

# Engineering Project: CANDLE CONVECTION

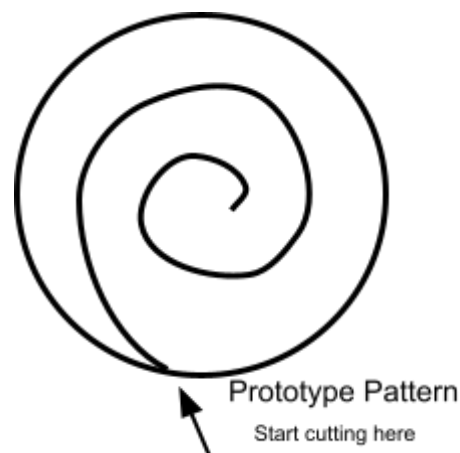
**Objective:** Design, observe, and modify a structure made from aluminum foil that rotates by using the convection currents from a candle.

## Materials:

Candle apparatus (candle, candle holder, ~25cm skewer stick, tape), aluminum foil, scissors, timer, lighter (monitored by teacher).

## Procedure:

1. Use the prototype pattern to draw a spiral design on a piece of aluminum foil. Cut along the drawn curve. Try to keep the aluminum foil as smooth as possible.
2. Make a triangular dome in the center of the aluminum and place it on top of the pointy end of the skewer stick. Try not to let the skewer poke a hole through the foil. Your aluminum structure should barely rest on top of the skewer.
3. Light up the candle and watch your structure spin. You may make slight adjustments to your structure to maximize speed, but you may not modify the prototype design. Sketch your structure.
4. Count the number of revolutions. One complete revolution is each time the bottom tip of the aluminum foil passes a reference point (the skewer's vertical position is a good reference). Use a timer to record the time it takes to make 10 revolutions.
5. To calculate the speed of your structure, divide the number of rotations by the total time it takes to complete them. Use seconds for time.
6. Think of a change (or changes) that will improve your structure and increase the speed. Use a new piece of aluminum foil to create your revised design. Sketch your new structure and label the changes.
7. Test your new structure and record the time to complete 10 revolutions. Calculate the speed as you did in Step 5.



## Data:

### Convection Structure Comparison

Prototype Sketch		Revision Sketch with Labels	
Time to complete 10 rotations (sec)	Speed (rot/sec)	Time to complete 10 rotations (sec)	Speed (rot/sec)

**Analysis:** Construct a bar graph that compares the speed of your prototype to your revised design.

**Conclusion:**


1. Explain convection as it applies to this project. Use the words ***hot air, candle, current*** in your answer. \_\_\_\_\_  
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2. Did your revisions improve the speed? \_\_\_\_\_ Make one inference as to why or why not:  
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3. Predict what would happen to the speed of your structure if the skewer were about 3 cm taller:

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4. If you had the freedom to set up the experiment yourself, what changes would you make and why? Include a sketch if needed. \_\_\_\_\_

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