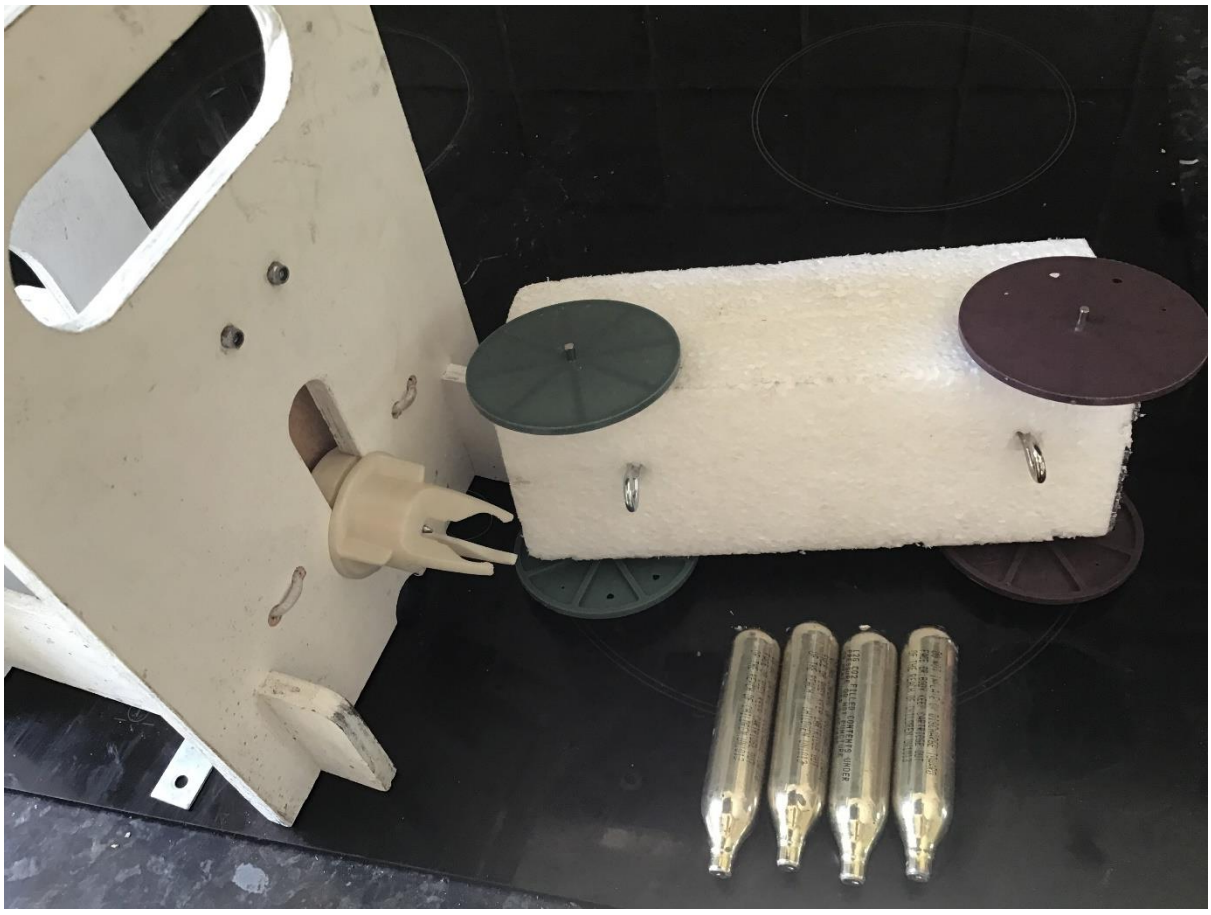
Using the CO2 launcher



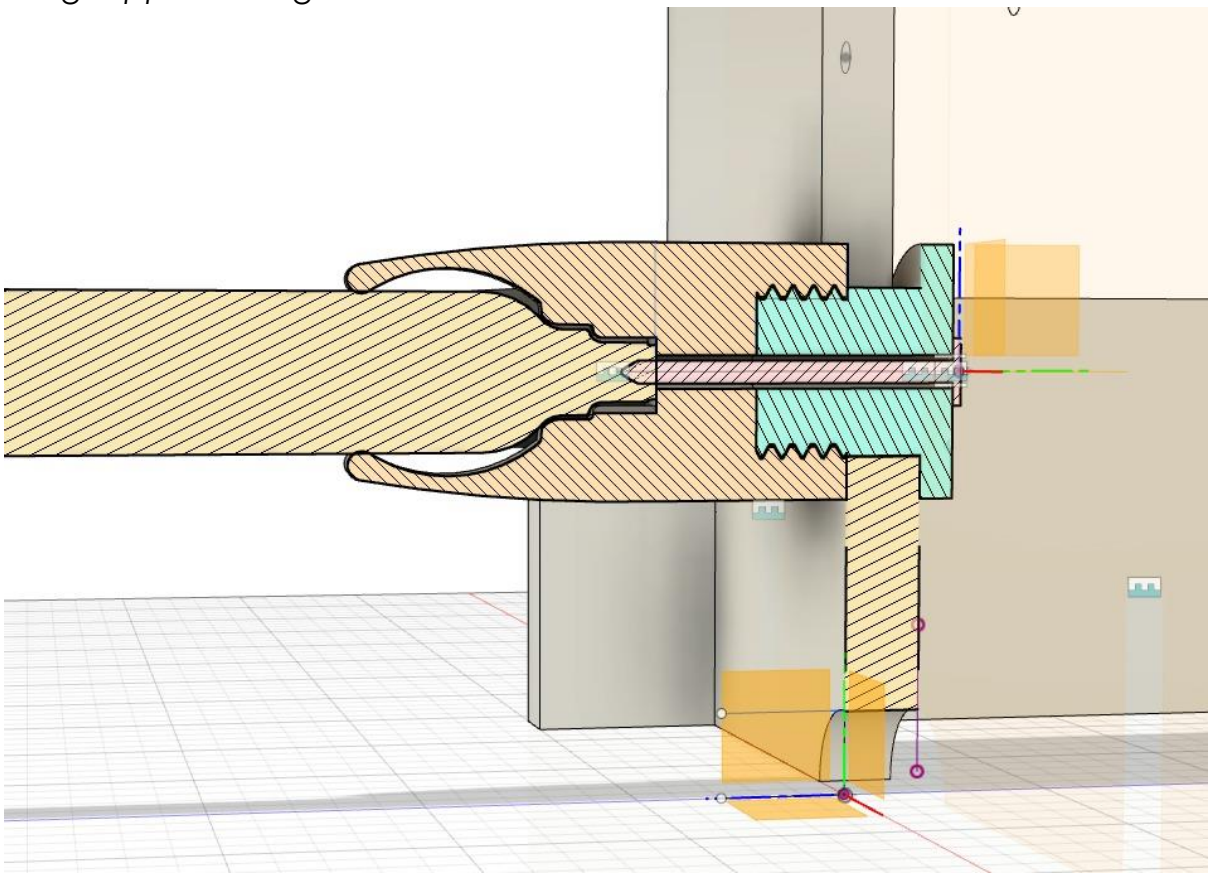
About the CO2 launcher.

Race To The Line foam rocket cars can be powered by pyrotechnic rockets in national competition stages. These rockets generate a great deal of smoke and flame and need to operate outdoors.

The design of the Race To The Line foam blocks also supports the use of 18mm diameter, 12g CO2 cartridges as a source of safe thrust that can be used indoors or for testing. These cartridges are commonly used to fizz drinks or provide inflation for bicycle wheels among other things. The cartridges contain Carbon Dioxide gas (CO2) under high pressure. If the cylinder is punctured the gas escapes quickly creating a powerful and useful source of directed thrust.

The system works by a spring-loaded arm striking a pin that is touching the back of the CO2 cylinder. This provides enough force for the pin to create a small hole in the metal of the cylinder allowing the gas to escape in a controlled way and the car to accelerate away at speeds of up to 40 mph.

The CO2 system can be made in schools using 3D printers and laser cutters using supplied designs and 3D models and Autodesk Fusion 360 files.



Assembling the car and pin holder.

The CO2 launcher uses two 3D printed parts that screw together to allow height adjustment to support different sizes of wheel.

The part with arms holds the cars and the cylinder gently to prevent the car rolling away. The two parts screw together through the slot in the front of the launcher. A hole through the middle allows a pin or nail to precisely and consistently pierce the end of the CO2 cylinder.

Operating the CO2 launcher

1. *Ensure that the car is safely secured on the tether line using the supplied plugs and screw eyes. Have a brake system at the far end (brush brakes or a blanket) and weights on the ends of the tether system so that the car is fully secured.*

2. *Ensure any audience are 5m away from the path of the car. Only the operator should be near the car.*

3. *Insert a CO2 cylinder into the hole in the back of the car, ensuring it is pushed all the way in. The narrow, neck end should be toward the back.*

4. *Pull back the arm on the CO2 launcher and secure it in its elevated position using the pull pin through the hole in the back panel.*

5. *Roll the car back toward the launcher so that the arms engage the cylinder and hold it. Adjust the height if necessary.*

6. *Insert and check that the nail is pushed through the holder and against the back of the C02 cylinder and the fabric pads are in place to reduce the shock on the 3D printed part.*

7. *Check that the track is clear.*

8. *Announce that you are about to fire the car.*

9. *Hold the CO2 launcher firmly with one hand and pull the pull pin.*

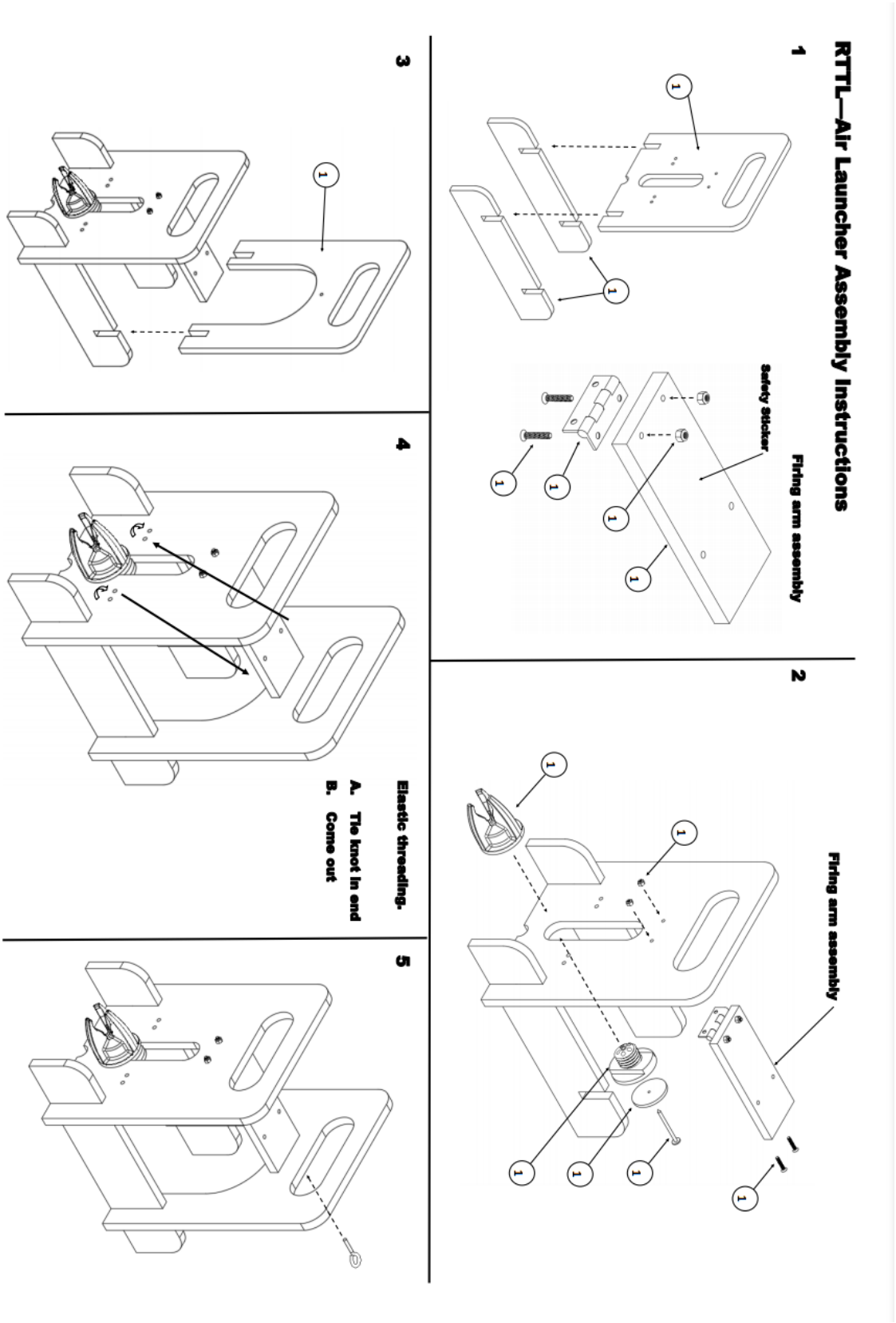
The arm should fall quickly, striking the nail and puncturing the CO2 cylinder.

Remove the car from the track and repeat steps 1-9 to launch more cars.

Cylinder holder and pin in place.

Pull pin holding arm and arm in striking position.

APPENDIX


RTTL—Air Launcher Assembly Instructions
1
Firing arm assembly
Safety Sticker
2
Firing arm assembly
3
4
Elastic threading.
A. Tie knot in end
B. Come out
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