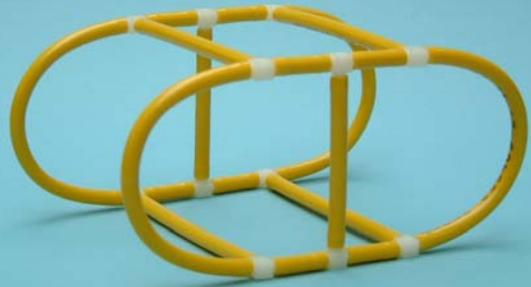


# PART 1

## Build the ROV frame



The ROV frame is the body or chassis of the ROV that holds the thruster motors, the propellers, and the buoyancy tanks.



1. ROV frame kit:
  - 12 x Tee joiners
  - 8 x 21mm long tubes
  - 2 x 60mm long tubes
  - 4 x 95mm long tubes
  - 4 x 120mm long tubes



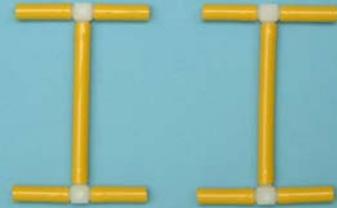
2. Select 4 of the Tee joiners and all 8 of the shortest tubes (21mm).



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**3.** Assemble the pieces into 4 side struts as shown.



**4.** Add 2 vertical strut tubes (60mm) and combine with the 4 side struts to create 2 "H" assemblies.



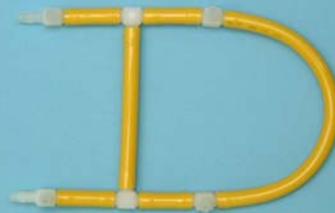
**5.** Take 8 more Tee joiners to be added to the 2 "H" pieces.



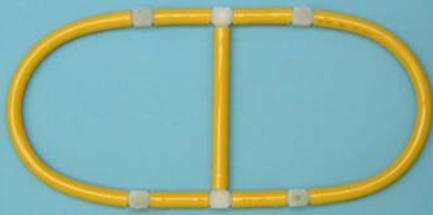
**6.** Push the Tee joiners in and twist them all the same way so they look like table legs.



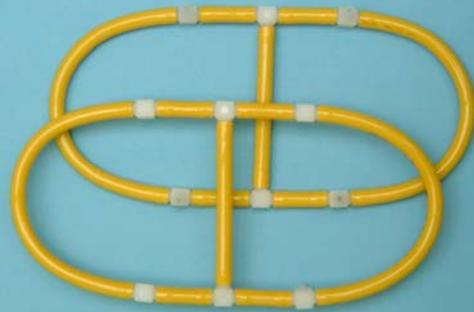
**7.** Take the 4 longest tubes (120mm) and gently bend them into "C" shapes with your fingers.



**8.** Push the "C" shaped tubes on to both of the "H" shaped assemblies to make them into "D" shapes as shown.



**9.** Do the same to the other sides of the "H" to make 2 oval shapes.



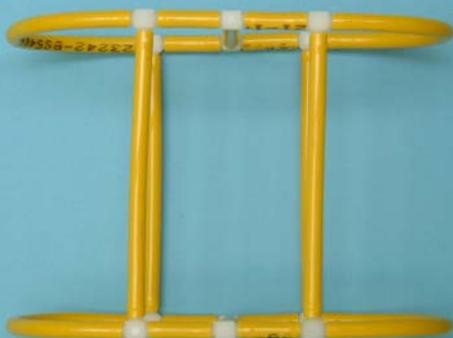
**10.** You should now have 2 oval shaped sides of the ROV frame.



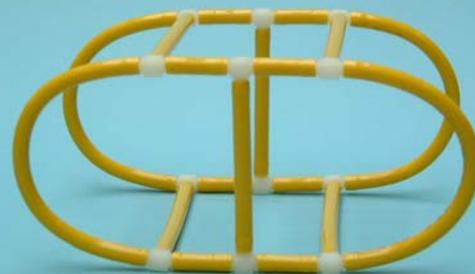
**11.** Take the 4 remaining tubes (95mm).



**12.** Attach 2 tubes to one side of the oval and 2 tubes to the other side.



**13.** Connect the 2 ovals together and gently straighten any slight bends or curves.



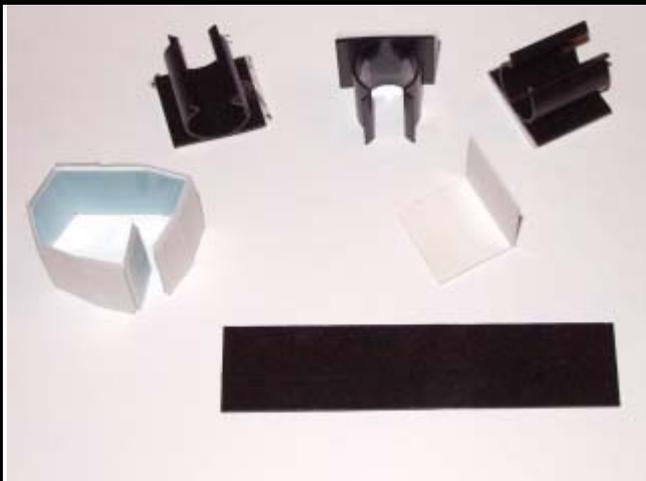
**14.** The basic ROV frame is finished.

# Part 2

## Assembling the thruster cluster

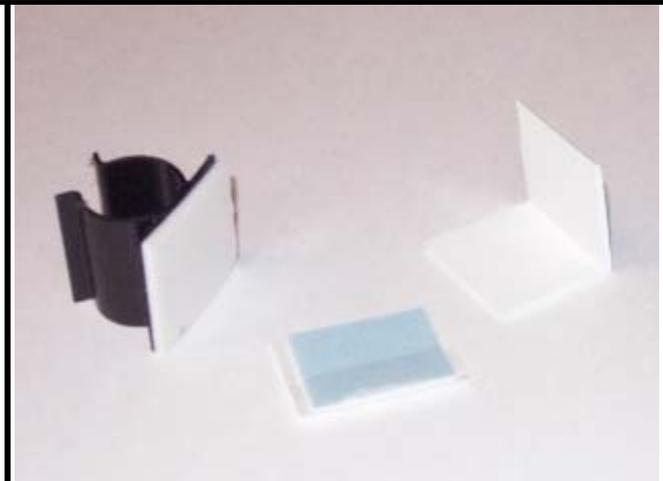


The thruster cluster will be used to attach the ROV thrusters (motors and propellers) to the frame. After it's completed, the cluster assembly will be mounted to the ROV frame and the motors will be attached to the cluster.

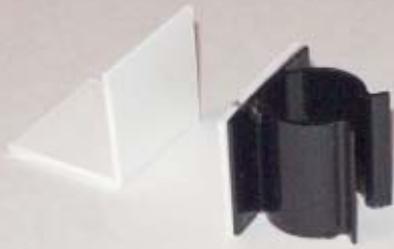


1. Collect the components for the cluster. There should be:

- 3 x "C" shaped motor clips (black)
- 1 x "L" shaped bracket (white)
- 1 x rectangular plate (black or clear)
- 2 x small sticky tabs (from the strip of sticky tabs)



2. Take one "C" motor clip, the "L" shaped bracket, and 2 small sticky tabs.



**3.** Peel the paper backing off one side of the small sticky tabs and stick them under one side of the “L” bracket.



**4.** Peel the paper backing off the sticky tab on the clip and stick the “L” bracket squarely to the clip as shown.



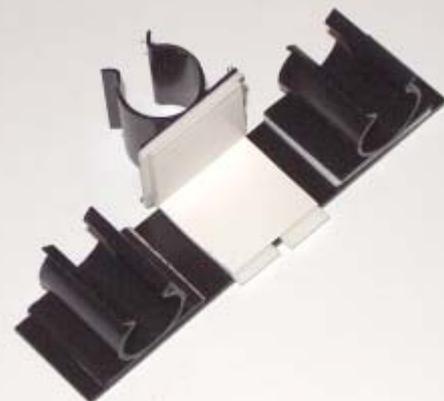
**5.** Take the other 2 “C” clips and the rectangular plate. If there is protective film still attached to the plate, peel it off first (both sides).



**6.** Peel the backing off the sticky tabs and fix the clips to the plate as shown. They should be about 3mm to 5mm in from the ends.



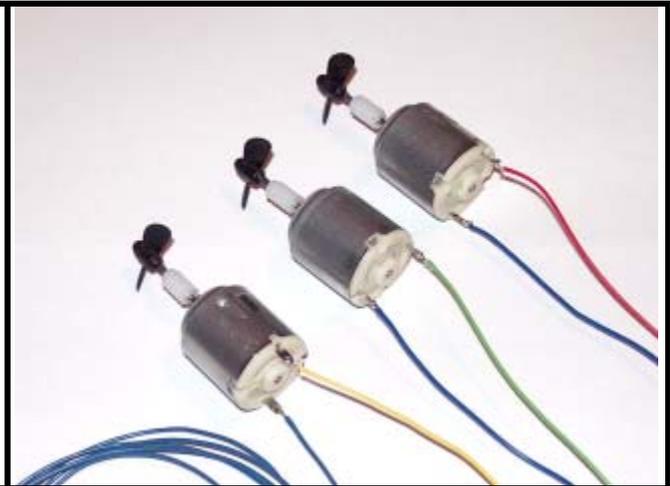
**7.** Take the two parts of the cluster.



**8.** Peel the backing off the small sticky tabs under the “L” bracket and attach together as shown.

# Part 3

## Assembling the thruster motors



1. Gather the 3 motors and the 3 propeller assemblies.

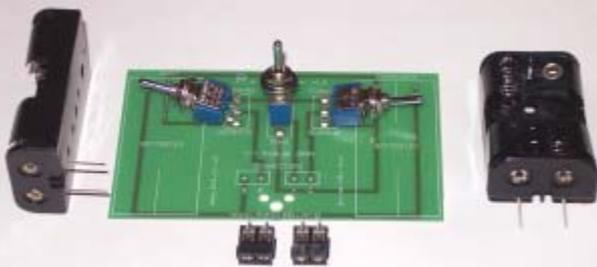


2. Push the propeller assemblies firmly onto the shafts of the motors.

3. Take the four long lengths of flexible wire (red, green, yellow and blue).
4. Strip 1cm of insulation from both ends of each of the lengths. Twist the metal strands of wire together with your fingers.
5. Notice that one of the two tabs on each of the motors is denoted with a small square or circle recessed into the plastic next to the tab. These tabs are to be 'commoned' (connected together) using the blue wires (slightly thicker than the other wires).
6. Solder the long piece of blue wire to the tab marked with the square on the first motor. Then solder one of the short pieces of blue wire to the tab marked with the square on the second motor, and the other short piece of blue wire to the tab marked with a square on the third motor.
7. Solder the yellow wire to the other tab on the first motor (the motor that has the long piece of blue wire already soldered to it). Solder the red and green wires to the other tabs of the other two motors.

# Part 4

## Assembling the control panel



1. First insert the 3 switches fully down onto the board and solder them to the board. Ensure that the holes are completely filled with solder to hold them securely in place.

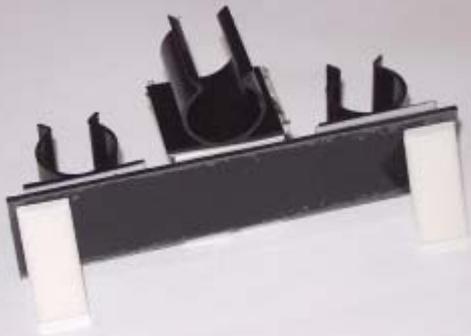
2. Solder the battery boxes onto the board. Use a pair of sticky tabs underneath each battery box to secure them to the board. Trim the legs after soldering.



3. Solder the terminal blocks to the board such that the screw holes are oriented towards the closest edge of the board (towards the 3 larger holes in the board).

# Part 5

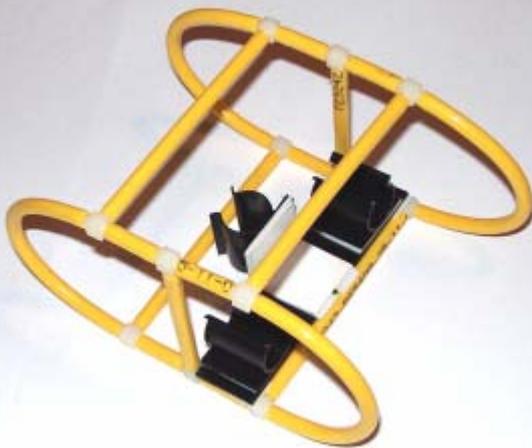
## Assembling and testing the ROV



1. Take the assembled thruster cluster and 2 more small sticky tabs.



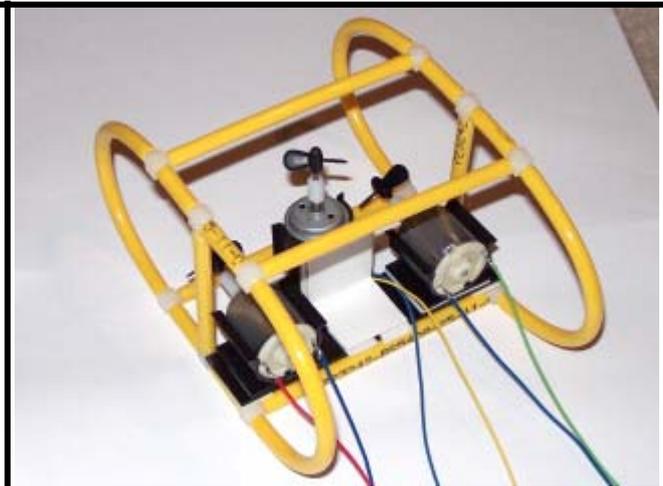
2. Peel off one side of the paper backing and affix the tabs to the underside of the thruster cluster at the ends, as shown above.



3. Fix the thruster cluster to the bottom inside of the frame. The vertical motor clip should be in the gap near the centre of the frame. The rectangular plate should fit against the vertical strut and line up with the horizontal struts. It may help to test fit the cluster in position first, before removing the backing from the sticky tabs.



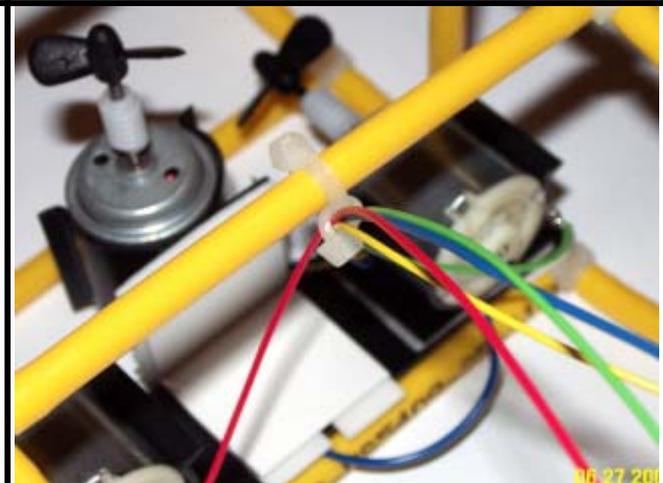
4. Clip the vertical thruster (with the yellow wire) into the middle position, bringing the wires backward to the stern of the ROV.



5. Clip the port thruster (with red wire) into the left side and the starboard thruster (green wire) into the right side, bringing the wires backward. Solder the two short pieces of blue wire from the left and right motors onto the blue wire tab located on the centre motor (the 'common').



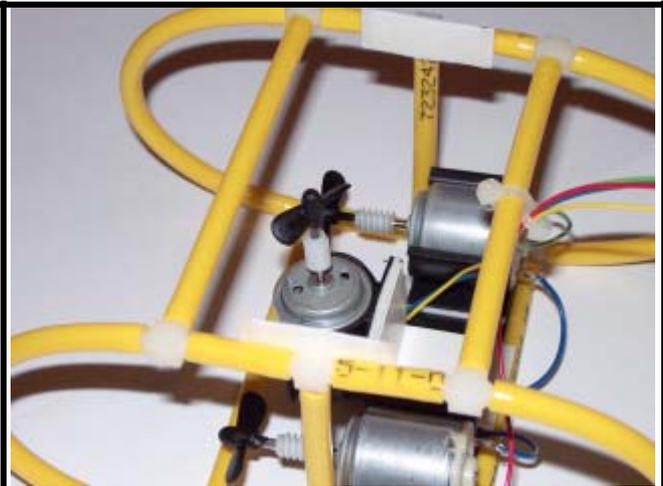
6. Take one short white cable tie and loop it loosely over the top stern strut. Attach the wire bundle using another white cable tie to the first tie, like the links of a chain.



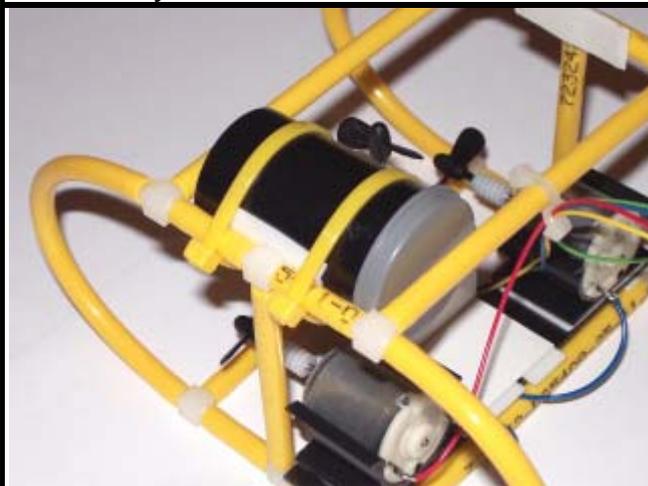
7. When the wires and ties are central and in position, pull the ties tight and clip off the excess tie tails with wire cutters.



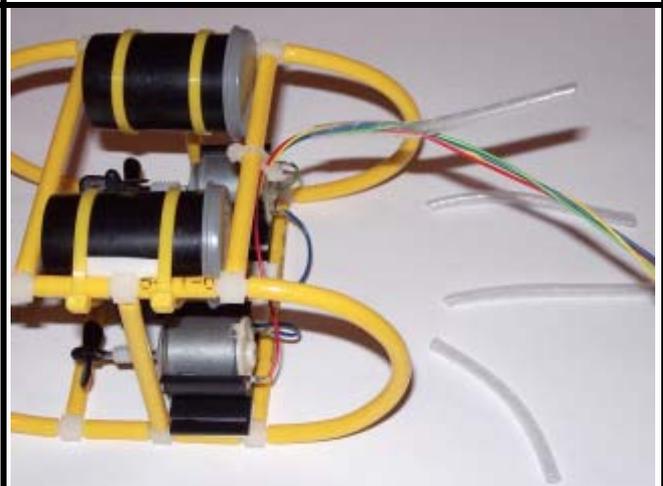
**8.** Take the 2 empty film canister “buoyancy tanks” and 2 small sticky tabs.



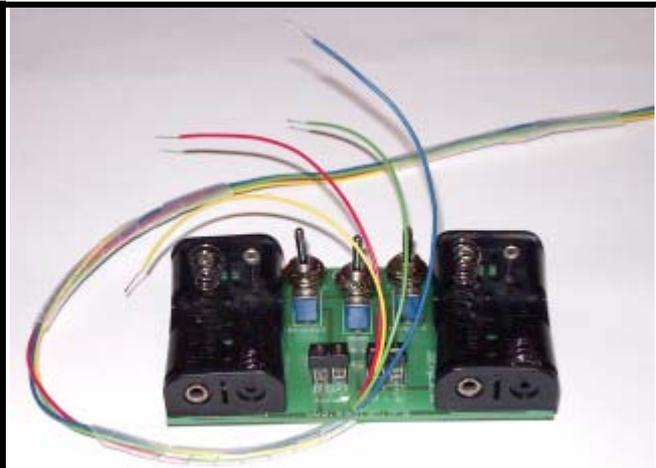
**9.** Affix the sticky tabs to the joining Tee’s at the top inside centre of the frame.



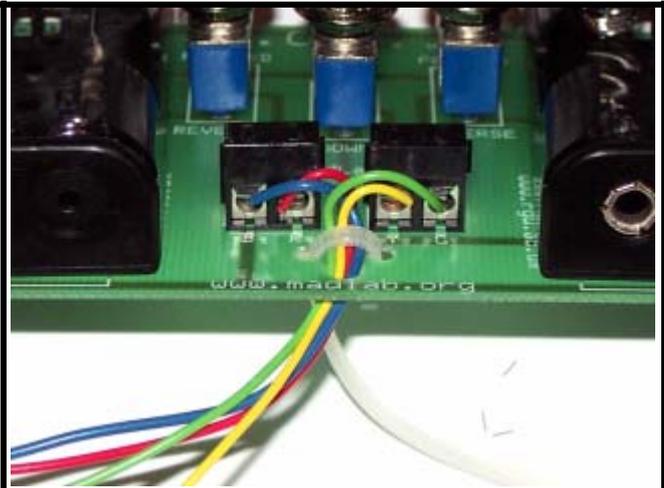
**10.** Fix the buoyancy tanks to the sticky tabs and secure the tanks in place with a pair of long yellow cable ties around each tank. Trim the tails of the cable ties.



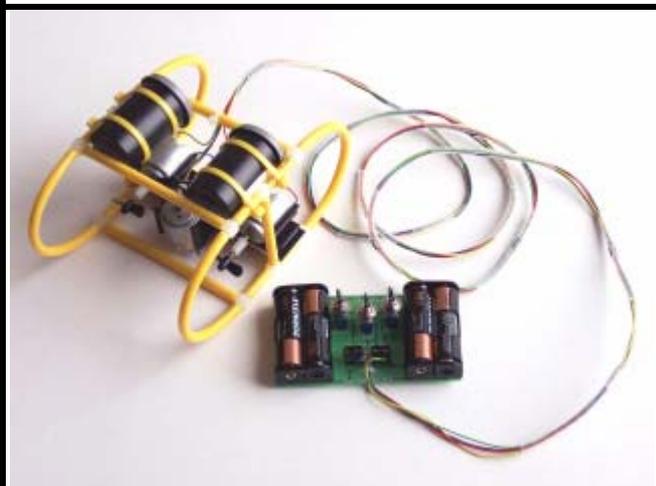
**11.** Bind the umbilical cable with the short pieces of spiral cable wrap about 20cm apart. By taking one of the wires outside the wrap for one turn, the cable wraps can be made less likely to slide up and down the umbilical cable.



**12.** Feed the four long wires up through the large hole on the circuit board from the metal side. If the wires are unequal in length, then trim them all to the same length and re-strip the wire ends if necessary. Insert the wires into the terminal blocks and tighten the screws down. The screw holes are marked on the board with the corresponding colours (B = blue, R = red, Y = yellow, G = green).



**13.** Secure the wires to the circuit board with a short white cable tie wrapped through the two smaller holes in the board. This will provide some strain relief for the cable.



**14.** Your ROV is now ready for testing and trimming.

**15.** Add the batteries, making sure to install them with the correct polarity.

**16.** Check to see that the motors run when switched on. The switches have 3 positions. Centre (straight up) is OFF.

**17.** You are now ready for sea trials.

**18.** Check the buoyancy of the ROV. It should just float at the surface.

**19.** Add metal nuts or washers inside the tanks if it floats too high in the water.

**20.** Check that the ROV moves in the correct direction according to the switch positions. Have fun with your new ROV!