FINAL DRAFT OF The Helicopter Hypothesis Project

IDD

Testable Question: What is the effect of the different type of wings on the amount of time it takes to fall?				
Independent Variable (IV): We changed the type of wings for the helicopter.				
Levels: --->	Fold each of the wings inwards	Fold both wings down-wards	Fold each half of each wing cross-wards.	Cut each wing half-way vertically
Trials: --->	3 times	3 times	3 times	3 times
Dependent Variable (DV): The result of the change was the helicopter didn't twirl as much as the original model, and it took a shorter time to fall. (seconds)				
Constant/Controlled Variables (CV): The materials used to make the helicopter and the number of trials per level stayed the same in the experiment. Also, the body and the size of the paper clip stayed the same. Furthermore, the paper clip stayed where it was on the helicopter.				

Angelique Contona 11/27/2016 7:44 AM

Comment [1]: The IDD has a question in the correct format, the IV and DV are clear and specific, the levels are clear and specific, the trials are consistent with the data table, and there are a sufficient list of CV's. (Level 4)

Hypothesis

If I fold each of the helicopter's wings upward, the helicopter will take a shorter time to fall than the helicopter whose wings we didn't fold, determined in seconds. According to the article, "What is Drag?" , "The air molecules push against the object and the difference between the velocity and direction of the air and the object cause the object to slow its movement." So, if I decrease the amount of space that the air molecules can push against the object, this will cause the helicopter to take a quicker time to fall. Also, this means that if I increase the amount of space that the air molecules can push against the helicopter, this would cause the helicopter to take a longer time to fall. Therefore, if I fold each of the helicopters wings upwards, it gives less space for the air molecules to push against it which proves why my hypothesis is correct.

Angelique Contona 12/3/2016 10:23 AM

Comment [2]: The hypothesis uses the "If (IV) then (DV) because (rationale with quote and explanation) format. There is a thorough explanation of the concepts with a link to the variables. This hypothesis shows that the student has a thorough understanding of scientific thinking and the concepts for this lab.(Level 4)

Procedure

Materials:

- 8.5 x 11 computer Paper (Helicopter Sample sheet)
- Notepad/Idd chart
- Meter Stick
- Standard Paperclip
- Pen/Pencil
- Scissors

Step 1: Cut out a helicopter sample out from the computer paper
Step 2: Cut the dotted line in between the 2 rectangles X and Y
Step 3: Fold Rectangle A and rectangle C into section B.
Step 4: Then fold the square D upwards onto the folded rectangles A, B and C.
Step 5: Attach the paperclip fully onto the square D upwards.
Step 6: Finally, fold rectangle Y onto either side of the helicopter . However, rectangle X has to be folded in the opposite direction of rectangle Y. (Lightly crease when you fold, not too hard)
Step 7: Drop your helicopter with rectangles X & Y facing the ceiling and the paperclip facing the floor. When you drop it, see how rectangles X & Y (Now the wings) twirl, causing the helicopter to take a long time to fall. (seconds)
Step 8: Then change the wings for the first level. Fold both wings inward halfway so they stick up. The body of the helicopter and the paperclip should stay the same. The drop height should stay the same
Step 10: Record the results on the amount of seconds the helicopter took to reach the floor in your data table.
Step 11: Repeat this change 2 more times. (Total of 3 trials)
Step 12: Change the wings for the second level. Fold both wings downward halfway so they face down. The body of the helicopter and the paperclip should stay the same. The drop height should stay the same.
Step 13: Record the results on the amount of seconds the helicopter took to reach the floor in your data table.
Step 14: Repeat this change 2 more times. (Total of 3 trials)
Step 15: Change the wings for the third level. Fold each half of each wing cross-wards. The body of the helicopter and the paperclip should stay the same. The drop height should stay the same.
Step 16: Record the results on the amount of seconds the helicopter took to reach the floor in your data table.
Step 17: Repeat this change 2 more times. (Total of 3 trials)
Step 18: Change the wings for the fourth and final level. Cut each wing half-way vertically. The body of the helicopter and the paperclip should stay the same. The drop height should stay the same.
Step 19: Record the results on the amount of seconds the helicopter took to reach the floor in your data table.
Step 20: Repeat this change 2 more times. (Total of 3 trials)

Angelique Contona 12/3/2016 10:24 AM
Comment [3]: Student provides a complete list of materials for this experiment. Student also provides a thorough list of numbered steps with a diagram. This will allow another person to repeat this investigation exactly as the student did it.

This is a 3.5. This student could have provided more detailed diagrams or pictures to improve the clarity of the directions.

NOTE: this student DID include a picture of the helicopter template but I couldn't get it to fit in this document!

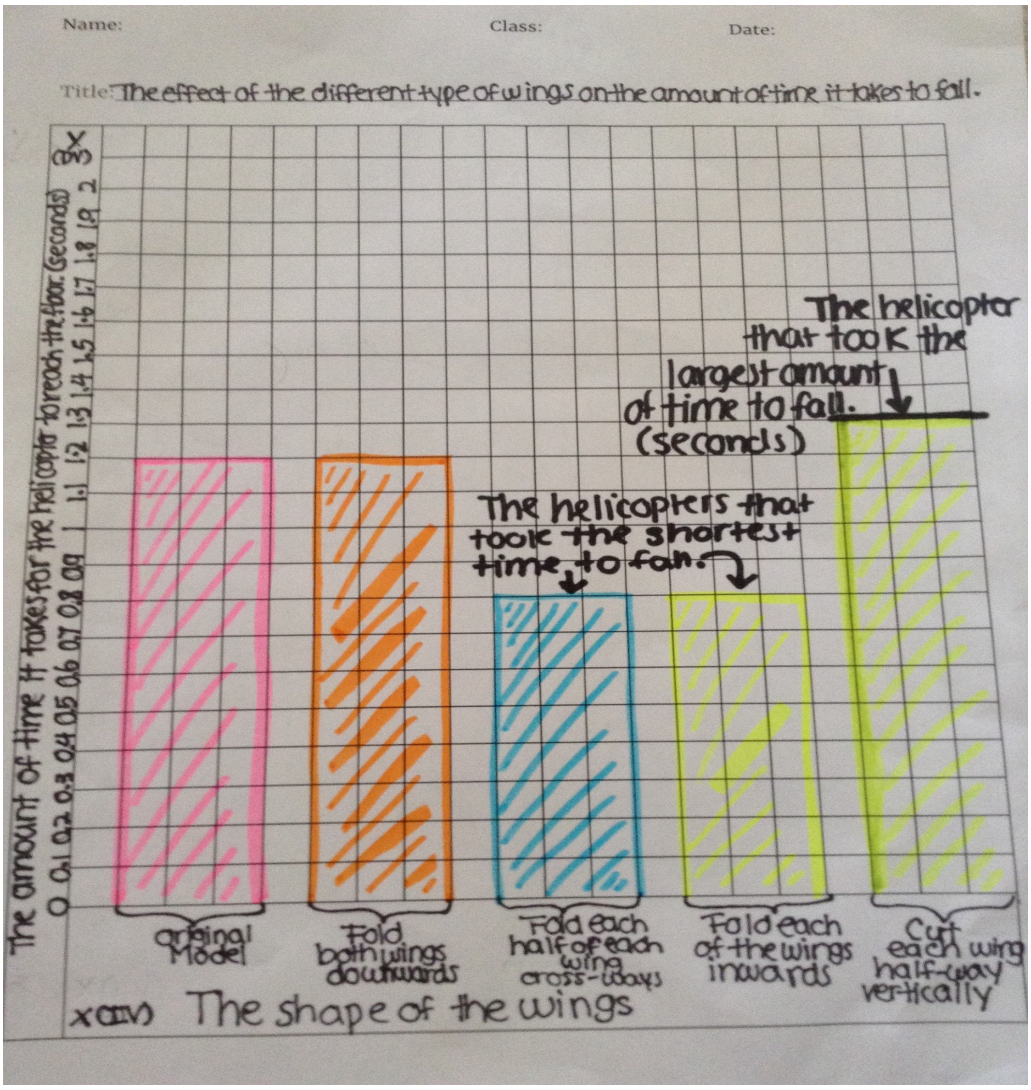
Data

Angelique Contona 11/27/2016 7:45 AM
Comment [4]: This student has a data table consistent with the IDD. To improve he/she should include sample calculations for the average. (Level 3.5)

Question: What is the effect of the different type of wings on the amount of time it takes to fall?

Independent Variable: The shape of the wings		Dependent Variable: How long it takes for the helicopter to fall to the floor, measured by a timer from the time it's dropped.			
		Trial 1	Trial 2	Trial 3	Average (Add up the numbers across the row then divide by 3)
LEVELS	Original Model	1.36 seconds	1.29 seconds	0.83 seconds	1.16 seconds
	Fold both wings downwards.	0.96 seconds	1.46 seconds	1.28 seconds	1.23 seconds (continues on)
	Fold each half of each wing cross-wards	0.86 seconds	0.96 seconds	0.71 seconds	0.843 seconds (continues on)
	Fold each of the wings inwards	0.79 seconds	0.79 seconds	0.69 seconds	0.756 seconds (continues on)
	Cut each wing half-way vertically	0.84 seconds	1.37 seconds	1.56	1.256 seconds (continues on)

Data Graph:



Angelique Contona 11/27/2016 7:04 AM

Comment [5]: This graph is a level 4. This student has annotated the graph to show analysis of the data. All parts of the graph are present. The graph is neat and stragically colorful. This means that the colors are not there for the sake of coloring the graph, but are meaningful.

SCIENTIFIC DISCUSSION PARAGRAPH

A pattern I see when I look at my data table/graph is cutting the helicopter's wings will cause the helicopter to stay in the air longer and folding the wings will cause it to reach the floor at a quicker pace. According to my data, when i cut each wing half-way vertically, it stayed in the air an average of about 1.3 seconds. Also, when I folded each wing inwards, it took an average of 0.8 seconds to fall. Furthermore, when I folded each half of each wing, it also took an average of 0.8 seconds to fall. According to the yellow article it states, " The paper helicopter falls to the ground as a result of gravity, a force that pulls two objects together. In this case, the earth's gravitational force pulls the helicopter down towards the ground. As the paper helicopter drops, it passes through a large number of air molecules." This means that because of the weight of each wing when they were folded, more gravity must be pulling the helicopter down, causing it to take a quicker time to reach the floor. Moreover, according to, "What is Drag", "The air molecules push the object and the difference between velocity and direction of the air and the object cause the object to slow its movement." This means that the less amount of space that the air molecules can push against the helicopter, the quicker it will take to fall. Also, this means that the larger amount of space that the air molecules can push against the helicopter, the longer amount of seconds it will take to fall which explains why the helicopter took the most time to fall when we cut each wing in half-way vertically. It gave more space for the air molecules to push against it.

Angelique Contona 11/27/2016 7:52 AM

Comment [6]: This discussion has a clear and specific claim. 3 pieces of data are provided from the data table/graph. Scientific reasoning that explains why the he helicopter with the cut wings took the longest to fall to the ground. Two relevant and well chosen text based details (quotes) are provided and explained thoroughly. This student also explained both sides of his/her claim- which fell the fastest and why AND which fell the slowest and why. (Level 4)