



Name _____ Per. ____

Helicopter Lab Report

Abstract

I noticed that diving birds pull their wings in, and I wondered if wing size affects speed. I tested 5 paper helicopters with different length rotors in 5 trials each, dropping from a 2 meter height. We found that smaller rotors cause a decrease in flight time. These results indicate that surface area of wings does affect speed in flying objects.

Introduction

Soaring birds spread their wings wide, but when birds dive down quickly they tuck in their wings. Toy airplanes and helicopters seem to follow the same design principle, because the size and position of wings seems to change the vertical speed. The purpose of this lab is to determine how the rotor length of a paper helicopter affects flight time. The problem we are investigating is, "If rotor lengths on paper helicopters are decreased, then flight times will also decrease compared to uncut helicopters .

Methods/Procedures

Materials: paper helicopter templates, scissors, metric ruler, stopwatch.

In this experiment, we cut out 6 identical paper helicopters, then cut the rotors to lengths of 12, 10, 8, 6, 4, and 2 centimeters. Holding the helicopter base at 2 meters above the ground inside a classroom, we launched and measured the time it took to hit the floor for 5 trials each. Class totals were combined for a minimum of 50 data points per rotor length.

Results

I found it interesting that the flight time equaled 0.2 times the rotor length, plus 0.3. ($y = 0.2x + 0.3$). During the experiment I noticed smaller rotors make helicopters rotate faster. Also, different people have different launching techniques and this could have affected our results.



Descent Times of Paper Helicopters (Seconds)

Rotor Length (cm)	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Our Average	Class Average
8							2.0
7							1.8
6							1.6
5							1.2
4							1.1
3							1.0

Graph: Staple your print-out from computer lab. Remember **SULTAN**: Scale, Units, Labels, Title, Accuracy, and Neatness! Honors: include a trendline and trend equation, numbers rounded to the tenths place.

Discussion

Conclusion: The data does support the hypothesis that if rotor lengths on paper helicopters are decreased, then flight times will also decrease compared to uncut helicopters.

The evidence for this conclusion is shown in the mean descent times in our data.

Interpretation of Results: During the experiment we noticed that different people launch helicopters with slightly different methods, which may have affected the results

by causing some helicopters to have more lift than others.

Possible sources of errors include different launch methods, inaccurate measurements, and helicopters that had been folded back and forth a lot on their rotors (not "fresh").

Environmental conditions that may have impacted my results include air currents from people walking by or from launching near the door.

Application: An aeronautical engineer would use this information to design aircraft for maximum descent speeds.
(name a professional)

Future Research: Another variable that could be changed to explore this further would be to change the design of the rotors, or try the experiment under lower air pressure, or test underwater propellers to see if they have the same effect.