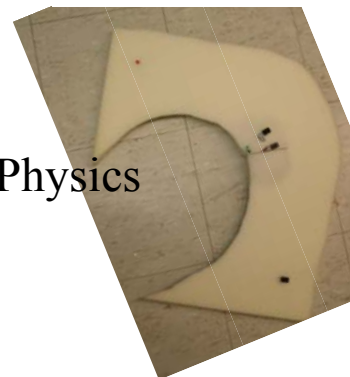


Syracuse University Saturday Morning High School Physics Teacher Workshop

Make and Take — Center of Mass Toss

(adapted from Marty Alderman)



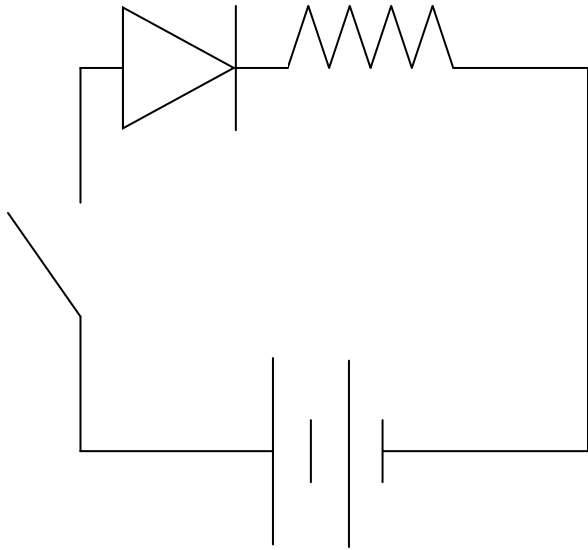
Legal Disclaimer: Please know and understand all safety instructions for the equipment you are using today. Improper use of razor blades can result in serious bodily injury or even death. Incorrect use of soldering irons can cause severe burns. A screwdriver can easily poke your eye out.

Materials List

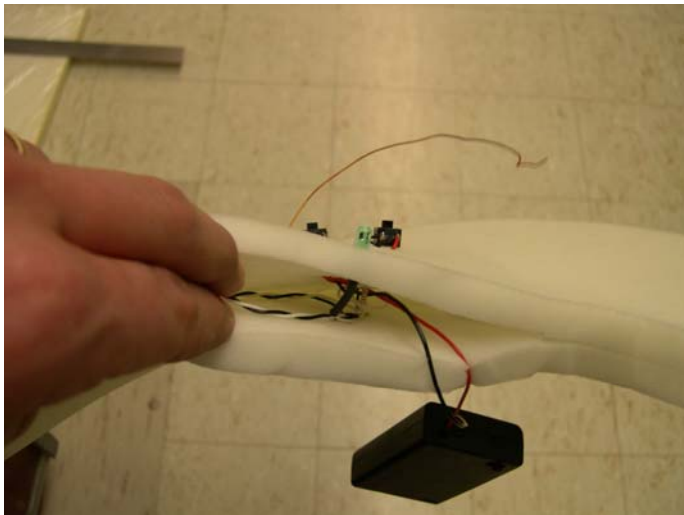
Item	Quantity	Part Number
Foam	1 (18" x 18")	McMaster-Carr 8643K863
SPST Slide Switch	2	Digi-Key SW100-ND
Red LED	1	Digi-Key P301-ND
Green LED	1	Digi-Key P302-ND
3 AA cell battery holder w/switch	1	Jemeco 216143PS
110 Ω 1/4 W resistor	2	Jameco 59061

Misc: insulated wire (white/black twisted pair), heat shrink, 5 minute epoxy, thin magnet wire

1. Determine the shape of your object and cut it out from your foam sheet.
2. Determine where you want to put your battery pack. Remember, the batteries are fairly heavy compared to the foam. Place the batteries close to where you want the center of mass to be located.
3. Cut a slit into the foam to make a pocket for the battery pack. Epoxy the switches on the surface of the foam in a convenient location near the battery pack. Use extreme caution wielding a razor blade.
4. While the epoxy cures, solder a resistor to the shorter lead of each LED. Next, determine where your center of mass will be. Cut lengths of wire to reach from the battery pack to the LEDs plus a couple extra inches. Slide a piece of heatshrink over the black wire and solder this to the free end of the resistor. Solder the white wire to the long lead of the LED. Shrink the tube, make sure the LED leads do not touch each other.
5. Poke holes into the foam, one should be at the center of mass (use your knowledge of physics to find this location), the other, far away, with a small screwdriver and insert your LED assemblies.
6. Cut slits halfway through the foam from the back side. The slits should connect the LEDs to the battery pack to form a chase to bury the wires. Run these wires into the battery pocket.
7. Twist all three black wires together (2 LED, 1 battery pack) and solder.
8. Poke a small hole near a switch and run a white LED wire through the hole. Solder this wire to one switch terminal. Do the same with the other white wire and switch.
9. This part is tricky. Cut a small length of red wire and twist one end to the red battery wire. Push this through a hole created for one of the white wires and solder this to the free terminal of the switch.
10. The other end of the red wire is inserted through the other hole and soldered to the last remaining switch terminal.
11. Insert batteries stuff battery pack and excess wire into the pocket. Poke a length of thin magnet wire through the foam, wind around the battery pack, and twist tightly. Oh, you might want to turn the battery pack ON/OFF switch to on, or your thing won't work!
12. Try it! When you get home, epoxy the LEDs in place and the wire chases shut.



Circuit diagram.



The guts.



The guts.



All done!!