

Your task is to design an airplane modeled after the American Crow!

Biomimicry is the process people use when they look to nature as inspiration for a design. The term comes from Greek words **bio** (life) and **mimesis** (to imitate). Biomimicry can focus on imitating structure (ex. a shark's skin for swimsuits), process (i.e. photosynthesis in solar panels), or even systems (ex. a sustainable cities). The goal isn't for a solution to simply "look like" its natural counterpart (this would be more an example of biomorphism; rather biomimicry is focused on *function*).

Your challenge is to explore how American Crows can fly while carrying items in their mouths. Quick facts about American Crows: they weigh between 0.7-1.4 pounds, and they carry food (and other items) in their mouths while flying. American Crows can carry items up to $\frac{1}{3}$ pound. For more about the American Crow, check out this [All About Birds Guide](#).

Step One: Get inspired!

We encourage you to go outside or use the All About Birds Guide link above and watch American Crows in flight. **How do their wings bend and move? How long/large are items that crows carry in their mouths?** Next, we want you to check out the [National Audubon Society](#) link to see how you can create a paper airplane modeled after the American Crow (it is the final example on the list so scroll down). You can use this paper airplane design as your base model; however, you will need to modify the design because you need to ensure that your paper airplane can carry approximately $\frac{1}{3}$ its weight in paper clips attached to its front.

Step Two: Collect Materials

Since you can use paper of any type, consider how large and sturdy you want to make your airplane and how heavy it will be as a result. You cannot use any tape or other materials in making the plane. You will also need paper clips that will be attached to the front of your airplane (mimicking an American Crow carrying items in its beak).

Step Three: Design Your Airplane

Remember to draw a picture of your ideas first. Engineers draw out their ideas to think through their designs and share their creations with others. Pay close attention to how you will attach your paper clips to your airplane.

Step Four: Build Your Airplanes

Once you have thought through your ideas, begin building your two airplanes. Remember to BE PERSISTENT! Even if your airplane doesn't work right away, keep at it! Scientists and engineers learn a lot from their failures; it is a crucial part of the design process (check out how scientists and engineers talk about seeing failure as a launching point for learning with this short (2 minute) [National Geographic video](#)).

Test Time!

Keep track of how far your paper airplane travels by using a tape measure or other tool). First, measure how far your paper airplane travels without any paperclips. To ensure that you have representative data, calculate the average length traveled over the course of five trials. You can calculate this by adding the length of each trial and then dividing that number by five. Once you have calculated this average, you can start adding paper clips. Recall that an American Crow can carry approximately $\frac{1}{3}$ its body weight. Translating this to an 8.5x11 sheet printer paper and standard size paper clips, your airplane should be able to travel the same distance with three paper clips attached to the front. We recommend you test your airplane after you add each paper clip to identify how the added weight changes (if at all) the way the airplane functions. Don't hesitate to modify your design along the way in response to how your airplane travels.

It is important to point out that how far you throw the airplane, the wind, and the angle in which you throw the airplane does affect the distance and speed; therefore try to keep these variables consistent (the same) as you test the airplane against added weight.

Reflection Questions:

- What was successful about your design? What was a failure point? For more about how engineers learn from failure points, check out [Succeed by Failing](#) by Crash Course Kids.
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If you like this challenge, you can always try out the other paper airplane designs found on The National Audubon Society link above. For additional inspiration and challenges, check out the Youth Design Challenge organized by the [Biomimicry Institute](#).

Step 5: Sharing your Airplane on Instagram or email.

We want to see your airplane! With permission from your parents, or guardian, share a picture of your airplane for our Instagram page. Direct messaging or emailing an image of your challenge gives us the written consent to redistribute the image on our official instagram page.



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