Radio Controlled Soaring Digest

September
Vol. 32, No. 09

CONTENTS

September 2015
Vol. 32, No. 09

Front cover: Chris Williams' new 1/4 scale Scheibe Bergfalke IV on its maiden flight at White Sheet Hill 2015.
Canon EOS 70D, ISO 100, 1/1250 sec., f5.6, 100 mm

Back cover: "Before the Storm," a photo by Gorazd Pisanec. "This picture was taken on the slope Kebelj on the mountain Pohorje near my hometown. The two models are a Viking and a Stinger. Yes, the large cylinder is wrapped grass. I was using a Sigma 18-125mm lens."
Olympus E520, ISO 100, 1/80 sec., f4, 18mm

"Sailaire over Tucson Arizona." Photo by David Nutt. Olympus E-PL1, ISO 200, 1/1600 sec., f11, 42mm

R/C Soaring Digest

September 2015

Volume 32 Number 09

Managing Editors, Publishers Bill & Bunny (B^2) Kuhlman

Contact bsquared@rcsoaringdigest.com
http://www.rcsoaringdigest.com
Yahoo! group: RCSoaringDigest
FaceBook: https://www.facebook.com/RCSoaringDigest

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 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.

———

Published by B2Streamlines
http://www.b2streamlines.com
P.O. Box 975, Olalla WA 98359

———

RC Soaring Digest is published using Adobe InDesign CS6

In the Air

July 25, 2015

Dear Bill & Bunny,

It gives me great pleasure to inform you that you are the recipients of this year's Le Gray Award. This award is given yearly to the person or persons whom the League of Silent Flight deems to have made a significant contribution to R/C soaring. Your "labor of love," the *RC Soaring Digest*, has been and continues to be an extremely useful source of information to the whole R/C soaring community from rank beginner to seasoned expert. I'm sure Jim Gray would be very proud of what you have accomplished. May you long continue to provide this valuable service.

Congratulations and thank you,

Jim Deck, LSF President

August 1, 2015

Dear Jim,

Our sincere thanks to all at the League of Silent Flight for honoring *RC Soaring Digest* with this award. This is a truly humbling experience for us. We owe a debt of thanks to Jim Gray for seeing the need for *RCSD* back in 1984, to Judy Slates for her role in evolving the substance and format, to everyone who has submitted materials for publication over the decades, and to those readers all over the world who are both supporters of *RCSD* and evangelists for RC soaring.

Bill & Bunny Kuhlman

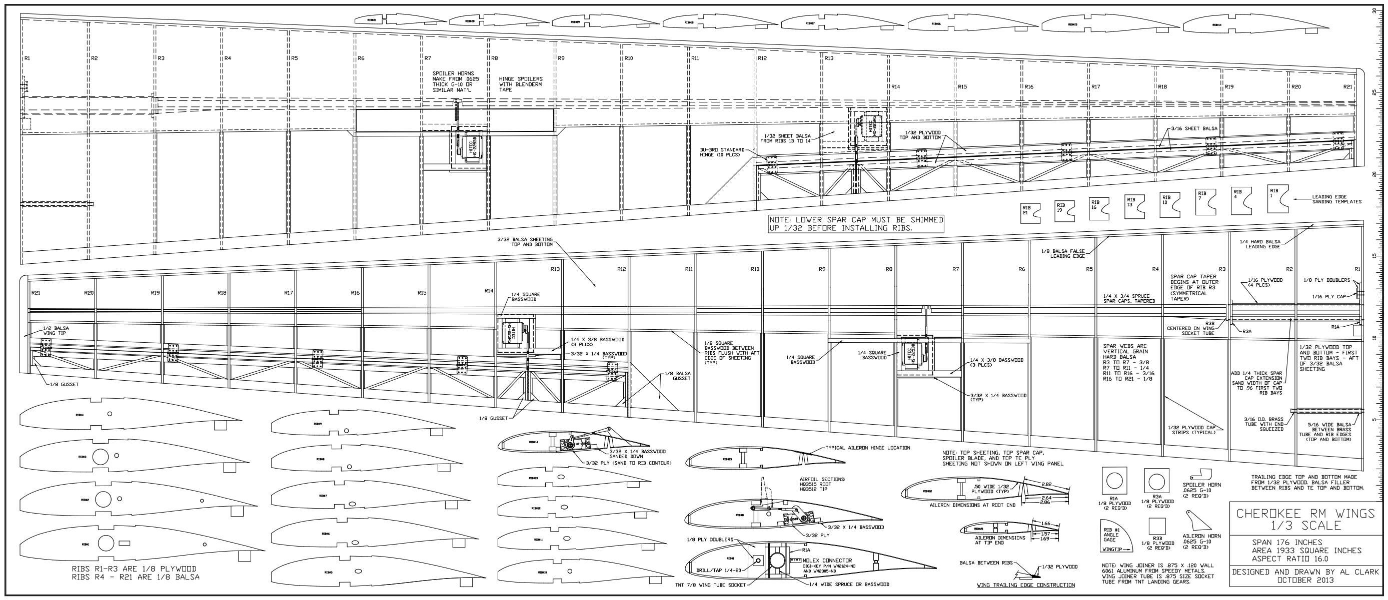
Construction log

1:3 Cherokee RM, Part 4

Edited from <http://www.rcgroups.com/forums/showthread.php?t=2127351>

Al Clark, hotdogx@knology.net

Wing Construction



Before wing construction begins, the spar caps, trailing edges, false leading edges, and leading edges need to be spliced from four foot stock.

For the 1/4" X 3/4" spar caps, use the 12:1 rule which gives 9 inch long scarf joints.

These are done the same way as the fuselage longeron scarf joints detailed in previously, except the glue is 15 minute epoxy. Mix a fresh batch for each spar cap joint so it will have a bit of time to wick into the wood before it sets.

I used small clamps to put light pressure on these scarf joints while they cured – don't use too much pressure or the joints will slide apart.

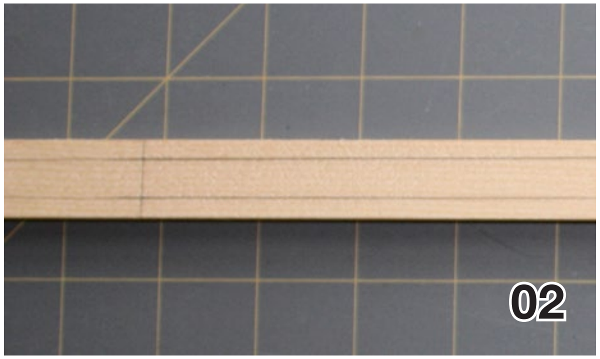
One of the finished scarf joints is shown in pic 1.

Trim the length of the joined spar caps to about 1/8" longer than required; the excess will be trimmed off at the tip when construction is almost done.

The joined spar caps must be tapered to 1/4 inch width starting just outside of rib #3. Draw a line across the spar cap 8.25 inch from the root end (this is the outside of rib #3).

Measure the distance between this line and the end of the spar cap, and divide by four.

Mark a line across the spar cap at each point so you will have four equal lengths.

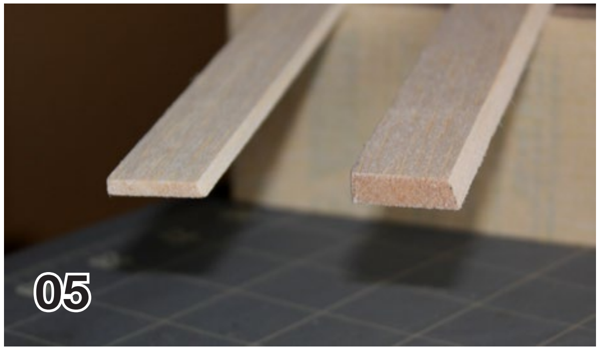


01. Splice joint; 12:1, so splice is 9" long.

03. Close-up of taper at spar cap root.

04. Finished spar cap with double taper.

05. A finished false LE and LE with the bottoms beveled at 22 degrees.



At the line closest to the end of the spar cap make two marks 3/8 inch apart centered on the spar cap. At the next line make two marks 1/2 inch apart, and at the next make two marks 5/8 inch apart.

Now you can connect the marks on each side with a pencil and straightedge and this will be your guide for tapering the spar cap. See pic 2 which shows the lines with the two marks that are 1/2 inch apart.

I used a scroll saw to cut off the wood outside the pencil lines, and finished up with a 12 inch sanding block with 60 grit paper, followed by 220 paper. Make sure when sanding that you don't sand an angle on the sides of the spar cap – the cross section of the spar cap should be rectangular (square at the tip).

After the spar cap tapering is done, add the 1/4 square spruce pieces to the edge of the spar at the root end using CA+ or 15 minute epoxy.

These pieces run straight for 8.25 inches and then taper over the next 3.875 inches. They add the necessary width to the spar cap to accommodate the wing rod socket tube in the first two rib bays.

Once these 1/4 square spruce pieces are added, sand the outer edge a bit so the width of the widened spar cap ends up at .96 inches. See pic 3.

A finished, tapered spar cap with the widened root end is shown in pic 4.

The 1/32" ply trailing edge pieces are not primary structure so an 8:1 scarf joint is OK (about 5 inches long).

Cut the trailing edge pieces to their tapered size measuring off the plan to get the correct widths. Don't forget to account for the 5 inch scarf joint length when checking the plan for the trailing edge width on the outboard trailing edge piece (e.g. make the measurement at 43 inches wingspan for the wider end, not 48 inches).

Use 15 minute epoxy or CA+ on the scarf joints and make sure the trailing edge pieces are perfectly flat when glued so the edges line up well. After gluing, trim all four trailing edge pieces to about 1/8 inch longer than the required length.

The 1/8" thick false leading edge pieces are cut from a 3" X 48" balsa sheet and also use a 5 inch long scarf joint.

Check the plan rib heights to determine how wide to cut the false leading edge pieces - add at least 1/8 inch to the widths so you will have enough material to sand the bottom and top of the false leading edge flush with the ribs later. If you want, you can bevel the bottom edge of the false leading edge pieces at 22 degrees now to match rib #1, but be aware that the angle of bevel decreases as it goes towards rib #21.

Trim final length to 1/8 longer than required. Cut the leading edge pieces from a 1/4" thick sheet of 3" X 48" hard balsa, and join with a 5 inch scarf joint. Again bevel the bottom of the leading edge now if you like. Don't forget that the leading edge is taller than the false leading edge (check the plan for widths and add some extra width for shaping later).

Pic 5 shows a finished false leading edge and leading edge with the bottoms beveled at 22 degrees.

At this time it's a good idea to sand off some of the charring from the edges of the laser cut ply and balsa ribs using a block with 220 grit. No need to remove all of the charring, just get some of it off to help ensure a good glue joint. Be careful on the balsa ribs not to change the contours.

Now the gluing of the wing parts can begin!

Right wing

I started on the right wing.

Lay the lower spar cap over the plan and mark the position of each rib on the spar cap. Pick up the spar cap and do a fit check on each rib. Due to the variance in spar cap material thickness, and also a little variance in the taper width, some of the rib notches will likely need to be sanded a bit to get a good fit. The spar cap needs to end up flush with the outer edge of the ribs.

Make up some 1/32" shims from leftover 1/32" plywood – one shim per rib. Put some wax paper over the plan and place the shims down on the plan near each rib.

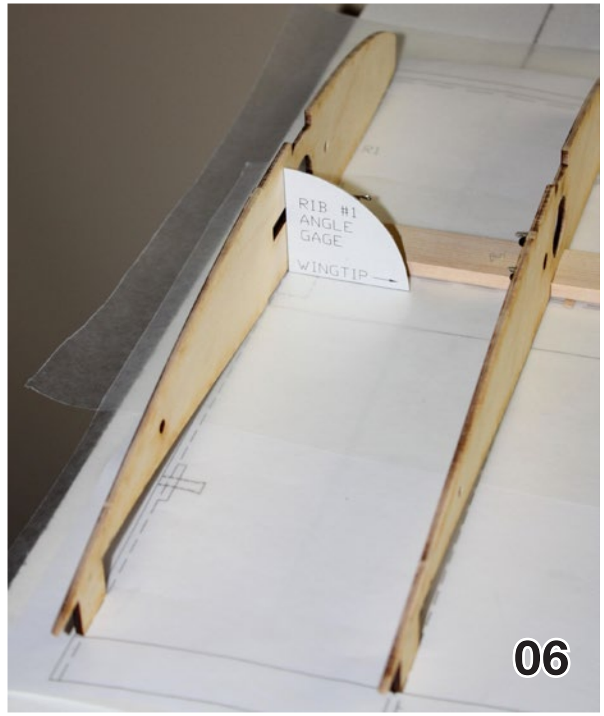
Pin the spar cap down over the plan so the front edge aligns with the plan. Don't worry about the rear edge – we are going to reference everything off the front edge of the spar cap.

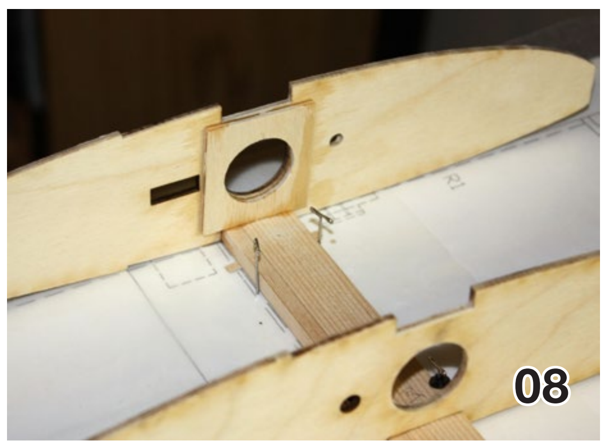
Dry fit each rib to the spar. The tab at the aft end of each rib needs to be sitting on the building board when the rib is in position on the spar cap – adjust the spar cap notch in the ribs if necessary.

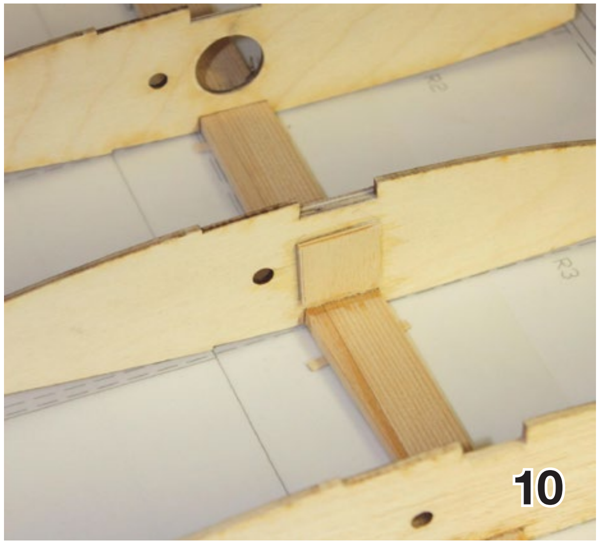
Starting with rib #2 glue each rib to the lower spar cap using a small square to make sure each rib is perpendicular to the building surface.

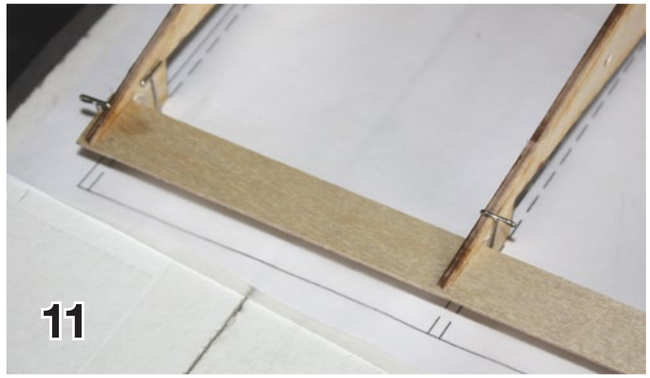
Now go back to rib #1 and use the angle gage to glue it at the proper angle – make sure this rib aligns well over the plan so it fits properly against the fuselage center section later. See pix 06 and 07.

Glue the wing socket tube doublers R1A and R3A onto the outboard side of rib 1 and the root side of rib 3 with CA. See pix 08 and 09.









Glue R3B to the outboard side of rib 3, centered on the wing socket tube hole. R3B serves as the wing tube stop when inserting the wing tube later on. See pic 10.

Position one of the 1/32" plywood trailing edges onto the aft end of the ribs with a few small clamps or clothespins. See pic 11.

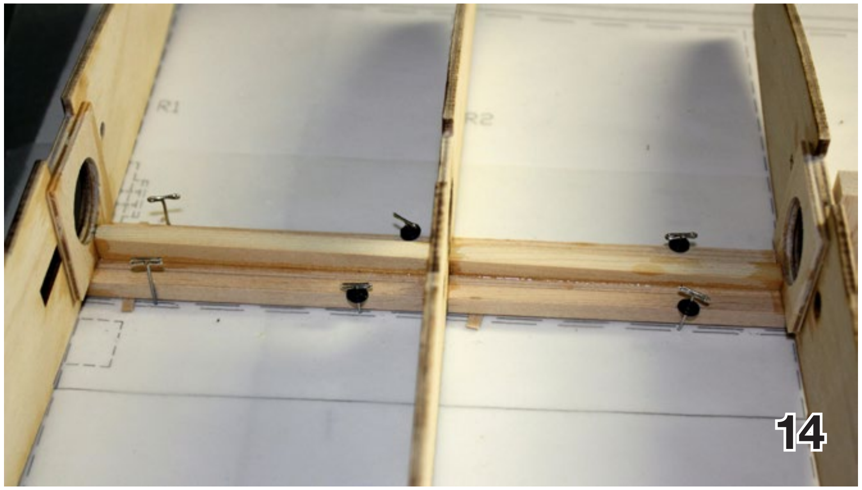
Measure from the wing tube socket hole to the aft edge of the trailing edge on the fuselage center section and set the wing trailing edge position to match this distance.

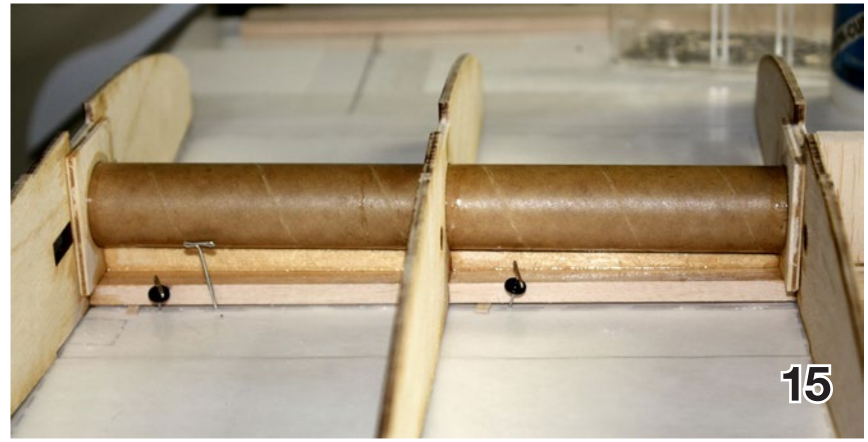
The aft edge of the trailing edge should end up about 1/64" to 1/32" behind the aft end of rib #1.

Set the trailing edge position at rib #21 so the aft edge is behind the end of the rib the same amount.

12. Lower 1/32" plywood trailing edge glued in place.

13. Rear view of the lower trailing edge glued in place.





Sight down the trailing edge and adjust its position at rib #11 so it is straight. Go back and double check the position at rib #1 and rib #21 and CA the trailing edge at ribs #1 and #21.

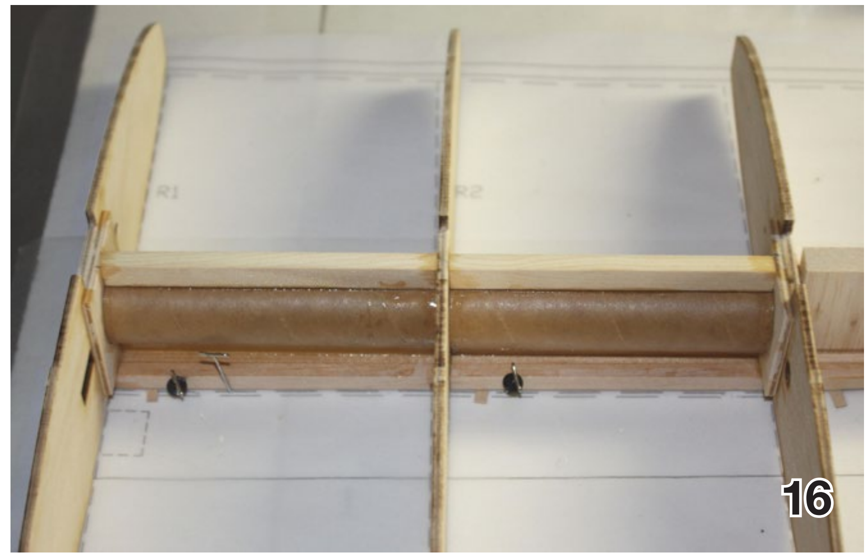
Sight along the trailing edge again to make sure it's straight and CA to rib #11.

Now set your long straightedge on some scrap balsa and slide it up against the trailing edge at ribs #1 to #11 - use it as a guide to ensure the trailing edge is straight while gluing it with CA. Do the same thing for the ribs between #11 and #21. See pix 12 and 13.

Do a fit check of the top spar cap to the rib notches and sand the rib notches as necessary so the spar cap ends up flush with the top edges of the ribs. Remove the top spar cap.

Fit and glue the webs between ribs 3 and 21 using CA+. Don't forget the slot in the web between ribs 7 and 8 – this provides clearance for the spoiler horn. I forgot to take a photo of the webs before the top spar cap was added.

Add the 1/4" wide pieces of spruce between ribs 1 and 2, and ribs 2 and 3 using CA+. These pieces should contact the wing socket tube. See pic 14.



Cut the wing socket tube to length and glue in place with 15 minute epoxy. It should be glued to ribs 1, 2, and 3, and to the top edge of the 1/4 wide spruce pieces. See pic 15.

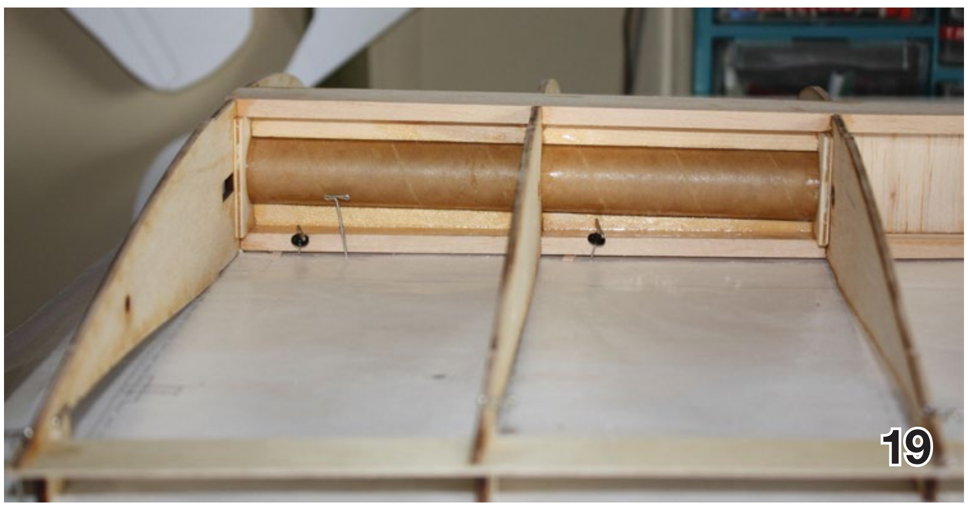
Make up some more 1/4 wide spruce pieces to go on top of the wing socket tube between ribs 1 and 2, and ribs 2 and 3, and glue in place with CA+. These two pieces should be flush with the spar cap notches in ribs 1, 2, and 3. See pic 16 and 17.

Fit check the upper spar cap again and sand the top of any webs if needed.

Make sure the lower spar cap is pinned down well, and all the rib tabs are also held down with pins, then glue the top spar cap into place using 45 minute epoxy. The epoxy will fill any small gaps between the webs and the spar cap. See pic 18 and 19.

After the epoxy cures on the top spar cap, cut and fit the vertical grain 1/16" ply webs for the first two rib bays and glue to the spar caps and wing socket tube using CA+. See pic 20.

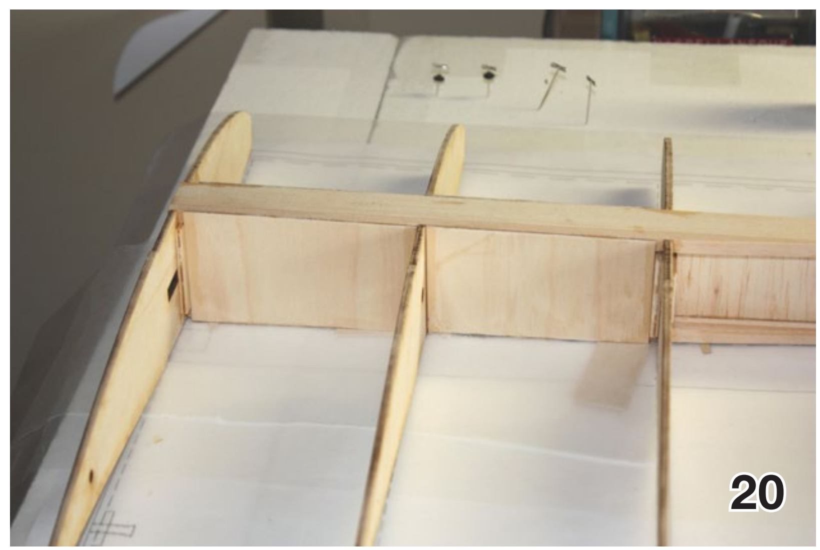
Next will be adding the false leading edge and finishing off the trailing edge.



18. Right wing with upper spar cap glued into place.

19. Aft view of the wing socket tube with the upper spar cap glued on.

20. 1/16"plywood vertical grain webs glued between ribs 1 and 3.



Wing False Leading Edge and D-tube Sheeting

Before the 1/8" false leading edge can be installed, the front of the ribs must be checked with a long straightedge to see if any ribs need to be sanded a bit; some ribs might even need a small amount of balsa added.

We want all ribs to contact the false leading edge so it ends up straight.

Glue the false leading edge on with CA and let a small amount hang down below the ribs so it can be sanded for a good fit.

After gluing, use a sanding block to sand the upper and lower edges flush with the edges of the ribs so that the angle matches the rib contour.

Be careful not to sand the ribs or you will get a small flat spot that ruins the D-tube sheeting contour later. Use masking tape on the ribs if you want to be safe. See pix 21 and 22 (the false leading edge has not yet been sanded down to the ribs in these pix).

Measure the distance under the trailing edge at rib #1, at the 4' span point, and rib #21, and cut some 3/16 balsa sheet to make support pieces to fit under the trailing edge.

21. Front view of the false leading edge at the wing tip.

22. The false leading edge glued on as viewed from the rear.

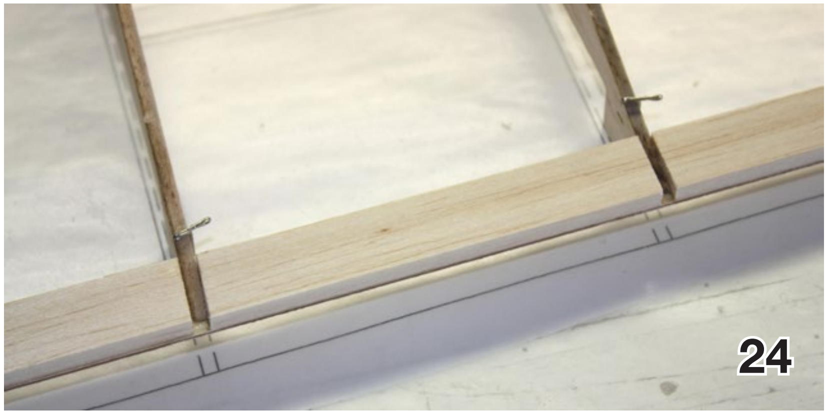
You will end up with a two tapered pieces. These will support the trailing edge while the webs are sanded.

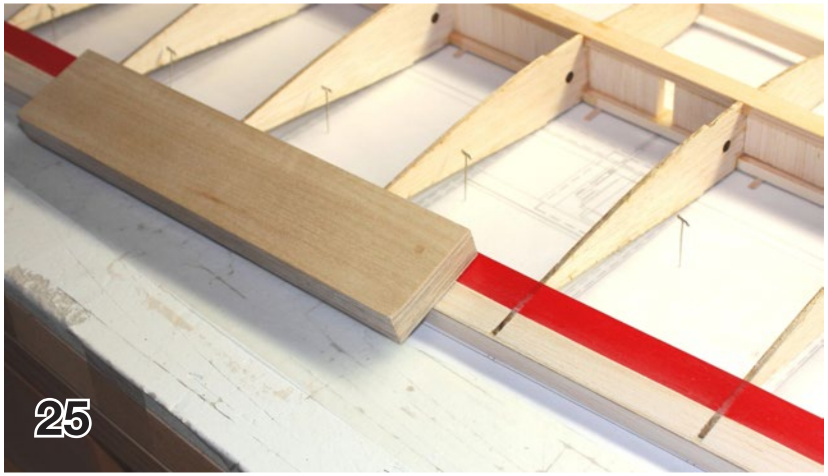
Place these tapered pieces under the trailing edge and pin the aft ends of all the ribs down so the tabs are all in contact with the building board.

Cut 4' and 3' lengths of light 3/16" balsa to match the width of the trailing edge.

Cut these into pieces to fit between all of the ribs and glue into place using CA+. Make sure they are tight against the lower 1/32" ply trailing edge piece.

After gluing, I trimmed the 3/16" balsa pieces down close with my razor plane, then applied a long piece of 3M plastic tape across all the ribs to protect them while sanding the balsa pieces down the rest of the way with a sanding block.



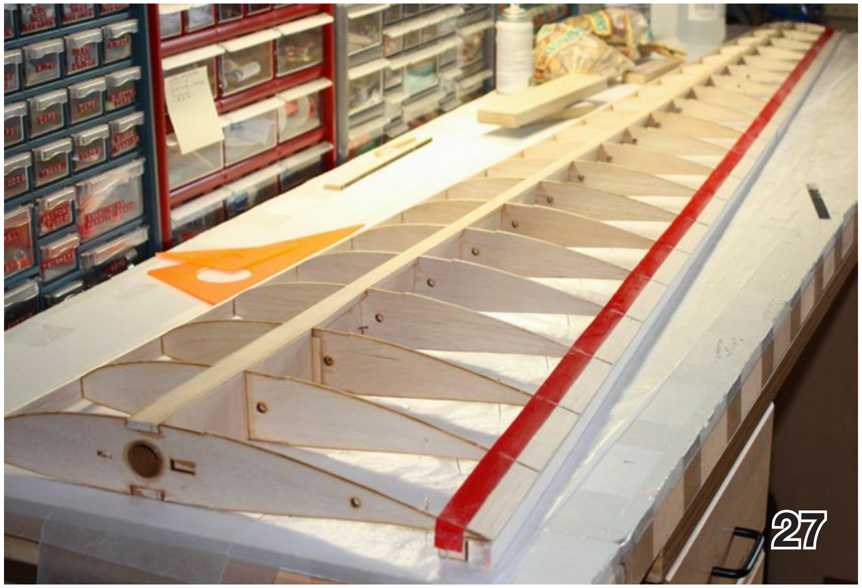


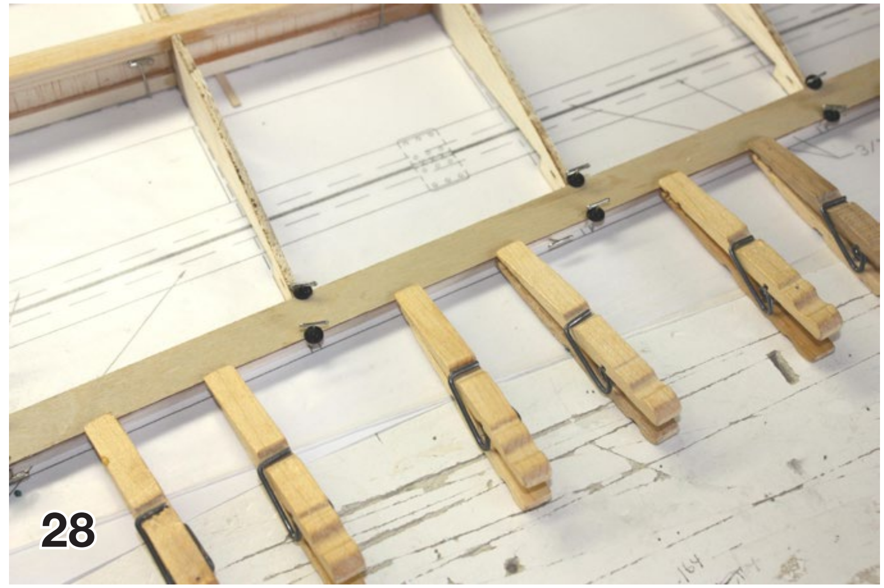
23. The 3/16" balsa trailing edge web pieces all glued in place.

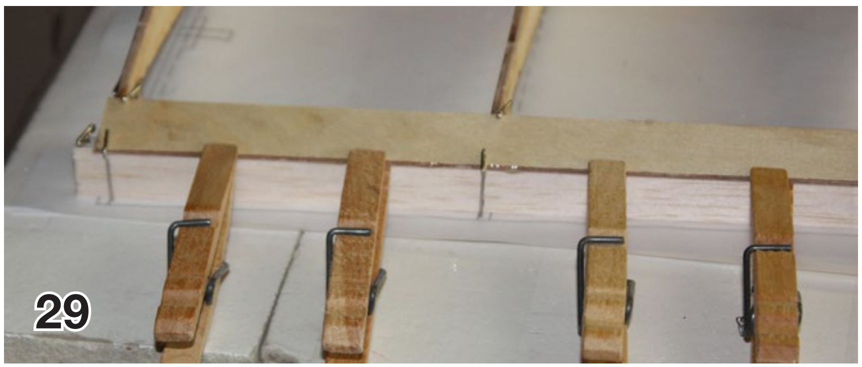
24. Close-up of the balsa trailing edge web pieces glued in place.

25. 3M plastic tape was placed on the ribs for protection. A sanding block was used to make the webs flush with the rib top edges.

26. Close-up of the sanded 3/16" balsa web.







27. All of the trailing edge webs have been sanded. The protective tape is still in place.

28. The top 1/32" plywood trailing edge piece glued to the underlying webbing. Pins and clamps hold it in place.

29. Close-up of the pinned and clamped top 1/32" plywood trailing edge piece at the wing root.

Once all the 3/16" balsa pieces have been sanded flush with the rib top edges we are ready to glue on the top 1/32" ply trailing edge piece. See pix 23 - 27.

The top trailing edge piece is glued on using a combination of 30 minute epoxy and CA. You will need a lot of pins and clothespin clamps (reversed clothespins) or similar small clamps.

Before gluing make sure the 3/16" tapered balsa pieces (the same ones we using during the sanding of the balsa webs) are set under the bottom trailing edge piece about 3/32" - 1/8" ahead of the rear edge (pin then down in a few spots so they won't move).

Apply 30 minute epoxy to the underside of the top trailing edge piece except leave the forward 3/16 inch dry (no epoxy). The epoxy should be fairly thin except make it thicker on the aft-most 3/32" or so.

Set the top trailing edge piece into place and start pinning it down with a pin at the aft edge behind each rib, and a pin at the front edge beside each rib.

Make sure the aft edge of the top trailing edge piece aligns well with the aft edge of the bottom trailing edge piece.

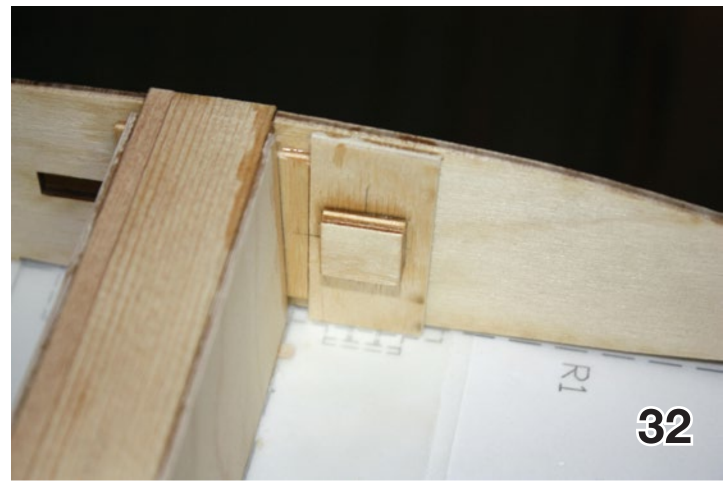
Now run CA along the front edge of the top trailing edge piece between the balsa web and the trailing edge piece – do this between all the ribs.

Next attach two clothespin clamps to the aft edge of the trailing edge between each rib. Double check that everything is pinned down well and let it cure for 4 or 5 hours. See pix 28 - 30.

Remove the wing from the building board. Add the larger and smaller 1/8" ply doubler pieces to rib #1 just ahead of the spar.

Drill through these with a #7 drill using the hole in rib #1 as a guide. The drill bit should be perpendicular to the rib when drilling. Tap the hole with a 1/4-20 tap, saturate the threads with CA, and re-tap.

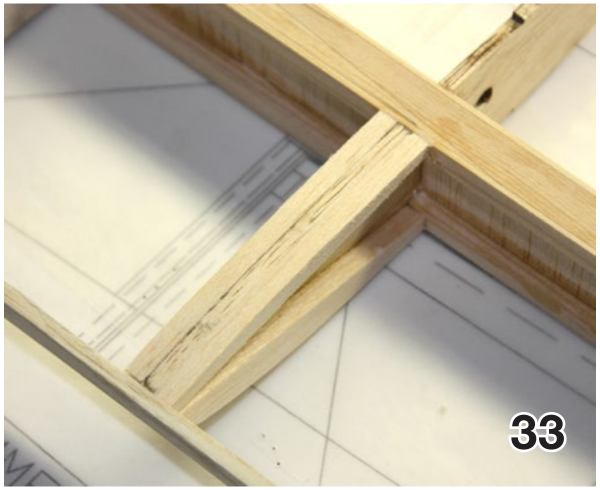
Sand the surface of the smaller doubler and glue on the 1/16" thick ply cap with CA+. This tapped hole is used to hold the wing on later with a 1/4-20 threaded nylon rod. See pix 31 and 32.



30. This photo shows the entire trailing edge glued up and being held in place with pins and clamps.

31. Tapping the 1/8" plywood doublers with a 1/4-20 tap.

32. The 1/16" plywood cap glued onto the 1/8" plywood doublers.



33

34

35

Sort through all of your 3/32" X 4" X 48" balsa and weigh the pieces (we want to use A grain balsa here.) Use the heaviest pieces on the bottom D-tube sheeting (helps with handling loads when the glider is finished), with the inboard sheet being heavier than the outboard sheet.

Before we sheet the D-tube check all the ribs at the spar caps and do any touch-up sanding if required.

There is no need to scarf the D-tube sheeting. Instead rib #12 will be widened with scrap strips of 3/16" balsa on each side that are sanded to contour (top and bottom) – the sheeting will be butt glued at rib #12.

Pic 33 shows the 3/16" balsa pieces on the bottom of rib #12; you can also see the pieces on the top of the rib.

Cut the two pieces of 3/32" bottom D-tube sheeting to fit. The inboard piece will need some additional 3/32" sheet added to make it wide enough. Leave 1/8" extra on the root end, leading edge, and tip end.

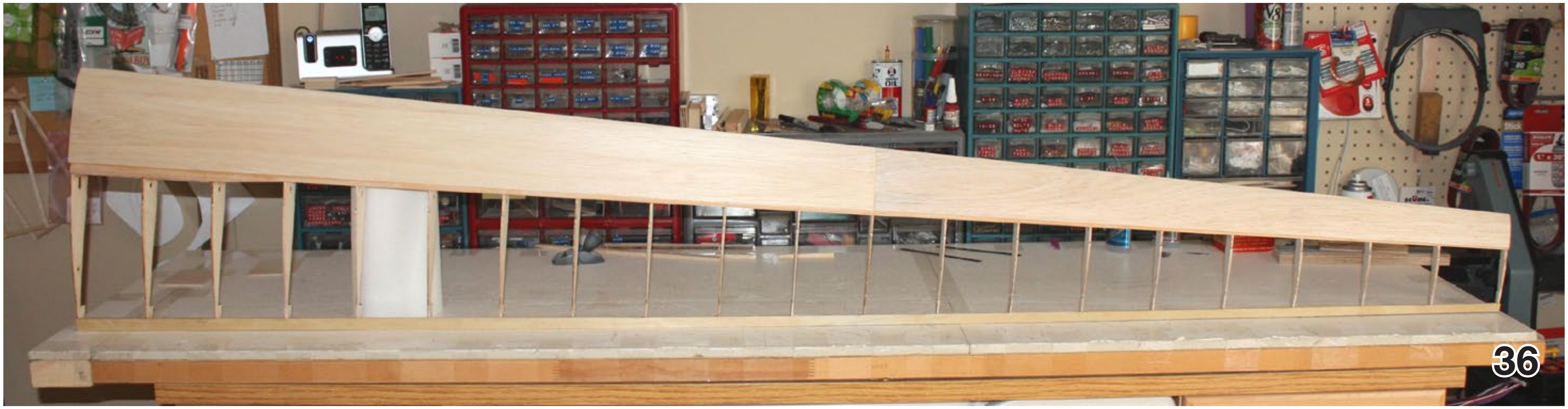
The inboard bottom D-tube sheet will be installed first.

Make a pencil mark on the center of the spar cap near each end and the center of rib #12 to align the sheet.

Set the sheet into place, align with the marks, and CA the entire edge of the sheet to the spar cap.

Flip the wing over and CA the sheet to all the ribs and the false LE, starting at the center rib and working towards the ends alternating sides. Do the same for the outboard piece of sheeting. See pix 14 and 15.

Trim the sheeting close to the false leading edge so only 1/32" or so remains.



Before gluing the top D-tube sheeting, the entire wing needs to be pinned down.

NOTE: 1/16" thick balsa shims are needed under all the rib tabs to prevent wash-in from being introduced into the wing (originally we used 1/32" shims under the lower spar cap, but we now have 3/32" thick balsa D-tube sheeting on the lower spar cap, so we need to add the 1/16 shims to the rib tabs to make up the difference).

Pin down each rib at the trailing edge and the spar at each rib.

We will use a combination of 30 minute epoxy and CA to install the top D-tube sheeting. Start with the inboard sheet.

Again mark the spar cap and rib #12 as before to align the sheet. Mix up some 30 minute epoxy and apply to all the ribs except the outer two (ribs 2-11 get epoxy). Don't get the epoxy on the false leading edge at each rib.

Set the sheet into place, align with the marks, and CA the entire edge of the sheet to the spar cap.

Now starting at the center rib and working your way to the ends (alternating one rib at a time on each side) apply some CA to the false leading edge immediately in front of the rib and pull the sheeting down over the rib and onto the false leading edge.

The CA will cure in few seconds and you can move to the next rib. When you get to the end ribs. CA the sheet to the entire rib.

Repeat all this for the top outboard D-tube sheet.

Unpin the wing from the board and finish gluing the sheet all along the false leading edge with CA.

Let the sheeting cure for 4-5 hours and then sand all the excess D-tube sheeting flush with the false leading edge. See pix 36 and 37.

Next we will work on the spoiler installation.

Spoiler Installation

Make the spoiler blades by cutting/sanding 1.5 inch trailing edge stock down to 1.375 width; cut two blades each about 12.25 inches long – the extra length will be sanded later to fit.

If you don't have access to 1.5 inch trailing edge stock, just cut a 1.375" wide piece off some medium density 3/8" balsa sheet and plane/sand to the trailing edge cross section shape (that's what I did on mine).

Note the top surface of each blade has a very slight curve (across the blade) that needs to be sanded in to match the rib contour – check it against the plan to get the curve correct. See pic 38 for a finished blade.

Cut a piece of 1/4" square basswood for the aft spoiler bay frame, and cut notches in ribs 6-9 to fit the basswood – it should be flush with the rib top edges and 1.4 inches behind the rear edge of the upper spar cap.

Check it for straightness with a straightedge and CA it into place. See pic 39.

Also at this time cut/sand notches in the top of ribs 7 and 8 to clear the spoiler blade when it is in the closed position.

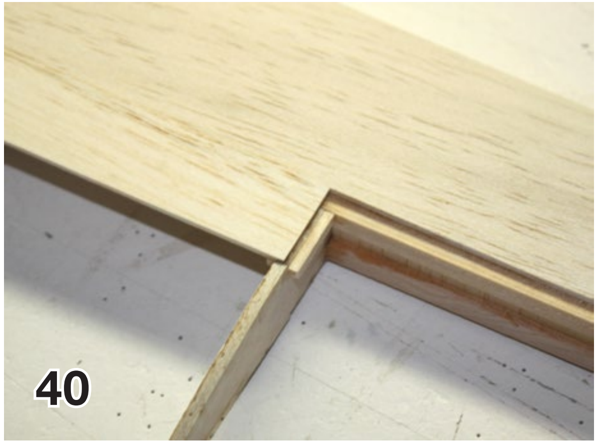
Now the rest of the 3/32" balsa sheeting can be added behind the center of the upper spar cap. Note this sheeting goes back to the end of the notch on the top of each rib. Sheet up to rib 6, and then from rib 9 out to the tip.

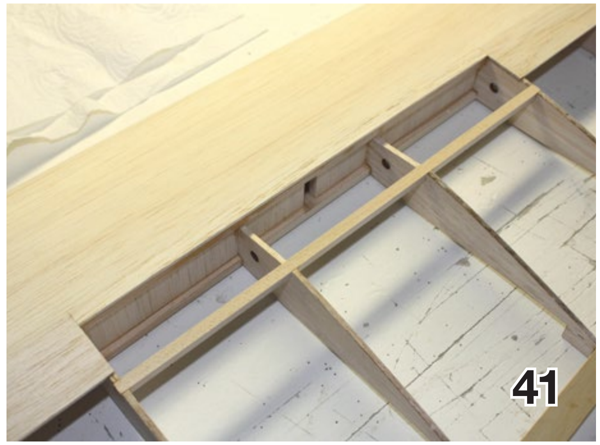
You will need to make a butt joint in the sheeting at rib 17 – just add a scrap piece of 1/8" thick balsa to each side of rib 17 (similar to what we did when putting on the D-tube sheeting) to provide something to glue the sheeting to.

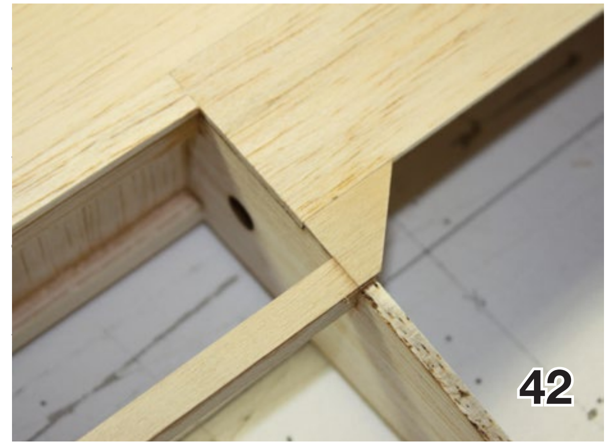
Also at this time add a strip of 3/32" sheeting onto the top of the spar cap between ribs 6-9; this should end up flush with, or slightly behind, the aft edge of the upper spar cap. See pix 40-41.

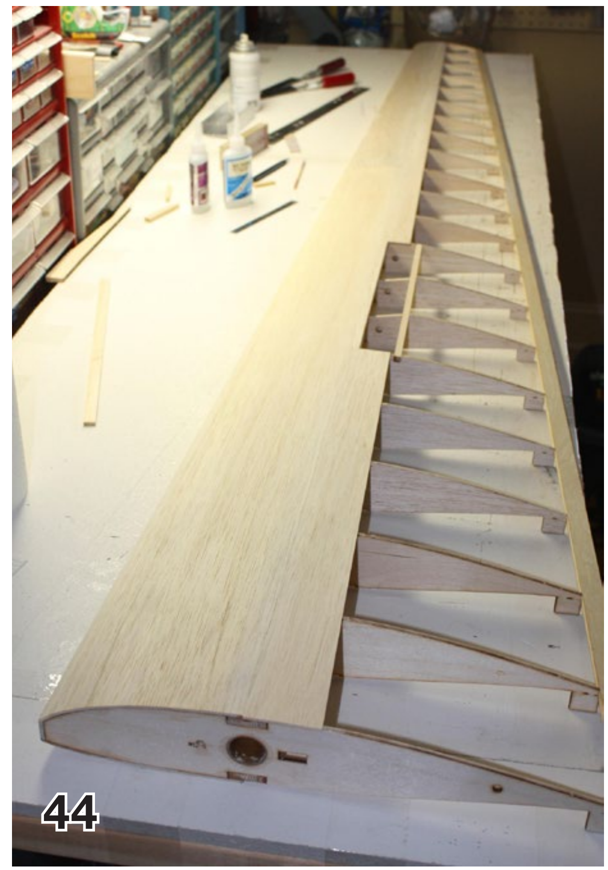
38. Finished spoiler blade. Note the top surface of the blade is curved to match the rib profile.

39. 1/4" square basswood installed at aft end of the spoiler bay.







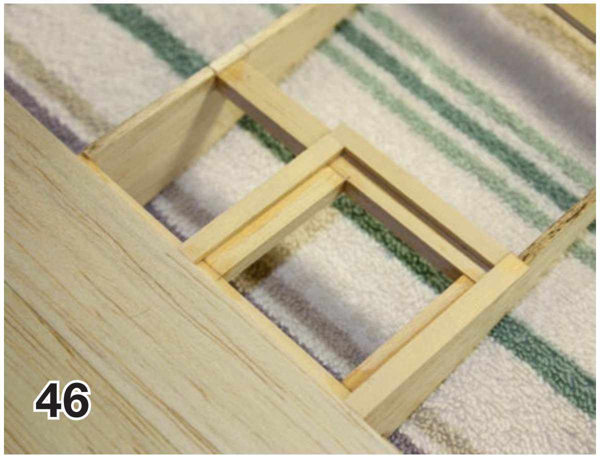
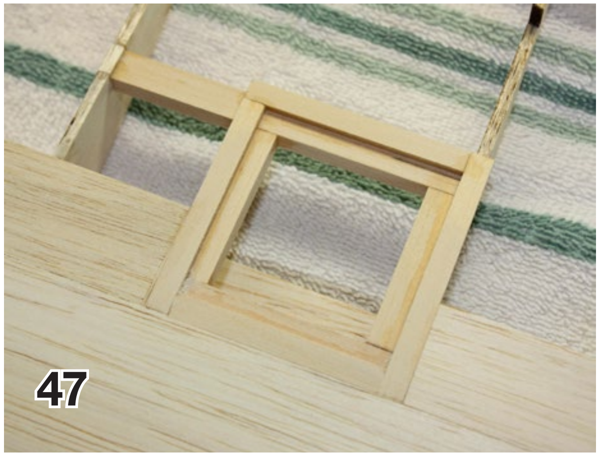


Cut and fit the small 1/32" ply gussets, and the strip of 1/32" ply that goes on top of the 1/4" square basswood, and CA into place. See pix 42 - 44.

Sand the 3/32" sheeting and 1/32" ply so the joints are smooth and the rib contours are maintained; be careful here, it is easy to sand a flat spot into the sheeting at the glue joints.

Fit the spoiler blade into the spoiler opening so you have about 1/64" clearance all around, or perhaps just a bit more.

Building the spoiler servo mount is next. It consists of a basswood frame and a 3/32" plywood door that also serves as the servo mounting platform.

The frame is made from pieces of 1/4" X 3/8" and 1/4" square basswood. Refer to the plans for what goes where.

Be sure to maintain the inside dimensions where the servo will go through the frame. The rest of the dimensions aren't as critical.

Pay attention to the depth of the notches that are cut for the 1/4" X 3/8" basswood pieces that run between the ribs.

The piece nearest the spar cap is flush with the rib edge, but the rear most piece must be 1/16" below the rib edge – this will make the 3/32" ply door flush with the balsa sheeting and the 1/32" ply cap strips when the wing is finished.

The servo opening in the frame must be surrounded by 3/32 X 1/4 basswood pieces to provide a surface for the covering to attach to, and leave a lip to mount the servo door onto.

While we are making the spoiler servo mount frame we'll go ahead and also make the aileron servo mount frame.

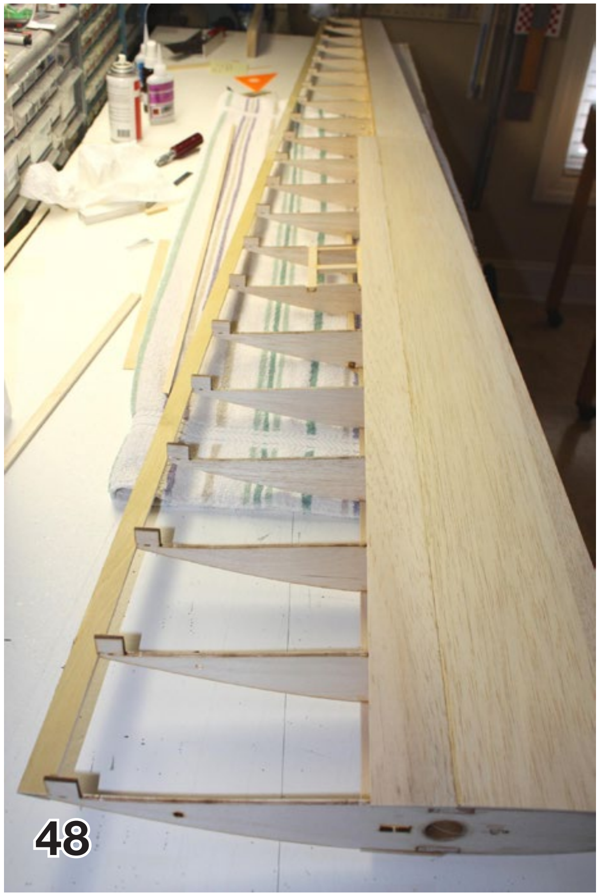
Now the remainder of the 3/32" balsa sheeting can be added to the bottom of the wing.

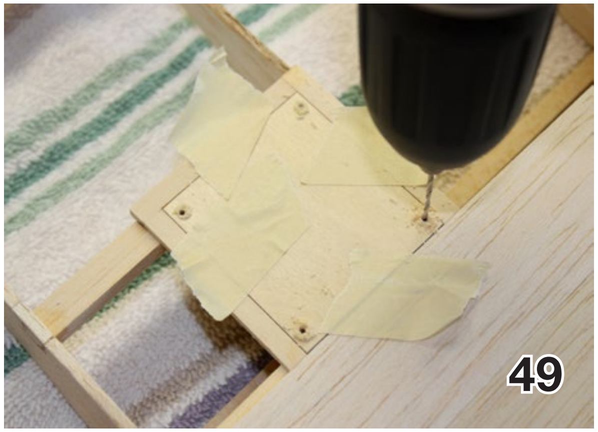
This sheeting will run right past the spoiler servo frame and serve as the front edge of the servo opening, but for the aileron servo opening the sheeting will run up to the framework on either side. See pix 45-48.

45 - 46. Spoiler servo frame.

47. Aileron servo frame.

48. The first piece of the aft 3/32" sheeting is installed on the wing bottom. Note this sheeting runs right past the spoiler servo bay.





49

50

51

Cut and fit 3/32" plywood doors for the spoiler and aileron servo mounting frames.

Leave a small gap all around for the covering material. Tape the doors into place and drill 4 holes in each with a 1/16 dia. drill bit.

Remove the doors, mark each one for orientation, and drill the holes in the door out to 3/32" inch.

The doors can now be attached using #2 button head sheet metal screws.

The doors will also need to be sanded a bit (with the screws out) to exactly match the rib contours. See pix 49 - 51.

The servos are mounted to the doors using 3/4" long pieces of 1/4" X 3/4" spruce (grain needs to run parallel to the servo mounting screws).

One piece on each servo will need to be notched to clear the servo wire.

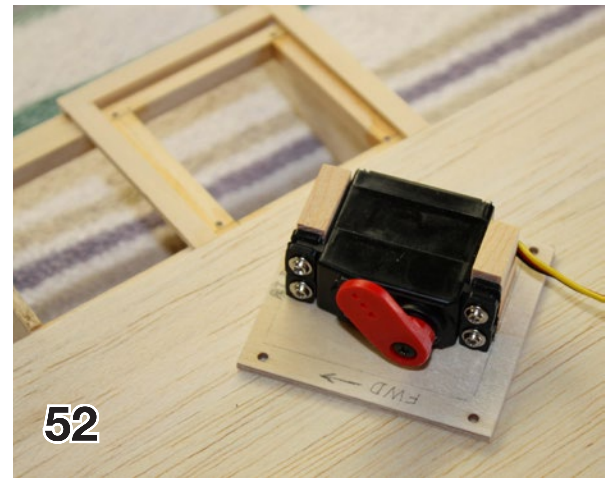
Mark the inside of the servo frame onto each door using a pencil – this will be the guide when positioning the servo mounts.

Screw the blocks to the servo, then position carefully on the door and tack glue the blocks with CA.

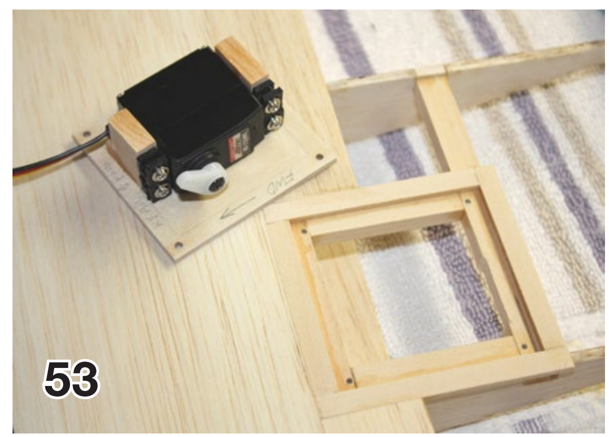
Remove the servo and finish gluing the blocks with CA.

Set the angle of the servo arms (closed spoiler and neutral aileron) per the plan and screw the servos back onto the doors.

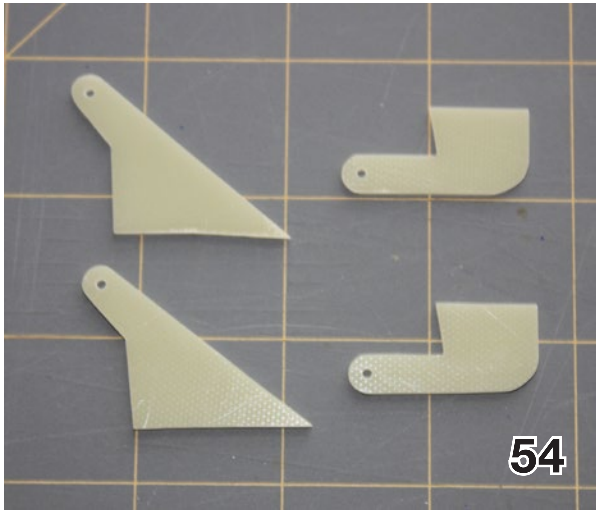
See pix 52 and 53 for the mounted spoiler (52) and aileron (53) servo.



52



53



Copy the spoiler and aileron horn shapes off the plan and glue the templates to the G-10 with rubber cement. Cut the horns out a bit oversize and sand to final shape.

I cut these with a scroll saw but the glass kills the blades quickly so you have to sacrifice a couple blades.

Drill the holes with a 1/16 dia. drill bit on a drill press. See pic 54.

Spoiler pushrods

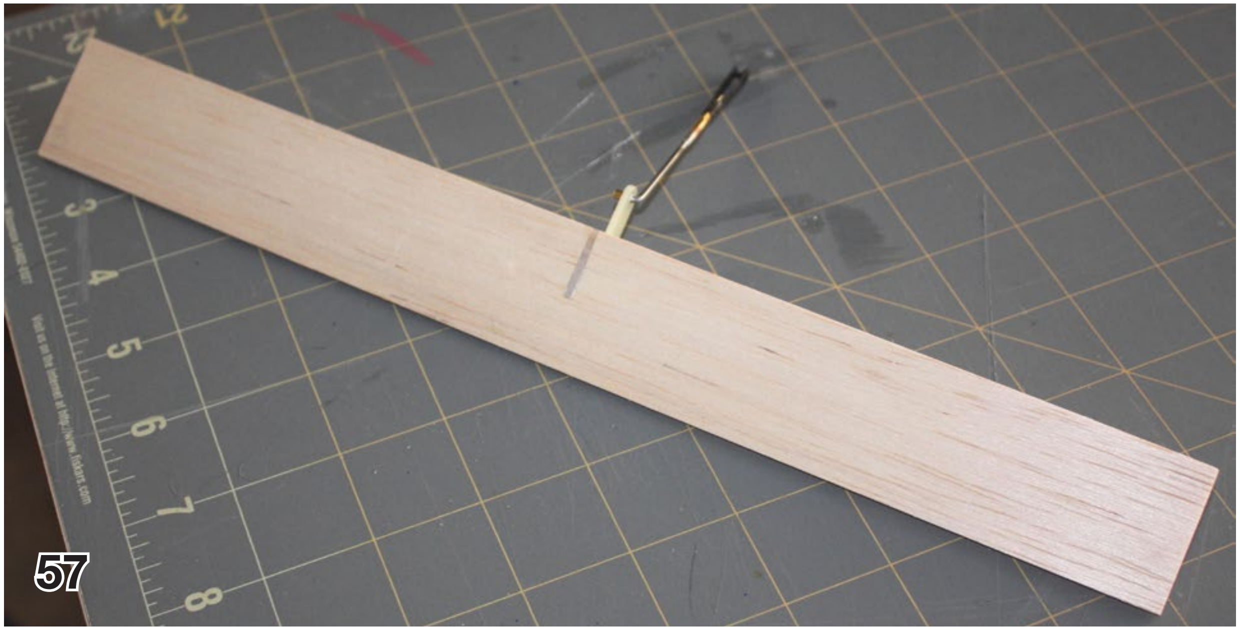
Make up the spoiler pushrod from a piece of 1/16" music wire soldered into a 2-56 threaded brass coupler. A Du-Bro Kwik Link is then threaded on.

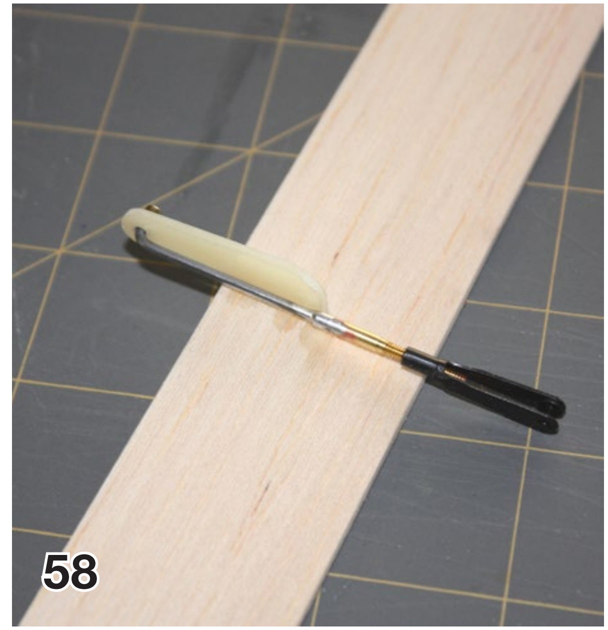
The music wire has an L bend in the end which goes through the spoiler horn hole, and a 1/8" long piece of brass tube is attached by crimping it slightly into a small notch that has been ground into the 1/16" music wire with a Dremel cutting disc; a small amount of CA is also applied to the brass tube. See pic 55. Note: this spoiler pushrod was later revised as follows.

Spoiler Pushrod Revision

After pondering the spoiler pushrod setup some more, I realized that after the covering is on the wing, adjusting the Kwik Link on the spoiler pushrod would be a real pain due to difficult access.

So the spoiler pushrod I showed previously has been changed to the one in pic 56.





57. The G-10 control horn with the attached pushrod (early version, since revised) glued to the spoiler blade.

58. Another view of the spoiler pushrod (early version, since revised) in the position it will be inside the wing.

I still use the Kwik Link to connect to the servo arm, but at the spoiler horn I am now using a Great Planes Screw-Lock connector.

The set screw is a very short socket head screw that came with it - you can make your own by cutting off any 4-40 socket head screw with a Dremel tool.

With this setup the pushrod length adjustment is now at the spoiler horn which is easily accessed.

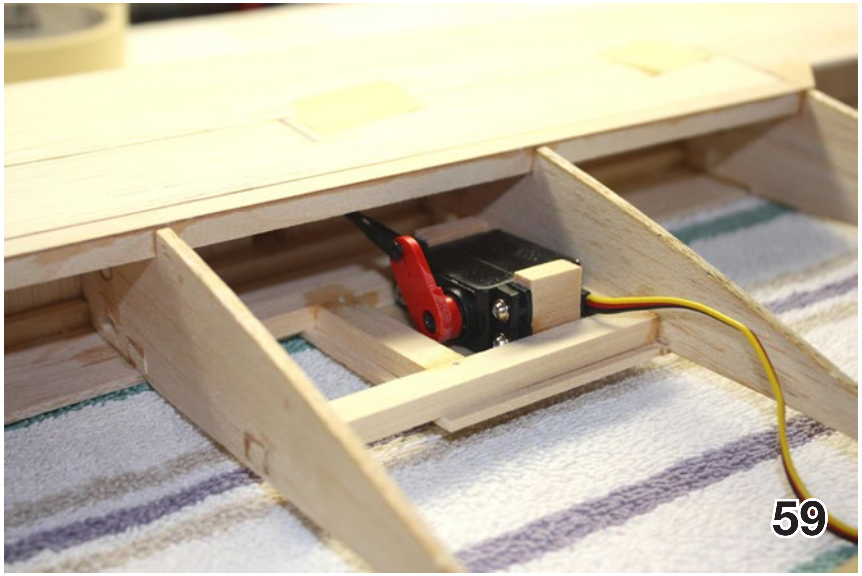
(Please note the this update was made after some of the following photos were takenand the pushrod shown is the earlier version.)

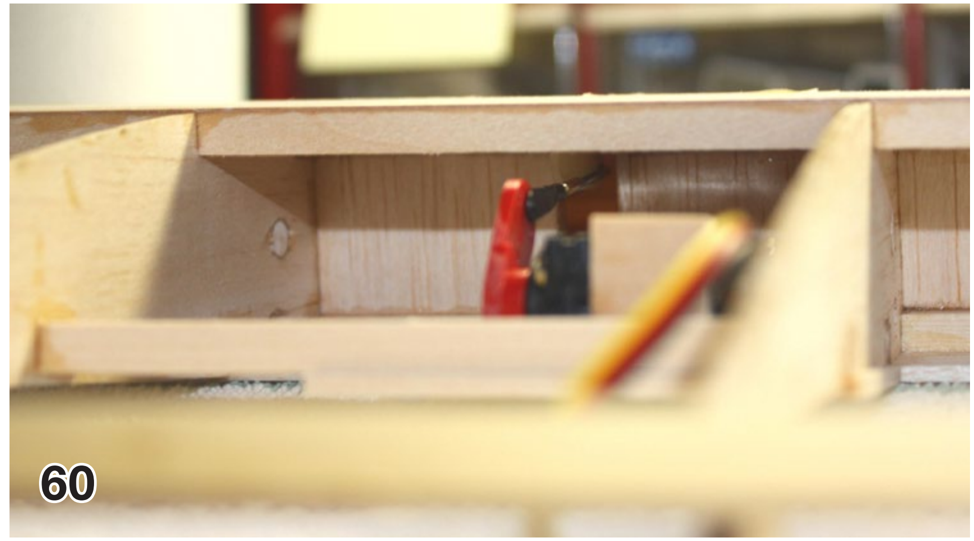
Position the spoiler pushrod assembly over the servo arm and mark onto the D-tube sheeting where the horn ends up.

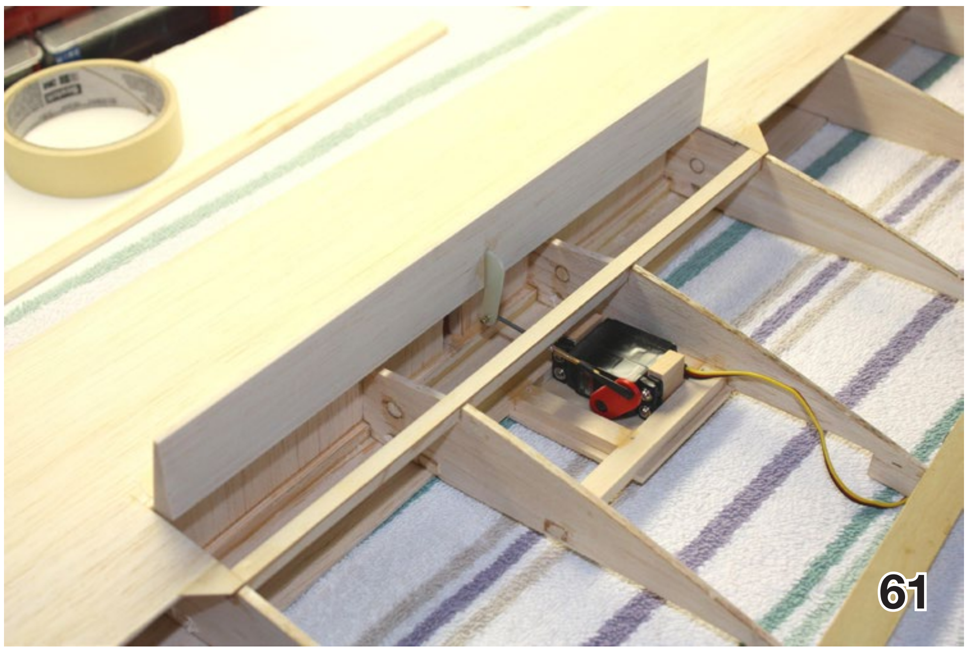
Now center the spoiler blade in the spoiler opening and mark the spoiler blade where the horn needs to be. Cut a 1/16" wide notch all the way through the spoiler blade (I used my scroll saw) to fit the horn.

Dry fit the horn and check the alignment of everything with the spoiler blade in position.

When all lined up properly, CA the horn to the spoiler blade (sand the G-10 a bit before gluing). See pix 57 and 58.



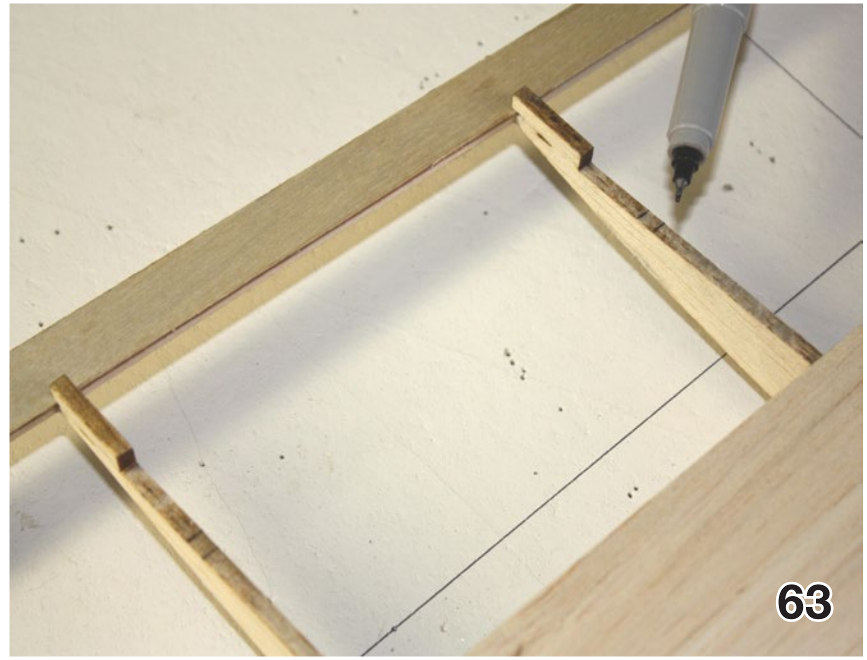




59 - 61. The spoiler pushrod runs under the upper spar cap. The servo arm must have enough travel to push the spoiler fully open.

Tape the spoiler blade into place, adjust the Kwik Link and attach it to the servo arm. Plug the servo into the receiver and check the throw. You should have nearly 90 degrees of travel with 100% throw. See pix 21-23. Note: see post #101 showing revised spoiler pushrod hooked up to the spoiler blade.

The aileron will be built next. Since we already have the aileron servo mount done that will save a bit of time.



Aileron Construction

Cut four pieces of 1/32" plywood to 1/2" X 37" inches. These will be the aileron spar caps.

Refer to the plan and mark one line (at the center of the hinge line) across the top of ribs 12-21, and mark two lines (these are where the edges of the 1/32" ply pieces end up) across the bottom of ribs 12-21. See pix 62 and 63.

Glue the bottom two ply pieces to the ribs, aligning the edges on the marks you made. Note on the inboard end these 1/32" ply strips need to extend 1/16" inch inboard of rib 12 to align with the rib cap strip later. See pic 64.

62. The aileron hinge line is drawn on top of ribs 12 - 21 with a fine Sharpie and long straightedge.

63. Two lines drawn on the bottom of ribs 12 - 21 where the edges of the 1/32" plywood strips are located.

64. The bottom 1/32" plywood pieces glued to ribs 12 - 21.

We will install the webbing at the back of the wing aileron opening first (the forward-most pieces of webbing).

Measure the depth of ribs 12 and 21 between the bottom ply piece and the top of the rib at the hinge line.

Cut a tapered strip of medium density 3/16" balsa that serves as the webbing between the upper and lower 1/32" ply pieces.

Note the bottom of this strip needs to be sanded to an angle (check it against the plan) so make sure you add a little extra height when you cut it to allow for this, and also to allow the tops of the webbing to be sanded down flush with the ribs later.

Pin the wing down to the building board from ribs 12-21; don't forget to put the 1/16" shims back under the rib tabs.

Cut the 3/16" balsa strip into pieces that fit between all the ribs, starting at rib 12. Take your time and get a good fit on these. You will probably need to sand the angle a bit on the bottom of each piece to get a good fit.

The bottom of each piece should be positioned flush with the edge of the lower 1/32" ply piece, and the top of each piece should be located on the forward side of the lines drawn across the rib tops.

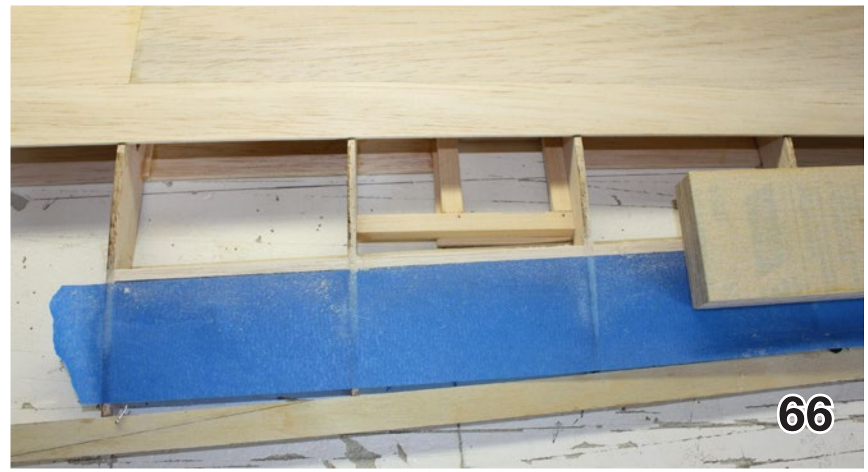
What we want to end up with, when both the front and rear webs are all glued, is a small gap at the top of about 1/64" inch (the thickness of my 6 inch steel machinist's ruler).

I used CA to install the webbing. See pic 65.

After you have all the forward web pieces installed, carefully sand the tops down flush with the ribs. It's best to protect the ribs with some tape while doing this. See pic 66.

Now cut the 3/16" balsa pieces for the rear webbing (the front face of the aileron) and install the pieces in the same manner as before.

I used my 6 inch machinist's ruler to set the gap at the top. Sand the tops of these webs down to the ribs, protecting the ribs with tape. You should now have all the webs installed with a 1/64" gap at the top. See pix 67 - 70.



65. The first three webs are glued into place on the wing side of the aileron bay.

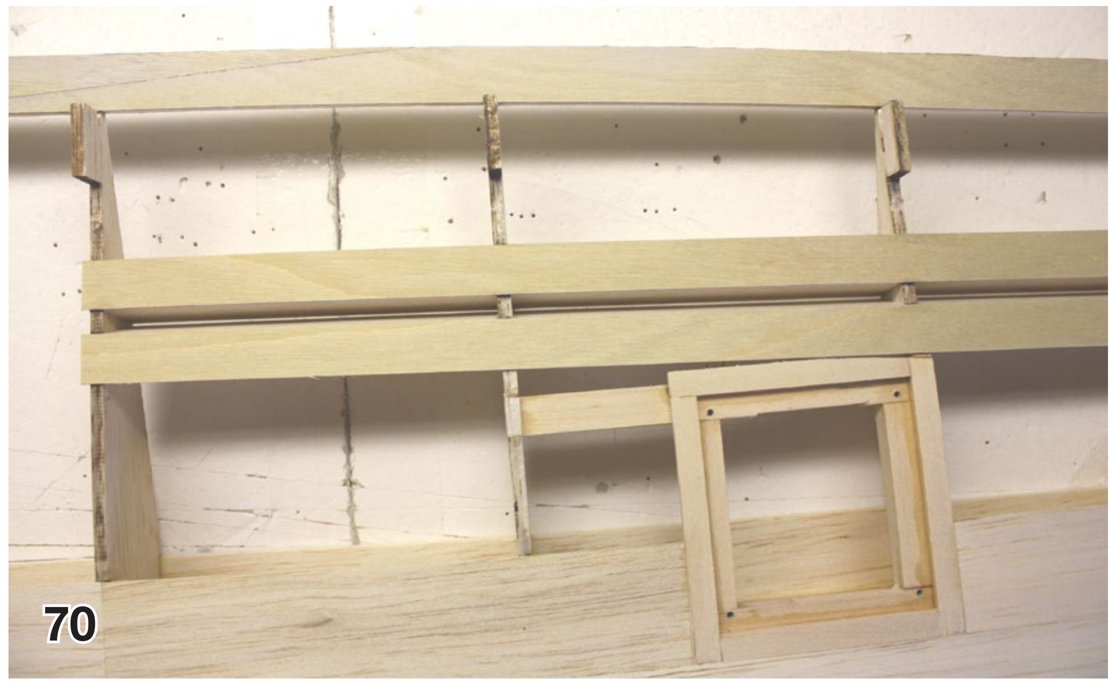
66. Sanding webs down fluch with the top edge of the ribs. Tape protects the ribs from sanding damage.

67. Aft (aileron face) webs being glued into place. machinist ruller used to get 1/64" spacing from front webs.

68. All aileron webs glued into place.

59. Close-up of top aileron webs. Note 1/64" gap centered on hinge line.

70. Bottom view of aileron webs. Gap at the upper surface of the wing can be seen if you look closely.

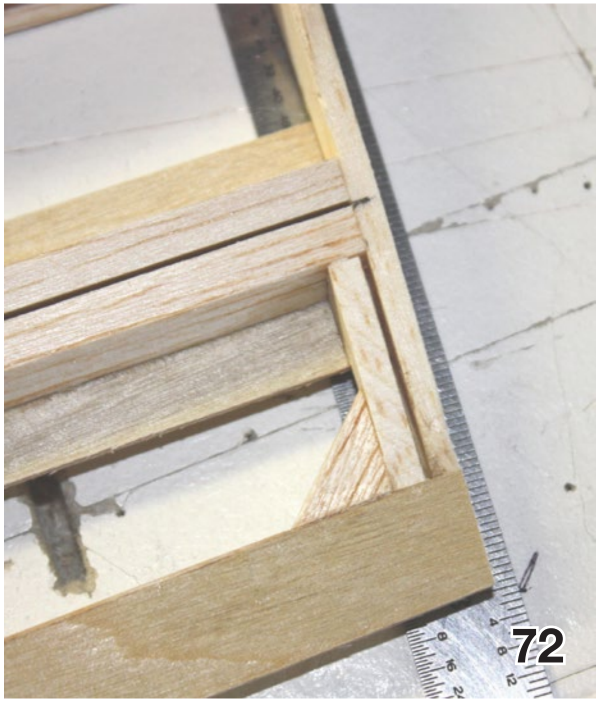


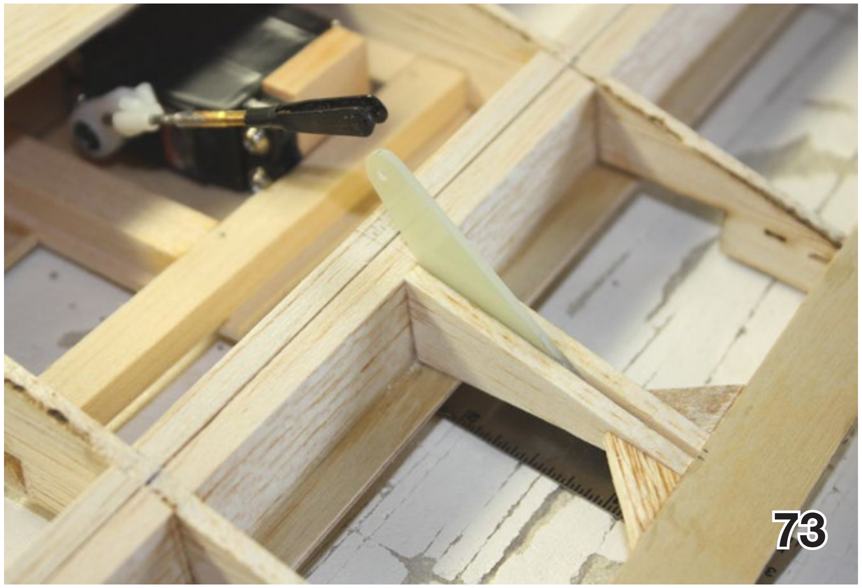
Cut the two aileron end ribs to fit between the rear webbing and the wing trailing edge near ribs 12 and 21, and glue into place - these should be positioned with a 1/32" gap from the wing ribs. Add the 1/8" balsa gussets. See pix 71 and 72.

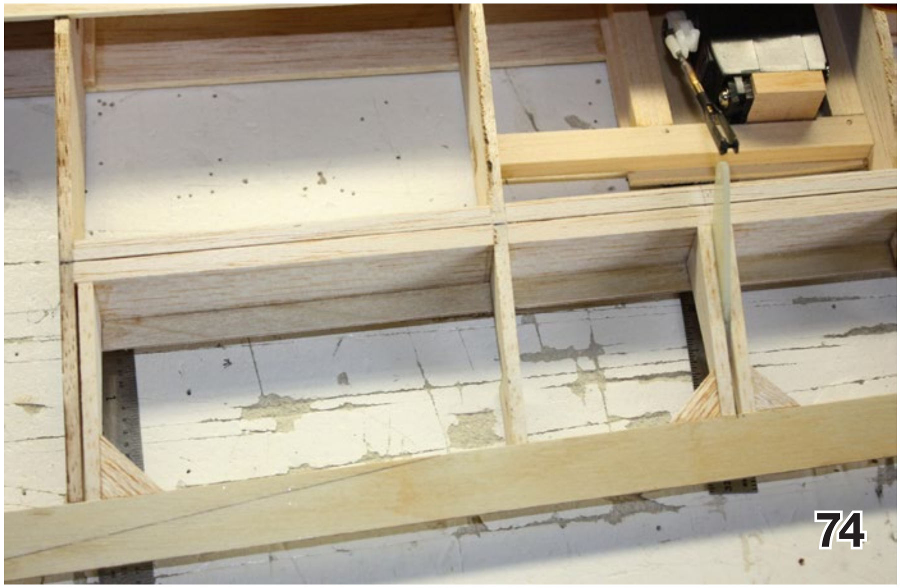
Put the aileron servo door with servo in place, attach the aileron pushrod to the servo arm, determine exactly where the aileron control horn needs to be positioned, and mark the web and wing trailing edge.

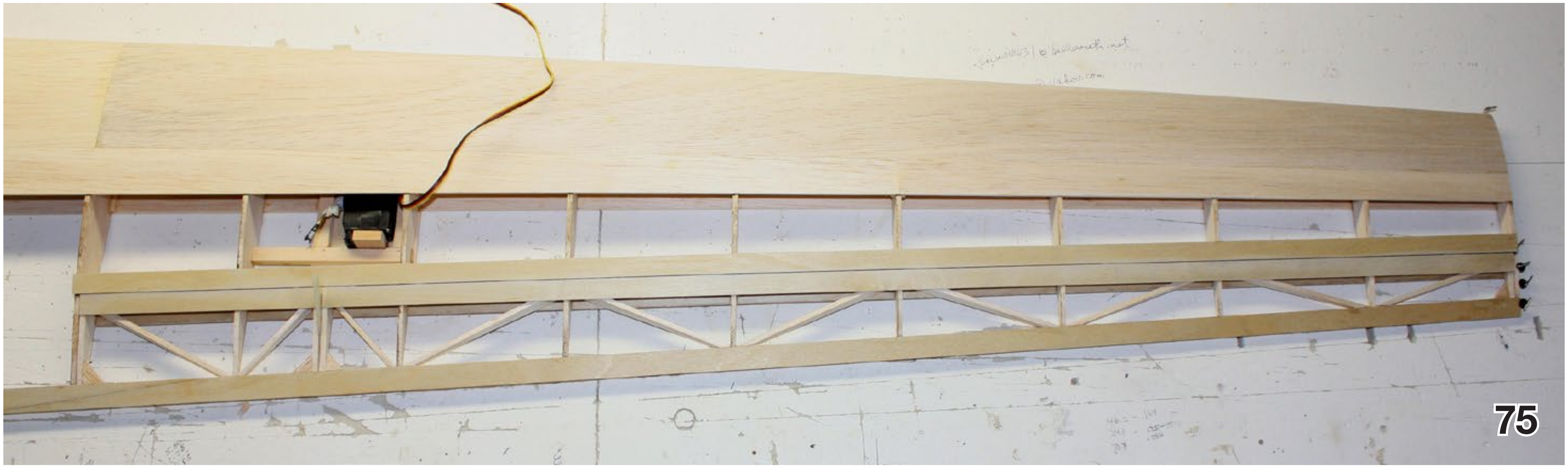
Cut the two aileron ribs (use the aft end of rib 13 as a pattern) that will locate the control horn and glue these between the webbing and the wing trailing edge. Add the two 1/8" gussets. Glue the aileron control horn in using CA. See pix 73 and 74.


71


72


73


74



Fit the hard balsa diagonals and glue them into place with CA+.

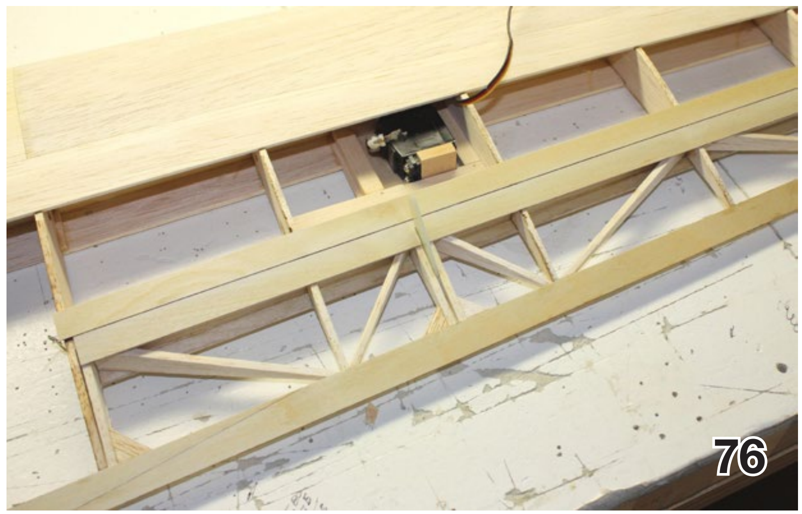
I forgot to do this until after I had glued on the top 1/32" ply pieces. It’s much easier to do it before gluing on the top 1/32" ply.

You can see the installed diagonals in pix 75 and 76.

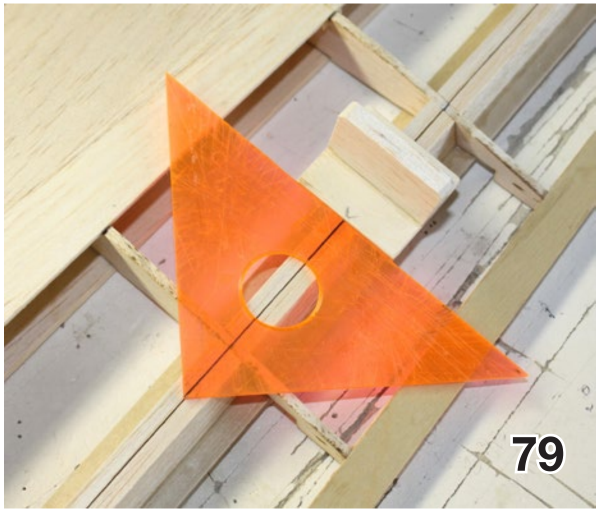
The hinge slots are made using a small sanding tool – a piece of 1/8" plywood that has two strips (one on top of the other) of 100 grit sandpaper, 5/8" wide, glued on with CA+.

I leave about 3/8 inch extra plywood on each side of the sandpaper. See pix 14 and 15.

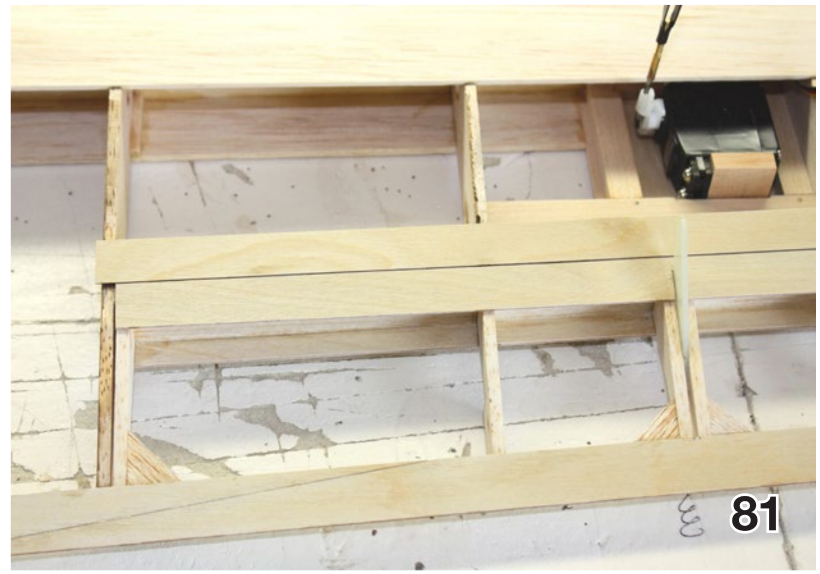
Position the 1/8" ply sanding tool on top of the webs using a small triangle that



75 and 76. These photos show the aileron diagonals in place. Unfortunately, the 1/32" plywood pieces were already in place when the photos were shot. The hinge slots (See pix 79 and 80.) were also created before the 1/32” plywood pieces were glued on.


79


80


81

has a center line marked on it – I hold the triangle down over the hinge line with one hand and operate the sanding tool with the other hand.

Make sure the sandpaper strip is positioned correctly over each hinge location and sand until the 1/8" ply touches the top of the webs.

This will form perfectly fitting hinge slots once the upper 1/32" ply pieces have been glued on. See pix 79 and 80.

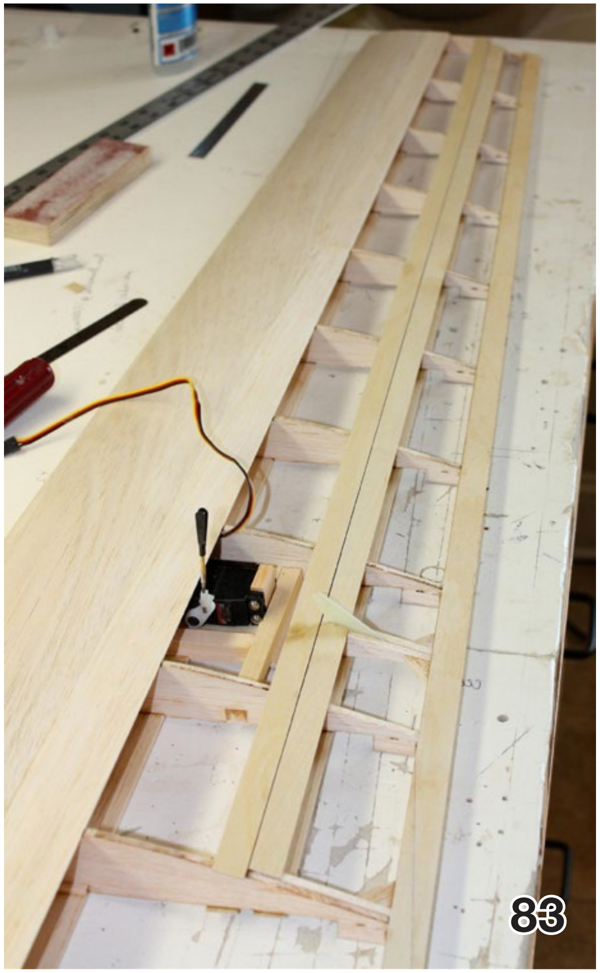
Remove the aileron servo door (or at least the front two screws from the door) so the wing can rest on the building board.

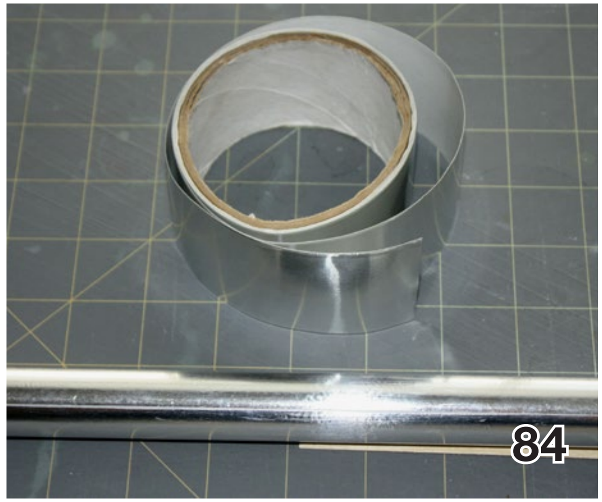
Pin the wing back down to the building board from rib 12 to rib 21 (remember to put the 1/16" shims back under the rib tabs).

Glue the top two 1/32" ply pieces to each rib, positioning them using a 1/64 inch thick spacer (I used my 6 inch machinist's ruler again) in the gap between the front and rear webbing.

The aft 1/32" ply piece will need to be notched to clear the aileron control horn. You can also cut the aft 1/32" ply piece off at the end of the aileron ribs if you like, rather than running it out onto ribs 12 and 21. See pix 81 and 82.


82





Remove the wing from the building board and finish gluing the 1/32" ply pieces with CA. See pic 83.

There is a little more work to be done on the wing panel before the aileron can be cut loose. This will be covered in the next posting.

Wing Tube Fitting

The 7/8" X .120 aluminum wing joiner tube is a slightly loose fit inside the TNT phenolic wing socket tube.

To remedy this use aluminum duct tape. My duct tape measures .004 thick, and I applied one layer to the aluminum wing joiner tube which gives a pretty good fit.

The duct tape is 1.9" wide, so apply one piece and then cut down another piece to cover the rest.

If you are careful you can lay a piece of this onto the aluminum tube and work it down a little at a time with no wrinkles. It might take a couple tries but the results are pretty good. See pix 84 - 86.

More Wing Panel Construction

Before cutting the aileron loose there is some more work to do on the wing panel.

Cut all the rib tabs off just outside the rib line and then sand them down to the rib contour. The laser cut slot in each tab lets you know when you have sanded far enough.

I had originally intended that the aft edge of the wing sheeting remain unsupported. However, as I handled the wing panel it became apparent that the unsupported edge would eventually get cracked due to handling loads. Therefore I have added pieces of 1/8" square basswood between the ribs all along the aft edge of the top and bottom sheeting. See pic 87.

Cut the 3/16" O.D. brass tube (rear wing pin tube) to length. sand the outside with 100 grit, and glue into ribs 1 and 2 with CA.

Add some pieces of scrap 5/16" balsa to the top and bottom of the tube, between ribs 1 and 2, with CA+, and sand flush with the top and bottom rib edges.

Crimp the outboard end of the 3/16" brass tube slightly to prevent the rear pin from sliding into the wing.

Sheet the bottom of the wing with 1/32" ply from rib 1 to rib 3. Note the ply ends 1/16" inch past the outboard side of rib 3; just as if it were a cap strip. See pic 88.

Glue the 1/32" X 1/4" ply cap strips to the bottom of all ribs. Glue the large 1/8 balsa gusset into place on rib 12. See pix 89 and 90.

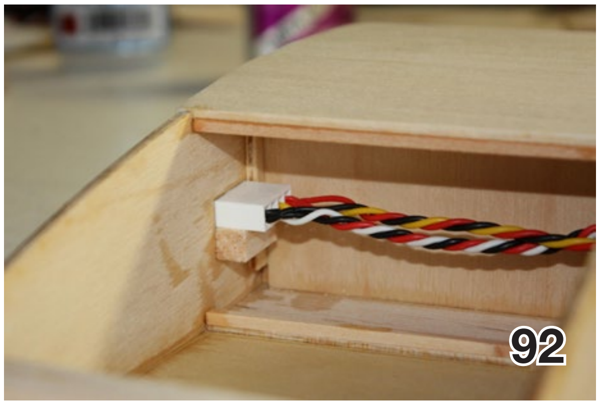
87. 1/8" square basswood reinforcement added to the aft edge of the 3/32" balsa sheeting.

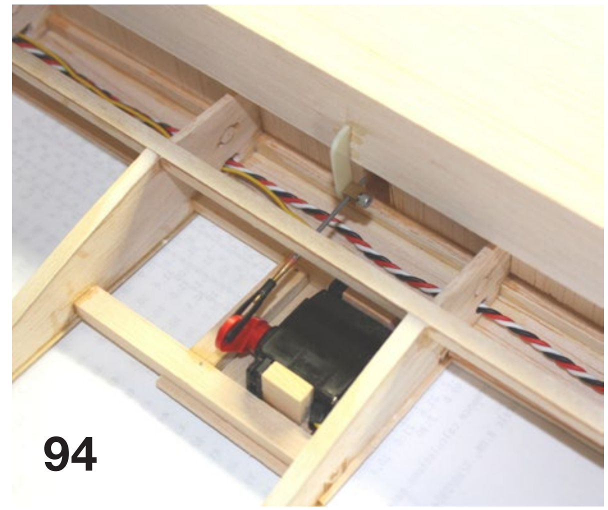
89. 1/32" x 1/4" plywood cap strips added to the bottom of the ribs.

90. Large 1/8" balsa gusset at corner of wing aileron opening.

91. Bottom 1/32" plywood sheeting across the first two rib bays. The spoiler servo wiring is threaded through the ribs.

93. Outside of rib 1 showing the installed Molex connector shell; note the pins holes are UP.





Route the servo wires between the two servos and the Molex connector at rib 1. See pic 91.

I used long #22 wire servo extensions for this, but you could also use #22 wire if you have it on hand.

Tape the plugged-in connectors if using servo wire extensions.

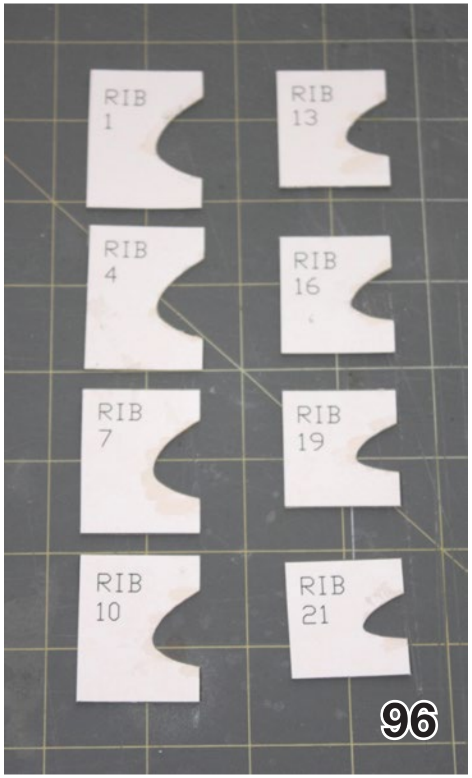
At rib 1, cut off the male plug on the two servo extensions, leaving enough length to get to the Molex connector.

Strip all six wires and twist the blacks together and the reds together, then tin the four ends with solder.

Trim the ends to about 1/8" long and crimp them into the Molex connector pins, then carefully solder the tinned wire to the connector pin with a small amount of solder.

After soldering, crimp the rest of the connector pin down onto the wire insulation.

Insert the four pins into the connector shell, making sure they are in the same order as the ones on the fuselage, and that the connector shell holes are at the top.



CA a small piece of scrap 5/16" square balsa onto rib 1 at the bottom of the connector hole, and then CA the connector shell into rib 1 so it is flush with the root side of the rib. See pix 92 - 94.

Sheet the top of the wing with 1/32" ply from rib 1 to rib 3, again running 1/16" past the outboard side of rib 3.

Glue the 1/32" X 1/4" ply cap strips to the top of all ribs.

Sand the D-tube sheeting flush with the false leading edge if you haven't already done so.

Glue the 1/4" balsa leading edge to the front of the wing, and razor plane the top and bottom edges tangent to the D-tube sheeting. See pic 95.

Make the leading edge sanding templates by gluing the eight templates from the wing plan to manila folder stock and cutting them out with an X-Acto knife. See pic 96.

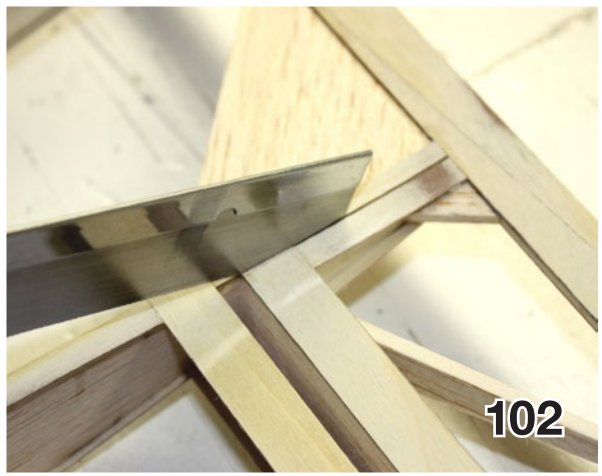
Use a razor plane and sanding blocks to shape the leading edge, checking often with the sanding templates as you progress. See pix 97-98.

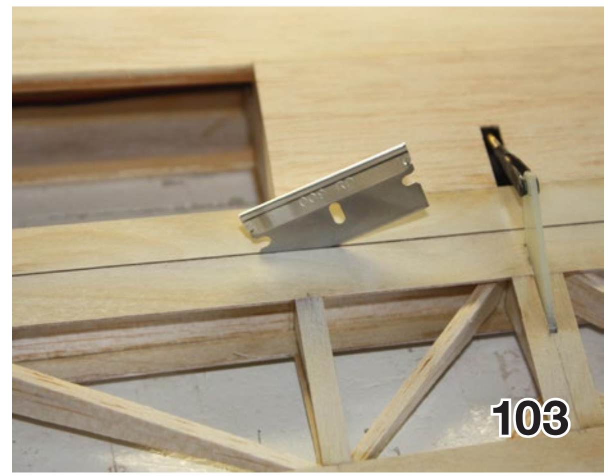
Glue on the 1/2 hard balsa wingtip and round off the front corner and the edges. See pix 99 and 100.

Put the wing rods into the fuselage and slide on the wing panel. Check the fit of the root to the fuselage center section. Due to variances in sheeting thickness you will probably need to do some sanding to get a good match.

Also look at the gap and sand the root end of the wing and/or the fuselage center section to get a decent fit. You might even find it necessary to add some pieces of thin plywood and sand them down to get a nice fit. See pic 101.

Next the aileron will be cut loose and the hinges will get a final fitting.



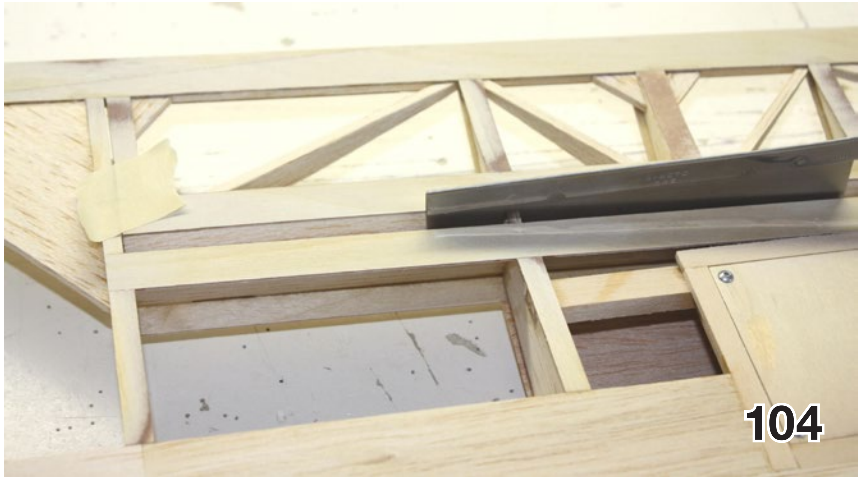


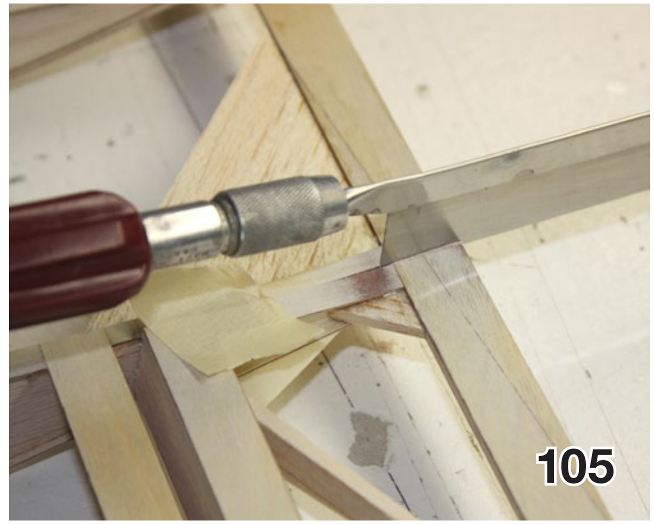
Cutting the Aileron Loose and Completing the Wing

Once all the sheeting, LE, wingtip, and cap strip joints have been sanded smooth, the aileron can be cut loose from the wing panel.

At each end of the aileron, cut through the lower 1/32" ply piece using a razor saw, then cut through the 3/16" web. See pic 102.

Put some tape on each end of the aileron to hold it into the wing. Cut partially through all of the ribs, from the top, using a razor blade inserted through the 1/64" gap. See pic 103.





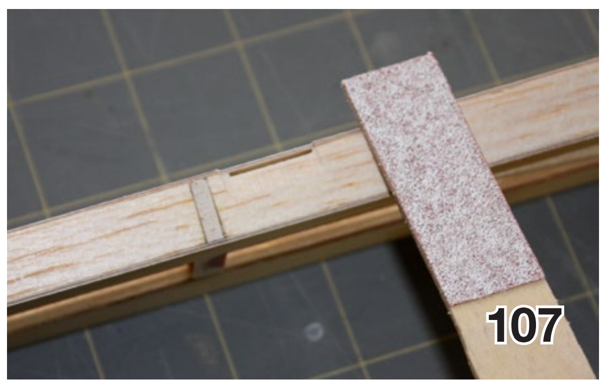
Use a razor saw to cut through the remainder of each rib from the bottom side. See pic 104.

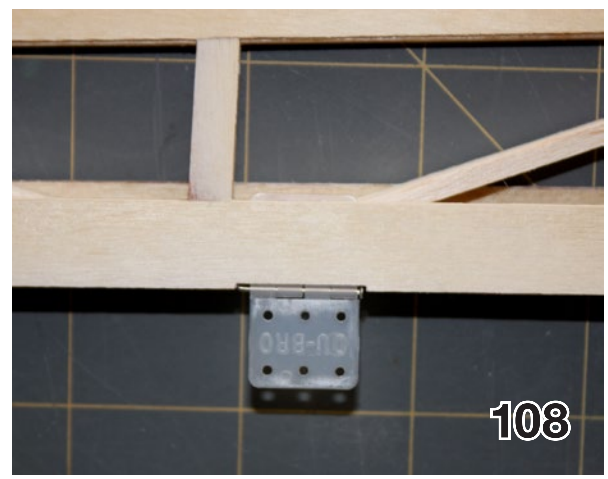
Now cut through the wing trailing edge at each end of the aileron. See pic 105.

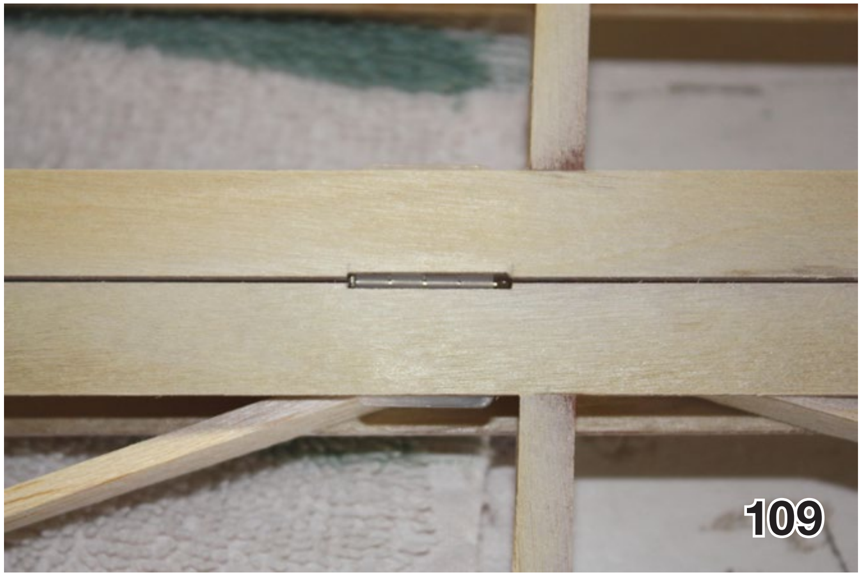
The aileron can now be removed from the wing. See pic 106.

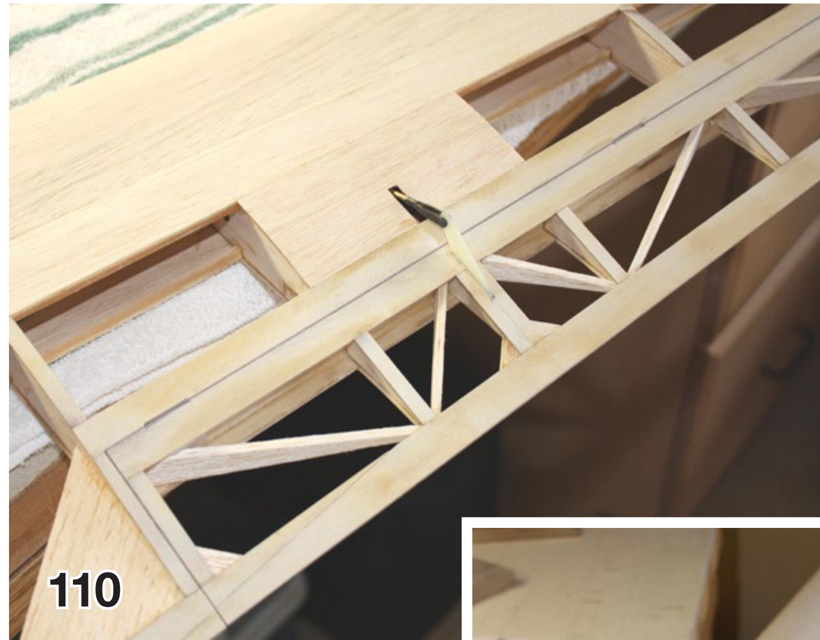
Sand the webs flush at each end of the aileron, and sand the rib stubs flush with the face of the aileron and the back of the wing.

The hinge slots need to be relieved a bit at the hinge line to clear the center of the pinned hinges. Make up a small sanding stick with 100 grit and remove about 1/32 inch to get the right amount of clearance. See pix 107 and 108.









109. *Hinge dry fit showing relief in wing and aileron for the center of the hinge.*

110. *Edges of the 1/32" plywood on top of the wing and aileron have been beveled to provide clearance on upward deflection. Here you can see the small gap at the hinge line with the aileron dry fitted.*

111. *View of the entire aileron during the dry fit check.*

Next bevel the edges of the 1/32" ply on top of the wing and the aileron just about 30 degrees to allow the aileron to move upward 1.5 inch measured at the root end.

Dry fit the aileron and hinges and check the gap and the up/down movement to make sure you can get 1.5 up and .8 down travel. See pix 109 - 111.

And that completes the right wing!

Yee Haa!

Now just repeat everything to build the left wing. It will go faster because you already have some parts made and you know how it goes together.

112

113

114

Wings Are Finished

The second wing is now built.

I thought I'd include a few pix taken just after fitting the wing roots to the fuse. See pix 112 - 114.

She takes up most of my shop!

Next will be making the canopy and frame, a few other odds and ends, and then covering.

I need to decide soon on my color scheme so I can order the Solartex.

German Aerospace Center

DLR

Bionics in aeronautics – Venus Flytrap used as a model for new flap design

14 August 2015

http://www.dlr.de/dlr/en/desktopdefault.aspx/tabid-10081/151_read-14505/

Researchers at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) are researching a morphing wing trailing edge that can be smoothly transformed into any shape and will make conventional flaps redundant. The flaps on the wings of today's commercial airliners are actuated via a complicated mechanism. Their arrangement and the resulting gap when they are extended compromises the aerodynamics, increases fuel consumption and contributes to inflight noise. The new technology, on the other hand, is flexible, its movement being based on that of carnivorous plants. This enables the gap between the wing and the flap to be eliminated.

Efficiency through pressure

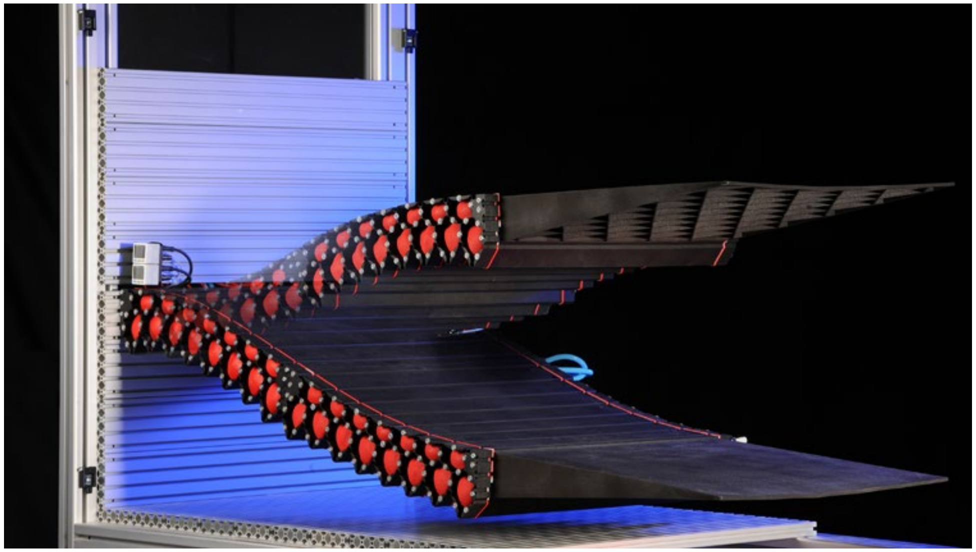
When looking for a suitable technical solution for deforming the trailing edge of a wing during flight, the Venus Flytrap proved to be a good source of inspiration. This is something of a surprise, but only at first glance. "The carnivorous Dionaea Muscipula needs to be able to close its trapping leaves very quickly to catch its flying insect prey," says Benjamin Gramüller from the DLR Institute of Composite Structures and Adaptive Systems. "It does this by changing the pressure in the leaf cells and using a leaf-shape geometry optimised through evolution." Research has shown that the Venus Flytrap builds up tension through water pressure. When triggered – when a fly enters the trap – this can be quickly discharged. The trap then snaps shut. "We are now using the principle behind the plant's movement for aeronautics applications," adds Gramüller.

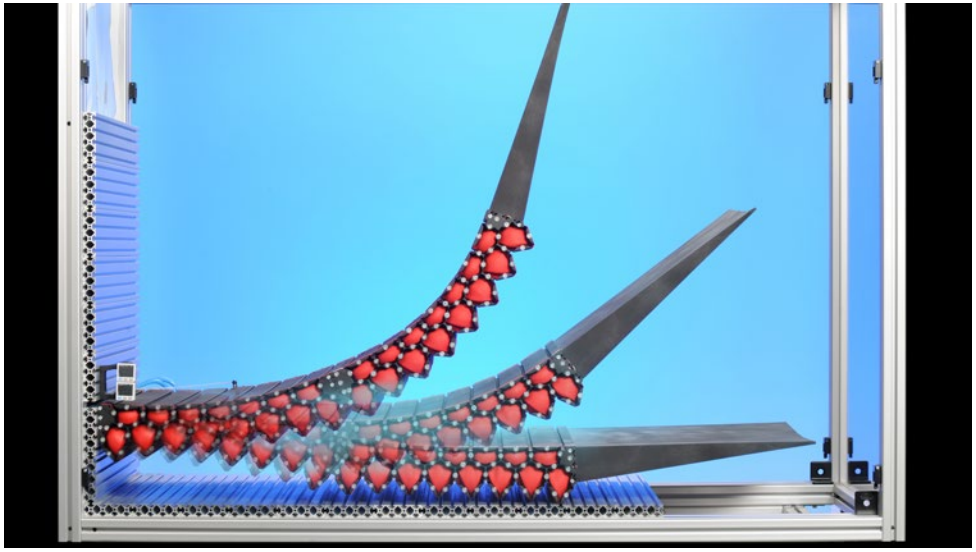
Movement in two cell layers

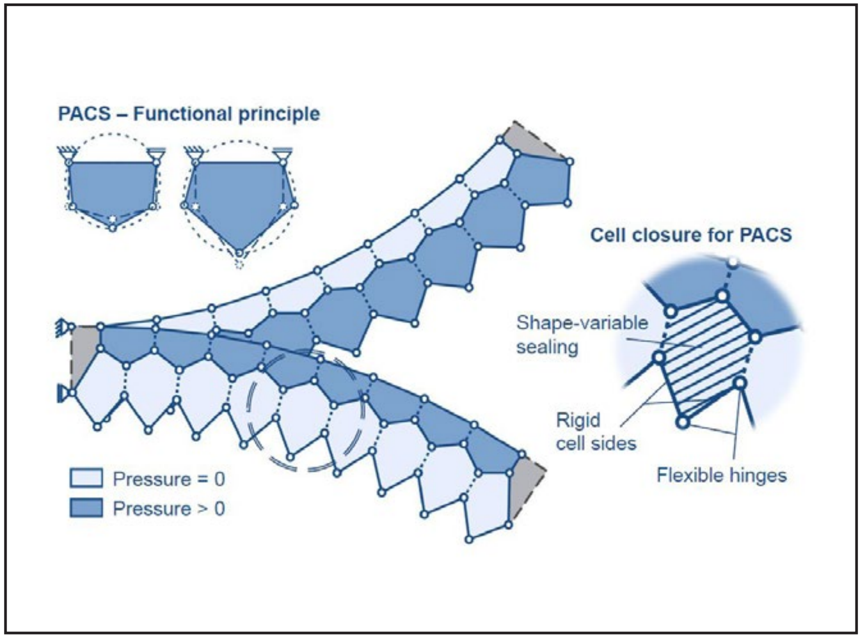
The DLR researcher and his colleagues have translated the cell system's idea of using pressure to assume a desired shape on the trailing edge of a wing. To do so, they have developed the world's first flap demonstrator, which is operated with compressed air and can flexibly assume aerodynamic shapes for cruising or landing. The plastic cells in the demonstrator have different sizes to form the appropriate shape for the trailing edge of the wing. Two layers of cells lie one on top of the other. “To raise the edge, we pressurise the lower cell layer, and to lower it, we pressurise the upper one,” explains Gramüller. “The compressed air can be easily supplied from the existing compressed air system in an aircraft.” The DLR researchers have already been able to use the new flight technology to demonstrate that the desired flap shapes for take-off and landing can be achieved depending on how the compressed air is applied.

The aircraft is able to maintain itself in the air at low speed – for example, during landing – thanks to the increased lift coefficient from the extended flaps. The flaps increase the curvature of the wings during slow flight and hence compensate for the loss of speed.

In future, the researchers plan on testing their new flap technology in a wind tunnel. The PACS (Pressure Actuated Cellular Structures) research project is being carried out in conjunction with Airbus Defence and Space.







ODR
ONE DESIGN RACING

text by Greg Hine, greghine@gmail.com

photos by Dave Garwood, Greg Hine, Bryan Lorentzen and Alex Paul

Contest Director Mike shouts, “Launch one,” above the wind noise. My caller Tom gently releases my Bad Voodoo One Design Racer (ODR) at the edge of the slope. It eagerly takes to the air.

“Out and up,” I think to myself as I push the nose over a little and head out from the slope. I want to stay clear of the other three aircraft in this heat’s race.

“Launch two. Launch three. Launch four,” Mike continues as all the airplanes in the heat get airborne.

There’s a strong breeze and good slope lift. “This is going to be an excellent race,” I think to myself. All four planes circle up and begin to hold position for the start. Actually, it takes some concentration to keep my plane from climbing too high and going too far out from the slope.

With the four planes now in the same airspace, I broaden my visual field to keep all planes in sight. This is not the time for a mid-air collision.

“Twenty seconds” the automatic timer blares.

I ease into an inbound turn toward the slope and hold altitude high above the start line as my mind starts to wander… “How did I end up in central Kansas participating in adrenaline rush slope racing?”...

My mind drifts back to when I was a fairly new RC pilot… “Fifty dollars? Will someone give me fifty dollars?” The auctioneer asks. I had come over to the Longmont Colorado RC auction to see what might be available.

Silence. No one responds. “Okay, forty dollars, will someone give me forty dollars?”

The auctioneer is holding up a smallish glider with the servos already installed. He says all it needs is a receiver and battery. Still no interest.

“Thirty-five… Will someone give me thirty-five dollars? I raise my hand and the glider’s mine. I bring it home, set it in a corner and I go back to routinely flying powered aircraft at our local Boulder RC field.

Sometime later…

Reaching for something in my shop I bump the neglected glider and it catches my attention. What model is it? I dust it off and carry it over to my computer to begin an Internet search.

A SIG Ninja! A slope glider. After a little further investigation I install a receiver and battery and, when the wind’s right take the glider to NCAR a nice 400’ SE facing slope here in Boulder, Colorado. I am quickly introduced to what will soon be my passion: Slope soaring.

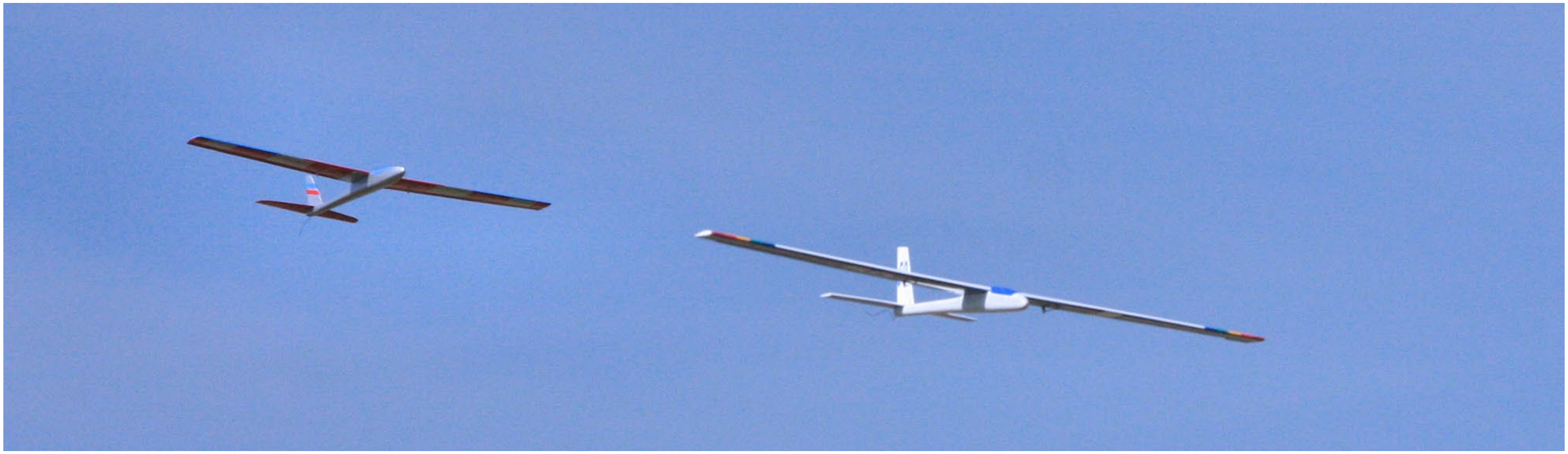
Dave Garwood

Upper row: IDing racers. Left photo by Bryan Lorentzen, right photo by Dave Garwood.
Lower row: Launching the ODRs. Photos by Dave Garwood.

Nice turn! Photo by Dave Garwood.

Pilot line. Photo by Bryan Lorentzen.

Main image: Flagger indicating time to turn. Photo by Dave Garwood.
Inset: Crossing the line. Photo by Alex Paul.



In the heat of the race. Photo by Dave Garwood.

For me slope soaring is the pinnacle. It can be as relaxing as gently riding a light afternoon lift or with an appropriate slope and wind, it is fast, adrenaline flying.

At our local power field, zooming by a few feet in front of another pilot is considered bad manners and poor piloting.

On the edge of a slope, pilots know it's just staying in the strong lift band.

On the slope one has to sense the wind, read the thermals and feel the plane. You learn to anticipate the wind shifts and how they will affect the slope, the lift and your plane.

Over time my "quiver" of slope planes grows: a DAW '126, a combat Bee, North County Moth, Windrider Fox, Fisher Ultra V, another '126, more Bees at different weights, a Vindicator.

I soon discovered several weekend slope events are held here in Colorado: the Western Colorado Slope Challenge, Glacier Ridge, Super77th, and Blue Mesa.

While mostly billed as combat slope events, I found they're really just weekend fun flies where a dozen or more pilots come with their favorite planes and everyone enjoys the camaraderie while flying the slope. I'm hooked.

My spring, summer and fall calendars begin to revolve around the slope weekends.

Soon it's time to start venturing farther afield to larger slope gatherings.

Within a day's drive of Colorado I find Soar Utah (held south of Salt Lake City every other Labor Day weekend) and the Midwest Slope Challenge at Wilson Lake, Lucas, KS (in mid-May each year).

Reading the web, I see the Midwest Slope Challenge has four different racing events: Combat, Warbird, ODR and Unlimited.

I decide that if I'm going to drive to mid-Kansas I might as well participate in more than one event. Since I already have combat Bees I decide upon One Design Racing. The planes are inexpensive and of similar design so the race is more pilot against pilot than different plane against different plane. Cory, one of our local slope pilots, agrees to sell me one of his used ODR racers.

The speaker blares out “Ten seconds” and I’m brought back to the race at hand.

I hold my plane’s position, like a Harrier Hawk hovering, and at five seconds to start I push the plane’s nose over for a quick descent toward the start line.

Mike yells “Clean start” as I level out on the race course. “Easy on the controls now,” I say to myself. “Fly smoothly… every control movement consumes energy and speed.”

“Turn,” Tom shouts in my ear while he taps my shoulder. My ODR has just crossed the far end of the course on the first lap. I slap the stick over and my Bad Voodoo makes a quick turn, levels out and heads back toward the start line.

Back at the start end of the course I pull up into a sharp turn, gaining some energy and speed by taking advantage of a slight change in the wind direction. My ODR is quickly racing toward the other end of the course again.

“Turn,” Tom says with another tap on the shoulder and the plane is heading back. It takes concentration, quick reflexes and smooth flying to stay near the front of the pack.

My ODR is flying well. It appears I ballasted it just about right for today’s conditions. 32 ounces, three under the weight limit.

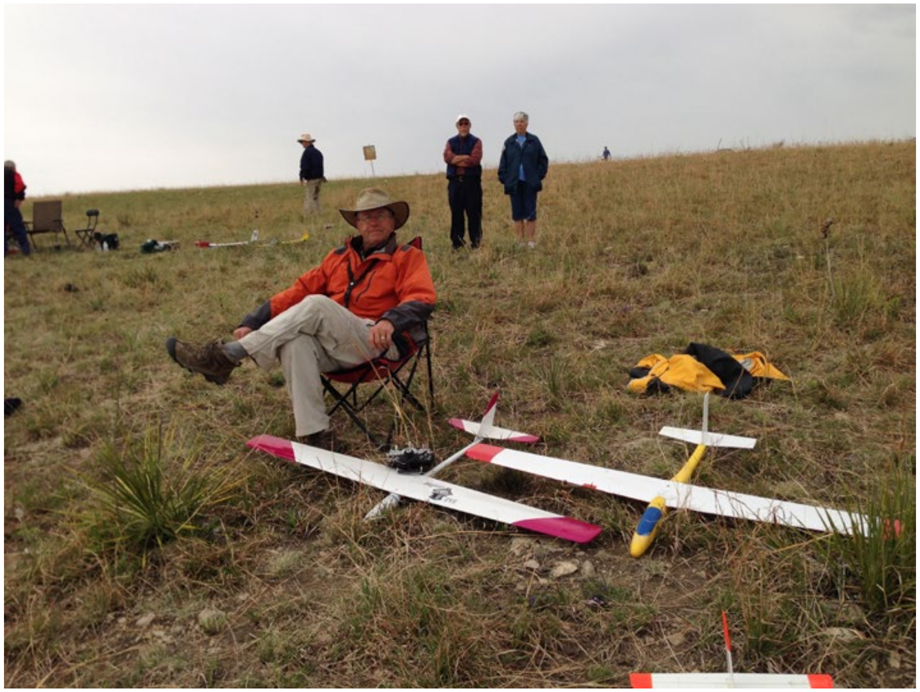
Back and forth.

Concentrate.

Back and forth.

Fly smoothly.

The race is soon over. Tom taps me one more time as my ODR crosses the start/finish line for the last time and says “Second place, nice job.”



The author with his Bad Voodoo and Duster.

I head the plane out and up from the slope into a big smooth turn back over the hill and into the wind. I put the flaps out and the plane slows and settles into the grass. It was a good race. I pick up and turn off the plane, confirm my finishing place with Darla, who’s keeping the score, and then I sit down and relax while I watch others fly, awaiting for my next heat.

Join the fun! ODR planes are a great introduction to the thrill of slope racing without spending an arm and a leg. The planes are relatively easy to build, easy to transport and are great slope flyers, even when you’re not racing.

Let’s race together at the Midwest Slope Challenge in May!

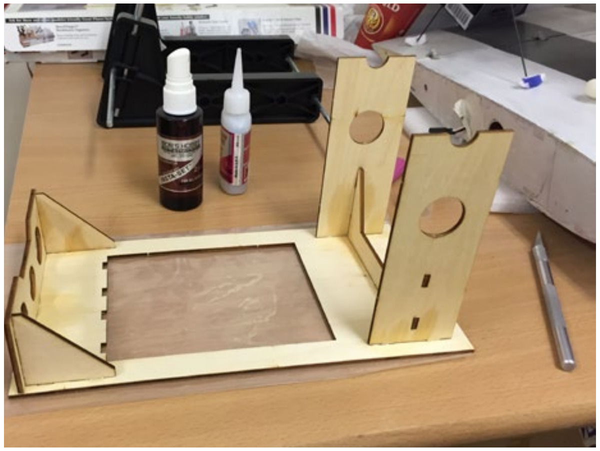
Staufenbiel STRATON 5,00m ARF

Sverrir Gunnlaugsson, sverrirg@gmail.com

Being part of a small community of modellers in Iceland, and an even smaller one gliding-wise, I've spent some time thinking how I can best satisfy the need for some large scale gliding/thermaling from the ground up for a reasonable amount of money. So when I saw Staufenbiel introduce the Straton earlier this year my interest was piqued.

Granted there wasn't much information available — no in-flight video and only the unboxing video from Staufenbiel at first.

Then Staufenbiel announced a 10% discount off it during a modelling show in Germany early in March, so here was the chance to get a 5 meter powered glider with everything bar the ESC and receiver for 719€ (~$785) delivered free to Denmark where I could pick it up and bring it home as an extra suitcase next time I flew over. As you can see in the photos, the Straton is well packaged and boxed and that plan worked.



Did I mention that the fuselage is in two parts and the wing breaks down to four parts, making the box much more maneuverable and cost effective in shipping!

Just under a week later the first flying video appeared on YouTube and I knew I had made a good call.

Guess I wasn't the only one that got excited seeing that video as the PNP version sold out in a few days after the release of it.

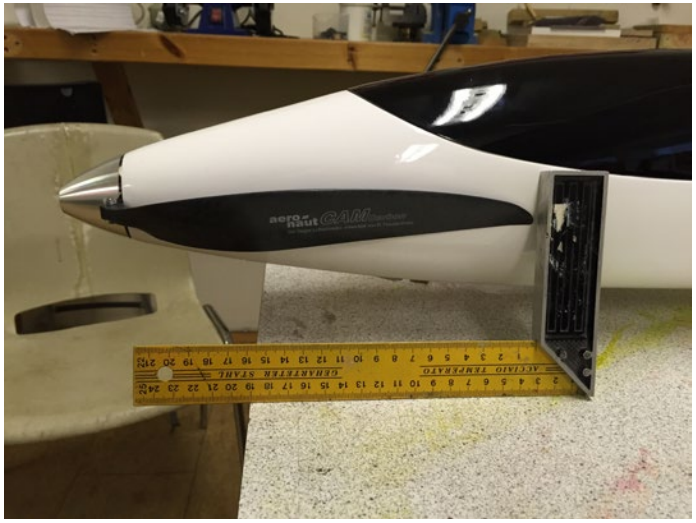
When the Straton got back in stock the price had gone up by 60€, but still a great value for what you get. You can also get an ARF version for 599€ vs. the 859€ for the PNP version.

Note that for shipping addresses outside of the European Union you can subtract the value added tax, bringing the prices down to 503€ and 722€ respectively.

Upper left: Cradle for assembly of the fuselage.

Upper right: Add some glue to the fuse-lage joint.

Left: And make sure it's straight!



Left: The first kits were supplied with a Aeronaut Cam prop that isn't up to the RPM's and were replaced by Staufenbiel's own product.

Middle: Shown here besides a 22x10 propeller.

Above: Impressive size for an electric motor when you are used to the 13" and 14" sizes.

The Straton comes double boxed and had survived the transport Germany - Denmark - Iceland without damage.

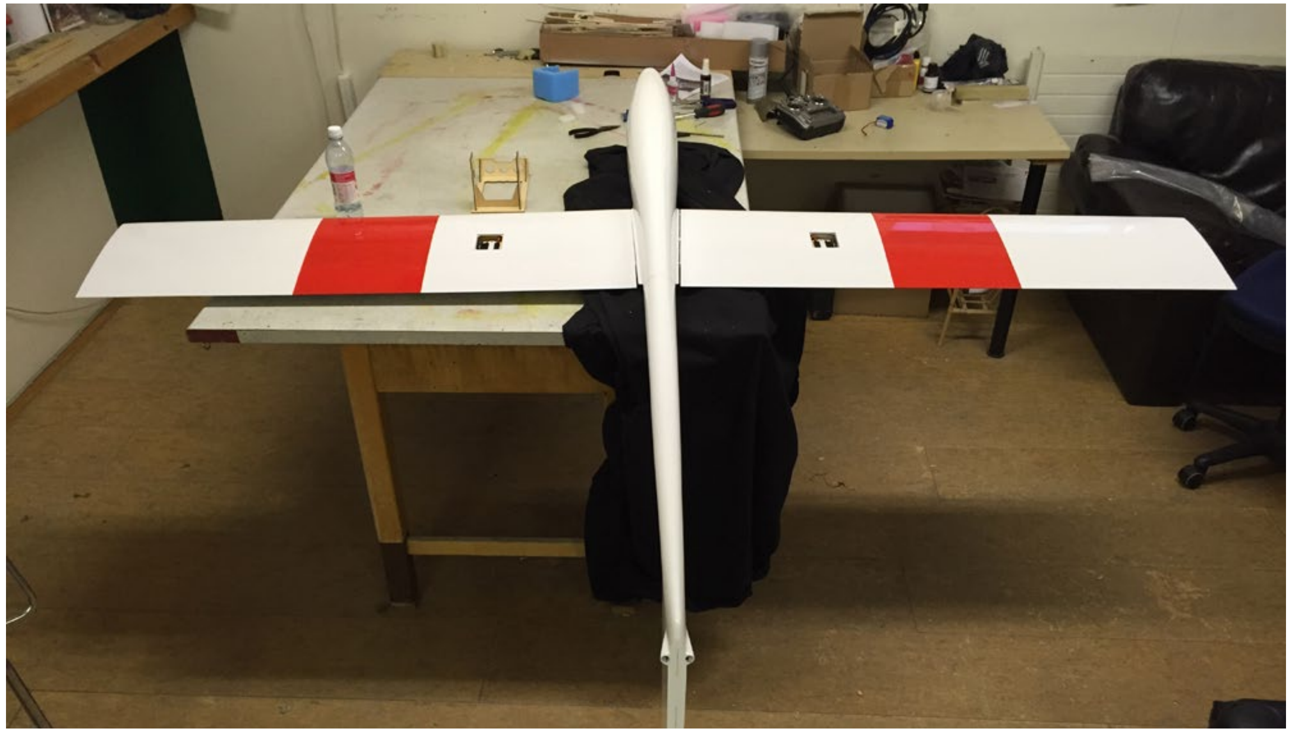
Only thing wrong was a small patch of paint had chipped off one of the wing tips but it was glued back in and is hardly noticeable.

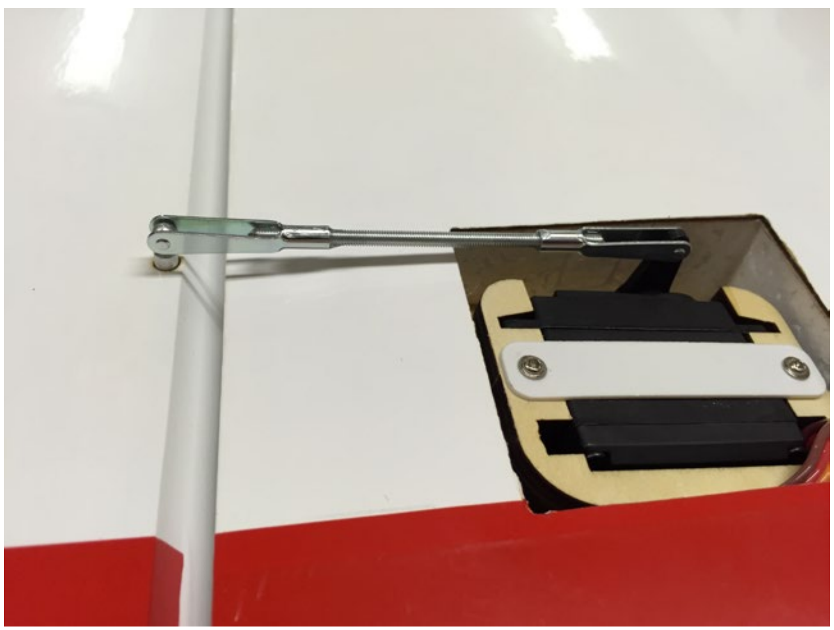
The wings are Styrofoam core skinned with abachi and covered with Oracover.

A solid steel joiner runs through the fuselage with solid carbon tubes connecting the outer halves.

Straton dimensions

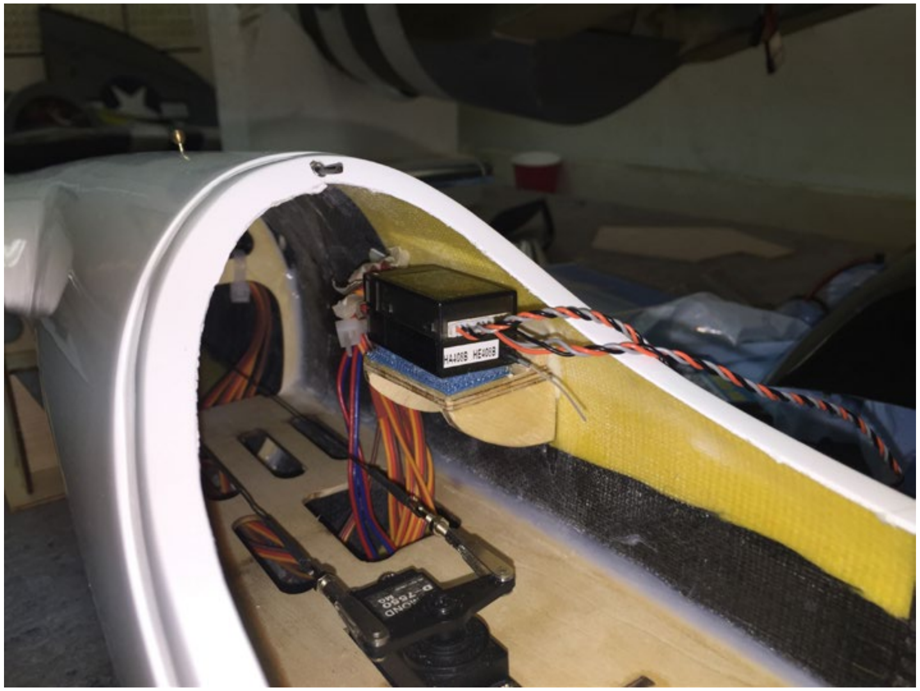
Wingspan:	500 cm, 197"
Length:	225 cm, 88.5"
Weight:	8,4 kg, 296 oz.
Motor:	310 kV
Wing area:	165 dm^2, 17.75 ft^2, 2557.5 in^2
Profile:	HQ/W-2,5/12 + HQ/W-2,5/11 + HQ/W-3/10,5

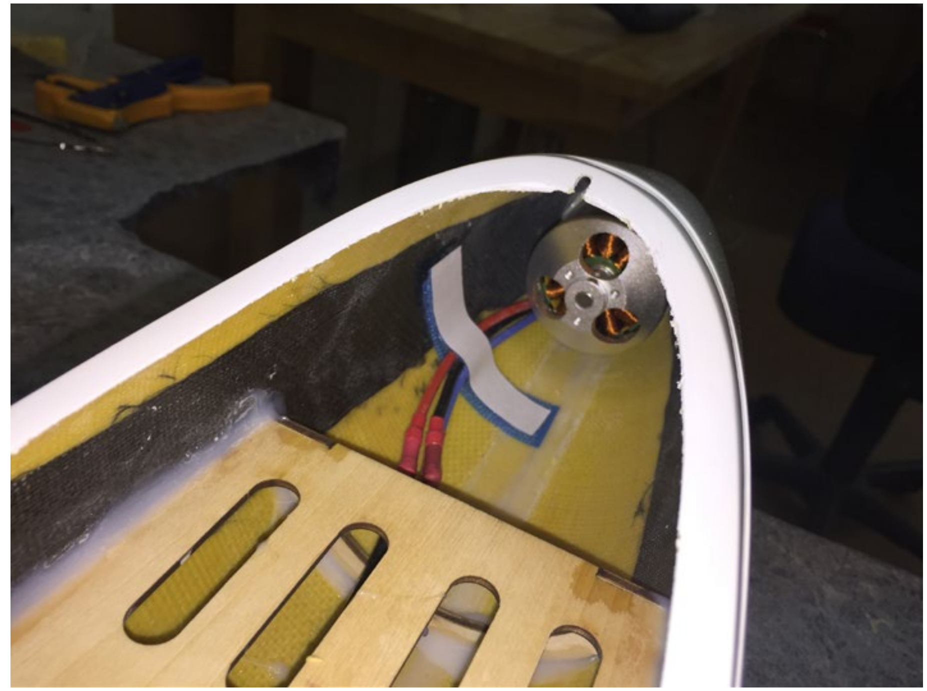




The wing comes in four parts, divided at the aileron/flaps and flaps/ fuselage. The flaps could have a nice career as barn doors!

Staufenbiel wants you to use Z-bends with the included linkage but I found some of them to be too brittle and besides I like my links to be solid above certain sizes. So I replaced the included rods for 3mm threaded rods with clevis on both ends adding a carbon tube over the elevator linkage due to its length.





Upper left: I made a small shelf for the receiver mostly to get it above the carbon strengthening that is around the middle of the fuselage.

Upper right: No work needed on the motor besides securing the wires.

Left: I'll be using separate batteries for the receiver as I like to have a bit of redundancy in my larger planes. Two LiFe packs will power the receiver through a Powerbox switch and the 85A Dymond ESC with XT90 connector can be seen under the cockpit floor.

The fuselage molding is clean and neatly done and with sanding of the gelcoat the fuselage halves join up neatly.

The motor installation doesn't require much change but make sure that you've gotten the Staufenbiel propellers as the Aeronaut Cam that were supplied first aren't rated for the RPM you can achieve on the included motor.

Check the tail-boom/tail for stiffness and make some arrangements if you feel it is too soft. There was some flex around my servo box so I added some spacers around it to box up the inside of the vertical tail to strengthen it.

Another thing to watch out for is that some of the supplied control pushrods were a bit too brittle and snapped easily when bent.

And if you have a lighter battery than the recommended 6S 7000 mah you might need some weight in the nose to compensate.

As the battery I'm using (6S 5800 mAh) is lighter than the recommended 7000 mAh

I needed to make a dolly for the takeoff so IKEA came to the rescue with the EKORRE child walking aid supplying the majority of components. Staufenbiel later introduced their own dolly. Due to the large size of the prop we need some serious ground clearance.

one I needed to make a ballast for the nose. Film put in the bottom of the nose with some steel sand and epoxy poured in and left to harden. Later fastened with silicone so it can be removed if I acquire a heavier battery at a later date.

Now came the big day or should I say evening as the maiden was around 2100 GMT/local time.

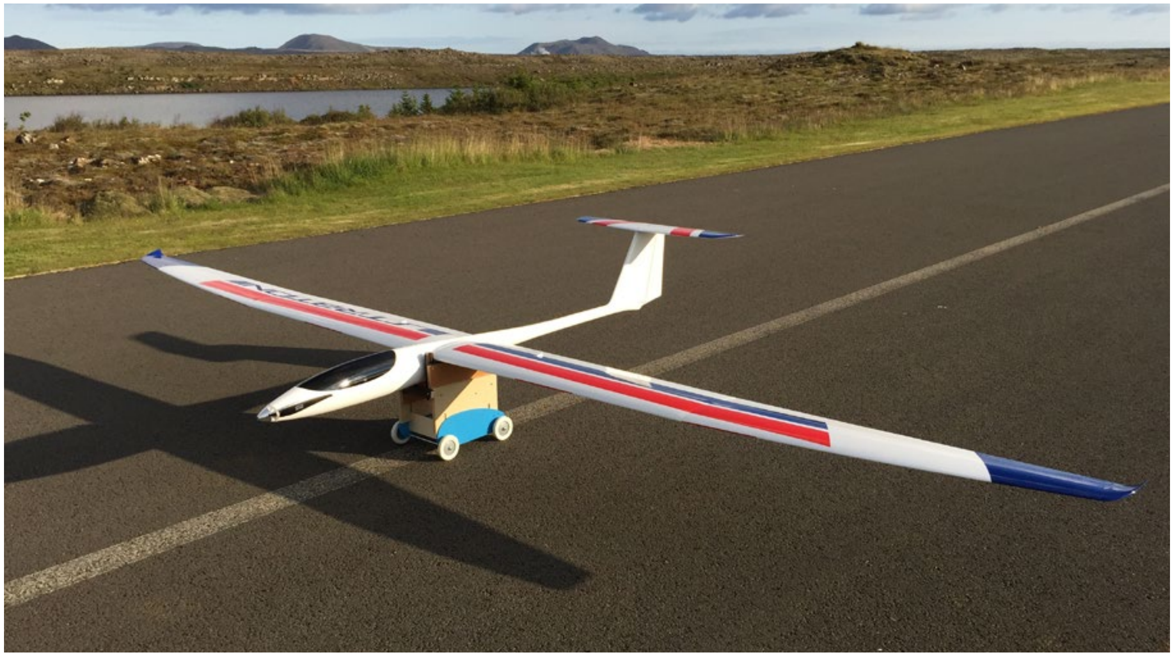
The dolly was placed on the center line of the paved runway, with a wingspan of 5 meters we had a clearance of just over 2,5 meters on either side.

With about 10° flaps I slowly advanced the throttle and down the runway the Straton went.

I was able to control the heading with rudder and soon I started to feed in up elevator.

Shortly thereafter the Straton rose up from the cradle climbing authoritatively up in the sky.

I had not enabled the brake on the ESC for the first flight, so the freewheeling prop provided some drag, but nonetheless it was apparent that the MH32 profile is working as expected.



The Straton takes up a lot of space! With a wingspan of 5 meters we had a clearance of just over 2,5 meters on either side of the 10 meter wide runway.

Seeing how it fits the runway (120 x 10 meters).

Final control checks before the maiden flight.

On final approach.

Landing in 3, 2...

It did a roll and loop without problem after diving for speed, and overall the handling was very predictable and nice.

Climbing for height I tried out the crow braking and it really slows the plane down as expected, as expected some down elevator is needed but the climb isn't excessive if you don't program it in for the first flight. In it's current configuration I've got the motor activated on the throttle stick and the flaps/crow set up on a three position switch, giving me takeoff flaps and then full crow braking. For full proportional control I've also got the crow programmed in on a slider but I'll probably switch them over to the throttle stick and put the motor on the slider for more precised applications during the landing faze.

All in all I'm very happy with the performance of the Straton and the price is hard to beat!

Links:

Video of maiden flight: http://bit.ly/stratonflight or https://youtu.be/7cLtNjqTzb4

Staufenbiel: http://modellhobby.de/

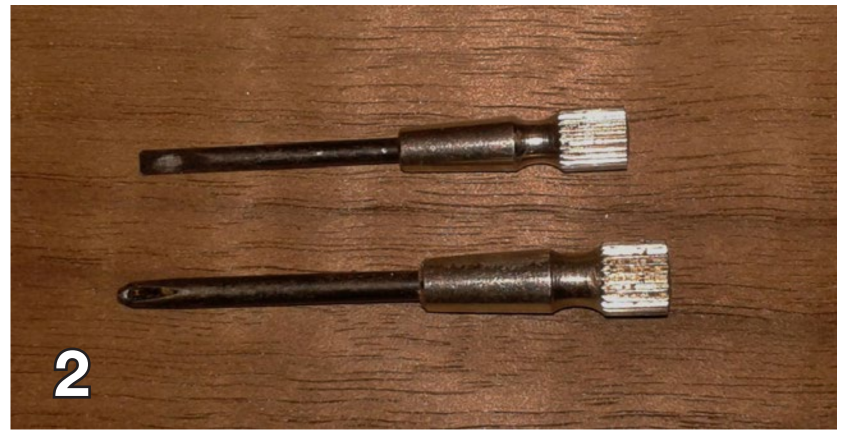
Happy after a good maiden flight!

Tom's Tips

Handy little screwdrivers

Tom Broeski, T&G Innovations LLC, tom@adesigner.com


1

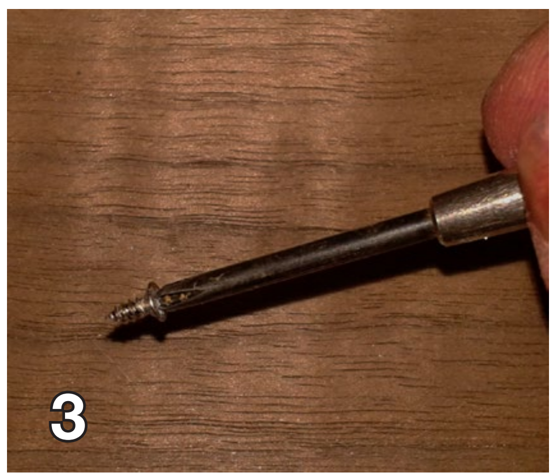

2

I have a bunch of cheap jeweler's screwdrivers and found there were times I couldn't get one down in where I needed to. Sooo....

I took a couple and cut the handles off like so: Photo 1 —> Photo 2.

I ran them over a magnet a couple of times to help hold the screws. Photo 3.

I use these little guys a lot more than I thought I would because they can get in where nothing else could.


3


4

Two Gadgets for Shaping Trailing Edges

Chuck Anderson, chucka12@outlook.com

Shaping and notching trailing edges for ribs is one of the most tedious tasks for scratch builders. Here are two tools I have been using for years that make it easier.

1. Trailing Edge Sanding Jig

Standard balsa trailing edge stock is too thick for modern airfoils and it is necessary to fabricate them unless using carbon fiber trailing edges as used on the Ava.

Maybe someday, but I have been shaping my own balsa trailing edges for over 30 years using a simple sanding jig made from two pieces of flat iron bolted together to give the desired thickness and width.

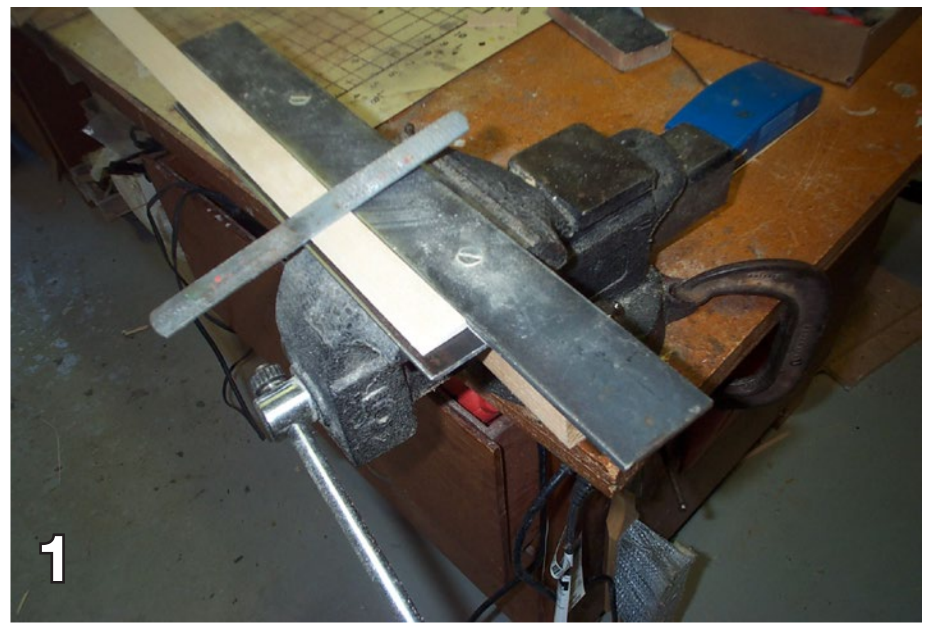
For standard 1 inch wide balsa trailing edge, I use two 3/32 inch thick, two inch wide flat iron strips offset 1 1/8 inches bolted to a short 2 by 4.

Clamp the jig in a bench vice to shape the trailing edge..

Standard balsa trailing edge stock is good source material and is already near the desired shape.

The trailing edge is held against the jig while sanding to the desired shape with a course sanding block or a wood rasp.

The thin trailing edge can be hardened by coating with thin CA, but a better solution is to glue 1/16" by 1/4" spruce or bass to standard 3/4 inch balsa trailing edge.



2a

2b

Bass is easier to sand down to a thin edge and is what I use most often.

Smaller or thinner trailing edges can be shaped on this jig by shimming with masking tape or thin cardboard.

2. Trailing Edge Notcher

For years, I notched trailing edges for ribs by epoxying short lengths of hacksaw blades between wood blocks. When I bought a router attachment for my Dremel rotary tool, I built a simple jig for notching trailing edges.

I drilled a hole in the center of a 4 by 6 inch scrap of lite ply and glued a strip of hardwood to the plywood for a fence. I use 3/32" balsa for most ribs, but a Dremal 3/32" router bit was not available. So I made one by breaking a 3/32" drill bit so that only about a half inch of the drill flute was left. Not as good as a router bit but it did an acceptable job of notching balsa.

The scrap of drill bit left from making the router was epoxied to the plywood 2 inches to the side of the router bit.

The jig is clamped to the router attachment with C-clamps.

Adjust the rotary tool to expose 1/8 inch of the router bit above the lite ply table. Shift the tool until the trailing edge fits between the bit and the fence and the rib spacing is correct.

I have since bought a pack of four router bits from Micro Mark that include 1/16", 3/32", and 1/8 inch bits that covers everything I need.

Both tools were made many years ago and were whipped up in a few minutes from material in my scrap box for an immediate need.

I could have done a better job but they work so I never got around to building a better version.

TWO HIGH ALTITUDE SAILPLANES

Lamson L-106 Alcor and Perlan 2

The L-106 Alcor, conceived during the early 1960s by Robert T. (Bob) Lamson (1914 - 2011), was one of the first sailplanes in the U.S. made of composite materials. Other innovations, like a pressurized cockpit (a first for a sailplane) and a solar heater, keep the Alcor's pilot comfortable at high altitudes.

The sailplane's fuselage consists of Sitka spruce veneers overwrapped with fiberglass. Wings are S-glass and foam sandwich assemblies. S-glass monospars were used for the wings and tail. This construction allowed for an airframe that was both light and strong. These materials also had an interesting side effect -- the wings bent upwards in flight. Although this might be a bit disconcerting to some, it actually has aerodynamic benefits that improved performance, especially in turbulent conditions.

Lamson flew the experimental sailplane recreationally from 1973 until it was donated for use in a scientific study. From 1985 to 1989, the Alcor flew in a study of the Chinook Arch in Alberta, Canada. The Chinook Arch is a weather phenomenon associated with severe turbulence in the Canadian Rockies. Unlike powered aircraft, the Alcor could glide over the area of interest and collect undisturbed meteorological and environmental data for extended periods of time.

The Alcor is currently on display in the main gallery of the Museum of Flight in Seattle, Washington.

Resources:

1986 Status Report, Flight Research Institute, Seattle.

1987-88 Status Report, Flight Research Institute, Seattle.

1988-89 Status Report, Flight Research Institute, Seattle.

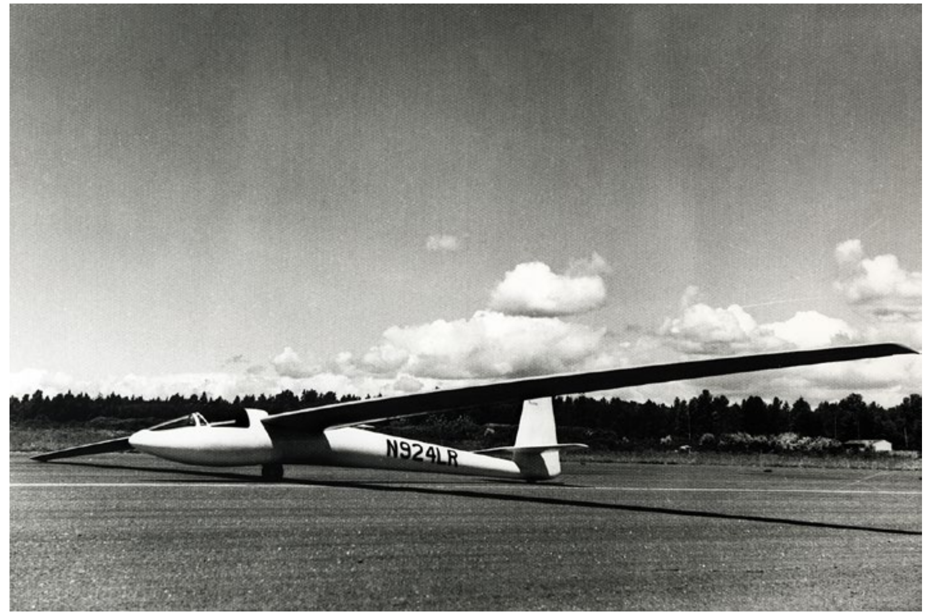
http://www.museumofflight.org/aircraft/lamson-l-106-alcor-glider

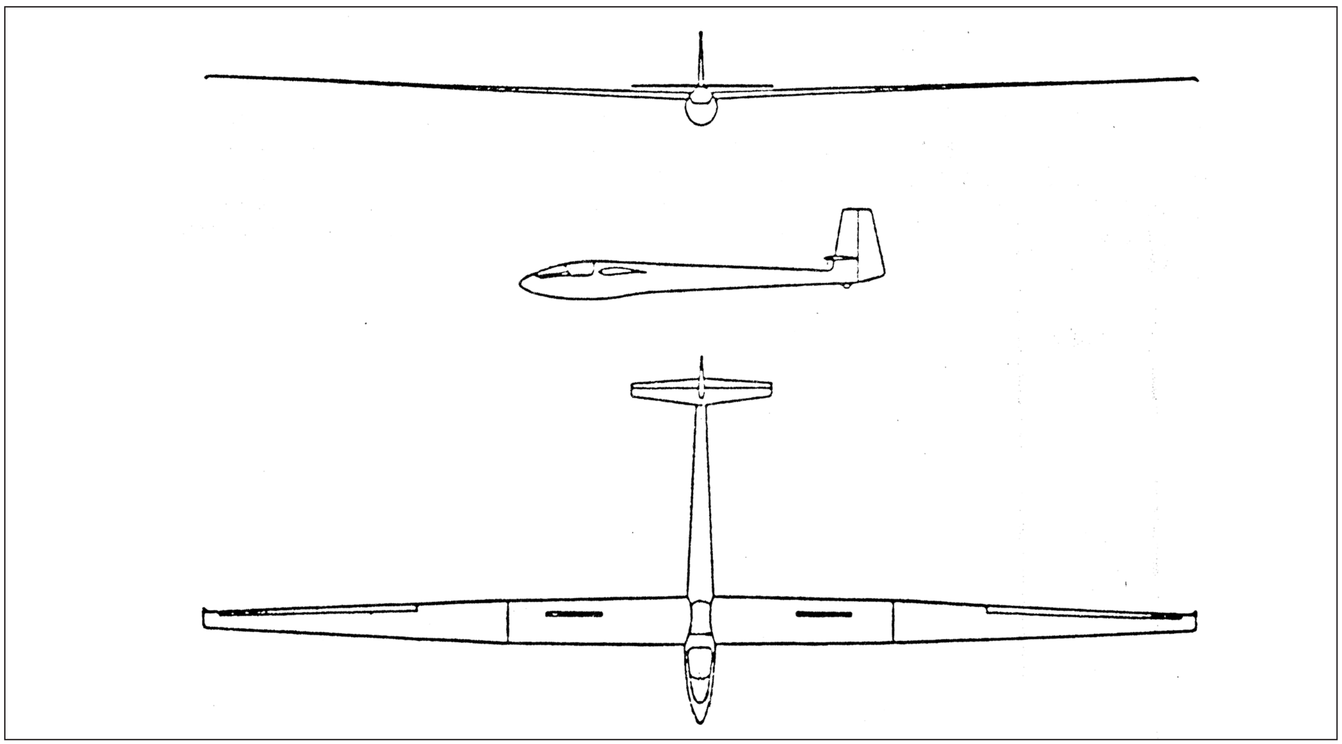
Soaring Pilot, Volume 1 Number 4, Winter 1973/1974, Soaring Pilot, Manchester England, 1974.

Dimensions:
- Crew: One
- Length: 25 ft (7.6 m)
- Wingspan: 65 ft 7 in (19.99 m)
- Wing area: 154 sq ft (14.3 m2)
- Aspect ratio: 28:1
- Empty weight: 550 lb (249 kg)
- Gross weight: 950 lb (431 kg)

Performance:
- V_{NE}: 140 mph; 122 kn (225.26 km/h)
- L/D: 43:1 at 55 mph (89 km/h)
- Sink rate: 90 ft/min (0.46 m/s) at 50 mph (80 km/h)


N924LR


N924LR



The Perlan 2 is being built by RDD Enterprises of Redmond, Oregon, with financial support from Airbus Group. The completed aircraft was displayed at EAA AirVenture 2015, Oshkosh Wisconsin.

Stratospheric mountain waves were properly exploited for the first time only in 2006, when the Perlan I glider (a modified DG Flugzeugbau DG505M) flown by Einar Enevoldson and Steve Fossett reached 50,671 feet over the Andes mountains of Argentina. Enevoldson was a test pilot for Germany's DLR and for NASA who had researched the phenomenon with meteorologist Dr. Elizabeth Austin. Fossett was the millionaire adventurer who first backed the project.

On September 3, 2007, Steve Fossett disappeared while flying over the Sierra Nevada Mountains and his death was eventually confirmed. At the time of Steve's passing, the structural and aerodynamic design of the fuselage of Perlan 2 had been completed, along with the aerodynamic design of the entire sailplane (glider). Unfortunately, both Steve Fossett and the funding for completion of Perlan Mission II were lost. In July of 2014 Airbus Group became the partner and title sponsor of Airbus Perlan Mission II.

Looking much like one of the current F3J models, the Perlan 2 is designed to reach heights of 90,000' and more. True flight speed at 90,000 will be 350 knots (403 mph).

Perlan 2, benefitting from the lessons learned on Perlan 1's ascent, incorporates a pressurized cabin to allow its pilots to enjoy unencumbered flight, with full control over stick and rudder, and many small switches. The cabin pressure of 8.5 pounds per square inch (psi) gives a cabin atmosphere equal to flight at about 14,000 feet. With an empty weight of 1,100 pounds, and a wing area of 262 square feet, the 84-foot span machine is amazingly light for the structural strength required for stratospheric flight.

With more wing area than a conventional sailplane, it would stay aloft, but never compete with such craft at lower altitudes. But in the thin air at 90,000 feet, with 98 percent of the earth's atmosphere beneath it, it will be unrivalled. Because it carries two into a very hazardous realm, it is equipped with specialized equipment, including dual-redundant oxygen rebreathers, a drogue parachute to allow rapid descent in the unlikely emergency, and a ballistic chute for a lower-altitude emergency descent.

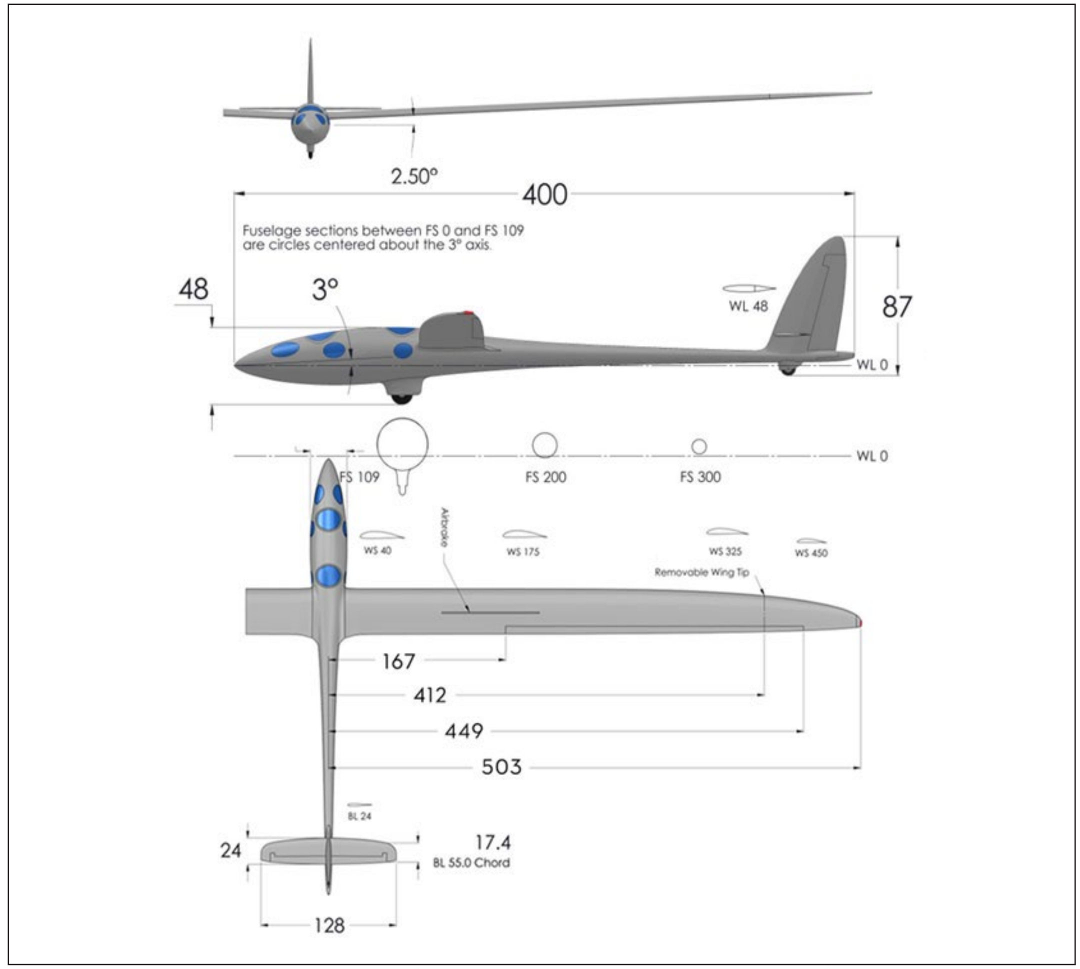
Statistics

Crew	2
Cabin Pressure	8.5 PSID
Empty Weight	1265 lbs
Gross Weight	1800 lbs
Wing Span	84 ft
Wing Area	263 sq ft
Aspect Ratio	27
Wing Incidence	1.5 °
Horiz. Tail Incidence	-0.5 °

Equipment

To do scientific research at the edge of space while keeping the crew safe the Perlan 2 has been equipped with:

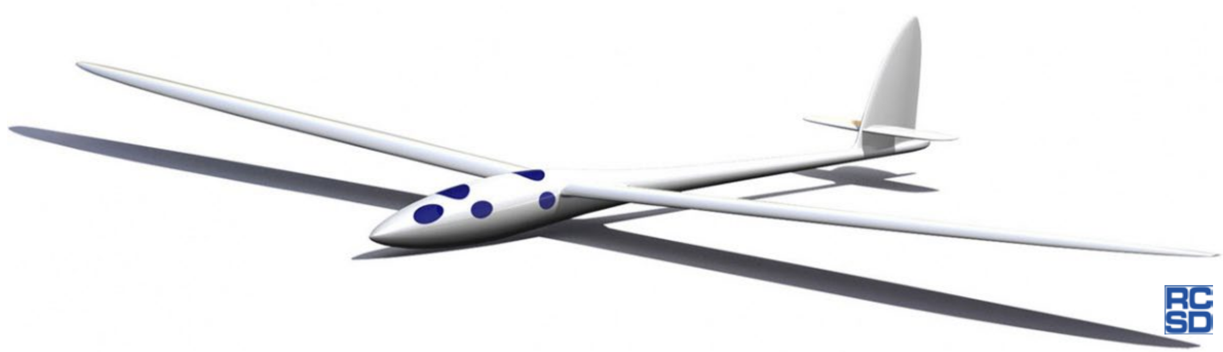
- Cabin pressure regulator and air bottle
- Re-breather system for life support
- Tail drogue parachute and BRS parachute
- High altitude radar transponder by Sandia Aerospace
- Instrumentation and lighting to fly at night by Whelen Engineering
- Data loggers to validate world record, LX-9000
- Scientific instrumentation
- Cameras to record meteorological conditions
- Lithium-ion rechargeable batteries
- Telemetry to communicate with mission control and scientists on the ground



Resources:

http://www.perlanproject.org/

http://www.ainonline.com/aviation-news/aerospace/2015-07-16/toward-unknown-soaring-new-heights-perlan-ii



FAI News

World Record Claims, European F3J Championship, F3B World Championship and F3K World Championship

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

==

Claim number : 17616
Sub-class :F5 Open (Radio Control Flight)
Category: Aeroplane
Group : Electrical Motor Solar Cells
Type of record : Distance to goal and return: 188
Course/location : Ballenstedt (Germany)
Performance : 1’140 m
Date :24.07.2015
Current record : 1000 m (09.09.2013 - Valery Myakinin, Russia)

==

==

Claim number : 17625
Sub-class :F3 Open (Radio Control Flight)
Category: Glider
Type of record : Distance in a straight line: 156
Course/location : Pioche, Nevada (USA)
Performance : 228.7 km
Pilot : John A. Ellias (USA)
Date :09.08.2015
Current record : no record set yet

==

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).

Sport: Aeromodelling - F3J - Thermal Duration Gliders
Title: FAI F3J European Championship for Model Gliders
Type : Continental
Date: 26.07 - 02.08.2015
Location: Dupnitsa - Bulgaria

Final Results :

F3J - Senior
- 1st : Arijan Hucaljijk CRO
- 2nd : Jan Littva SVK
- 3rd : Dominik Prestele GER

F3J - Junior
- 1st : Sylvain Quoy FRA
- 2nd : Timo Welzel GER
- 3rd : Tilen Marc SLO

F3J - Team Senior
- 1st : Slovakia
- 2nd : Czech Republic
- 3rd : Turkey

F3J - Team Junior
- 1st : Germany
- 2nd : Ukraine
- 3rd : Bulgaria

The full results can be found at the following address :
http://bulgaria2015.com/?page_id=65

FAI congratulates the Winners and thanks the Organisers of the Championship.

2015 FAI World Championship for Model Gliders Class F3B
Deelen/Arnhem, Netherland
26th July to 2nd August 2015

					Round 1			Round 2			Round 3			Round 4			Round 5			Round 6				
Rank	StNr	Name	Country	Licence	Duration	Distance	Speed	Duration	Distance	Speed	Duration	Distance	Speed	Duration	Distance	Speed	Duration	Distance	Speed	Duration	Distance	Speed	Penalty	Total
1	23	Herrig Martin	GER	2884	1000,0	1000,0	961,8	998,6	1000,0	632,0	994,3	1000,0	902,6	1000,0	1000,0	1000,0	1000,0	833,3	948,7	998,6	1000,0	1000,0		14810,3
2	22	Herrig Andreas	GER	2883	995,7	1000,0	982,0	997,1	1000,0	817,1	1000,0	1000,0	1000,0	1000,0	923,1	964,3	991,4	650,0	948,7	990,0	1000,0	869,9		14672,2
3	48	Böhlen Andreas	SUI	11629	997,1	782,6	849,4	1000,0	1000,0	916,7	994,3	1000,0	927,0	1000,0	1000,0	867,1	1000,0	937,5	933,4	1000,0	1000,0	831,2		14428,3
4	56	Paulson Kyle	USA	701947	1000,0	1000,0	984,9	1000,0	875,0	0,0	932,8	900,0	960,1	998,6	1000,0	912,8	980,0	958,3	933,4	1000,0	950,0	729,4		14307,6
5	21	Dylla Thomas	GER	3098	1000,0	850,0	869,7	1000,0	1000,0	841,1	1000,0	933,3	1000,0	998,6	750,0	929,8	990,0	833,3	1000,0	998,6	1000,0	685,8		14254,3
6	10	Duchesne Denis	BEL	7070	944,3	875,0	990,9	998,6	1000,0	826,4	766,8	1000,0	840,2	1000,0	937,5	922,4	992,9	1000,0	853,6	991,4	863,6	869,9		14216,7
7	24	Kunz Andreas	GER	3112	948,6	1000,0	937,0	1000,0	1000,0	753,7	997,1	1000,0	925,3	992,9	1000,0	805,4	998,6	857,1	916,2	1000,0	0,0	698,8		14183,2
8	53	Vaisanen Pasi	SWE	43500	994,3	1000,0	879,0	1000,0	1000,0	745,0	998,6	909,1	944,9	957,1	1000,0	877,4	1000,0	777,8	822,8	991,4	1000,0	752,8		14170,2
9	49	Huggler Niklaus	SUI	48397	987,1	791,7	905,8	964,3	904,8	898,0	742,5	1000,0	1000,0	998,6	956,5	879,1	1000,0	764,7	861,0	990,0	1000,0	789,8		14136,9
10	9	Rossman Hans	BEL	2100790057	992,9	880,0	1000,0	992,9	875,0	855,7	998,6	913,0	979,7	997,1	933,3	917,6	991,4	937,5	739,1	998,6	1000,0	684,7		14135,9
11	52	Stahl Joakim	SWE	24580	997,1	1000,0	900,8	984,3	1000,0	818,2	985,7	1000,0	710,0	1000,0	727,3	917,0	998,6	923,1	767,3	1000,0	1000,0	824,7		14132,4
12	17	Stonavsky Jan	CZE	1204	928,6	909,1	789,9	992,9	1000,0	852,7	991,4	1000,0	885,5	998,6	1000,0	886,9	995,7	1000,0	648,6	1000,0	947,4	761,6		14102,4
13	51	Ekman Jonas	SWE	23414	997,1	909,1	867,4	971,4	1000,0	791,4	997,1	900,0	912,1	994,3	888,9	923,0	992,9	1000,0	772,4	998,6	958,3	721,3		14013,7
14	50	Kubler Thomas	SUI	12459	985,7	1000,0	861,1	992,9	875,0	910,0	997,1	1000,0	777,6	1000,0	1000,0	932,8	998,6	0,0	0,0	1000,0	909,1	746,6		14000,7
15	34	Villani Ennio	ITA	15686	998,6	958,3	894,1	1000,0	857,1	864,1	845,5	956,5	940,4	1000,0	846,2	887,4	864,3	1000,0	840,2	998,6	909,1	796,7		13968,6
16	32	Amici Danielle	ITA	12190	991,4	1000,0	891,0	992,9	555,6	791,9	995,7	1000,0	700,9	997,1	961,5	897,6	984,3	1000,0	747,4	998,6	950,0	746,2		13961,4
17	15	Fusek Petr	CZE	1112	990,0	640,0	827,8	990,0	960,0	703,0	776,8	1000,0	895,0	997,1	1000,0	851,9	998,6	916,7	791,3	1000,0	1000,0	674,2		13921,4
18	42	Lobov Oleg	RUS	35	684,3	863,6	883,8	988,6	833,3	447,4	985,7	956,5	959,5	917,1	1000,0	946,1	998,6	1000,0	931,5	997,1	608,7	657,7		13919,2
19	39	Donker Duyvis Frits	NED	258302	1000,0	1000,0	845,0	961,4	1000,0	850,3	865,5	833,3	952,2	995,7	733,3	847,7	1000,0	1000,0	839,7	990,0	791,7	704,2		13907,1
20	25	Krischke Johannes jun	GER	3741	980,0	923,1	898,4	997,1	1000,0	758,3	998,6	1000,0	905,4	855,7	777,8	859,7	997,1	1000,0	766,4	997,1	800,0	764,6		13887,5
21	57	Zaballos Darrell	USA	316694	1000,0	1000,0	990,9	984,3	884,6	536,8	997,1	958,3	886,1	1000,0	1000,0	895,3	997,1	764,7	737,5	992,9	789,5	739,7		13869,1
22	30	Krust Jean Philippe	FRA	29087	955,7	1000,0	872,0	987,1	1000,0	786,9	719,6	900,0	818,1	914,0	863,6	891,9	997,1	809,5	881,3	1000,0	894,7	462,1		13762,6
23	3	Kullack Tim	AUS	22320	1000,0	913,0	842,8	1000,0	916,7	839,3	998,6	913,0	886,9	1000,0	814,8	790,0	997,1	611,1	784,2	992,9	1000,0	680,6		13696,5
24	35	Sakurai Naoto	JPN	F0377	998,6	461,5	842,8	998,6	916,7	1000,0	991,4	904,8	687,2	1000,0	888,9	891,4	1000,0	862,1	889,7	998,6	800,0	658,0		13679,2
25	11	Hansoulle Steve	BEL	7044	768,6	1000,0	771,2	995,7	880,0	790,4	997,1	909,1	916,0	994,3	1000,0	869,3	1000,0	1000,0	851,5	991,4	888,9	698,1	-300	13674,9
26	19	Krogh Soren	DEN	4270	1000,0	1000,0	813,4	920,0	904,8	824,7	997,1	1000,0	655,1	995,7	833,3	922,4	1000,0	1000,0	572,1	998,6	904,8	642,8		13659,4
27	14	Baudis Jiri	CZE	1135	935,7	800,0	851,6	997,1	961,5	920,1	992,8	1000,0	876,7	998,6	869,6	920,0	997,1	1000,0	756,4	998,6	818,2	668,3	-300	13658,4
28	20	Rasmussen John Willum	DEN	2289	1000,0	700,0	813,4	995,7	916,7	538,9	1000,0	950,0	876,2	977,1	909,1	878,0	997,1	1000,0	763,9	1000,0	888,9	654,5		13643,5
29	29	Krust Yannick	FRA	2602	868,6	869,6	793,7	1000,0	777,8	737,0	998,6	826,1	811,8	868,6	1000,0	860,2	997,1	1000,0	854,7	1000,0	1000,0	569,3		13617,3
30	7	Flixeder Bernard jun	AUT	4300330193	994,3	1000,0	905,8	987,1	666,7	796,0	991,4	920,0	962,1	0,0	0,0	0,0	992,9	884,6	785,1	1000,0	1000,0	704,9		13590,9
31	40	Smits Jeroen	NED	28498	1000,0	954,5	778,6	991,4	791,7	703,8	977,1	950,0	944,9	995,7	722,2	882,9	995,7	1000,0	836,1	997,1	739,1	678,6		13561,7
32	4	Rae Mike	AUS	57729	992,8	1000,0	791,8	1000,0	833,3	692,7	998,6	1000,0	740,4	991,4	846,2	883,5	998,6	966,7	754,3	994,3	684,2	675,2		13493,2
33	13	Timmermans Jan	BEL	7097	881,4	1000,0	825,8	1000,0	857,1	719,8	818,3	900,0	941,9	1000,0	923,1	791,3	1000,0	812,5	765,2	1000,0	863,6	725,9		13475,3
34	45	Goodrum Craig	RSA	116438	998,6	900,0	852,1	1000,0	821,4	789,4	991,4	833,3	875,6	998,6	846,2	860,2	1000,0	931,0	765,2	992,9	814,8	658,3		13464,4
35	6	Aichholzer Günther	AUT	7200200262	978,6	363,6	799,5	992,9	840,0	788,4	964,3	960,0	892,8	998,6	1000,0	882,4	1000,0	939,4	804,6	1000,0	500,0	710,0		13377,1
36	8	Flixeder Gerhard	AUT	4300330182	981,4	1000,0	799,5	855,7	1000,0	803,8	1000,0	1000,0	902,1	856,7	909,1	0,0	998,6	705,9	692,6	991,4	863,6	556,3		13355,2
37	55	Lachowski Mike	USA	75586	984,3	750,0	0,0	1000,0	750,0	649,3	997,1	954,5	863,0	1000,0	1000,0	848,2	985,7	750,0	939,7	990,0	904,8	692,0		13324,5
38	31	Medard Patrick	FRA	1074	985,7	0,0	0,0	1000,0	761,9	878,8	755,4	920,0	694,0	985,7	1000,0	815,7	827,1	1000,0	939,1	982,9	666,7	788,0		13245,6
39	54	Graves Dillon jun	USA	888038	887,0	550,0	867,4	680,0	909,1	786,9	1000,0	760,0	895,0	992,9	814,8	738,8	1000,0	923,1	883,0	992,8	772,7	746,2		13230,7
40	38	Boerman Ronald	NED	618319	985,7	750,0	795,6	987,1	666,7	761,1	849,8	739,1	830,5	984,3	956,5	870,3	988,6	950,0	848,9	1000,0	681,8	606,8		13129,7
41	46	Goodrum Michelle	RSA	117997	880,0	833,3	797,6	992,9	807,7	610,1	987,1	869,6	799,5	805,7	923,1	909,9	998,6	800,0	790,9	998,6	800,0	649,5		13038,2
42	37	Yoshida Naotsugu	JPN	F0367	975,7	909,1	647,5	741,4	818,2	825,9	915,6	826,1	821,6	720,0	944,4	755,9	997,1	423,1	941,0	992,9	904,8	517,6		13017,2
43	18	Hansen Jan	DEN	4308	1000,0	937,5	805,4	1000,0	875,0	478,8	1000,0	913,0	793,1	939,8	772,7	801,3	995,7	878,8	647,1	448,6	909,1	0,0		12974,6
44	16	Schreiber Ondrej jun	CZE	1515	998,6	1000,0	691,3	857,1	833,3	588,5	961,4	840,0	897,7	992,8	727,3	832,6	990,0	666,7	796,8	992,9	739,1	671,3		12965,1
45	43	Sheremetev Andrey	RUS	1446	1000,0	923,1	548,7	998,6	750,0	766,8	821,2	782,6	697,5	998,6	866,7	799,0	992,9	1000,0	843,8	998,6	772,7	793,0	-300	12933,7
46	27	Portella Daniel	ESP	2542	990,0	956,5	0,0	994,3	818,2	756,4	997,1	739,1	660,3	990,0	692,3	769,2	991,4	1000,0	722,5	992,9	818,2	669,6		12875,8
47	41	Konovalov Dmitri	RUS	0068A	972,9	772,7	950,6	997,1	961,5	889,0	622,3	900,0	595,1	998,6	750,0	885,2	998,6	966,7	737,5	1000,0	680,0	673,9	-600	12854,2
48	47	Smith Allen	RSA	116439	1000,0	650,0	734,8	801,4	791,7	556,2	1000,0	869,6	787,0	995,7	708,3	800,8	998,6	952,4	736,3	1000,0	850,0	625,7		12850,9
49	5	Skinner John	AUS	18661	868,6	791,7	659,6	850,0	909,1	758,3	970,0	1000,0	788,7	997,1	807,7	838,1	998,6	833,3	826,2	997,1	760,0	741,3	-300	12825,8
50	33	Rosso Carlo	ITA	14902	988,6	461,5	903,3	987,1	909,1	482,8	991,4	875,0	852,7	997,1	769,2	912,2	988,6	916,7	826,2	987,1	450,0	690,6	-300	12769,4
51	36	Suzuki Yasuhiro	JPN	F0291	985,7	846,2	0,0	998,6	722,2	798,1	590,8	850,0	856,5	998,6	766,7	816,6	988,6	692,3	755,2	990,0	681,8	701,3		12766,4
52	12	Hansoulle Axel jun	BEL	7050	985,7	833,3	748,3	870,0	833,3	672,7	955,7	1000,0	786,2	892,9	703,7	810,0	998,6	461,5	671,5	970,0	772,7	661,2		12634,7
53	44	Teterin Sergei jun	RUS	0060A	995,7	538,5	811,9	1000,0	1000,0	454,6	990,0	869,6	764,1	904,3	777,8	697,7	987,1	769,2	649,5	998,6	777,8	641,0	-300	12430,0
54	26	Aymat Carles	ESP	1732	950,0	833,3	721,9	965,7	722,2	597,7	992,8	909,1	700,4	992,9	818,2	698,7	855,7	882,4	675,8	954,2	863,6	627,7	-300	12286,6
55	2	Pisarello Carlos Martin	ARG	117781	981,4	708,3	698,7	938,6	681,8	579,1	1000,0	680,0	641,4	995,7	652,2	730,3	982,9	700,0	697,1	732,9	480,0	588,2		11676,7
56	28	Valls Sergi	ESP	2675	868,6	454,5	823,7	785,7	666,7	485,2	777,8	826,1	771,6	924,3	692,3	697,3	998,6	423,1	727,1	748,6	727,3	641,3	-300	11082,8
57	1	Gianello Emilio	ARG	117782	595,7	666,7	625,2	700,0	500,0	0,0	838,3	772,7	626,8	640,0	611,1	660,5	941,4	275,9	615,2	727,1	625,0	443,9		9994,1

Complete results for the 2015 FAI F3B World Championship are available at: <http://wc2015.f3b.nl/docs/results_2015.pdf>

2015 FAI World Championship for Model Gliders Class F3K
Ludbreg, Croatia
19th - 26th of July 2015

Senior fly off results

Marcus Stent, caller for Alex Hewson, has written a personal account of the fly off. Thanks to Alex and the NZRCSG Yahoo! group, Marcus' account is printed in this issue beginning on the next page.

ROUND 1 | ROUND 2 | ROUND 3 | ROUND 4 | ROUND 5 | ROUND 6 | TOTALS

	Name	1	2	3	4	5	6	Penalty	Score	%	Class	FAI/AMA	Club	State
1	Alex Hewson	1000	1000	-998,3	1000	1000	1000		5.000,00	100.0%		NZL10491		New Zealand
2	Anthony Rotteleur	1000	1000	996,6	1000	1000	-995		4.996,60	99,93%		FRA 737		France
3	Hermann Haas	1000	998,3	-991,6	1000	1000	996,6		4.995,00	99,90%		AUT 630036 0077		Austria
4	Richard Swindells	1000	998,3	-993,3	1000	1000	995		4.993,30	99,87%		GBR53602		Great Britain
5	Charles Morris	1000	-978,2	998,3	1000	1000	993,3		4.991,60	99,83%		USA856840		United States of America
6	Ricardas Siumbrys	1000	-934,7	996,6	1000	1000	995		4.991,60	99,83%		LTU273		Lithuania
7	Joe Wurts	0	998,3	1000	1000	1000	993,3		4.991,60	99,83%		NZL9725		New Zealand
8	Cederic Duss	-986,6	995	998,3	1000	1000	996,6		4.989,90	99,80%		SUI62557		Switzerland
9	Bruno Pavani	1000	996,6	991,6	1000	1000	-988,2		4.988,30	99,77%		BRA 8238		Brazil
10	Hakan Sjoberg	1000	993,3	989,9	1000	1000	-986,6		4.983,20	99,66%		SWE-71172		Sweden
11	Kevin Botherway	969,9	-906,2	991,6	1000	1000	998,3		4.959,80	99,20%		NZL7554		New Zealand
12	Craig Goodrum	0	934,7	993,3	1000	1000	991,6		4.919,60	98,39%		116438		South Africa

Junior fly off results

ROUND 1 | ROUND 2 | ROUND 3 | ROUND 4 | ROUND 5 | ROUND 6 | TOTALS

	Name	1	2	3	4	5	6	Penalty	Score	%	Class	FAI/AMA	Club	State
1	Dillon Graves	1000	1000	996,6	1000	1000	(976,4)		4.996,6	100.0%		USA888038		United States of America
2	Cederic Duss	1000	996,6	996,6	1000	1000	(991,6)		4.993,3	99,93%		SUI62557		Switzerland
3	Oleksandr Pomogaev	1000	(911,2)	989,9	1000	1000	991,6		4.981,5	99,70%		UKR 688		Ukraine
4	Tshepo Molefe	(981,6)	996,6	993,3	1000	998,1	991,6		4.979,7	99,66%		116451		South Africa
5	Franziskus Muschler	991,6	998,3	991,6	1000	(844,4)	971,4		4.953,0	99,13%		GER 3610		Germany
6	Max Finke	1000	889,4	1000	1000	(818,5)	1000		4.889,4	97,85%		GER 3459		Germany
7	Anton Pitelguzov	(0)	988,3	988,3	1000	924,1	899,0		4.799,6	96,06%		UKR 689		Ukraine
8	Matthias Freitag	1000	998,3	978,2	783,3	(655,6)	993,3		4.753,1	95,13%		GER 3661		Germany

Complete results for the 2015 FAI F3K World Championship are available at: <http://www.f3k2015.com/results.php>

A preview of a coming video of the Championship can be seen at

https://www.youtube.com/watch?v=fRJRjArAUno

Flyoff, a personal account

Marcus Stent, via Alex Hewson and the NZRCSG Yahoo! group

Marcus Stent from Australia has put together an awesome account of the fly off from his perspective. Is well worth a read.

— *Alex*

Part 1:

I had the great honor to call for Alex in the fly-offs and be part of his success in the fly-offs. I'm not taking any credit for his win because he is a great flyer and his kiwi team were there all the way, but with all of the Kiwi's in the fly-offs, someone had to fill in and I was glad I was able to help.

It started with Alex asking me to call for him at the end of the preliminaries, mainly because I spoke New Zealand (hey bro) and I had worked with the NZ team when they visited Australia for our Jerilderie tournament.

Joe actually asked me to call (10 minutes later), but I had to decline because Alex had already asked. It felt like I had been asked on a date by a Hale Berry and then 10 minutes later by Scarlet Johansen!! LOL

Alex and I met up an hour before the fly-off to run through how he liked to be called and his terminology for the air, different parts of the field and directions. To my surprise we called very similarly and so there wasn't much adapting I had to do. The main focus for me was about discussing the air, clear clock reading and having a plan B at all times.

We did 10 minutes practice and it was time to go...

Part 2:

We walked out to the flight line for round 1 of the fly-offs. It was 8AM.

There is hardly a puff of air.

Alex: "We need to call 9:58 (the max), hero or zero. What do you think..."

Marcus: "Lets check out the air first (trying to hedge my bets), there was some light lift over the houses earlier."

Alex: "OK, I'll check over the houses and you keep an eye on everyone else."

Flight testing time starts.

Someone picks up some very light lift over the tents. 3 others hit the lift and pull brakes, one pilot continues to circle and circle and circle.

Marcus: "Take a look Alex," as I point to the circling plane which continues to circle.

Alex: "Good, I found nothing over the houses."

Alex: '9:58'

And we are away! Alex heads straight over the tents. Alex hits the lift first and was on top of the pack early. I kept Alex informed on where other pilots were going up stronger and Alex re-centred on three occasions to stay with the fluffy, poorly formed lift. It then got a little bit marginal (but not scary) for a short time, but a final re-centre by Alex and he was back on top of the pack. It was a Good start.

Most pilots got the 9:58. 2 pilots missed their 9:58 calls and 2 called conservative and got their times.

Next was 3x3:20.

Alex has 2 different styles of turnaround. The first is where he slides the plane in at 45 degrees to make the turnaround faster (270 degrees) and the second is a conventional catch and 360 degrees spin. We discussed the options and decided to take the safer, more repeatable approach of option 2.

The flight times were relatively easy and Alex did normal (360) turnarounds and dropped 3 seconds along with Anthony Rotteleur.

Alex now had 2 x 1,000's in the bag.

It was a good start.

Part 3:

There is now a half hour break. The organisers decided on a break after every 2 rounds to let Cederic (who is in both Senior and Juniors) have a break.

Alex grabs me and says, "Lets go have a review." So we find a quiet spot to have a chat.

Marcus: "Ok, how was the communication?"

Alex: "Great, I understood everything you said."

Marcus: "Air calls?"

Alex: "Good, you kept me informed just the right amount."

Marcus: "Competitors calls?"

Alex: "Good, no probs. If you think I need to move faster, then make sure you tell me to go. Just say FASTER! FASTER!"

Marcus: "OK. Anything else?"

Alex: "The only thing I have is don't forget to pick up the Lanyard and find the timer (in prep time) next time."

Marcus: "Yep, sorry, I was a bit nervous and focused on the 9:58 call, it won't happen again." And it didn't.

Alex: "All good."

Marcus: "All good! Lets keep doing what we are doing."

We had a man hug and went to hydrate and keep cool.

I was pleased our communication was working so well.

I thought to myself, we need to just keep doing the basics right and the result will look after itself.

Part 4:

Round 3 was 1,2,3,4 and it was relatively uneventful.

There was a fair amount of good lift around and we kept talking about our options and how good the lift was and if we would go back to it for the next one. There were a few pilots who mixed up the order (deliberately to get back into good air) so there was always someone in some lift and the breeze was light so it was easy to get back to them. I kept my air calling simple and my time calls for the turnarounds clear, even and regular.

Alex lost 5 seconds along with Cederic and Charlie. Anthony dropped 6 and Joe dropped 4 for the 1,000. Nice work Joe!

Alex had a late catch at 2:59.8 and 1:59.7 and so lost the 0.8 and 0.7 due to the truncation rule (only whole seconds get recorded for your score). It is tight at the top.

Round 4 was AULD x 3 and things started to get interesting...

The good lift in Round 3 had now become softer and more broken and the flight testing time lift was less convincing. A small feeder had blown through and so Alex took the read off the launch and ran back for it. He hooked it with 2 others and was looking OK, but it was light. I watched 5 or 6 other pilots in some stronger air over the railway tracks (about 150m from Alex).

Alex: "My air is not so good"

Alex was only just climbing.

Marcus: "There is better air over the tracks. Take a look" I point over the tracks.

Alex: "I've lost it" He opens up his turn to sample more air. The other 2 pilots with Alex leave the weak air.

Alex: “Ok I’m going!”

Alex heads for the other gaggle over the tracks. Three quarters of the way there and we are in sink.

Alex: (gets that moment of doubt) “I should not have left my air!”

Marcus: (there is no hope of going back now and I needed to reassure my pilot) “Keep going it is there! Keep going!”

We are at half launch height now. The gaggle is in good air and climbing.
We do the ‘classic’ search under all the other pilots going up in lift and can’t find it! The air is more of a bubble that has popped off rather than a column!

Alex is searching, searching, searching. We are at 15-20m altitude.

Marcus: “Keep looking Alex it is there somewhere!”

Then a good pilot does what good pilots do, and their instinct kicks in. Alex turns and moves 45 degrees downwind..... and hits a tiny bump. First turn - hold. Second turn - hold. Third turn - he goes up. Fourth turn - he goes up again. It kicks off! Phew that was tight!

Marcus: “2:30 we are looking good.”

Alex makes 3:00

Rowdy calls over “What were you doing down there Alex, I though you were cooked!”

“Just trying to lead you into sink Rowdy 😬” replies Alex

The second 3 min is relatively easy and everyone gets it over the tents. It is strong and our plan is to go back to it for the last 3 min.

The third 3 min starts and Alex heads back over the tents (upwind), the breeze is very light.

I feel a very light feeder pass through just as Alex launches.

Marcus: “Something has just gone through” I am not sure if Alex hears me.
I watch downwind. There are three downwind over the tracks again and one plane is getting away downwind near the houses. All the competitor options were getting a fair way away. The air is moving faster than we think.

Alex: “S@#t, I’m in trouble! I need something!”

I turn and look at Alex. He is at half launch height.

I only have one option, my light, unproven, fickle feeder. He can’t reach the rest of the planes.

Marcus: (without hesitating). “Turn and go! It is at the back of the box, straight downwind. GO! GO! GO!”

Alex turns and goes!
Then just as Alex passes overhead he see’s the plane way downwind near the houses.

Alex: “MARCUS!! I CAN’T REACH THAT!!!”

Marcus: “No, at the back of the box! GO! GO!GO!”

Alex goes.

Unfortunately a Snipe at 205g does not have much go, but he is going!

Alex keeps going...

Alex gets to the back of the box....
10m high now...

Marcus: “There! It should be right there! Keep ...” Alex hits the bubble right on cue! It is a good little thermal and Alex thermals out for 3 min.

I think to myself, thank goodness for that! 🙂

We max out our AULD and get the 1,000, along with every other pilot.

As we walk off the field there is a lot of banter about how other pilots made miraculous saves and almost didn’t make it. The scores made it look a lot easier than it was. It wasn’t surprising to hear all the great save stories... This was, after all, the fly-off’s at the World Championships!

Part 5:

We were now on the last half hour break and I’m sitting in the Aussie tent drinking 2 litres of water and watching the air, when Alex comes bounding into the tent! He was nervous and excited! Hell, I would be too!

Alex: “Oh no! I’ve done the wrong thing and I just looked at the scores! I need to win the last 2 rounds! If I drop any points at all to Anthony then he wins! I have never won a fly-off before!"

I immediately think I need to calm the nerves and re focus! The thought of the old bull and the young bull joke enters my head! (Look it up if you don't know it!)

Marcus: "Time for a chat..."

Marcus: "There are only 3 things you need to remember."

I grab Alex by the shoulders, look him in the eyes and then press a finger into his chest.

Marcus: "One, this is the mantra I use when I am standing on the flight line. How do you win the comp, you win this round, how do you win this round, you get your time, how do you get your time, you find the lift. We need to find the lift"

I now press two fingers firmly into his chest we are locked in a trance...

Marcus: "Two, Joe just proved you can get 1000 in the turnaround task by not doing anything fancy and hitting the truncations. Listen to my voice, I'll read the clock and you catch on my call. We hit those truncations!"
I now press three fingers into his chest. Alex has not said a word....

Marcus: "Three, you are the best pilot here. You have proven it in the preliminaries and you are in front now. There is no Silver bullet, you just keep doing what you have been doing."

I grab his shoulders, again our eyes still locked...

Marcus: "Now leave the tent, find a quiet spot, don't talk to anyone and I'll meet you in the ready box in 5. Remember, find the lift, hit the truncations and you can do it."

Marcus: "OK?"

Alex: "OK"

We have another man hug.

Alex leaves the tent and I head for the ready box. I have no Idea if he comprehended a single word I said or if I said too much. It just came out. I hoped my pep talk could help him perform to his potential. I decided he was a smart kid and he could do it....

Part 6:
I meet Alex in the ready box and he is totally focused. I'm watching the air and the cycle has got a lot quicker and the thermals are a little smaller. I am mindful of the late morning overcast conditions that we tended to get each day, but it is looking really nice now.

As we head out to the field:
Marcus: "Just find the lift"

Alex: "OK." He has a steely focus in his eyes.

Round 5 is 3 x 3 min (or last 3 I can't quite remember).

The conditions are even better than I thought and I keep Alex informed about what is going. It was pretty straight forward in the end and everyone maxes their times.

We both smile and give each other a quick high five (as if to say we are another step closer, let's not get carried away, we still have a job to do) and head back to the ready box.

I look at Alex in the ready box and I see a steely focus with a mix of nervous anticipation!

The Juniors finish their round 5 and we are heading back out for the final round of the fly-offs.

This will decide the next F3K World Champion!

As a caller, I don't feel too nervous, just a strong sense of doing the things I can control and letting the result take care of itself. It has been my motto for many years and I am pleased I can maintain my focus at the one time I really need it. 'Find the lift and nail my timing calls' is all I say to myself 5 times in a row.

As we walk out to the field...

Marcus: "Find the lift and hit the truncations".

Alex: "OK!"

Marcus: "Listen to my voice and catch on my call."

Alex: "OK!"

I find the two official time keepers and notice one is Leonarda, one of the friendly local Croatian girls. "Hi" she says

Oh crap!

I scanned the sky.

Others in the same bubble were also struggling...

in her usual happy voice. “Hi” I reply, “You have Alex” and her face lights up, “that is very good!” she says.

As we walk over to Alex, he sees me walking with Leonarda. Alex has a big smile on his face! “My lucky caller! I always fly well when you are timing for me!”

Part 7:

Alex re-focused quickly after his little interlude.

We had a read in the flight testing time and so the first 2 minute went to plan. I was watching the flags and also watching 3 other mini gaggles of planes circling nicely.

Marcus:”1:00” I checked my clock was the same as Leonarda’s, which it was, “1:10... I:20... are we going back to the same spot?” I asked Alex. 1:30 was our previously agreed decision time.

Alex “Yep, it is good”

Marcus: “Listen to my voice, catch on my call...1:30..1:31...1:32..” I was counting as clearly and a loudly as I could as I moved back out of the way...”1:57..1:58..1:59..”

I could hardly even see Alex tip catch out the corner of my eye because I was concentrating so hard on the time. I didn’t even stop my clock and he was away so fast that I did not even start my clock for the next flight!!!

I looked over at Leonarda’s clock. Holy S@!t!!! 1:59.2

Marcus:” Great catch, perfect” I said to Alex as I ran back over to him to make sure he was going to get his time.

Alex:”All good” he was away again...

I synced my clock against Leonarda’s time, starting mine when hers read 1:00. I decided this was going to be the best way to get the clocks aligned.

Same routine, same comments “Listen to my voice, catch on my call,” same call in, same tip catch, same result...1:59,2!

I thought to myself, Wow, this is the big dance and this kid is really making it happen!

I ran back over to Alex to check his air...

Alex:” This is not good..”

Oh crap! I scanned the sky. Others in the same bubble were also struggling, but not badly. There were no other planes close and it wasn’t worth leaving the marginal air to chase something else.

Marcus: “There is nothing else close Alex!” Alex was going to have to make it work.

I was scanning the sky for signs and watching the gaggle struggle. There were no clear signs. It was half a turn up and half a turn down.

There was no time to play with clocks so I read off Leonarda’s clock “1:00..”

Alex kept working his bubble.... I kept the call routine the same.

Marcus: ”..1:30, you are going to be OK..

There is lift at the back box for the next one... 1:34... 1:35...”

Alex was a little out of shape coming in without his usual height.

I was reading the official clocks over Leonarda’s shoulder so my voice still faced Alex. It felt like I was yelling in her ear...”..1:58...1:59..” He caught at 1:59.4!

He was clean away again, but not so smooth and not as high.

I ran over to Alex to check if he was OK. He had found something almost straight away. Phew!!

Alex: “That felt late, what was my time”
Marcus:”0.4 late! That’s OK, we will nail the next one”

This was an easy 2 min and the lift was looking good for the next flight and the plan was to go back for it.

Same routine, same call “Listen to my voice, catch on my call.” Same tip catch, same result. Alex nailed it! I don’t remember the exact time but I remember thinking it was good. It was all he needed and no one was going to catch him. :-)

I ran back over to Alex and he was already in the thermal.

The last flight was an easy one.

Alex let out a huge involuntary sigh and now had a big smile on his face!

Marcus:”1:30... Land in the box!” .
“1:40... 1:50... 1:59” Beeeeeep, and it was all done! “Land in the box!”

We were still focused.

I scanned the landing area and someone had finished and was walking towards us. I called out “Hey stop!” They stopped and Alex landed.

I can still picture Alex’s catching his plane (inside the box) and the feeling of relief and excitement for what Alex had achieved. I let out a huge cheer and raised my hands in the air.

He did it! He was the new World F3K Champion!

The celebration started and it was hugs and high 5’s all round.

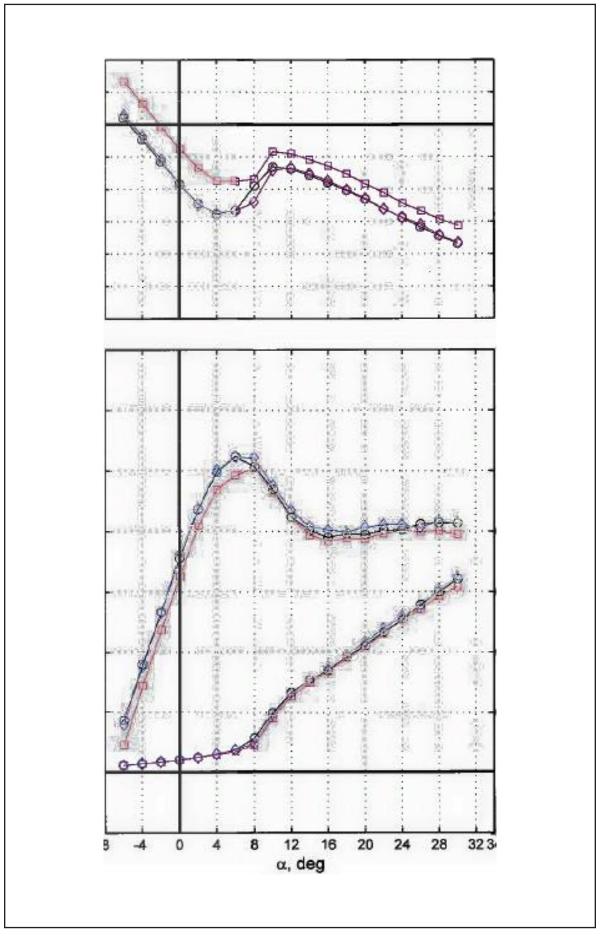
This little freeze frame of video captures the moment. Enjoy!

http://www.youtube.com/embed/AEklJDZQKyk?rel=0&wmode=transparent

Complete results for the 2015 FAI F3K World Championship are available at:

<http://www.f3k2015.com/results.php>

Some sort of alien invasion here in the wind tunnel at NASA Langley...



A PRANDTL ‘wing with semicircular tip elevons in the NASA Langley 12 foot wind tunnel.

Model is 6 ft span. Data is pitching moment, lift and drag. Courtesy of Al Bowers, Jay Dryer, and Barb Esker of NASA ARMD, and Sue Grafton of NASA Langley...

The PRANDTL ‘wing is being considered by NASA as a vehicle for the exploration of the Martian atmosphere.

— Al Bowers via Horten Flying Wing Believers on FaceBook.

Over-Weight & Forward CG

A lesson for RC soaring enthusiasts

https://www.genebenson.com/newsletter/newsletter_april11.htm

NTSB Record: ERA09LA459

Text derived from Gene Benson's Newsletter:

"In August of 2009 this Cessna 150 crashed shortly after takeoff in New Jersey, resulting in serious injuries to the private pilot and his passenger. According to the pilot, following the takeoff, the airplane would not gain altitude and started clipping the tops of trees beyond the end of the runway. The pilot pulled back on the yoke and stalled the airplane. The airplane collided with an embankment and came to rest in a creek.

"A weight and balance calculation was performed using the airplane's most recent weight and balance found in the logbooks. According to the calculations, the airplane would have been 24 pounds over gross weight with a center of gravity outside the forward envelope. For the calculations, it was estimated that there were 10 pounds of baggage in the number 1 baggage area based on articles found at the crash site. The temperature was 70 degrees Fahrenheit.

"This was certainly not a high density altitude takeoff with a temperature of 70 degrees Fahrenheit and an airport elevation of 421 feet. But the pilot had two things working against him. The airplane was too heavy, but only by about twenty-four pounds. **Perhaps an even greater factor than the overload condition was the forward CG location.**

"Airplane wings generate lift to compensate for the downward acting forces which are made up by the airplane weight plus the downward force produced by the stabilizer/elevator. During flight a small airplane may weigh 2000 pounds and have a tail-down force of 200 pounds so the wings must generate 2200 pounds of lift. Moving the CG aft, but within limits, may reduce the required tail-down force to 160 pounds so the wings must now generate only 2160 pounds of lift. This improves performance because the necessary angle of attack is reduced and thus induced drag is reduced. But moving the CG forward has the opposite effect. If increased tail-down force is needed, then the wings must generate more lift resulting in a higher angle of attack and increased induced drag. So this pilot was faced with a need to generate lift sufficient to overcome not only the twenty-four pounds of extra weight but also enough lift to overcome the additional tail-down force caused by the forward CG."

Bald Eagle takes flight

Michael Einspahr of Alpharetta, Georgia, <meinspahr@comcast.net> shot this sequence of three photos in Gig Harbor Washington.

Michael used a Canon EOS 7D Mark II camera with an EF70-200mm f2.8 lens for these images. All were taken at ISO 500, 1/500 sec., f4.0.

Thanks to Wayne Duncan for providing these photos for publication in *RC Soaring Digest*.