EParrot 40 size stunt trainer development Part 5 March 1, 2016

EParrot fuselage needed the top enclosure.

I have decided to form this part as thin balsa shell, using the PFP build-up mold.

This mold or forming fixture is shown above [1]. It has been prepared in about 15 minutes by removing one paper skin from the piece of PFP and folding it, squeezing the foam at the same time.

The curvature of the fixture was subsequently fixed by gluing, using the hot glue gun, to the bottom part of the form [2]. The bottom part is also PFP. I have used two PFP pieces (each one 0.20") for stiffness.

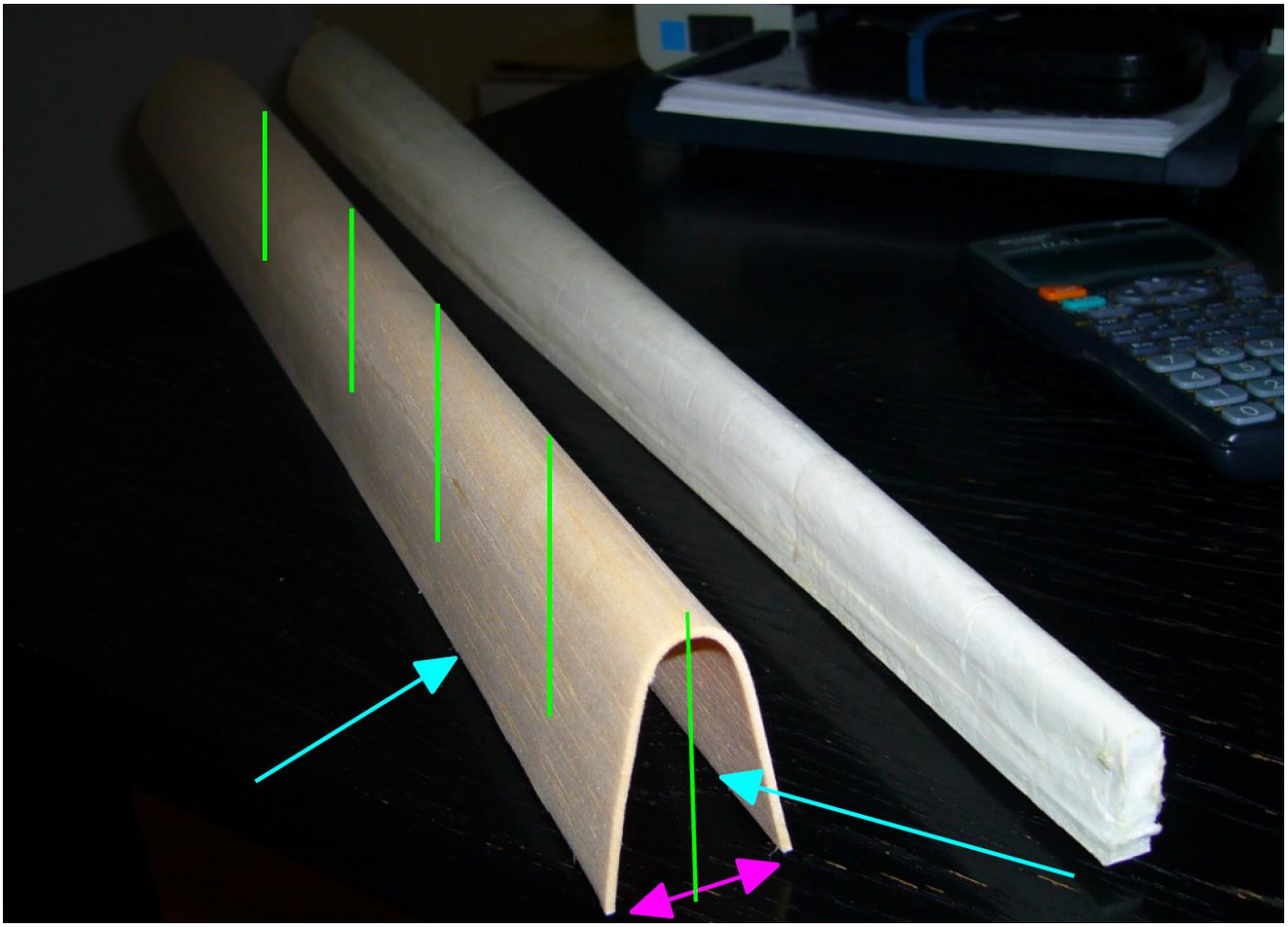
The fixture has been painted with Minwax to protect it from water.

The next step was soaking the 1/16" medium balsa in hot water.

After about 15 minutes, balsa was ready for forming.

1/16" thick medium balsa is very easy to bend and secure to the PFP fixture using the paper tape.

The result, after about 6 hours of drying in my basement, is shown above.



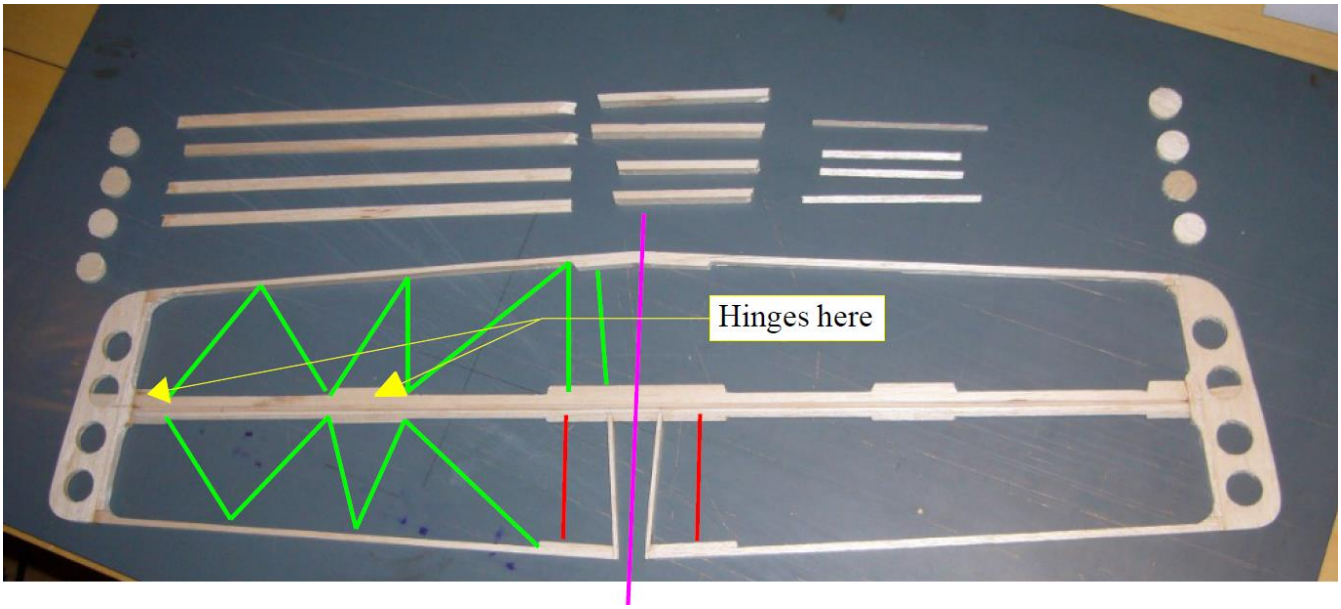
The balsa thin shell “narrow end” (tail area of the fuselage).

Small spring-back (magenta arrow) is no problem as there will be five 3/32” balsa formers (green lines) along the length of this enclosure (25”). When these formers are glued in, the shell will maintain the required shape and curvature very well. Also, the edges indicated by cyan arrows will be glued to the fuselage sides, providing the additional support.

Weight of the formed balsa enclosure as seen above: 14 grams (1/2 oz.).

Comment: the method described above can be used for any build-up fuselage of any stunt plane.
When the geometry of the enclosure is known, the preparation of the PFP forming fixture is very easy and fast.

This method saves a lot of time, weight and balsa when compared to the traditional method, in which the block of balsa is carved and sanded. Also, for all of us working at home, there is no need to sand anything and this eliminates the problem of balsa dust that floats everywhere.



This is EParrot's horizontal stabilizer and elevator partially ready. The basic material used: 1/4” medium and medium-hard balsa and soft balsa for the tips. The elevator's horn will be mounted using two hard balsa ribs located where the red lines are. The green lines represent a possible pattern of the diagonal ribs necessary to stabilize the assembly before sheeting with 0.031” balsa.

They, and hinges, will be mirror symmetrical w/r to the magenta line.

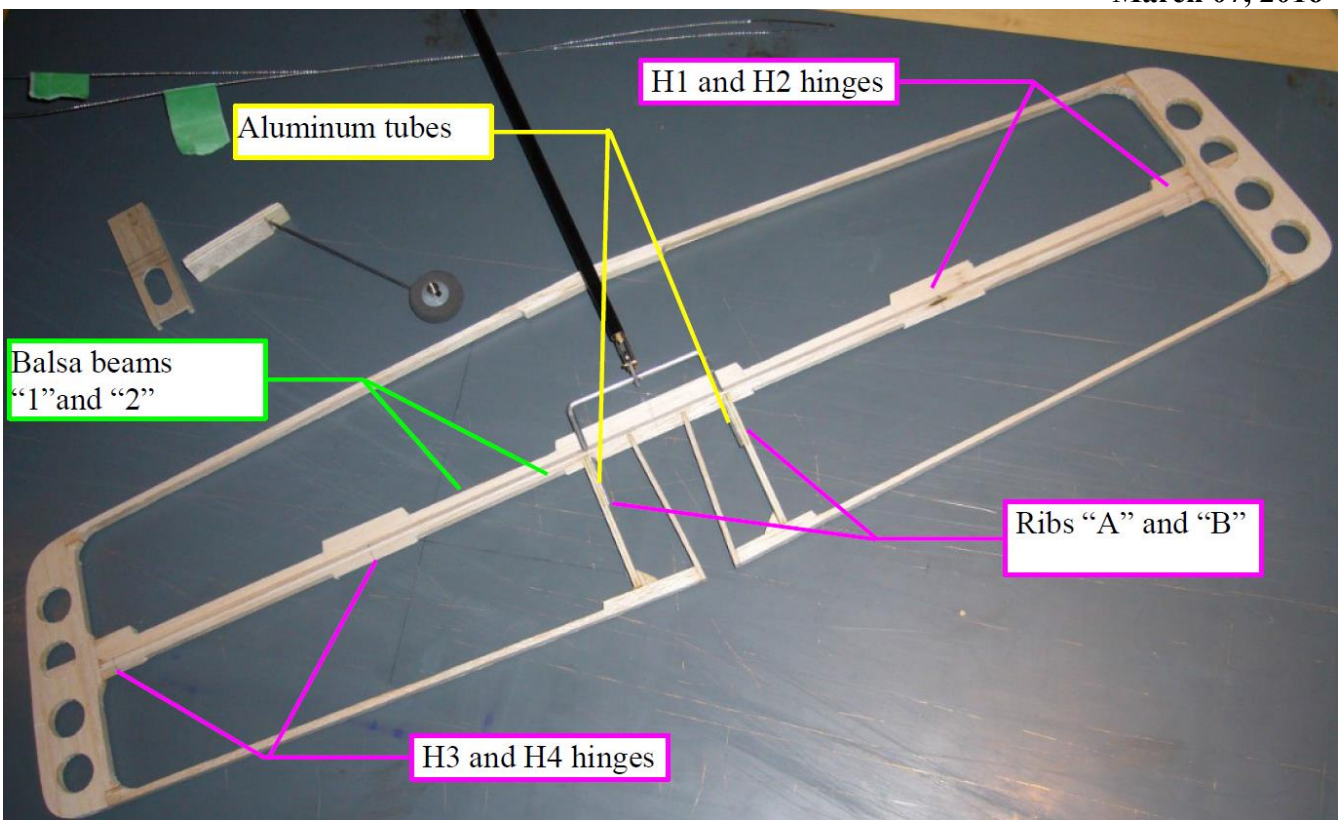
I have decided to construct both control surfaces as one assembly and cut off the elevator after sheeting. This method gives the best quality.

The balsa pieces shown above the horizontal tail assembly have been removed as the part of weight saving exercise. The weight of these pieces is 0.17 oz. (~5 grams).

The current weight of the assembly is 1/2 oz. (14 grams). It represents **the weight saving of 24%** by simply removing the material that is not needed.

The finished horizontal tail assembly should be below 50 grams (1.76 oz.) including the coloring and Mylar or Silkspan – almost 1/4 oz. less than initially budgeted.

March 07, 2016



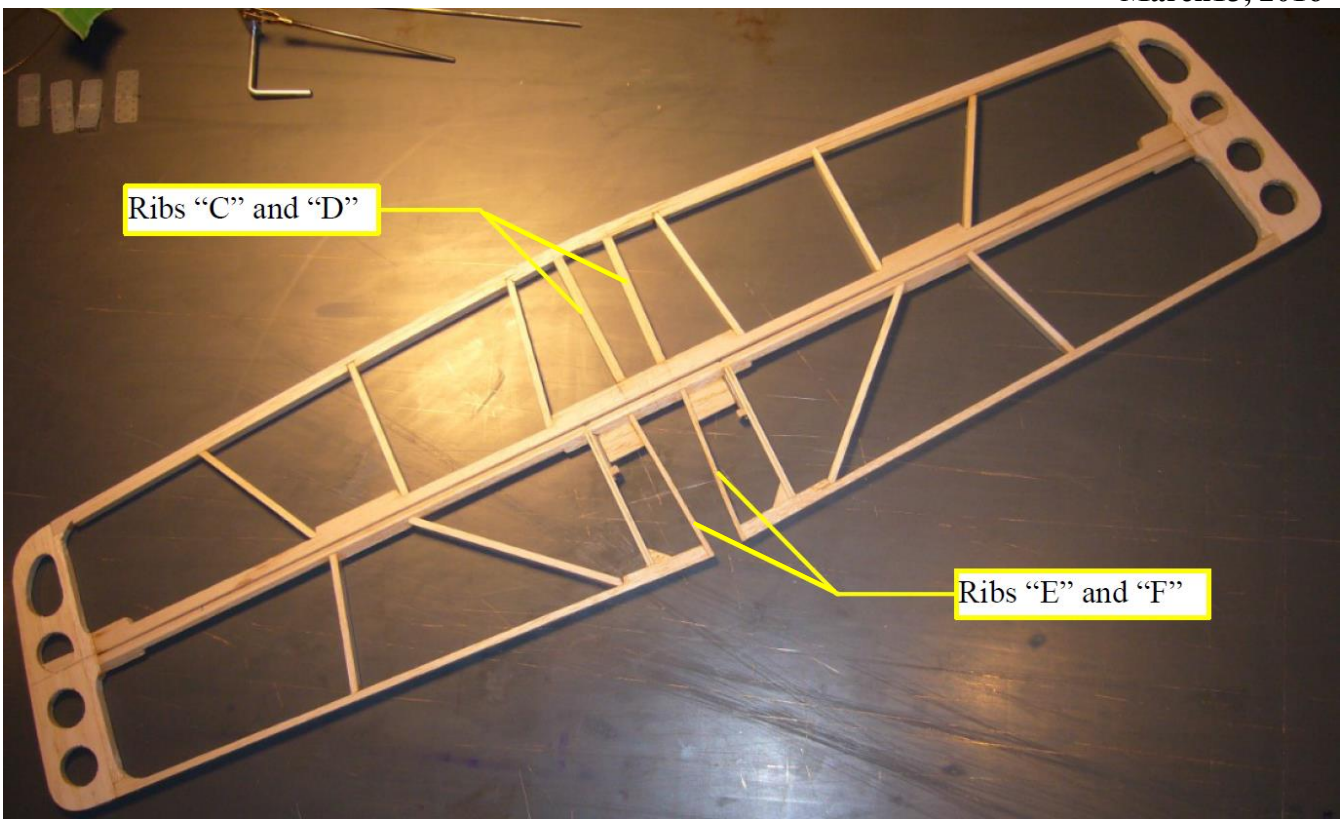
Another advantage of building the horizontal tail surfaces together is clearly visible above.

The elevator horn served as a fixture for proper mounting of the 1/8” light ply ribs “A” and “B”. The thin walled 1.0” long aluminum tubes matching the horn diameter (1/8”) have been epoxied to the grooves in the ribs “A” and “B” and glued in with the horn defining the spacing and position of these ribs.

This method practically eliminates the mismatch between the elevator's halves when the finished elevator is cut out and the hinges (H1, H2, H3 and H4) are glued in .

Comment: using the horn as a fixture was only possible because the balsa beams “1” and “2” are flexible enough to sufficiently bend in the middle. The amount of this bending allows to drill the holes for the horn in the LE of the elevator (beam ”2”). The drilling was done with 1/8” sharpened wire and then the holes were enlarged to the OD of the aluminum tubes using short drill bits.

March13, 2016



Complete skeleton of the horizontal tail just before sheeting with 0.031 balsa.

The LE of the horizontal stabilizer was widened by adding 1/8” light balsa beams. This allows for better rounding of the LE after sheeting and added only 1 gram . Also, the added material allows for stronger connection between the LE and the balsa sheeting by increasing the surface area to be used by glue.

The ribs were made using 3/32” light balsa, except the ribs “C” and “D” (fuselage mount, 1/8” medium balsa) and “E” and “F” (1/16” hard balsa).

The assembly shown above weights 19 grams (0.67 oz.)

Comment: I have been toying with the idea of simply covering this assembly with Polyspan without balsa sheeting as this would save about 10 grams but the horizontal tail has relatively large span, is thin (1/4”) and is exposed to bending and torsional forces generated by buffeting.

In comparison with Ultracote or Monocote, Polyspan adds more torsional and bending stiffness and is more thermally stable but all this maybe not enough to prevent occasional tail fluttering.

I finally decided to use the balsa skins that, after sanding and coloring, will be doped with thin Silkspan. Coloring is another interesting problem. I will use the permanent markers to make the “parrot's feathers” pattern on the bare balsa skins before doping Silkspan but the permanent markers ink is sensitive to acetone in dope so I have to seal the inked balsa with something not affected by acetone. Now, I have to somehow discover this “something”.

To be continued