‘Harpy’

designed by Graham McAllister

Building Notes

Materials

Hull Sides	1/16” medium balsa (1/32” balsa if using the foam core)
Hull Bottom	1/16” medium balsa, join two 3” sheets side by side
Transom	1/16” medium balsa, grain horizontal (1/32” if using the foam core)
False Stempost	1/8” light balsa (not required if using the foam core)
Stempost	1/4” medium balsa
Bulkhead	1/16” medium balsa (not required if using the foam core)
Deck	1/32” ply
Rudder	1/16” ply or 3/32” medium balsa
Rudder Shaft	2mm carbon rod in a plastic tube
Rudder Horn	1/16” ply drilled at 3/8” (10mm) centres for servo connection
Keel 1 1/2”x1/8”	6 strips of 1/8x1/4” bass with 2 strips of 1mm x 3mm carbon strip. Assemble like this, |bass|carbon|bass|bass|bass|bass|carbon|bass| The carbon strips can be left long to epoxy into 1/8” holes drilled into the lead bulb or slotted ScaleSailing bulb halves Keel length from hull bottom to bottom of lead, 7” to 8” plus approximately 1 1/2” inside of the hull to support the top of the keel. The keel is set such that if a line is drawn down from the transom, the keel fin at 7” below the hull is set 2mm further forward than where it exits the hull bottom. This gives a slight forward rake compared to the fin.
Bulb	Target weight of 7oz (200g) Set perpendicular to the centre line of the keel
Bowsprit	For a sloop rig, 3 1/2” overall, 1 1/2” projecting from the stem 1/8” or 3mm carbon tube, epoxy well to deck
Mast	9/32” K&S aluminum tube socket for a 1/4” to 7/32” taper mast as per the Kittiwake. Or 3/16” K&S aluminum tube socket for a 4mm carbon tube mast.
Booms	Sloop rig, 3mm carbon tube

Printing The Plans

The Harpy drawings are .pdf files, they are straighforward to print and should come out the correct size. The plans are designed to be printed on 'legal' paper, that is 8 1/2" x 14". If you do not have 'legal' size paper then two sheets of 8 1/2" x 10" can be taped end-to-end (tape on the back) and that should run through your printer fine.

Do not move the files to any other software, print them direct from your Adobe Reader software, the paper size should auto select 'legal'. Make sure that the 'scale to fit' or similar box is not checked in the print dialog box. This way they should come out at 100%.

To check the size, the deck minus the bow block will measure 297mm (11. 11/16"). The hull bottom will be the same length. The hull side will measure 308mm (12. 1/8") from the bottom left corner to the bottom right corner.

Hopefully that will make sense and work, at least on USA size paper. If you use 'A' size papers then I think it will still work on two sheets of A4 taped end to end.

Material Supply

The ‘Harpy’ Foam Core is available through www.scalesailing.com
email scalesailing@sbcglobal.net
We can also supply;
K&S Aluminum Tubing in 12” or 24” lengths, 9/32”, 1/4”, 7/32”, 3/16” outside diameter
Carbon extruded thin wall tube in 12” or 24” lengths, 5mm, 4mm, 3mm outside diameter
Carbon solid rod in 12” or 24” lengths, 1.5mm, 1.8mm, 2mm outside diameter
Carbon Flat Strip 1mm x 3mm in 12” or 24” lengths

Balsa Selection

Balsa selection is one of the main skills to learn when contemplating using balsa for any model. The wood comes in so many grades that any store selection of, for instance, 1/16" balsa may only have a sheet or two suitable for our particular job.

For Footy panels like on the Harpy what to look for is a light weight sheet with a firm surface feel. Some lightweight balsa will be very soft to the touch. The sheet should be quite flexible along the grain length, some is very stiff. If it has a mottled surface avoid it, that is called 'C-grain' and will be stiff across as well as along the grain. C-grain is really unsuitable for curved surfaces.

Some better suppliers still sell 'contest grade' balsa which is usually very light but can be too soft. Having said that it will be quite easy to build with and treating with thinned laminating epoxy will harden it up. For a competitive lightweight Footy which you will treat with extra care then it could be the way to go. Above all, get your hands on the wood, empty the rack and look for the good ones. Be persistant and get the good stuff when you can.

Comments

‘Harpy’ can be built using a ScaleSailing foam core or as an open hull structure. There are no severe twists in the hull panels so assembly by the tape-and-glue method should be quite straightforward. Pre-curving the side and bottom panels by soaking then binding to a curved surface while they dry is recommended. Please feel free to experiment with different materials if you wish, Harpy is intended to be an experimenters boat.

Maximum displacement (weight) is 17oz (481g) to the designed waterline. With a target bulb weight of 7oz (200g). This should be achievable using light building methods, a micro rudder servo (HS-55), lightweight receiver and a reasonably light sail servo (HS-225BB) powered by 4x AA Lithium cells.

The foam core building method is covered in the instruction sheet which is supplied with the core and also is being shown in the 'Harpy' thread at
http://www.rcgroups.com/forums/showthread.php?t=832750

Here are a few initial building notes for the open hull method.
The deck is flat, I think a reasonable building scheme will be...

Pre-curve the hull sides and bottom to ease assembly. To do this cut out the panels and soak them in water with a little ammonia (or ammonia based cleaning solution) for an hour or so. Put a weight on the panels to keep them under the water. Use gauze bandage or similar to bind the panels to a curved surface about 1 foot or more diameter, like a trash can. Leave until dry.

Cut 4 strips of 1/16" balsa 3/16" wide and about 12 1/2" long. Glue these strips onto the hull side sheets along the top and bottom edges on what will be the inside face of the hull sides. Trim them short of the full length so that they fit inside of the false stem post and the transom. Using light balsa these strips should curve easily to follow the edge of the side sheets.

Mark the inside of the side and deck panel where the bulkhead fits. Tape the side panels to the deck with the panels under the deck rather than around it. Lay the deck down flat on a building board. Trim the bulkhead so that it can be twisted into position. Fit the transom and the false stem post. The transom will follow the inside edge of the hull sides. The bulkhead is set at 89 degrees to the deck (angle behind the bulkhead). Glue the transom, bulkhead and false stempost to the hull sides. Do not glue the sides, bulkhead or false stem to the deck yet. Then tape the hull bottom on to the sides etc. When it all looks straight glue the bottom in place.

When the deck is removed the hull will change shape somewhat so I would suggest using temporary struts across the deck edge to hold the shape. Run a bead of epoxy or waterproof wood glue along the inside of all of the joints.

Next work out the radio installation parts and fin support braces. A good plan is to use a single horizontal servo plate which has a slot the full length of the fin. The sail servo can be mounted across the hull forward of the fin, or to the left of the fin (viewed from behind). Trim the length of your plate to fit across the hull about 1.3/8" (35mm) down from the deck edge. Be careful not to distort the shape of the hull with this mounting plate.

Epoxy a length of 2mm carbon rod (or 1/8" x 1/4" bass) across the deck openning 'bridge', this goes on the underside and should be cut shorter than the full width so that it clears the hull sides. Offset the rod from the centre to allow room for the wire sheet guide loop to be glued through the deck bridge. This carbon rod (or wood strip) strengthens the bridge immensely. Seal the underside of the deck (not the gluing areas) with epoxy or varnish before it is glued in place. Glue the deck on next.

Give the balsa hull a coat of thinned laminating epoxy ('Z-Poxy' or 'West Systems' thinned with rubbing alcohol) inside and out to seal and harden the balsa. Sand the grain flat and give it a second thin coat if necessary. Fit the keel fin into the hull and the servo mounting plate. Use epoxy and make a good fillet both inside and outside of the hull to keel joint.

The rudder servo is designed to be fitted on the ply deck. Fit it after finishing the deck and use a bead of silicone sealant around the body of the servo. It seems best to use a simple bearing servo

like the Hitec HS-55, ballrace servos are more likely to corrude. A little ‘Vaseline’ under the servo output arm is recommended.

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