Simple Self-propelled 1-motor Hovercraft

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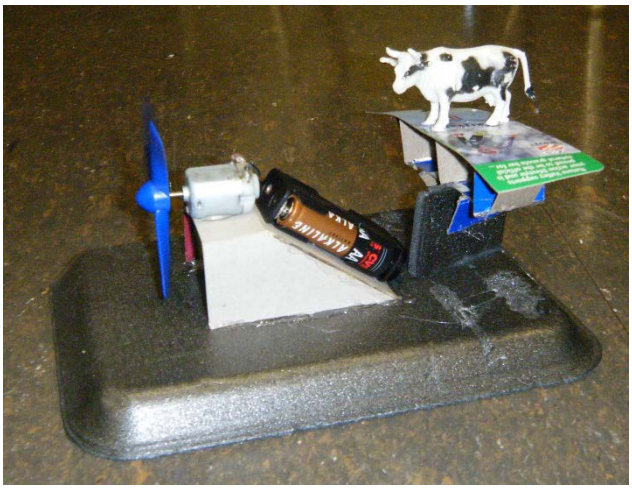
Based on a design from Instructable.com
http://www.instructables.com/id/Fifteen-Minute,-Self-propelled-hovercraft/



Goals:

Construction:

- Learn and use cutting tools properly for precision cuts and scoring
- Learn and use pin transfer method to mark cardboard for motor mount.

Electrical:

- Wire a series circuit with a toggle switch
- Use a soldering iron to make electrical connections

Engineering:

- Observe and document performance of hovercraft
- Design and implement modifications

Materials:

Foam tray (~8.5” x 6”)
Cardboard ~1/32” thick, (5” x 5” piece)
Graph paper, 1/4” squares, ¼ sheet
Small electric motor, 3V DC
Propeller
Battery holder for 2 AA batteries
Toggle switch
Wire, 3”, thin, (~22awg)

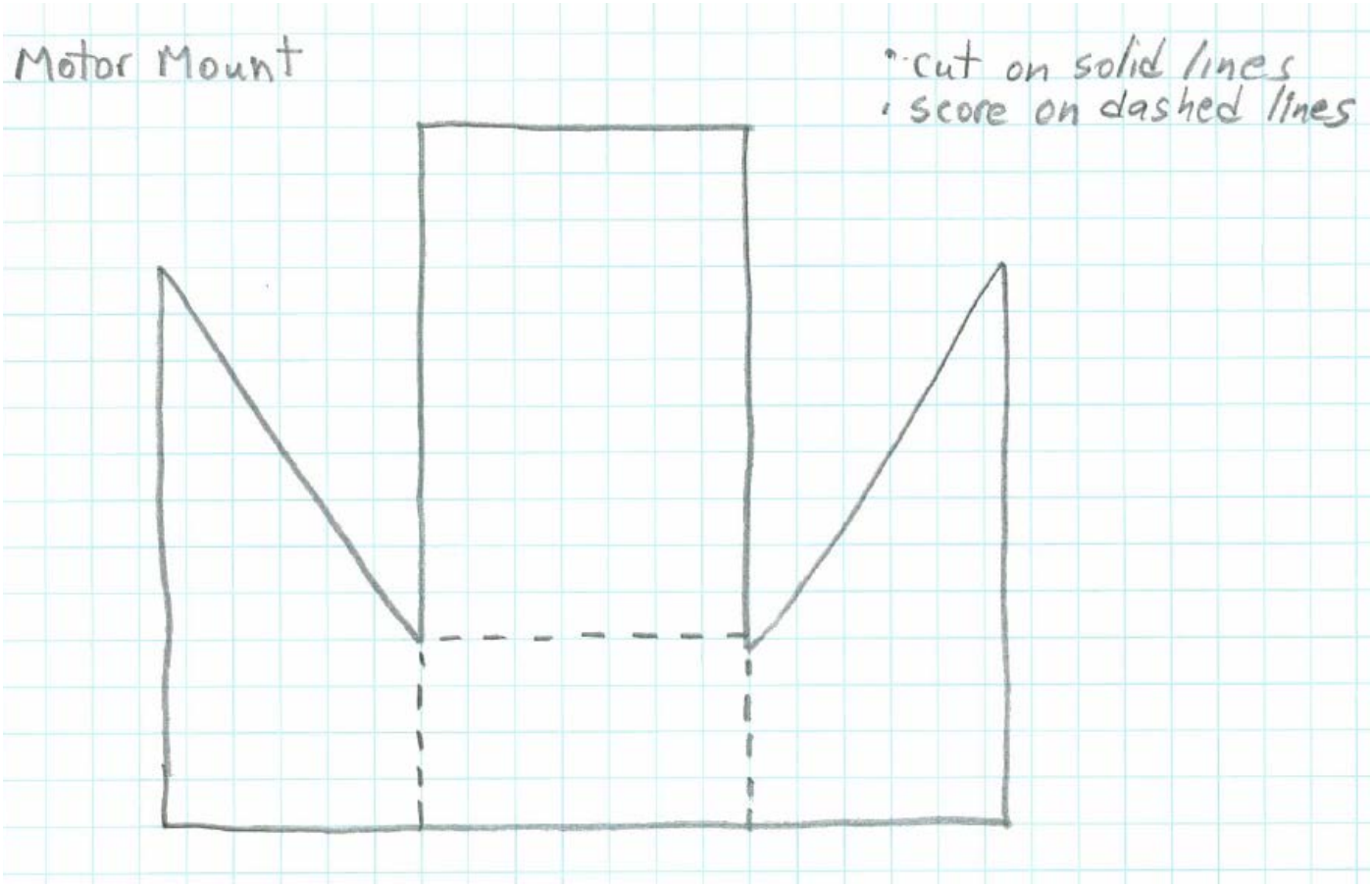
Tools:

Craft knife
Cutting mat
Metal ruler
Push pin
Hot glue gun and hot glue sticks
Wire stripper
Soldering iron
Solder
Helping hands

Step 1: Make the Motor Mount/Intake

Transfer the pattern
Lay the pattern below over the 5” square piece of cardboard. Use a push pin to transfer the corners onto the cardboard.

Cut on Solid Lines
Score and fold on Dashed Lines



Cut
Remove the pattern and cut the cardboard using the craft knife, the metal ruler, and the cutting mat.

Score and fold
Score the dashed lines and bend cardboard back along the scored lines.

Glue
Use hot glue to assemble the motor mount/intake. Check that the bottom opening measures 3” x 1 ¾”

Step 2 Make the Base

Make a pattern for the cutout
Make a pattern for a 3 x 1 ¾" cutout on the piece of graph paper. Make sure to use graph paper that has 4 squares per inch

Transfer the pattern
Center the pattern for the cutout on the top of foam tray and transfer the 4 corners using a push pin

Cut
Cut the opening in the foam tray using the breakaway knife and a ruler. Be careful not to dent the bottom edge of the tray.

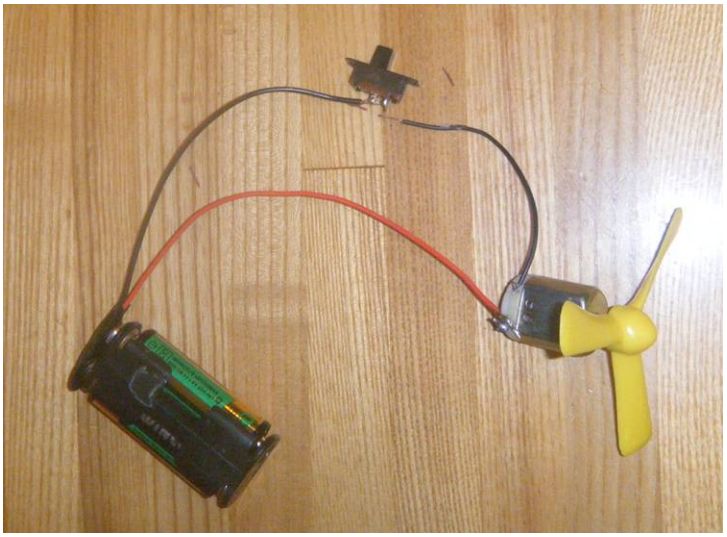
Step 3 Attach the Intake to the Base

Glue
Use hot glue to attach the motor mount/intake to the back of the foam tray, directly over the hole.

Step 4 Make electrical connections

Install propeller
Press propeller onto electric motor shaft

Setup motor wiring
Install 2 AA batteries in the battery holder and touch the leads to the 2 tabs on the motor. Switch the red and black wires. Note which connections will make the propeller blow air back past the motor. Make a mark on the motor to remind you where the red wire should be attached so the propeller will blow back past the motor.
Use the wire stripper to strip the ends of the short piece of wire and clean the ends of any other wires. There should be 1/8” of wire protruding from the insulation (cut the wire if longer)
Add the switch to your motor circuit and check that you can turn motor on and off. You will need the short piece of extra wire.

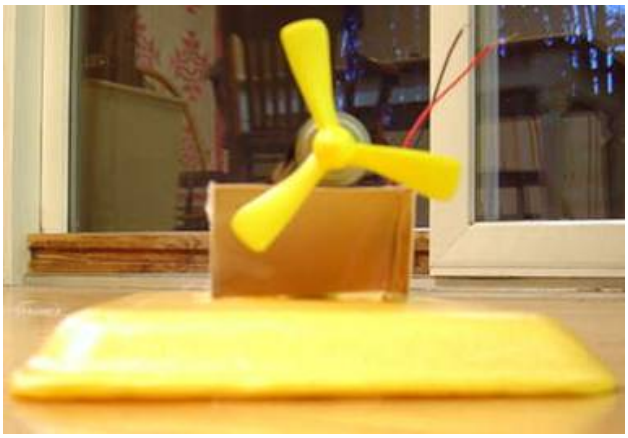


Solder wires
Make good electrical connections by soldering the wires to the switch and motor. Use the “helping hands” to hold the switch while you solder.

Step 5 Attach Motor, Battery pack and Switch

Check fit

Check the fit of the motor and propeller. Sit the motor on top of the mount and make sure the propeller can spin freely without touching the foam tray.



Glue

Attach the motor to the mount with hot glue, making sure not to glue any moving parts.
Attach the battery pack with hot glue.
Attach the switch with hot glue, being careful not to get glue in the sliding part of the switch

Step 6 Watch it run!

Observe and document

Watch the hovercraft and note how it performs.
Does it hover well?
How far above the round does it hover?
Does it travel in a straight line.
Can it carry any weight?

Step 7 Change the performance

Make modifications
How would you like to change the performance or appearance of the hovercraft?
Come up with 2 things you want to modify and experiment with ways to change its performance.
Note the effects the changes have.

Final documentation: **- to be clearly handwritten or done on a computer**

1. Describe 2 problems you had in construction and how you got past them

2. Describe 3 new skills you learned on this project

3. Write how the basic hovercraft works. Use clear, full sentences. Consider all parts of the device from batteries all the way to the foam tray.

4. List the 2 things you chose to modify. For each describe what you did and how well your modification changed the performance of the hovercraft. Use clear, full sentences.

5. Comments for the teacher on how to improve the project

Hovercraft Project **Name_____**

Final documentation:	Points	
1. Describe 2 problems you had in construction and how you got past them	10	
2. Describe 3 new skills you learned on this project	5	
3. Write how the basic hovercraft works. Use clear, full sentences. Consider all parts of the device from batteries all the way to the foam tray.	10	
4. List the 2 things you chose to modify. For each describe what you did and how well your modification changed the performance of the hovercraft. Use clear, full sentences.	10	
5. Comments for the teacher on how to improve the project	5	
Machine Construction and Performance		
Well-constructed using appropriate tools and methods	25	
Modifications designed and implemented	15	
Student behavior and work ethic in class		
Worked efficiently and did not distract others	5	
Was respectful to teacher, partner and other students	5	
Used tools and materials appropriately	5	
Cleaned up workplace and classroom well	5	
Total	100	