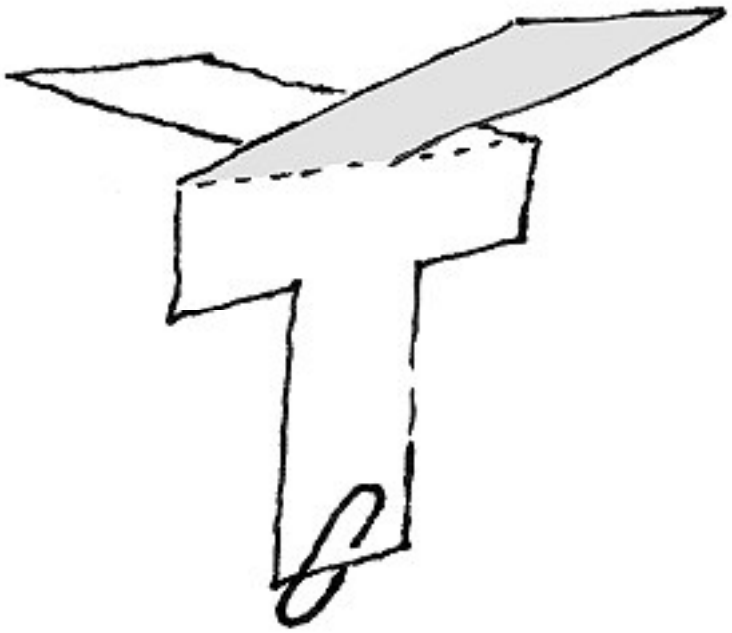
# The Perfect Helicopter Lab Report



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for
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Science-8
13th Period

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Problem

How do you get a paper helicopter to land in a predetermined spot?

Hypothesis

It is believed that one can get a paper helicopter to land in a predetermined place by attaching more weight to the tail of the helicopter in the form of paper clips. This is thought because greater amounts of mass attached to the tail would increase stability of the helicopter causing it to fall faster and give it less time to drift from the target area.

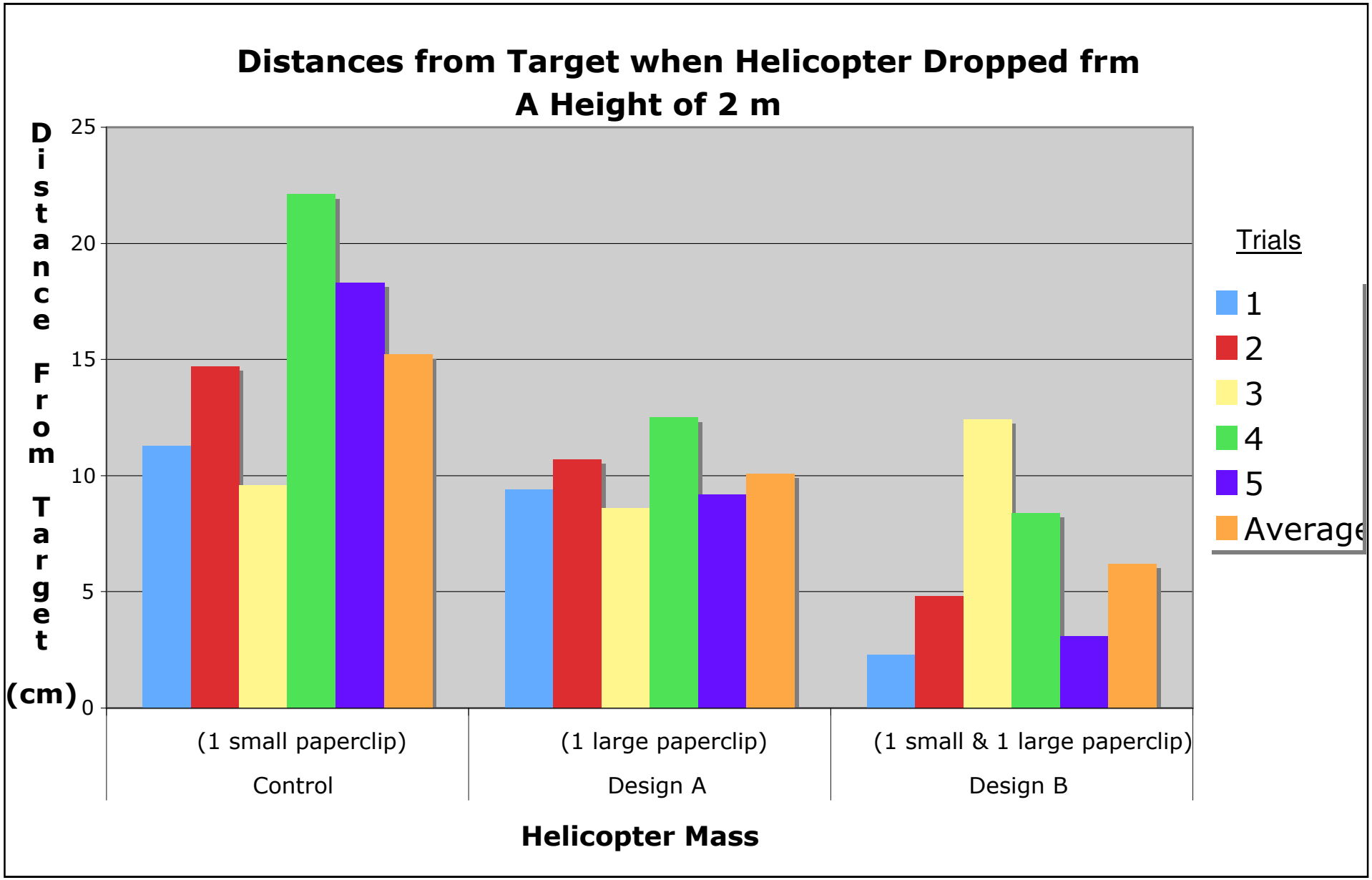
Data Collection

*Helicopter Distances (cm) from Target when Dropped from a Height of 2 m*

| Trial | Control (1 small paperclip) | Design A (1 large paperclip) | Design B (1 small & 1 large paperclip) |
|---|---|---|---|
| 1 | 11.3 | 9.4 | 2.3 |
| 2 | 14.7 | 10.7 | 4.8 |
| 3 | 9.6 | 8.6 | 12.4 |
| 4 | 22.1 | 12.5 | 8.4 |
| 5 | 18.3 | 9.2 | 3.1 |
| **Average** | **15.2** | **10.1** | **6.2** |

*Qualitative Observations for Helicopter Drops from 2 m Height*

| Control (1 small paperclip) | Design A (1 large paperclip) | Design B (1 small & 1 large paperclip) |
|---|---|---|
| Spun clockwise | Spun clockwise | Spun counterclockwise |
| Slow decent that wobbled | Very little wobble | Fell faster with no wobble and less spin |
| Wings stay extended during flight | Wings stay extended during flight | Wings tend to fold upward during flight |
| Landed lightly | Slight bounce on landing | Landed with 1 or two bounces |


Distances from Target when Helicopter Dropped frm A Height of 2 m
Distance From Target (cm)
25
20
15
10
5
0
(1 small paperclip)
Control
(1 large paperclip)
Design A
(1 small & 1 large paperclip)
Design B
Helicopter Mass
Trials
1
2
3
4
5
Average

## Results

During the experiment, the Control and Design A helicopters were observed spinning in a clockwise direction whereas Design B spun counterclockwise. Further, both A and B kept wings extended out when in flight where B's wings tended to fold upwards slightly. Design B also seemed to fall faster than the other designs. As you look at the chart of qualitative data, you will also note that the Control wobbled more in flight, but the more mass added to the tail of the helicopter resulted in more bouncing off the floor during landing.

When examining the table containing the distances from the target, the control helicopter's closest landing to the target was 9.6 cm away and was 22.1 cm away at it farthest. On average, the control landed 15.2 cm away from the target. Design A averaged 10.1 cm from the target landing between 8.6 cm at its closest and 12.5 cm at its farthest distance from the target. Averaging 6.2 cm from the target, Design B had the closest landing at only 2.3 cm from the target. Its farthest point was only 12.4 cm from the target.

Design B, on average, landed 9.0 cm or 59.2% closer to the target than the control and 3.9 cm or 38.6% closer than Design A. The Control was further from the target than Design A by 5.1 cm or 33.6%. The range of distances ran from the closest to the target of 2.3 cm by Design B to the furthest from the target by the Control of 22.1 cm. This is a difference of 19.8 cm.

## Conclusions

Design B with one large and one small paperclip consistently landed closet to the target. As seen both the table and graph, Design B landed on average at least 38.6% closer to the target than either of the other designs. With an average distance of only 6.2 cm from the target, Design B was 9 cm closer to the target than the Control helicopter's average of 15.2 cm and 3.9 cm closer than Design A's 10.1 cm average. Further, Design B had the closest landing of 2.3 cm. The next closest landing by either of the other designs was 8.6 cm, a difference of 4.3 cm. It appeared that the Control helicopter, having less mass, tended to drift sideways during its decent, traveling further away from the target. Since gravitational force does not change and as more mass was added, landing accuracy increased because the decent speed increased due to less spin of the helicopter. As noted in the qualitative observations, the wings of Design B folded upward probably resulting in less air resistance during its fall. This resulted in less drift from the target. However, it was also observed that more mass bounced on landing sometimes stopping closer, sometimes further from the target. It is believed that if more mass is added, bounce would increase and accuracy would decrease.