

The Loop Airplane

Objective: To construct and study the flight characteristics of a paper airplane constructed with a plastic straw and two circular paper wings. See drawings below. Loop dimensions are also given below and will need to be cut out of paper.

Equipment: plastic straw, paper pattern of wings, scotch tape

Procedure:

- I. Cut out wing patterns from the handout. On the rear or larger wing, print your name for identification.
- II. Fold each wing so that it forms a loop with the unmarked end resting on the dashed line of the other end. Fasten with clear tape.
- III. Cut off a 3.5 cm piece of scotch tape and then cut that strip in half to form two narrow strips. Place the straw inside the B loop and secure with one of the narrow strips of tape. Use the other narrow strip of tape to attach the A loop to the front of the plane.
- IV. Examine your plane to make sure that the two wing loops are lined up with each other when viewed end to end. Also look at your plane to insure that the loops are lined up parallel with each other. Look at your plane horizontally to see if each wing is attached so that it is perpendicular to the straw. Loosen the tape if adjustments are necessary.
- V. Test fly your plane. Move the loop wings and bend them slightly if necessary until your plane glides in a smooth pattern (no banking or spinning or diving or dipping).
- VI. Measure the distance flown. Fly it 10 times and get an average.
- VII. Now you will alter or change the design of your plane to determine which design gives the best performance for distance. We will not change the materials used to make the plane, but we will modify the size of the loops (both their width and their circumference) and their placement on the fuselage or body.
- VIII. Working still with wing loops A and B, move the wings closer together (10 to 14 cm apart). Fly this new design 3 times and record your results. Remember to check the alignment of the wings as discussed earlier.
- IX. Next, remove the A and B wings and attach the wider C and D wing loops as you did at the beginning. Test fly you plane 10 times with the wings at the ends of the plane and again 3 times with the wings closer together. Record your flight distances in a table.
- X. Average your distance reading for each test design. Include these in your table. Include the average deviation as well. Prepare a graph(s) to demonstrate the flight characteristics.

Conclusions: Which design factors provided the best flight performance?

Discussion: What was the dependent, independent, and controlled variables in this experiment. Can you develop a simple hypothesis concerning flight characteristics?

Data:

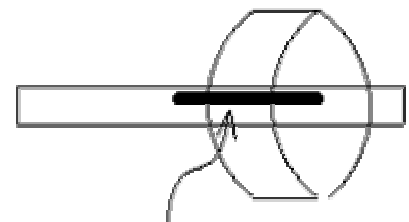
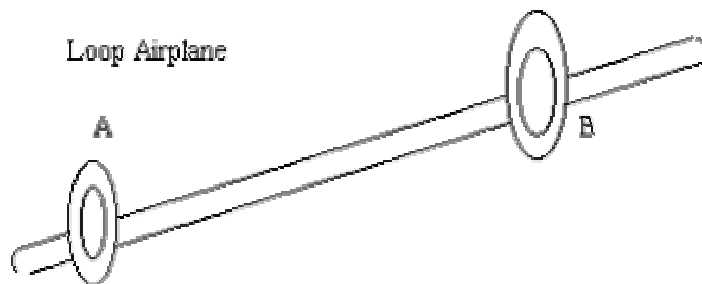
Trial Nmb	Distance Flown			
	Loop Wings A & B		Loop Wings C & D	
	Loops Far Apart	Loops Close Together	Loops Far Apart	Loops Close Together
1				
2				
3				
Average (w/ dev.)				

Loop A dimensions: 1.43 cm x 11.43 cm (9/16 in x 4 1/2 in)

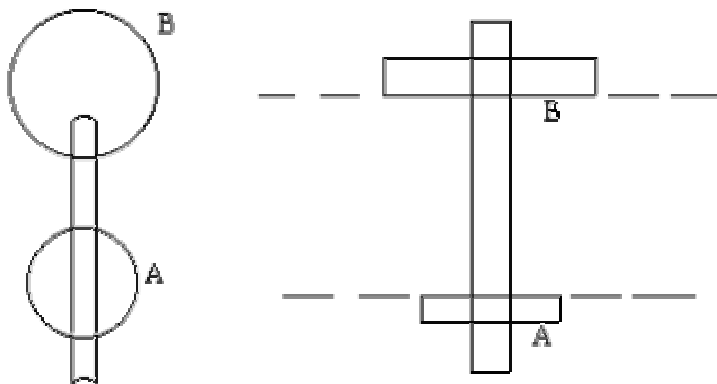
Loop B dimensions: 2.06 cm x 16.51 cm (13/16 in x 6 1/2 in)

Loop C dimensions: 2.06 cm x 12.38 cm (13/16 in x 4 7/8 in)

Loop D dimensions: 2.54 cm x 20.96 cm (1 in x 8 1/4 in)

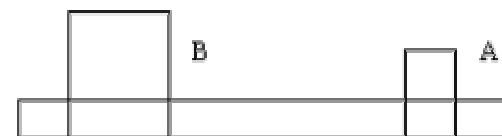


tape goes here



small loop lined up
with larger loop

loops are parallel



Loops perpendicular to straw

