Make the Farthest Flying Paper Airplane!

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DEFINE the Problem

My friends and I like throwing paper airplanes. They only fly about 10 feet if we are lucky but not that often. So, I'm going to try to make a very straight flying airplane that flies very far.

Anything can fly with a little help from lift, thrust, drag and weight.

Lift

In order to have lift on a plane you need a special plane wing with a special shape.

Thrust

Thrust makes objects zoom forward. Engines are used to make vehicles like cars, trains and plains have thrust.

Drag

Drag tries to stop motion. The bigger the mass the more drag it has.

Weight = mass x gravity

If you jump on the moon, you would be much lighter so you could jump higher because the moon has less gravity than earth.

IDENTIFY Constraints on Your Solution and Criteria for Success

Constraints

Paper

Tape

Paperclips

Weather

Criteria for Success

Distance 45ft

Straightness +/- 15ft

BRAINSTORM Multiple Solutions for the Problem

I first want to try 10 different types of paper airplanes. Then I want to try making modifications that will impact lift, thrust, drag and weight.

Lift

I think I can change lift by:

Changing the size of the wings or cutting the wings and tail

Thrust

Thrust cannot be modified because I am trying to throw it the same speed.

Drag

I can change the drag by:

Cutting the plane

Taping it

Weight

I can change the weight by:

Adding paperclips or by using heavier paper and I can make it lighter by cutting some of it off.

PROTOTYPE Your Solution: Paper Airplane Models to Test

1. The long-distance dart is made for going straight and fast.
2. The flutterby is made to go not exactly straight and is meant to look like a butterfly.
3. The whirligig it is meant to be thrown into the air and spin back down.
4. The hang glider's single wing rides far in the air. With just the right push it will go very far.
5. The hoop glider is a ring- shaped airplane that goes kind of far.
6. The flapped flyer is the perfect plane for testing flight patterns.
7. The duck plane is known for crash landings.
8. The arrow with the right throw it can go up to 40ft.
9. The nosedive is made to crash and, on the way, down do some twists and turns.

Different airplanes tested. Source: Student

TEST and Evaluate Your Prototype

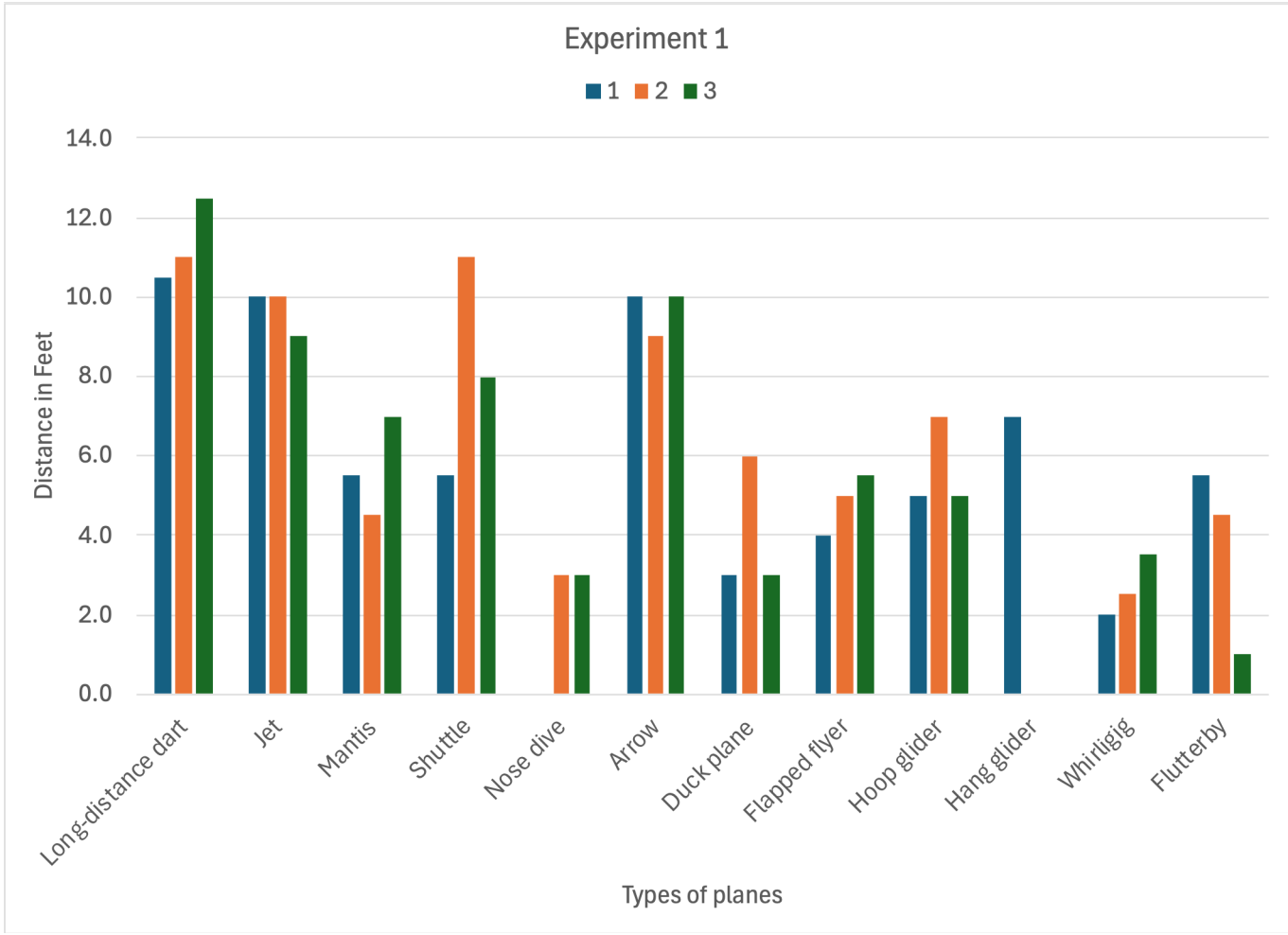
I went outside with a tape measure and measured every 5ft on a blocked road with chalk up to 45ft. I stood at 0 and threw each plane 3 times. After each throw I wrote down how far they went.

Test example. Source: Student

The airplanes that flew the farthest were:

1. The long-distance dart
2. Jet
3. Arrow
4. Hang glider
5. Shuttle

See table bellow for results.

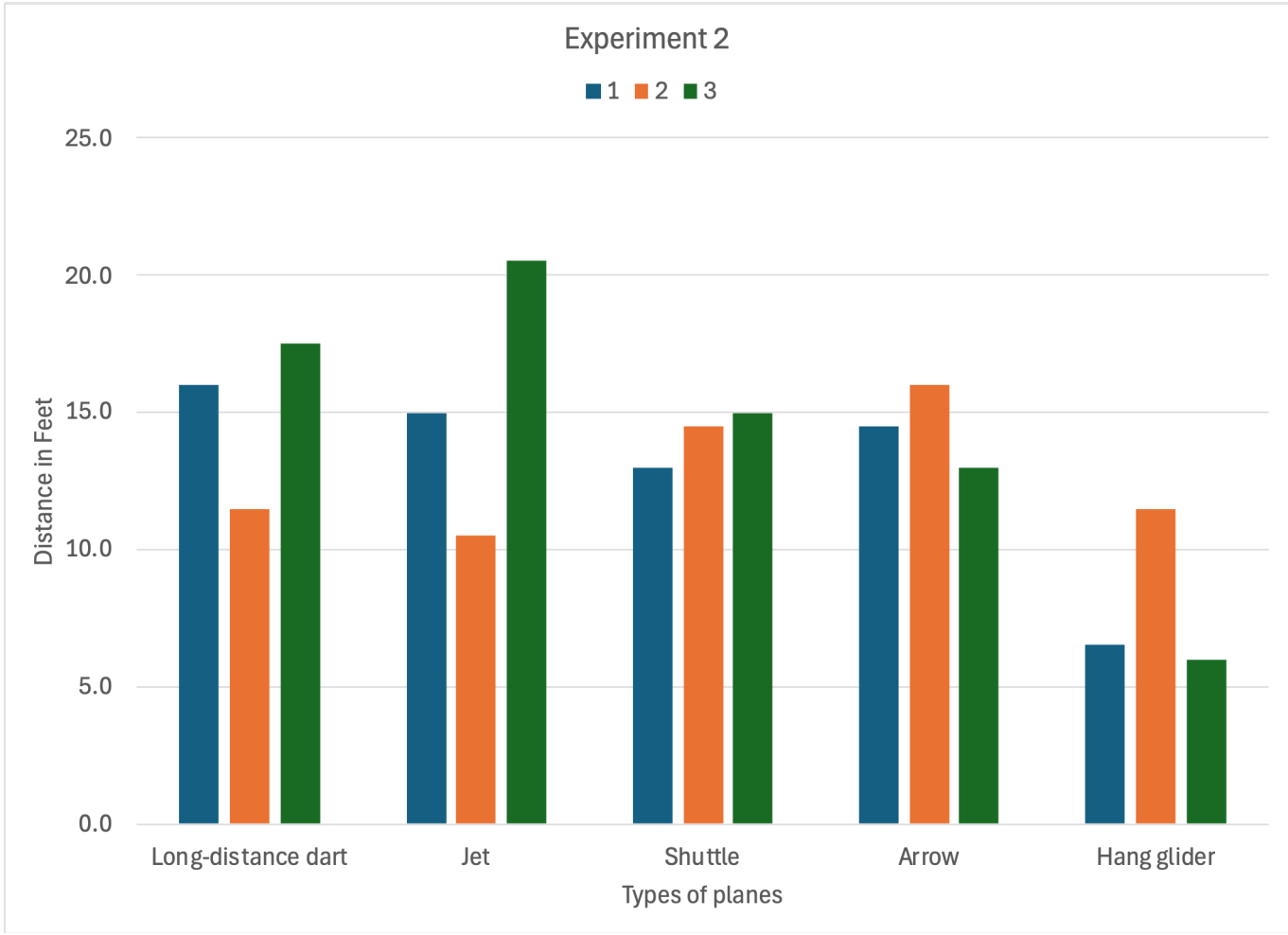


Results of Modification 1. Source: Student

I think these were best because they had less drag and more lift. An issue I’m still having is that it won’t fly straight or level. Sometimes it starts to drift up or side to side.

ITERATE to Improve Your Prototype

I think adding more weight will balance it out because it has to much lift. I think I can do this by adding paperclips to the bottom of the airplane.

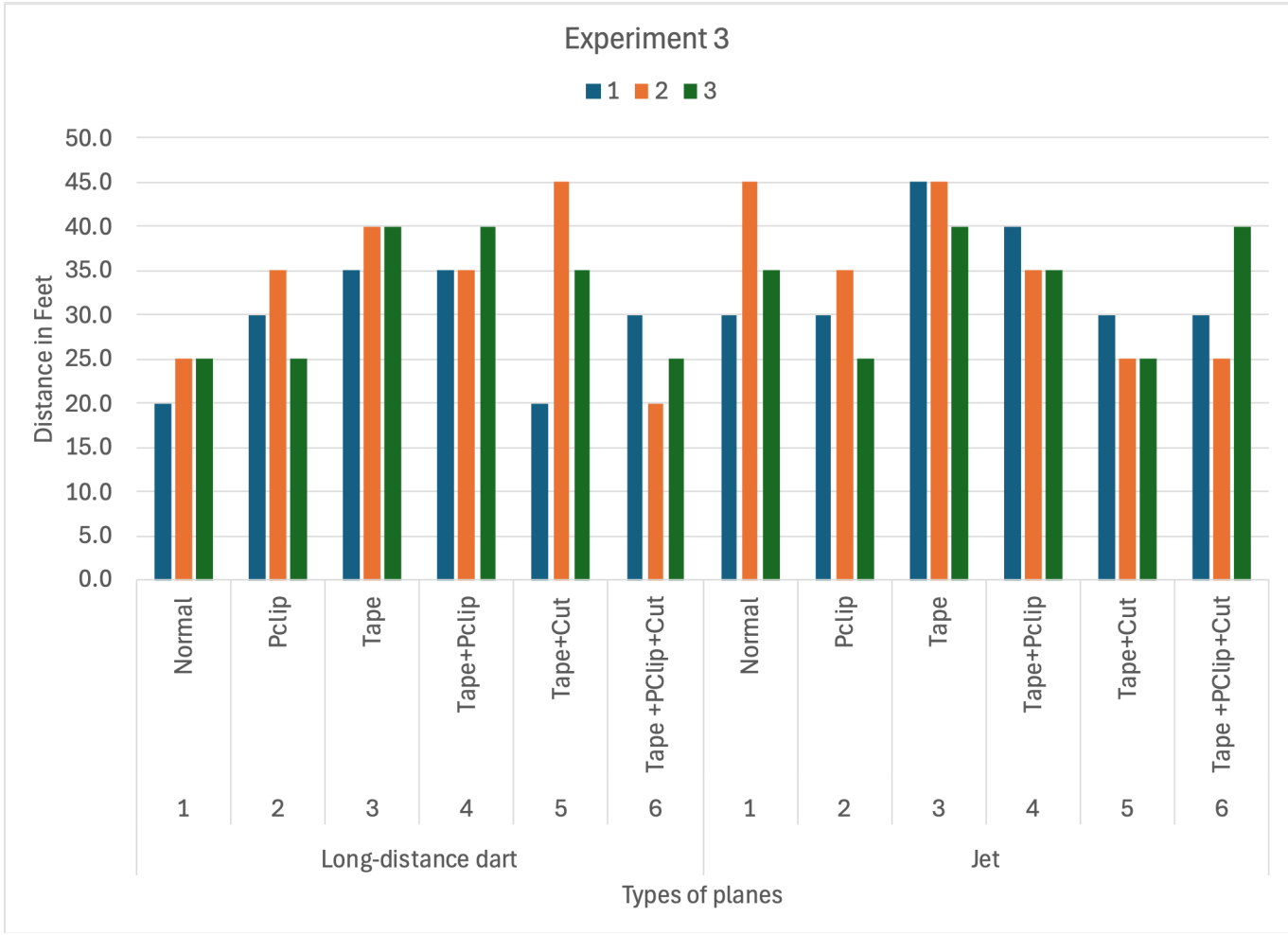


Results of Modification 2. Source: Student

It made some go further when I added paperclips to the front. It made some go up or down when I put paperclips to the back of the airplane. It seems like paper airplanes with paperclips in the front fly farther because they had weight and lift, so it evened it out.

I think adding tape will help it hold its shape better and increase lift and reduce drag.

I think cutting will help me control lift and drag.



Results of Modification 3. Source: Student

I taped the top of the paper airplane closed to try to decrease drag and it worked. I tried cutting it, but it did not work because they started flying left, right and up.

COMMUNICATE Your Solution

The paperclip helped the paper airplanes consistently fly straight and level. The tape really helped them fly farther and made them fly a little more than 45 feet. The tape helped keep the shape and it reduced drag. When I combined tape and paper clip it did not go farther than when I added tape. I tried cutting it to control the drag, but it did not work very well because the flaps made it spin and go offline. After all the testing the Jet is the farthest flying airplane, and I met my distance goal of 45 feet.

References

My first guide to paper airplanes by: Christopher Harbo

Let’s fly a plane! by: Chris Ferrie