

THERE'S AN EX-PLANE-ATION: THE EFFECT OF THE LENGTH OF WINGS ON HOW FAR AIRPLANES FLY

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J-ETSD-001T

Abstract:

All across the world, we all trust the common use of airplanes for global travel. Of course, this isn't a perfect system. Our project is important because it will cost less to fly planes and it is better for the environment. Planes usually cost a lot of money to make and for jet fuel, if you have improved wings you would be able to spend less money on jet fuel. Jet fuel is bad for the environment. we will be able to use less of it if planes go farther with better wings. We acquired model planes and customized the wings into three different sizes: large, medium, and small (based on length of wing). We tested the planes to see which size plane wing flies the farthest. The plane wing size that went the farthest should be the wing size that we use for real planes because it will be more efficient, cost less, and be better for the environment. If we launch a model plane with the launcher, then the one with the longest wings then the plane will fly furthest because it has more airflow over top of the wing, which will help lift the plane into the air instead of shorter wing wings that will have less of that effect. We launched each size wing 6 times and we found the average distance of the long plane wings was 6.2 meters, the average distance of the medium wings was 3.5 meters , and the average distance of the short wings was 4.2 meters. Overall, the long plane wings are the best for real planes because planes with longer wings fly farther so less money will be used for jet fuel.

Introduction:

Everything is said to have an ex-plane-ation. This project is to determine if the shape of a plane's wings affects its length of flight. Planes fly using a lot of fuel, about 1 gallon of fuel every second. (Smoot, 2023). The

importance of this experiment is to find what wing types go the farthest in meters so it can change the amount of fuel used in airplanes to cause less pollution.

The plane flies because it is made in such a peculiar way. Airplane wings are shaped so that air moves faster over the top of the wings. When the air moves faster the pressure decreases. So that the pressure of the top part of the wing is less than the bottom part of the wing so it can lift the plane (NASA, 2021). A plane stays midair because of four forces of gravity: thrust, weight, drag, and lift (PHL,2024). Thrust is the force that moves an airplane forward through the air. Thrust is usually created by a propeller or a jet engine in a plane, or an initial launch. It is the force that moves the plane forward. Drag is the opposite of thrust and is the air resistance that slows the forward movement of a plane. Most of the time, it is mostly air resistance. Lift is the upward force that is made by the movement of air above and under a wing(Arnot, 2019). Air flows faster above the wing and slower below the wing, creating a difference in pressure to keep an airplane flying (carr, 1961). Weight is a force that acts on all objects on Earth. The Earth pulls on all objects to the ground, and the more an object weighs, the stronger it is being pulled to the earth. A plane is no exception. Lift and thrust are stronger than weight and drag in planes, so planes move upward and forward. This is equivalent to flying. All 4 principles are crucial in this experiment.

Hypothesis:

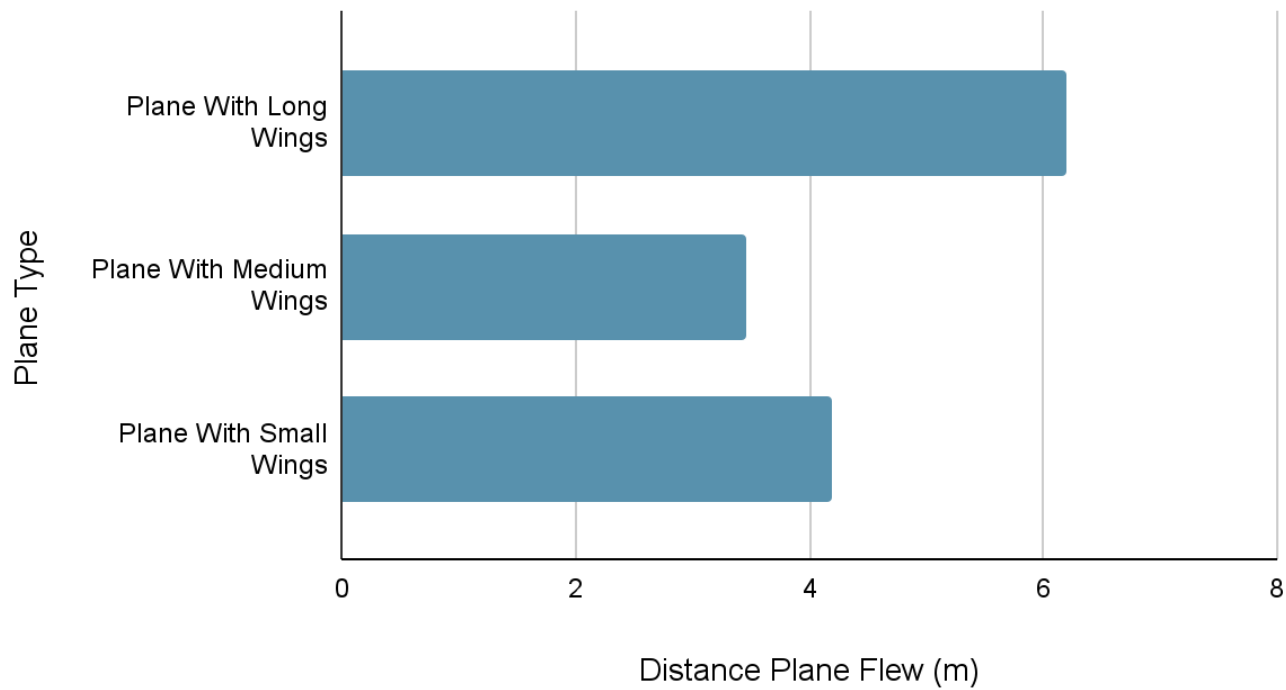
If we launch a model plane with a launcher, then the one with the longest wings will fly furthest because it has more airflow over top of the wing, which will help lift the plane into the air.

Methods:

We bought a six pack of styrofoam planes from amazon and used scissors to cut the wings so there were two small orange wings which were 21.59 cm, two medium blue wings which were 25.7 cm, and two large red wings which were 26.67 cm. We weighed each wing to make sure that all the wings were four grams. We put the wings in the planes and loaded the first plane in the launcher. We made sure to launch each plane from the same spot. We launched each plane three times for a total of 18 launches. We measured each plane with a tape measure. After we launched all of our planes we took our data and converted inches to meters.

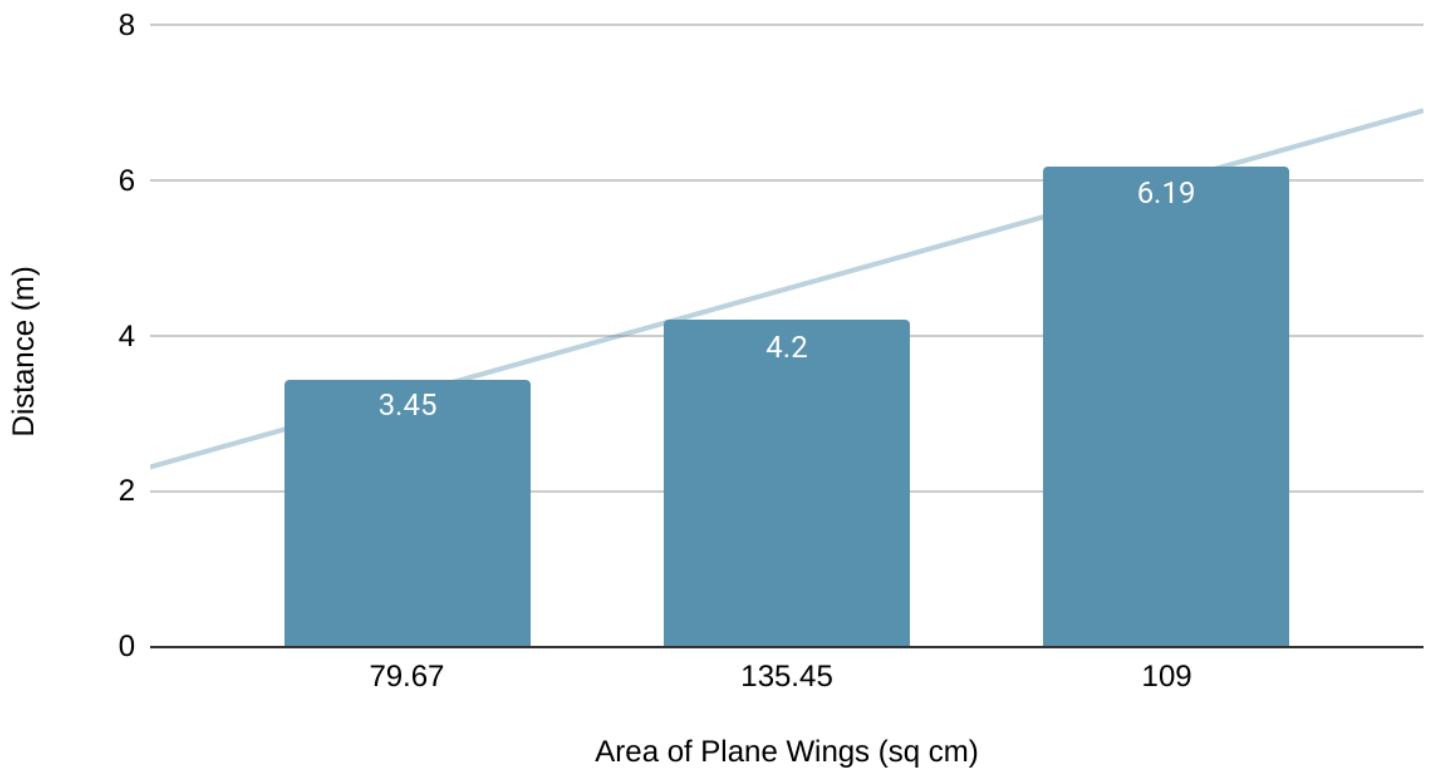
Results

The Effect of Length of Wings on Distance the Plane Flies



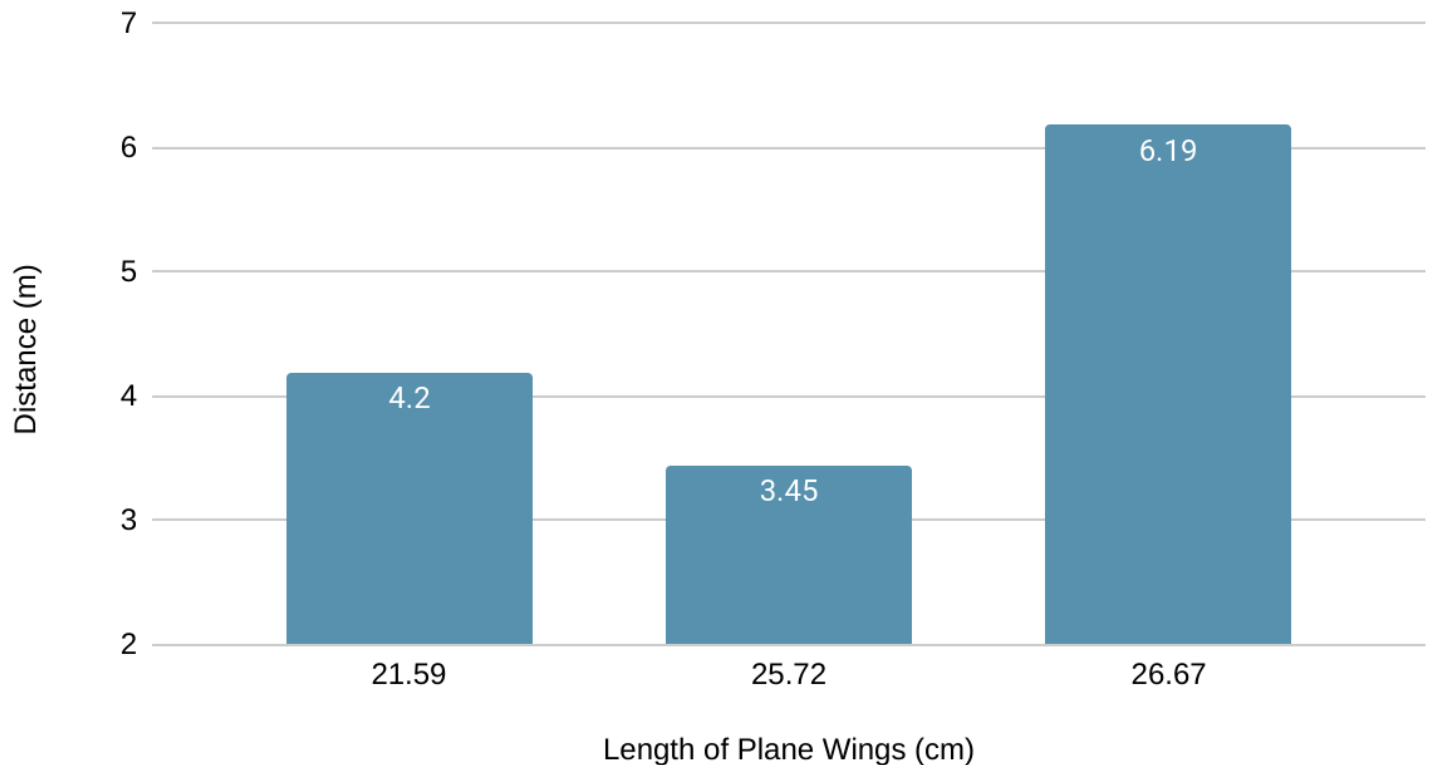
The plane with the long wings flew the farthest. The plane with the long wings flew an average of 6.19 meters, the plane with the medium wings flew an average of 3.45 meters, and the plane with the small wings flew an average of 4.20 meters.

The Effect of Wing Area on the Distance the Plane Flies



The plane with short wings had an area of 135.45 sq cm and flew a distance of 4.20 m. The plane with medium wings had an area of 79.67 sq cm and flew a distance of 3.45 m. The plane with long wings had an area of 109 sq cm and flew a distance of 6.19 m.

The Effect of Wing Length on Distance the Plane Flies



The plane with short wings had a length of 21.59 cm and flew a distance of 4.20 m. The plane with medium wings had a length of 25.72 cm and flew a distance of 3.45 m. The plane with long wings had a length of 26.67 cm and flew a distance of 6.19 m.

Discussion:

Overall, the plane with the long wings flew the farthest out of any other wing size, with an average of 6.19 meters. The plane with the small wings flew 4.20 meters, which is 0.75 meters more than the plane with the medium size wings which flew 3.45 meters.

We believe that the long wings flew farthest because there was more area lengthwise for the air to go over top and keep the plane flying. We believe that the small winged plane flew farther than the medium winged plane because the small plane had an area that was much greater than the medium wings; the greater area would give the air much more surface area to lift up on the plane, thus making the plane fly farther. The area of the small plane wings was 135 sq. cm, while the area of the medium plane wings was 79 sq. cm. In conclusion, the longer the wings on a plane the less fuel they would use because the wings would carry the planes farther.

Limitations:

All wings might not have been the exact same weight; weight could have been measured in a different unit. Planes could have been launched at a slightly different angle. Also, planes that were supposed to be the same could have been shaped slightly differently. During launching, there could have been a vague breeze, automatically pushing the plane off course.

Future Studies:

In future studies we would try even more various designs on wings, such as wing height, weight, and angle, since there is more to test & design than just length. We could try different materials to make the planes out of. We could also get a more exact scale to make sure the planes are exactly the same weight. We can use a device to test if there is wind so that we can launch during a time when there is very little wind.

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