Kiddy Craft MkIII
by: Richard Bristow

Introduction
The Kiddy Craft is intended to suitable for the unskilled hovercraft pilot being as indestructible as is possible. Fitted with more power it can make a nippy racer. Construction is as straight forward as possible. A single rudder is adequate. The curved bower and stern help stop the craft becoming trapped against curbs. Should the craft blow over on a hard surface the curved bow will allow it to roll back to the right way up. When operating on water foam hull has enough natural buoyancy to stop it sinking should it become swamped.

Useful links
http://robotbirds.com/
http://www.giantshark.co.uk/
http://www.slecuk.com/
http://www.fabrics-n-stuff.co.uk
http://www.hobbyking.co.uk

Materials
10mm EPP foam is used as much as possible. This material is flexible and absorbs impacts without creasing or tearing. I purchased this from Robotbirds on line. A single 900x600mm sheet is sufficient if you layout the parts carefully and don’t make mistakes.
Lite ply or birch ply is used for the duct ring and rudder pivot doublers. Thickness is not critical. For the duct ring I used 2 layers of 2.0mm lite ply or a single layer of 1.5mm birch ply. Buy this from your local model shop or on line from SLEC.
The motor mount of the prototype is fabricated from aluminium section from B&Q. As this is available on 1000mm lengths this is a bit uneconomic if you are just making one motor mount. Don’t worry, you can always build more. A ply motor mount would be a good alternative. The skirt is water proof rip stop, available on line from fabrics n stuff. The minimum quantity of a 1000mm length is more than enough.

Tools
Basic craft tool are all that is required. A scalpel or modelling knife, I used Swan Morton No.4 handle with No.26 blades. EPP cuts easily but blunts the blades surprisingly quickly. Blunted blades are liable to tear the surface of the EPP. A steel rule for measuring and cutting, 600mm rule is more useful but a 300mm rule can be used. A set square, I used a small engineer’s square but carpenter’s square will do. Some cheap carpenter’s squares are anything but square. A cutting mat prevents embarrassing damage to the kitchen table. The duct ring can be cut carefully free hand. Alternatively a screw fix circle cutter is pretty cheap.
A sharpie or a ball point pen is used form marking out on the EPP.

Glues
Hot glue, UHU por, normal cyano and polyurethane (Gorilla glue) all work on EPP. Hot glue is quick and remains flexible like the base material and has good gap filling properties. On the down side it is relatively heavy so don’t overdo it.

Poweeeeeéééé!
The duct takes 6.5” props. Some advantage may be found by using a larger diameter prop and cutting in down. This gives a blade with greater cord and effectively reduces the pitch. If you do cut a prop down make sure it is correctly balanced. Do not run with a damaged prop. Use the finest pitch prop you can find.

- 2820 1400kv brushless motor, 6.5x4“ prop, 3 cell 2200mAh lipo battery 25A ESC fast and furious!
- 2820 1400kv brushless motor, 6.5x4“ prop, 2 cell 1300 – 2200mAh lipo battery, 20A ESC . Cruiser.
- 2820 1100kv brushless motor, 6.5x4“ prop, 2 cell 1300 – 2200mAh lipo battery, 20A ESC. Cruiser.
- 600 size brushed ‘buggy’ motor 6.5x4“ prop, 7.2V NiMh buggy pack, 20A ESC. Heavy but does work with a hot wind motor.
The Model Hovercraft Association

Props, prop adapters, ESCs, batteries, motors and sundries are available online from giant shark, robot birds, hobby king, or from your local model shop.

Health & Safety
If you are unfamiliar with RC gear and Lipo batteries in particular then please read the instructions carefully. The prop is reasonably safe being tucked away in a duct but be careful any time the craft is live. Remove the prop before working on the craft if it is powered up. Cyano fumes are nasty so use in a well-ventilated space. Hot glue does get hot enough to burn. If you can’t use a sharp knife without cutting yourself then buy a box of plasters.

Construction

The majority of the EPP parts are pictured here. With careful planning all the parts can be cut from a single 900x600mm sheet. The hull bottom is, of course, the piece cut out from the deck.

Start gluing the hull together upside down on a flat surface. The hull sides, front and back are glued onto the underside of the deck. The front edge of the hull sides are chamfered to make a close joint with the curved front.

The hull bottom is glued inside the hull front and sides. The gap at the back is where the duct will slide in.
The duct front, the duct front doubler and the duct ring are glued together. I used UHU POR for this instead of the hot glue used elsewhere. Note the 10mm step at the bottom edge formed by the duct front and duct front doubler. This will fit to the back of the hull bottom. Also note a similar 10mm step formed at the top of the EPP duct front. This is to take the front edge of the air splitter.

The duct and the air splitter require that the EPP is curved. Here the EPP parts are curved and taped to formers of approximately the right size (a spray can and a paint pot) and left over night. The EPP will take on the shape which makes assembling the duct much easier.

The air splitter sides are glued to the air splitter (pictured here laid on its back). Having three hands would help a great deal when doing this. Note that the front edge of the air splitter plate is 10mm in front of the front edge of the air splitter side. This is to fit to the duct front assembly. Using a fast setting cyano here helps.

The air splitter assembly is glued to the duct front assembly and the duct glued to the air splitter sides and the duct ring. Pictured here lying on its front. Take care to get the duct to precisely follow the diameter of the duct ring. The tab sticking out from the duct is to take the rudder top pivot.
The whole duct assembly again, this time viewed from the front. The duct is held to the duct ring with tape while the glue dries. I used UHU Pour for this. Again, having three hands would make things much easier.

The hull viewed from underneath. Once dry, the whole duct assemble is slid into the gap at the back of the hull bottom. The step in the front of the duct should line up with the rear of the hull bottom. Glue around the top of duct to close any air gaps. Note the corner pieces glued into the rear corners of the duct. These together with the three thickness of EPP at the duct side provide adequate area to fix the inner edge of the skirt to. Also note the deck brace glued at the front and back of the hull. These help the hull ride up and over any obstacle following a ‘hard body impact’.

Cut holes though the back of the air splitter and the hull back to allow air to flow from the plenum into the skirt.

The rudder is fitted. Ply doublers are glued to the top of the deck and underneath the tab at the back of the duct and drilled to take a pivot pin. Select a length of tube which is a sliding fit over the pivot pin. This tube is glued into the rudder by cutting 2/3 way through the rudder on the pivot line, folding the joint open and gouging out sufficient foam to allow the joint to close neatly around the tube.
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<th>The Model Hovercraft Association</th>
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<td>The motor mount fabricated from aluminium section. Dimensions to suite your motor. This is then fixed to the duct ring with servo screws. Dripping some cyano into the screw holes stiffens the plying allowing the screw to bite better. The rudder servo is hot glued in place. You may need to trim the front of the air splitter to clear your chosen prop/prop adapter/motor assembly. Once trimmed, glue a strip of ply to the leading edge of the air splitter to stop it flapping around in the breeze.</td>
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<td>The skirt can be sown, glued or double side taped together. I used a family heirloom for this. I’m told more modern machines are available. Some of which run on electricity. The skirt sections are held together with double sided tape while being sewn.</td>
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<td>The skirt is fixed to the hull either with double side tape or hot glue. Take care to get the skirt straight and the corners neat.</td>
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<td>Find the correct balance point by moving the battery around. When balanced correctly the craft should turn around its centre. Adjust to find the best handling and performance. Once the best battery position has been found make a superstructure to your own design. This is made from 6mm EPP.</td>
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Hovercraft operation
The prototype craft has operated over tarmac, concrete, wet sand, water, snow and with enough power, short grass. As described above the balance point of the craft will affect how it handles and performs. Use too much power into the wind and the craft can blow over (the bow lifts and the craft flips over) if the pilot does not shut the throttle quickly enough.

Hump speed
When operating on water all hover craft have a hump speed. The craft is hovering above the surface of the water with an air cushion pushing down. This makes a depression in the water which the craft is continually trying to climb out of. The craft will be slow and appear to be struggling to make headway. Hump speed is the speed at which the craft finally manages to climb out of the depression. It will then stay ahead accelerating to a high speed without adding more power.
DECK SKIRT SIDE, 2 OFF
SKIRT END, 6 OFF
HULL BOTTOM
DUCK
AIR SPLITTER
HULL BACK
HULL FRONT HULL SIDE, 2 OFF
DUCK FRONT, DOUBLER
AIR SPLITTER SIDE, 2 OFF
DUCK FRONT, DOUBLER
RUDDER
RUDDER PIVOT CENTER, USE PLY DOUBLER
DUCK Front, DOUBLER
RUDDER PIVOT CENTER, USE PLY DOUBLER
DECK
HULL SIDE, 2 OFF
HULL BOTTOM CORNER, 2 OFF
DECK BRACE
HULL BACK
HULL FRONT
HULL FRONT
HULL BACK

Notes:
ALL DIMENSIONS TO BE CHECKED ON SITE
DO NOT SCALE FROM THIS DRAWING

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