<div align="center">**Inter City Rocket**</div>

General

This is a proof-of-concept exercise. You will build a rough (not-so-pretty) version of a moving part to use in your city model. This is called a Proof of Concept or POC. It gives you experience in working with the materials and connecting the electrical circuits. The version you build for your city model will look much better but will operate basically the same.

All of the parts and supplies you need are on your team's table. **Leave scissors, tape, cans of air and other supplies on the table when you leave the room.** You may have to partially disassemble your moving part so it fits in your pack for reasons that will become obvious.

The rocket plane is visually most effective if its flight path takes it across the length of your city (up to 50") and from the ground to the maximum height allowed (20"). The actual vertical height you can use will be less if the model has a lower level. Although you could have an opening that would allow launch from the lower level. For this exercise, we will use a 15" height and about 50" length.

In your city model, you will probably not want to use a tower like is used in this POC as this is a basic version. The upper end of the thread can be attached to the back or sidewall. For a great visual effect, you could attach cotton "clouds" to the wall and have a hole that the rocket flies into and disappears.

If there is a change in the rules that allows a rocket to fly beyond the city constraints, this rocket will fly freely perhaps as far as 20 feet.
Look closely at the prototype of this on display and do a launch.
Take the parts out of the bag and arrange them neatly on the table.
You have two coils of thread one is colored, probably red. The other is "invisible thread" use that for your real model. It is very hard to work with, as it is nearly invisible and very fine. It will make it look like your rocket is free flying even though it is not.

<div align="center">**USE ONLY MASKING TAPE TO ATTACH THINGS TO THE TABLE**</div>

1. **Build the Tower Base Assembly**
   Your kit will have either a long narrow piece of cardboard and some right angle carboard braces or a paper towel tube. Use the directions below appropriate for your kit.

   1.1. Attach/secure the Paper Towel to the Tower Base piece (4" X 8") cardboard about an inch from the back using duct tape.

2. **Build the Rocket Plane**
   2.1. Cut one of the straws in half.
   2.2. Cut one strip of paper about 0.5" wide and make it into a 1" diameter loop. Secure the circle of paper with a small piece of double-sided tape. Cut off excess paper.
   2.3. Cut a strip of paper about 1" wide and make it into a 1.5" diameter loop. Secure the circle of paper with a small piece of double-sided tape. Cut off excess paper.
   2.4. Using double-sided tape, attach the small loop to one end of the straw and then attach the large loop to the other end of the straw. The loops should be fad so that the place where the paper is joined is against the straw so that the heaviest part is on the straw side.
   2.5. To create the front of the rocket plane, seal the end of the straw where the small loop is by squishing it together then using masking tape to seal and hold it. When you build the rocket for your model, glue will probably be a better option.

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3. **Final Assembly – Prepare for Launch!**
   3.1. Time to set up the If the string is long enough to go the entire length of the table arrange the to do that, otherwise run at a diagonal so that both ends of the assembly are at an edge of the table.
   3.2. Using masking tape (from the front table), attach the tower base to the end of the table using two pieces of masking tape. The rear edge of the Tower Base piece (Step 1) should be at the edge of the table and the masking tape can go down the edge of the table and beneath it to make sure it's secure.
   3.3. Fasten one end of the clear thread to the top of the tower with masking tape.
   3.4. Slide the thread through the loops, with the small loop pointing towards the Tower Base.
   3.5. Fasten the other end of the clear thread to the 3" x 6" bottom Anchor Cardboard with masking tape as well.
   3.6. Attach the 3" x 6" bottom Anchor Cardboard to the table near the edge using masking tape. The tube on the can of compressed air should be able to be inserted all the way into the straw with the can of air upright and vertical. The clear thread has to be pulled tight, but not so tight as to pull over the tower.

4. **Test your Inter-City Rocket Plane!**
   4.1. With the rocket at the bottom of the string, insert the tube from the can of air as far as it will go into the rocket/straw.
   4.2. Press the trigger quickly and release.   The idea is to get a SHORT burst of air.
   4.3. The rocket will shoot all the way up the thread to the tower. If it didn't work, please try again! The main reasons it won't make it are slack string and pressing the trigger on the can of air too slow.

5. **Other things to try and suggestions for your city model.**
   5.1. Use different sized loops
   5.2. Use different lengths of straw
   5.3. Hang the straw on the outside of the hoops
   5.4. Paint and decorate your rocket plane
   5.5. Use a machine printed rocket plan that is hollow and has small loops on top to put the thread through.
   5.6. Be creative and think outside the box!
   5.7. Discuss as a team how the rocket plane can be integrated into your Future City and shown in your presentation. Can it be part of the solution to the engineering challenge?

6. **Parts List and Receipt for Parts**

	Unit Cost	Qty
Cardboard for bases, tower, braces, paper towel roll	$0.00	n/a
Invisible Thread 6 feet – pack of 6 (110 yds)	$4.99	1
Straw	$0.00	n/a
Paper: 8 ½" by 11"	$0.00	n/a
Can of Air – pack of 4 cans	$27.04	4
Total from Engineering Fair	$34.14	