

Name _____ Period _____ Date _____



Dronopter

STEM Sims

Lesson 2: Lifting Force

Lift is the upward force that lets a flying object rise up from the ground. Building the best dronopter requires choosing motors that give enough lift for flight. Can you find out which motors let the dronopter fly?

Here are some definitions to help you in your investigation.

Dronopter - a quadcopter drone

Mass - the amount of matter in an object

Grams - a unit for measuring mass

Force - a push or pull on something

Gravity - a downward pull on things due to Earth's mass

Newton - a unit for measuring force

Lift - an upward force that allows flight

Doing the Science

1. Start the Dronopter Simulation by clicking on the "Sim" tab.
2. Record in Table 1 the mass of each of the frame structures.
3. Calculate and record in Table 1 the mass of 4 motors for each motor type.
4. Calculate and record in Table 1 the total mass of the frame and all 4 motors.
5. Select the Newton Converter in the simulation.

6. Enter the total mass for each frame type and motor combination into the calculator and convert the value to lift force required in newtons. Record these values in Table 1.

Table 1.

Frame Type	Frame Mass (g)	Motor Type	Motor Mass (g)	Mass of 4 Motors (g)	Total Mass (g)	Total Lift Force Required (N)
Balsa		45/4/CW	45			
		50/6/CW	50			
		80/8/CW	80			
Aluminum		45/4/CW	45			
		50/6/CW	50			
		80/8/CW	80			
Composite		45/4/CW	45			
		50/6/CW	50			
		80/8/CW	80			
Steel		45/4/CW	45			
		50/6/CW	50			
		80/8/CW	80			

Do You Understand?

1. Which frame material and motor types required the smallest lift force for flight?
2. Which frame material and motor types required the largest lift force for flight?

3. The middle number of the motor type provides the lift given by that motor. For instance, the 50/6/CW motor gives 6 newtons of lift force. How much total lift would four of these motors give for flight?
4. Why did the steel frame not fly using the 45/4/CW motors?
5. If a 100/10/CW motor was used, would a steel frame lift off the ground?