



# Experiments with Compressed Air

## The Umbrella Launcher

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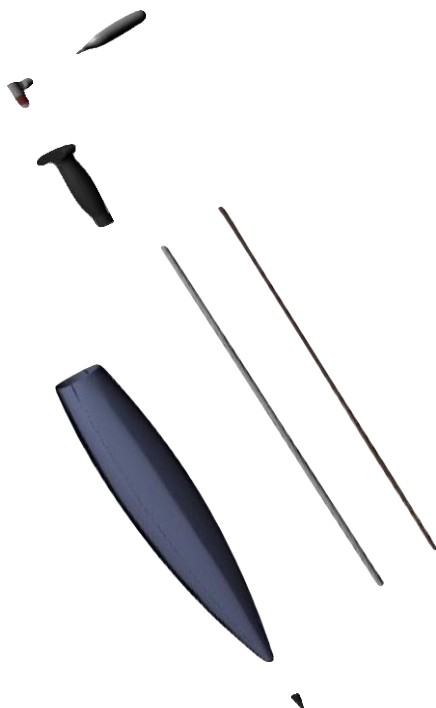
# The Concept - The Umbrella Gun

The goal was to use CO<sub>2</sub> to power a needle through the shaft of an umbrella – very James Bond. The difficult part was to find a way to remove the handle of the umbrella and have access to the inside of the hollow shaft of the umbrella. The best source for the firing mechanism for the Co<sub>2</sub> cylinders is a bicycle tyre filling kit.



## Parts used:

1. One Umbrella with a hollow centre pole (shaft)
2. One thin copper tube
3. CO<sub>2</sub> cartridge pump
4. CO<sub>2</sub> cartridges
5. A football inflating pin
6. some old used ball pen refills and pins



## Assembly Procedure:

1. Remove the handle of the umbrella. If your umbrella's handle is not removable you might have to cut the handle. I had to cannibalise the handle from one umbrella to fit another that had a hollow shaft.



2. Insert the copper tube through the umbrella shaft. The copper tube will act as the "barrel" for the projectile.



3. Carve out a part of the handle to make room for the firing mechanism (cartridge pump) for the CO<sub>2</sub> cylinder. Attach the football inflating pin to the CO<sub>2</sub> cartridge pump



4. Slide the CO<sub>2</sub> cartridge pump mechanism into the carved out part of the umbrella handle taking care to make sure the fit is air tight.

5. Cut the ball-pen refills to about 2-3" length and attach a needle into each cut piece, leaving the other end of the refill open. This is the projectile.

6. To fire the projectile, connect the open end of the refill on to the football inflating pin.



### **Possible Improvements:**

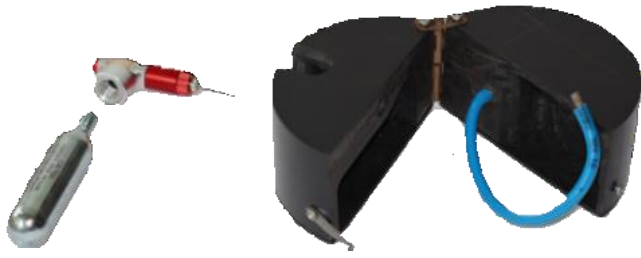
A better designed projectile would waste less energy and be more effective.

### **Conclusion:**

Compressed CO<sub>2</sub> can pack quite a punch. It is enough to fire a dart into a dart board as can be seen in the video below.



## Experiments with Compressed Air -The Box-Gun

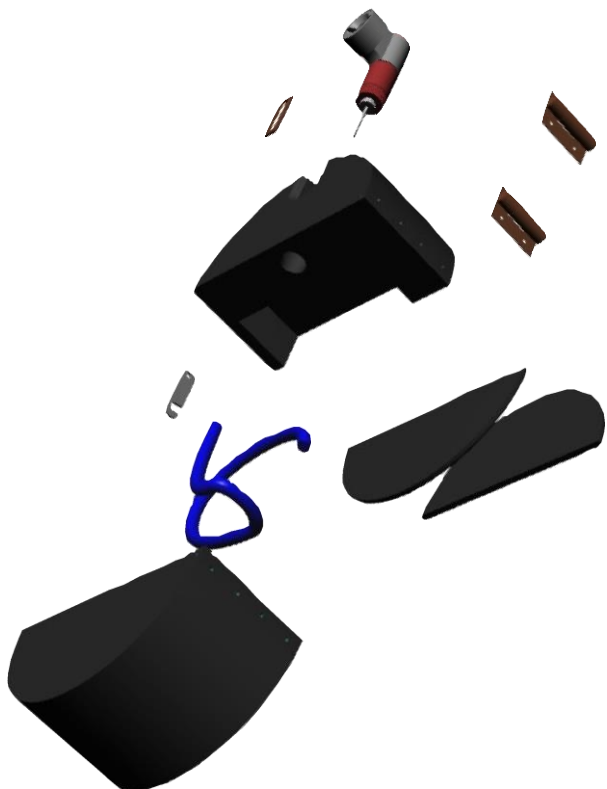


### Aim:

To see if length of "barrel" has an effect on terminal velocity of projectile

### Parts used:

1. A small cylindrical box and some plastic sheets
2. CO<sub>2</sub> cylinders
3. A CO<sub>2</sub> Cartridge pump
4. A football inflating pin
5. Some thin plastic tube
6. Some old used ball pen refills and pins



## The Concept:

The umbrella is a large device. I wanted to fit a CO<sub>2</sub> gun into a smaller box. To make it more complex I chose to work with a box that was round (like a section of a cylinder) and not a rectangle. The Box I chose was round with a flat top and bottom. A rectangular or square box is easier to work with but I wanted to explore how to get the right angles even in a box with round sides.

### Assembly Procedure:

1. Since most of the parts I use for my projects are salvage parts finding a round box that was hollow was not easy. I found a cylindrical box that was almost solid and I had to hollow out quite a lot of the box.
2. As much as I tried, I could not make enough space inside the box to accommodate a CO<sub>2</sub> cylinder so I decided to fit the cartridge pump and CO<sub>2</sub> cylinder on the outside since this was just a proof of concept project.
3. I carved out a section of the outer wall of the box to fit the firing mechanism and CO<sub>2</sub> cylinder and drilled a hole in the diagonally opposite end to provide an exit for the projectile.
4. Then I cut a small piece of plastic tube and connected one end of the tube to the hole that was drilled in the box.



5. I inserted the firing mechanism to the outside of the box and then opened the box to insert the football inflating pin into the open end of the plastic tube.
6. The projectile was then inserted into the hole that was drilled into the box and when the firing mechanism was triggered air would rush through the tube and fire the projectile placed in the hole.

### Possible Improvements:

A rectangular box like a compass box can house most of the firing mechanism and the CO<sub>2</sub> cylinder inside with only 2 holes to be drilled for the trigger and the exit hole for the projectile.

### Conclusion:

While the terminal velocity did not change the shorter "barrel" of the box-gun meant that the projectile is not as accurate as it is when fired through the umbrella.

