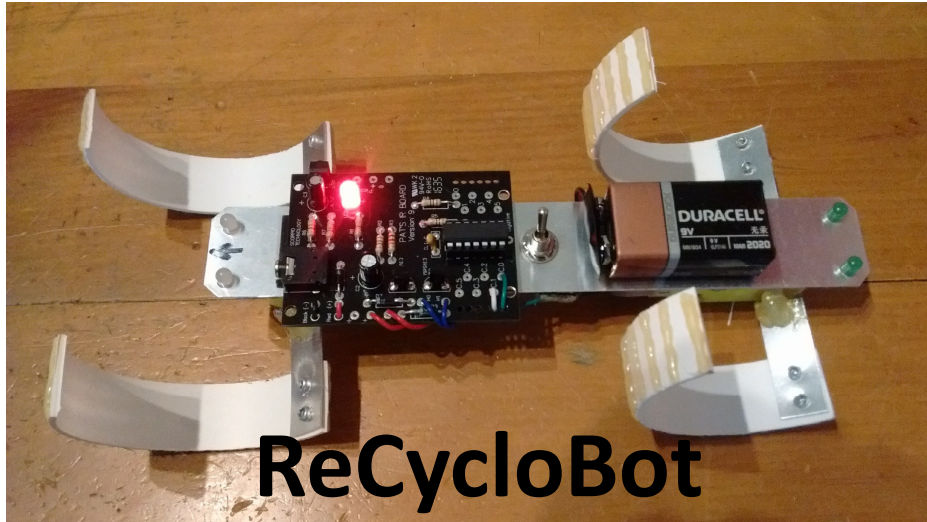


# How to Build Pat's ReCycloBot

Pat McMahon– V3– 15/3/2017

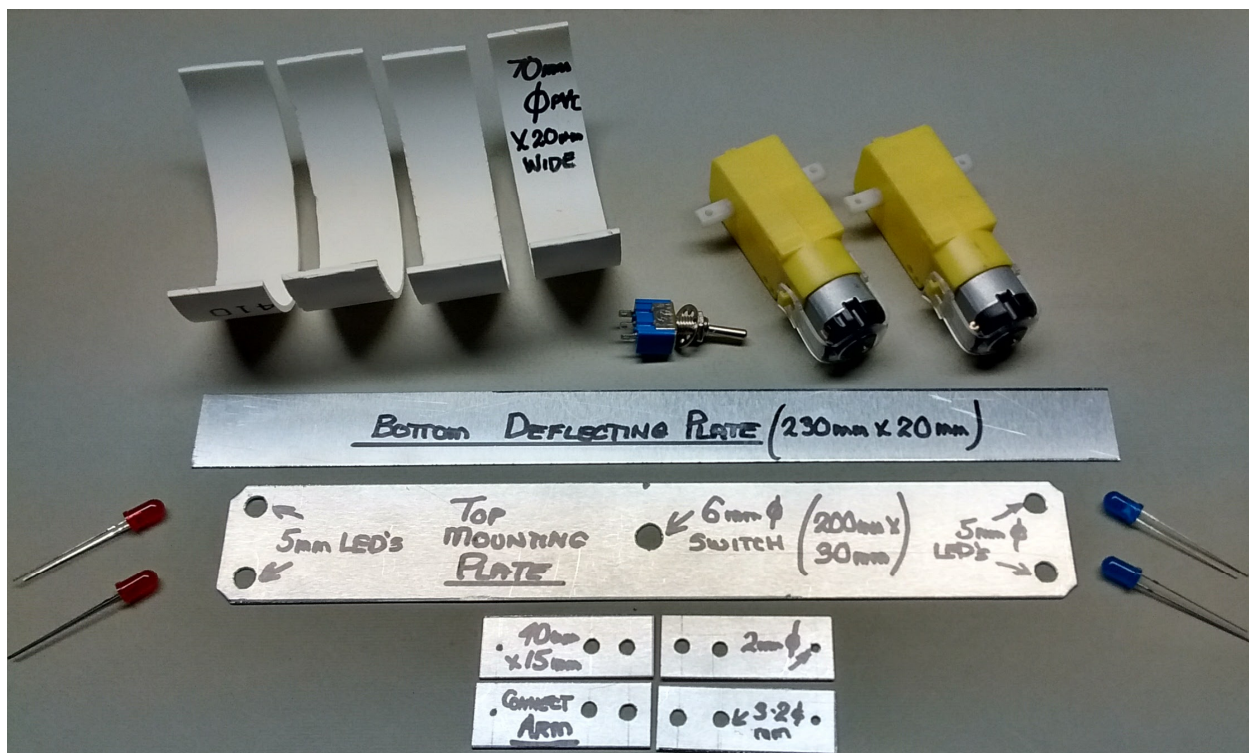
**Design Brief** – Using Recycled PVC and Aluminium off cuts, construct your own Infrared Controlled 14M2 Picaxe ReCycloBot with Whegs (not **W**heels/**L**egs)

**Note** – The photos taken in this “How to Build” are using Recycled & new parts. The same can be done using all new material & parts.



Below are some of the Production Steps, or you can use your own design, Tick off each box as you complete a task and Document it.  
**Tools Required**– Soldering Iron, Pop Rivet Gun, Small Zip Ties, Small Phillips Head Screwdriver, Hot Glue Gun, Drills, Velcro Tape.

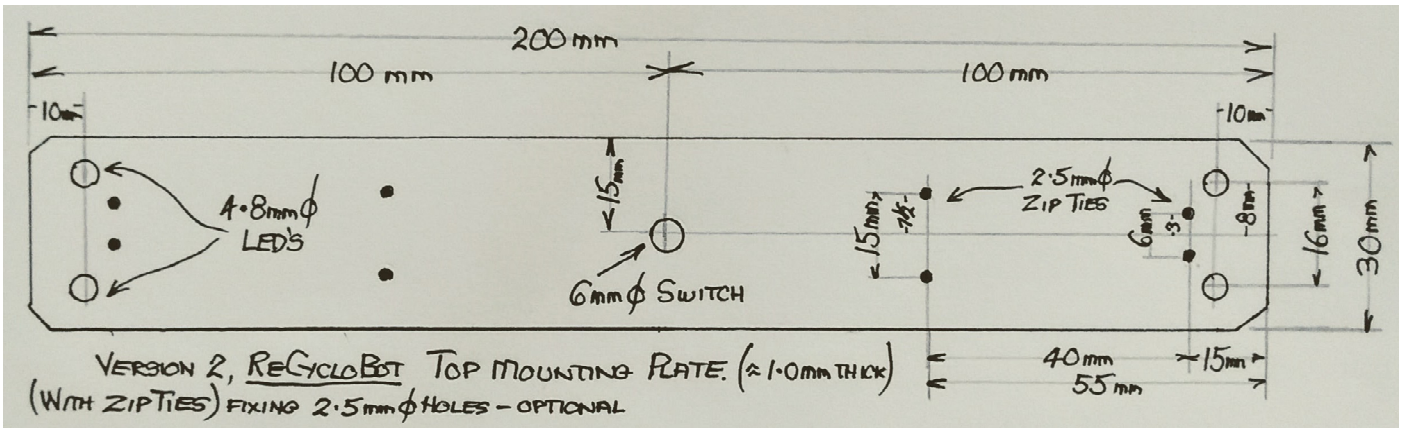
Below are the main parts required to construct your ReCycloBot propelled by Whegs, designed by the European Space Agency.



## Materials List -

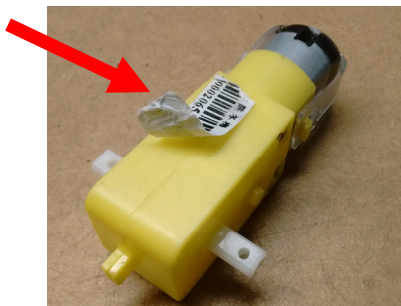
- 4 x 70mm Diameter 1/2 PVC Water Pipe x 20mm wide.
- 2 x Motor & Gearbox ratio 1 : 48
- 1 x Two way switch.
- 4 x 5mm LED's.
- 4 x M2 x 12 mm long Metal Threads & M2 Nuts.
- 4 x 40mm x 15mm wide x 1mm thick Connecting Arms.
- 1 x 200mm x 30mm wide x 1mm thick Top Mounting Plate.
- 1 x 230mm x 20mm wide x 0.6mm thick Bottom Deflecting Plate.
- 8 x 4.2 Pop Rivets.
- 1 x 14M2 Picaxe Infrared 14M2 Microcontroller & 9V Battery.
- 2 x Red (100mmx2.5mm) Zip Ties.
- 2 x Black (200mmx2.5mm) Zip Ties.

- Detailed Dimensions for the Top Mounting Plate ( with optional Motor fixing method using 4 x 2.5 mm Zip Ties )**  
Note—Optional small Zip Tie Motor Fixing holes are coloured in black, not needed if fixing with hot glue gun.

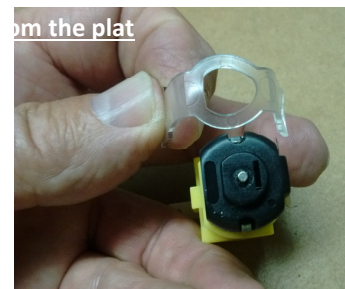


**Note-** Because of the Torque involved on the motors with using the Whigs, I found that on my initial prototypes, that the Whigs got out of phase on the motors, which caused the ReCycloBot to go to one side. To overcome this it is necessary before assembly, to carefully undo the gearbox and super glue the shaft inside the motor, to make a solid fixed shaft on both sides.

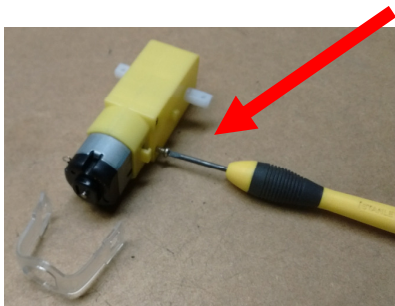
- Remove the manufacturers sticker as it may hold the two half gearbox cases together.**



- Carefully remove the clear plastic motor tensioner, noting the flat on one side of the hole for re-assembly.**



- Using a small Phillips head screw driver, remove the two self tappers and gently pull the housings apart.**

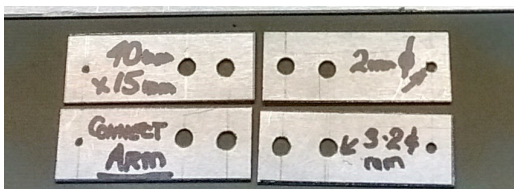


- Ensure both opposite half shafts are aligned and carefully Super Glue the cam lobe half shaft only. Allow the super glue to fully set before assembling**



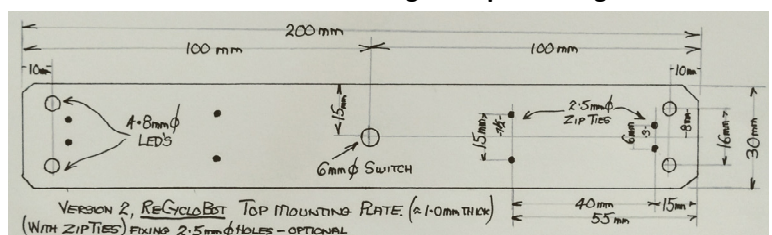
- Construct 4 Aluminium Connecting Arms**

(40mm x 15mm x 1mm thick) Drill holes  
2mm Diam 5mm in, 3.2mm Diam holes 5 & 15mm in.



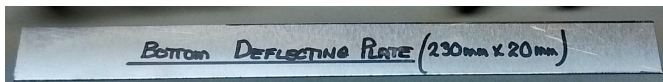
- Construct the Aluminium Top Mounting Plate.**

Drill using a 6mm drill for the switch, 4.8 mm(3/16th inch) for the LED's & 2.5mm if using the Zip Tie fixing method.

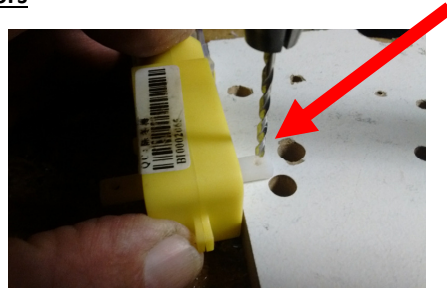


- **Construct 1 Aluminium Bottom Deflecting Plate**

(230mm x 20mm x 1mm thick)



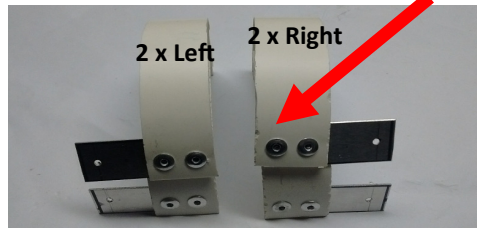
- **Drill 2mm Diam holes, 5mm in from both ends on both Motors**



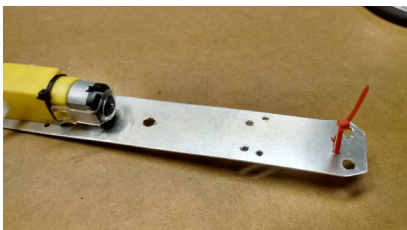
- **Cut 20mm wide Rings from the 70mm Diam PVC Pipe, then cut exactly in half.**



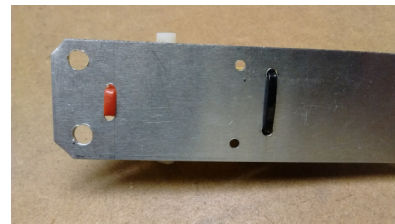
- **IMPORTANT- Drill one only 3.5mm Diam holes in the PVC & fix using a 4.2 Pop Rivet. Ensure the Connecting Arm is at 90 degrees to Whег, drill second hole and fix with second pop rivet. IMPORTANT-build 2 left & 2 Right facing Whегs (part Wheel/legs)**



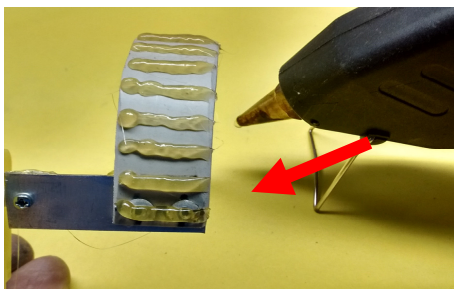
- **If using Zip Tie method, use red 100mm x 2.5 mm on motor ends and black 200mm x 2.5 mm around the motor housing.**



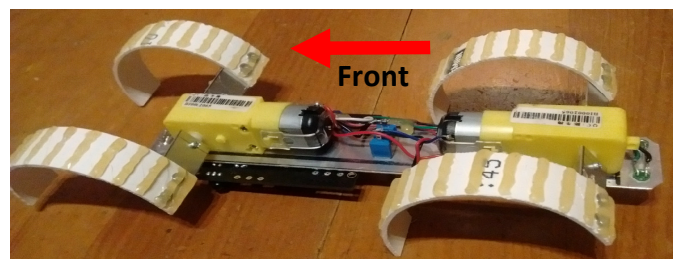
- **Ensure the Zip Ties are flat on the top of the Top Mounting Plate, for later mounting of the battery & microcontroller by Velcrose tape.**



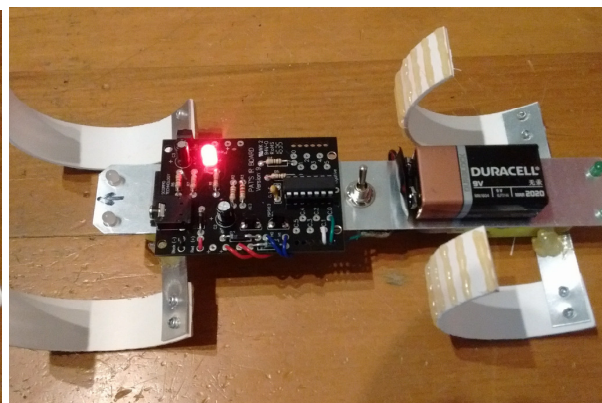
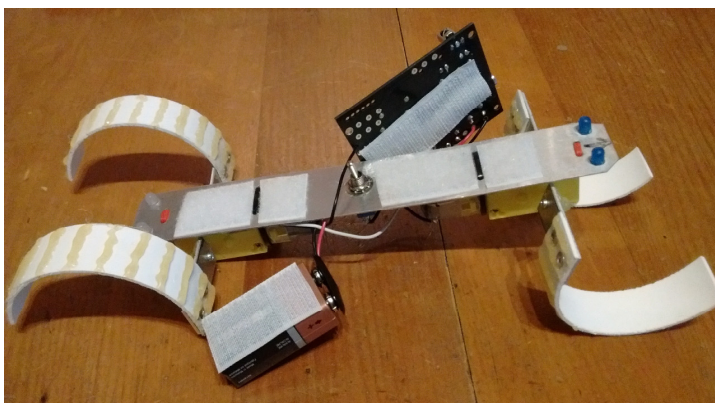
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- **IMPORTANT – Fasten the 4 Whегs to the previously drilled motor & Gearboxes Arms with M2 Screws & Nuts & secure with glue. Glue or Zip Tie Motors to top plate & Align carefully, centrally & 15mm in from ends.**

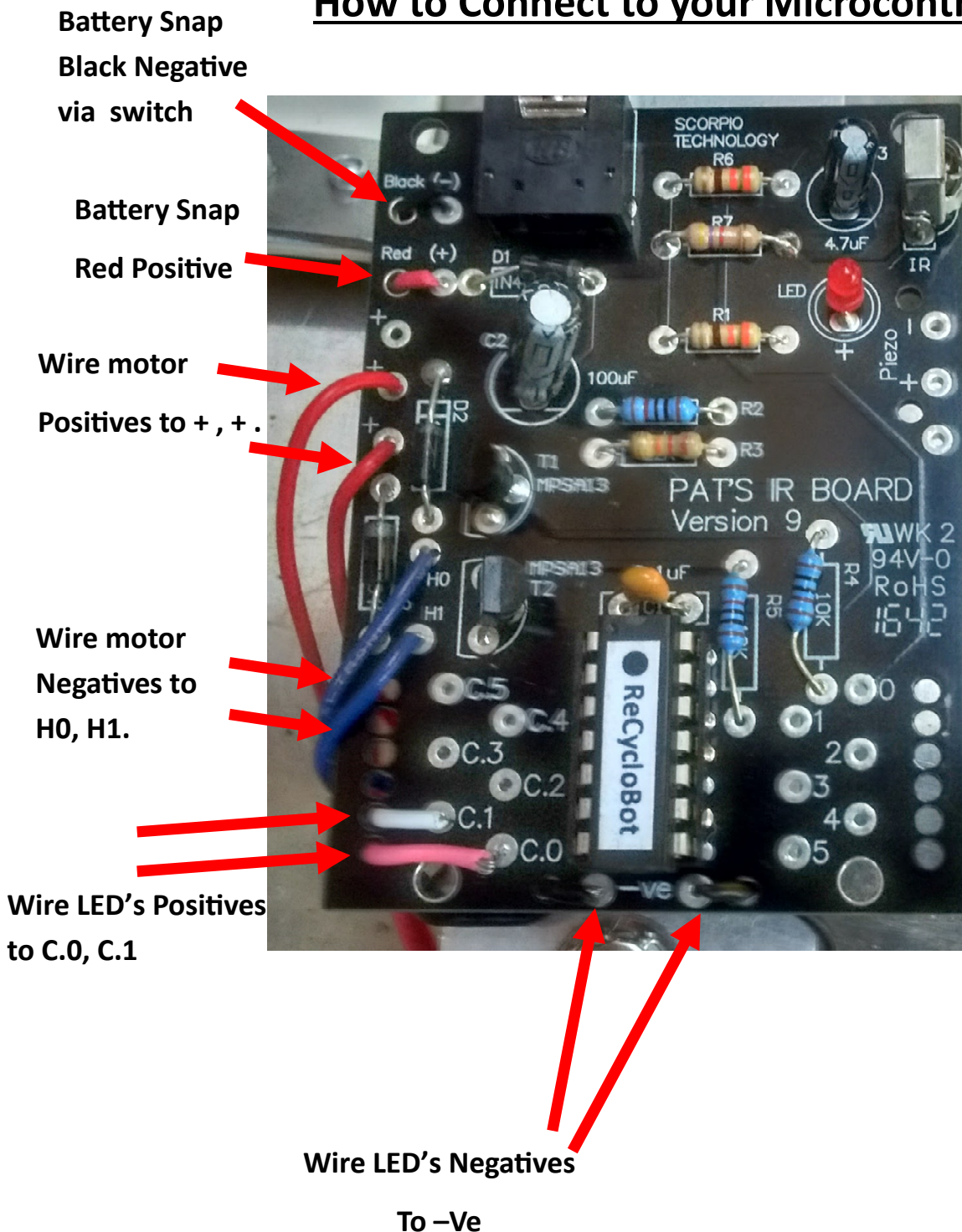


- **Wire in the Motors, 4 LED's, Switch & mount the 9V battery with Velcros, for easy replacement later. (See next page)**



- Build Pat's 14M2 Microcontroller, attach to the Top Plate with velcros or double sided tape. Program your Infrared Controlled ReCycloBot using Pat's ReCycloBot Program.

## How to Connect to your Microcontroller



**Note - If the Motors/Whegs are going in different directions, swap the Positive and Negative wires around on one motor only, at the motor.**

**Congratulations on Building & Coding your own ReCycloBot, Well Done!**