Name _____ Class Period _____

Student Data Sheet

Academy of Model Aeronautics
ALPHA: Center of Gravity (CG)

Background: The center of gravity **(CG)** of a plane is the point at which it can be balanced. By balancing the wing on your fingertips on the point shown in the illustration below, you can find the plane's center of gravity. A simple example this type of balance is a teeter-totter, the commonplace children's playground amusement.

Pilots of full-scale as well as model aircraft must correctly determine the CG before flight to ensure that the airplane is balanced. To fly any aircraft safely, flight control surfaces (ailerons, elevators, rudder) must be capable of providing effective control of a carefully balanced plane in order to maintain level flight.

The CG can be adjusted by placing clay or other weight on the nose or tail of the aircraft. Placing weight on the nose moves the CG forward. This causes the plane to be more stable and the plane should tend to fly in straight and level manner. Moving the CG to the rear has the effect of making the plane less stable. Between these two extremes is an appropriate location for the CG to maximize duration and distance, typically ¼ of the way back from the leading edge of the wing.

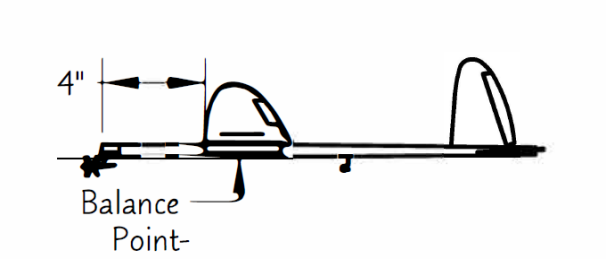
The **ALPHA** comes with a unique design system that allows you to move the wing back and forth on the fuselage to change the location of the CG

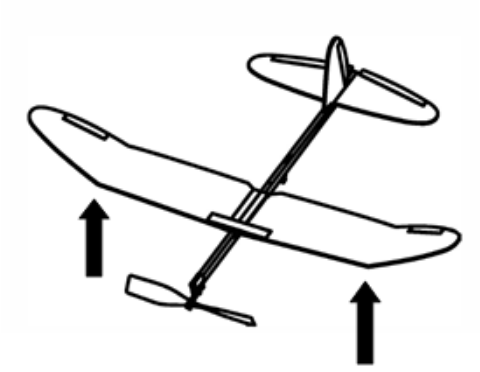
rather than adding weight to the nose or tail. Experiment with different wing placement. adjusting the CG, to maximize duration or distance.

Directions: You will be working with a partner to wind the motor and fly the plane to determine how changing the center of gravity affects the flight of the **ALPHA.** Follow the steps below.

1) As noted in the assembly instructions, position the wing about _____ centimeters (cm) from the nose of the plane.

2) Use your fingers to support your plane at the end of each wing. Doing this will give you a reasonably close estimate of the model's CG.





3) How does your model balance when you hold it by its wings? Check one:

_____ Nose pointed up.

_____ Plane is level and balanced.

_____ Nose pointed down.

4) Wind the rubber motor the same number of times for each trial. Launch the plane and time its flight. Repeat this procedure two more times and record your data in the table below.

5) Record your data in this table:

Wing Placement (cm)	**Time Aloft**			**Average Time in the Air**
	Trial 1	**Trial 2**	**Trial 3**	
Directly over estimated CG				
0.5 cm forward				
1 cm forward				
0.5 cm back				
1 cm back				

6) Calculate average time aloft:

7) How did your plane behave during flight when the wings were positioned ahead of the CG? Draw and explain.

8) How did your plane behave during flight when the wing was to the rear of the CG? Draw and explain.

9) Which wing placement resulted in the greatest average time aloft?

10) How did you position the wings to ensure a long flight? Check one:

____ Positioned slightly ahead of the CG

____ Positioned directly on the CG

____ Positioned a bit behind the CG