler will require a pull horn. They must be designed with a slight extension out from the bottom edge of the spoiler. (This is why you indented the center web a few steps ago.) A template can be made out of balsa for ease of shaping and then two of them reproduced in 1/16th inch aviation plywood. (Photo 17)



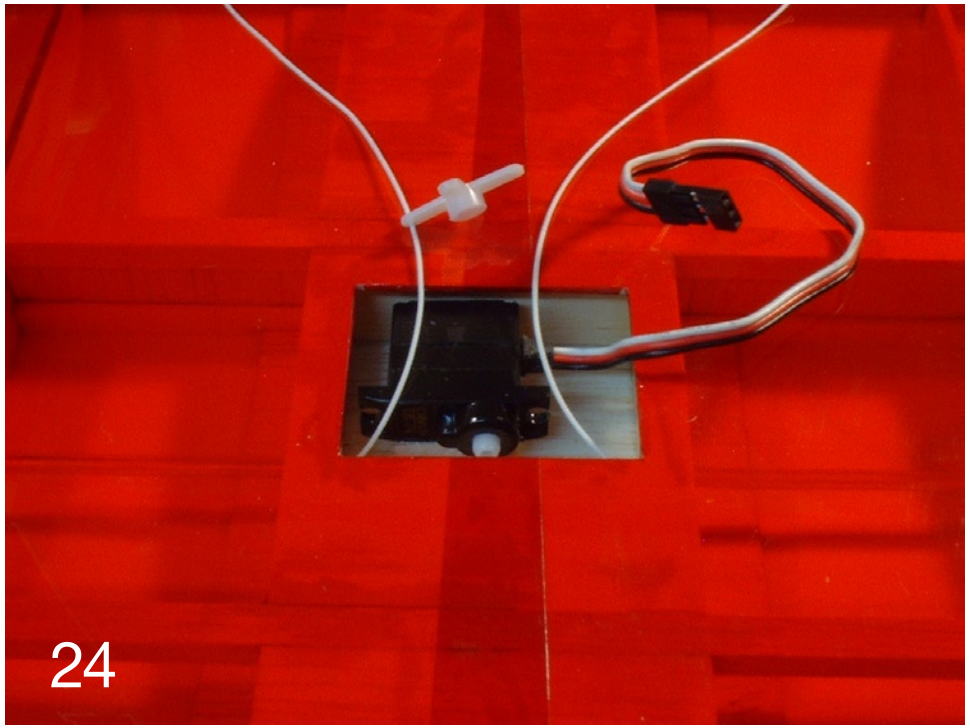
Once carved, a hole will be carefully drilled in the center of the under hang portion (center of the circle part) and glued into a small grove under the spoiler and in line to the tube exit point. (Photos 18, 19 and 20)





Now cover the spoilers and insure a solid but workable installation. (Photos 21, 22, and 23)

Once satisfied with the clearance you are free to tape the spoilers onto the wing using your favorite method of attachment. The servo can now be taped into place using a small block of balsa wood to elevate the servo allowing the extended servo horn to rotate freely. I use fiber reinforced carpet tape for both the small block and the servo. The spoiler string is threaded through the tube and attached to the spoiler pull horn using a toothpick as a wedge. Cut the toothpick off carefully as you don't want to snap the pull horn off the spoiler. This is an easy install and allows for replacement of the string.



Push the strings through the wing and attach both to the servo arm. (Photo 24) Now tighten the knots carefully and install the servo arm to the servo. Tighten the hitched knots until there is equal tension on each servo. Once the strings are locked in place, you MUST detach the servo arm before activating the servo electronically since you can't guarantee the center of the servo movement.

Add a servo wire extender as needed to reach and activate the correct channel on your radio. I use the throttle stick pulling toward me for spoiler activation, but you may prefer a no nonsense toggle switch. Again, personal preference is the benchmark for setting up your radio. Once the spoiler channel has been located and setup, you are free to reattach the servo arm. Check to see that the spoilers open evenly when activated and adjust the knots if they do not. (Photos 25 and 26) That's it.

Good luck and enjoy your THREE channel Olympic 650!

Cuesta Ridge in San Luis Obispo with Morro Rock in Morro Bay, California in the background. If you look closely you should be able to see the three smoke stacks for the power plant to the right of the rock. The plane is a Tangent ASH-26 with spoilers and flaps. All JR electronics inside, flown with a JR XP9303 transmitter. Photo by David Copple. FujiFilm FinePix S5000, ISO 200, 1/640 sec., f9.0, 17.2 mm.

SD4 Update

an F3B capable 'wing

By Stephane De La Haye Duponsel, theduponsels@yebo.co.za

My SD4 is flying well, and I've compiled some information lacking from the original article published in the April 2007 issue. I've also accumulated some contest experience in addition to being able to measure some performance parameters using an on-board data logger.

Airfoils Three airfoils are involved in the SD4.

The HQs-1, 5_9, 0 is the original Helmut Quabeck airfoil that I modified to have a higher camber and thickness and is not used at all, just provided for those who are interested to see where my airfoil was derived. The idea was to have the same maximum lift as the popular MH45, but with less drag at the high angle of attack.

The wing uses the HQs_1, 64_9, 8 airfoil all the way through, with no wash out.

The HQs_1, 64_9, 8_90deg to LE is the HQs_1, 64_9, 8 modified so that one can place the template at 90 degrees to the leading edge. It makes for simpler geometry of rectangular foam blocks instead of swept ones. If you take a cross section of the wing at 90 degrees to the leading edge it ends up being a 10. 85% airfoil with 181mm chord instead of 9. 81% 200mm chord.

Contest flying I did enter my wing in a contest the day after maidening. I actually had no other glider to fly (I went through two gliders in one F3B event recently) and I wanted to participate, so what the hell!

I took the opportunity, putting my ego aside to test and get used to the glider. It is quite daunting with no experience and all eyes watching and ready to point the finger at my audacity for entering with a wing.

I was still getting to know the glider and flying mistakes also due to bad set-up did not help on a really windy day with more sink than lift.

On one of the later rounds I did get 1000 points once I got the hang of things, but too little too late!

I did get some comments from the peanut gallery, though they were impressed with the launch - they have only seen wings taking off like darts at high speed. I did learn a lot, and I gave it a proper go at our next thermal league.

I flew in a thermal league on April 1, and the rules this time had a bit of a twist for fun. We flew 6 rounds, 12min instead of 10min per round. And the landings were marked at 20cm intervals instead of 1m. It was not the usual man on man event - we were given one hour per round for all the members of our team to finish their flight.

I came 9th out of 19 open class entrants, with the scores being very tight from 10th place. I maxed four out of six rounds and most of the points lost were due to landing errors. Saving my beautiful wing was more important than the points, so I did not do the usual dork style and instead greased the landings only giving me +/- 3m spots.

The wing definitely needs to be structurally improved for competitive use. A 3-piece structure to handle the dorking and some metal geared servos just for the middle flap would stop those from stripping. Otherwise landing approach is now better controlled. Glide ratio control and hitting the spot at a reasonable speed at +/- 2 sec from target time is no problem, but still not as good as conventional for last second changes.

I flew my friend's Escape, a Muller design, for the last round, because in the 5th round I damaged some servos during an out landing. I was trying to ride a small bubble about 50m of the ground, far away and could not make it back home.

Anyway, the Escape was horrible to fly. Dropping its wing tip if I slowed it down to SD4 speed in a thermal, and it was very difficult to slow down for landing. I must say that with negative feedback from other pilots about wings, one is quick to criticize. But in the same late afternoon conditions the Escape was more difficult to fly, and I got a worse time than the one with the SD4 in the weak lift conditions.

Sink rate I wanted to get some proper data on the minimum sink ability, so I set off at sunrise one day to do some tests in "dead air " conditions with the data logger.

The best flight descent rate was 0. 41m/sec and worst was 0. 51m/sec with flight times ranging from 7min 30sec to 5min 45sec. There was a slight tail wind - of course the direction had to change 180 degrees after I laid out the winch. So winch launch heights were not great, ranging from 180m to 200m. I use 65mm diameter cams on my winch in calm or windy conditions to get good line speed.

My friend braved the early morning with me and flew his Supra. At the beginning I was really impressed to find out that I was beating him easily, but only to find out later that his poor launch heights were due to his winch. When he launched with mine he was getting similar launch height, but by the then thermals started kicking in and we could not compare.

It is for sure that his minimum sink is much better, but by how much I don't know. He had a data logger in his and he later gave me his minimum sink rates. It is interesting to see how these two ships compare under the same conditions.

My friend's Supra data in the same air is as follows:

Minimum sink was 0. 4037, 0. 3556 and 0. 42986 m/s. So on average about 20% longer hang time than the wing.

To put this in perspective, here is the data for both machines:

Supra Wing area: 67. 6 dm
Stab area: 5. 38 dm
Weight: 1800g

SD4 Wing area : 60 dm
Weight:1700g

The performance of the SD4 is equal to or maybe slightly better than that of the Supra once airspeed is taken into account.

My suspicion is that a wing will do better in a distance task.

Further considerations After going through a couple of cracked wing joiners after spot peg landings I am not so sure if using a 2-piece wing is the way to go.

I have managed to solve the problem by preventing the wings from flexing forward by using some 5mm grob nuts at the ends of the rear wing joiner. This stops the sliding in the rear wing joiner and without flex the carbon joiner can withstand the impact.

The advantage of using a 2-piece wing is that you are maximizing the weight distribution near the nose where one needs it for balancing. There is also no awkward 25 degree joining and structure of the middle panel of a three piece wing.

But after building the 100g fuselage I could only use a small NiMH 850mAh AAA battery pack as it was too nose heavy, so in hindsight going with a three piece wing will probably be the strongest and only a touch heavier. And I will be able to use a larger battery pack.

Active stabilization When I have more time I will use this glider (if it is still alive) as a test bench for active stability using a micro processor and wind vane angle of attack sensor. That way I can still have pitch stability with the CG much further back.

I think that this is the next step forward for a flying wing. It might also have some benefits for conventional gliders.

I develop projects using micro processor design for my work, so this is just up my alley.

There is a fellow who has built a tailless glider using this concept (Albatross) and he managed to have stability with a CG as far back as 28%. I am thinking that using a swept wing will give the glider more aerodynamic stability and thereby help the active stability to work with an even further back CG.

The one disadvantage is that the drag from control surfaces increases dramatically as the CG is moved even slightly backward.

For a flying wing I would initially keep the CG the same, having more stability on the pitch would already be a huge gain. One could also put a limit on the angle of attack just before stall. It would need a movable CG for different tasks (preferably changeable during flight).

I don't think that it is illegal now, but if the wing starts outperforming with active stability you can be sure that they will ban it.

SD4 is no more... My development on my SD4 has come to a grinding halt yesterday, May 20, when it got shot down on the same frequency. Another pilot forgot to put his peg on the frequency board. There are a few souvenirs left, but that is it!

I was quite excited to be able to participate at the f3b clinic yesterday in preparation for the f3b team going to the world champs soon. So on Friday afternoon I did a few tests using ballast for the first time.

I was relieved to see that there was no visible affect on roll rate or handling while holding ballast up to 70cm from the root into the wings. There is space to go up to 550g in each wing, but I only went up to 360g as it was more than enough to make the wing go like a missile during speed run tests, even in a stiff wind.

Launch height is about the same as without ballast in the same conditions, so might as well ballast up for speed tasks.

What I learned:
Wing loading for speed: 40g/dm
Wing loading for distance : 34g/dm

Unfortunately, the accident happened on my first launch of the day, so I did not get to compare to the best.

What I did observe is that the f3b team is definitely beating the wing in launch height, no surprise there ! Even though the conventional design needs very high wing loading to penetrate, the extra launch height gained off sets the extra time needed in a dive to reach a good speed. Observing my tests the wing needs a lot less dive to reach good speed, but still not enough to better the height advantage of the conventional.

I have done a few mock test runs and based on my experience and the data logger info I think the wing will get a average time of around 22sec for speed. It is a good 4sec off the average conventional speeds, but with about 50m less height to start with.

I think that a lot of launch height can be gained buy simply using much thinner line as the wing pulls less tension than conventional. But the wear and tear from friction on the ground will make life very unpleasant and costly changing lines every couple of flights. The f3b team broke around 7 lines yesterday, crazy stuff they go through to get any extra advantage!

My experiences with the SD4 encourage me to continue developing a 'wing . It has been fun, and I might build another 'wing soon, but time is currently lacking.

HQs-1, 5_9, 0

1. 00000000 0. 00000000	0. 00000000 0. 00000000
0. 99114000 0. 00055000	0. 00025000 -0. 00175000
0. 97553000 0. 00153000	0. 00099000 -0. 00330000
0. 95241000 0. 00319000	0. 00222000 -0. 00467000
0. 92216000 0. 00568000	0. 00616000 -0. 00699000
0. 89508000 0. 00820000	0. 01204000 -0. 00949000
0. 85355000 0. 01256000	0. 02447000 -0. 01287000
0. 80645000 0. 01817000	0. 05450000 -0. 01777000
0. 75452000 0. 02480000	0. 07784000 -0. 02047000
0. 69857000 0. 03205000	0. 10492000 -0. 02286000
0. 65451000 0. 03753000	0. 14645000 -0. 02557000
0. 60907000 0. 04281000	0. 19355000 -0. 02758000
0. 54705000 0. 04918000	0. 24548000 -0. 02892000
0. 50000000 0. 05309000	0. 30143000 -0. 02983000
0. 45295000 0. 05605000	0. 34549000 -0. 03009000
0. 40631000 0. 05822000	0. 40631000 -0. 03021000
0. 34549000 0. 05975000	0. 45295000 -0. 03003000
0. 30143000 0. 05980000	0. 50000000 -0. 02941000
0. 24548000 0. 05864000	0. 54705000 -0. 02831000
0. 19355000 0. 05662000	0. 60907000 -0. 02606000
0. 14645000 0. 05130000	0. 65451000 -0. 02386000
0. 10492000 0. 04526000	0. 69857000 -0. 02158000
0. 07784000 0. 03955000	0. 75452000 -0. 01844000
0. 05450000 0. 03324000	0. 80645000 -0. 01533000
0. 02447000 0. 02189000	0. 85355000 -0. 01203000
0. 01204000 0. 01487000	0. 89508000 -0. 00879000
0. 00616000 0. 01022000	0. 92216000 -0. 00660000
0. 00222000 0. 00573000	0. 95241000 -0. 00407000
0. 00099000 0. 00378000	0. 97553000 -0. 00211000
0. 00025000 0. 00187000	0. 99114000 -0. 00077000
	1. 00000000 0. 00000000

The HQs-1, 5_9, 0 is the original Helmut Quabeck airfoil that I modified to have a higher camber and thickness and is not used at all, just provided for those who are interested to see where my airfoil was derived.

HQs 1, 64_9, 8

1. 00000000	0. 00000000
0. 99726094	0. 00018614
0. 98907372	0. 00073768
0. 97552803	0. 00167231
0. 95677225	0. 00312544
0. 93301189	0. 00519113
0. 90450728	0. 00797035
0. 87157076	0. 01158525
0. 83456323	0. 01612452
0. 79389022	0. 02158501
0. 74999742	0. 02776540
0. 70336580	0. 03437566
0. 65450633	0. 04104183
0. 60395441	0. 04744352
0. 55226392	0. 05324436
0. 50000123	0. 05804290
0. 44773896	0. 06160537
0. 39604966	0. 06408017
0. 34549959	0. 06534025
0. 29664252	0. 06530726
0. 25001361	0. 06433756
0. 20612360	0. 06266778
0. 16545318	0. 05878593
0. 12844777	0. 05350377
0. 09551263	0. 04752611
0. 06700841	0. 04025114
0. 04324722	0. 03241588
0. 02448924	0. 02397837
0. 01093985	0. 01547044
0. 00274738	0. 00702186
0. 00000000	0. 00000000
0. 00273309	-0. 00555339
0. 01091483	-0. 00986190
0. 02445659	-0. 01402225
0. 04320988	-0. 01761276
0. 06696905	-0. 02106143
0. 09547356	-0. 02411160
0. 12841089	-0. 02674164
0. 16541994	-0. 02892503
0. 20609503	-0. 03052703
0. 24999031	-0. 03167514
0. 29662469	-0. 03248333
0. 34548709	-0. 03284981
0. 39604207	-0. 03298303
0. 44773565	-0. 03282725
0. 50000145	-0. 03211167
0. 55226681	-0. 03074894
0. 60395914	-0. 02868018
0. 65451212	-0. 02606423
0. 70337195	-0. 02328203
0. 75000338	-0. 02043770
0. 79389558	-0. 01760614
0. 83456773	-0. 01465733
0. 87157428	-0. 01163821
0. 90450983	-0. 00878254
0. 93301357	-0. 00623071
0. 95677323	-0. 00404717
0. 97552849	-0. 00230735
0. 98907388	-0. 00103689
0. 99726096	-0. 00026066
1. 00000000	0. 00000000

The wing uses the HQs_1, 64_9, 8 airfoil all the way through, with no wash out.

HQs_1, 64_9, 8_90deg to LE

1. 00000000	0. 00000000
0. 99726094	0. 00018614
0. 98907372	0. 00073768
0. 97552803	0. 00167231
0. 95677225	0. 00312544
0. 93301189	0. 00519113
0. 90450728	0. 00797035
0. 87157076	0. 01158525
0. 83456323	0. 01612452
0. 79389022	0. 02158501
0. 74999742	0. 02776540
0. 70336580	0. 03437566
0. 65450633	0. 04104183
0. 60395441	0. 04744352
0. 55226392	0. 05324436
0. 50000123	0. 05804290
0. 44773896	0. 06160537
0. 39604966	0. 06408017
0. 34549959	0. 06534025
0. 29664252	0. 06530726
0. 25001361	0. 06433756
0. 20612360	0. 06266778
0. 16545318	0. 05878593
0. 12844777	0. 05350377
0. 09551263	0. 04752611
0. 06700841	0. 04025114
0. 04324722	0. 03241588
0. 02448924	0. 02397837
0. 01093985	0. 01547044
0. 00274738	0. 00702186
0. 00000000	0. 00000000
0. 00273309	-0. 00555339
0. 01091483	-0. 00986190
0. 02445659	-0. 01402225
0. 04320988	-0. 01761276
0. 06696905	-0. 02106143
0. 09547356	-0. 02411160
0. 12841089	-0. 02674164
0. 16541994	-0. 02892503
0. 20609503	-0. 03052703
0. 24999031	-0. 03167514
0. 29662469	-0. 03248333
0. 34548709	-0. 03284981
0. 39604207	-0. 03298303
0. 44773565	-0. 03282725
0. 50000145	-0. 03211167
0. 55226681	-0. 03074894
0. 60395914	-0. 02868018
0. 65451212	-0. 02606423
0. 70337195	-0. 02328203
0. 75000338	-0. 02043770
0. 79389558	-0. 01760614
0. 83456773	-0. 01465733
0. 87157428	-0. 01163821
0. 90450983	-0. 00878254
0. 93301357	-0. 00623071
0. 95677323	-0. 00404717
0. 97552849	-0. 00230735
0. 98907388	-0. 00103689
0. 99726096	-0. 00026066
1. 00000000	0. 00000000

The HQs_1, 64_9, 8_90deg to LE is the HQs_1, 64_9, 8 modified so that one can place the template at 90 degrees to the leading edge. It makes for simpler geometry of rectangular foam blocks instead of swept ones.

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