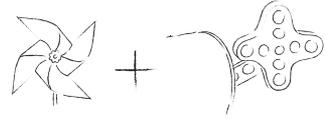




1. ENGINEERING TIPS:

1) Try this:



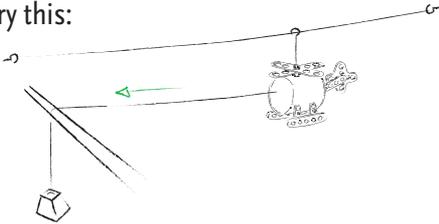
Is it windy outside? If not, how else can you create wind?

- 2) Think about winding a string around the axle of the tail prop and then pulling it. How can you alter the tail prop to make the string power it?
- 3) Think about how the propeller on top of the helicopter turns. Can you use the same method to power the tail prop too?

IMPORTANT NOTE: You can change the helicopter build however you want. In fact, you will probably need to alter it in order to solve the challenges.

2. ENGINEERING TIPS:

- 1) Think about hanging the helicopter from a wire that is suspended across the room. Can gravity carry the helicopter across the wire?
- 2) Try this:

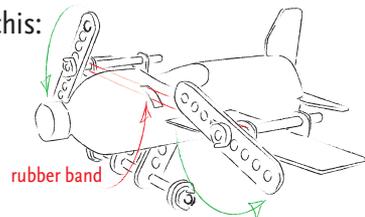


- 3) How many helium balloons would it take to make the helicopter hover in mid-air? Remember, try this challenge indoors!

IMPORTANT NOTE: You can change the helicopter build however you want. In fact, you will probably need to alter it in order to solve the challenges.

3. ENGINEERING TIPS:

- 1) Can any of the methods used in challenge #1 be used to solve this challenge?
- 2) If you apply double-sided tape along the length of one side of a ruler and lay the sticky-side of the ruler across the top of both exposed propeller axles, what happens when you slide the ruler from side to side?
- 3) Try this:



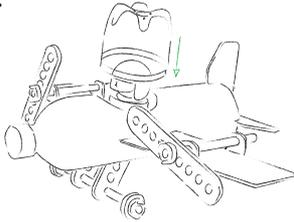
IMPORTANT NOTE: You can change the plane build however you want. In fact, you will probably need to alter it in order to solve the challenges.



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4. ENGINEERING TIPS:

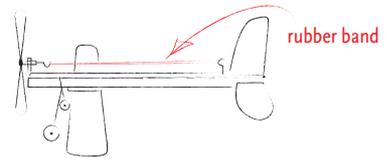
- 1) Find another toy or game piece that is about the right size to fit in the cockpit.
- 2) Think about how the pilot can be attached so it won't fall out when the plane goes upside-down. Can you find items in your home that will help with this?
- 3) Try this:



IMPORTANT NOTE: You can change the plane build however you want. In fact, you will probably need to alter it in order to solve the challenges.

5. ENGINEERING TIPS:

- 1) Think about what you learned from challenges #1 and #3. Can any of the same methods be used to solve this challenge?
- 2) Try this with a rubber band:



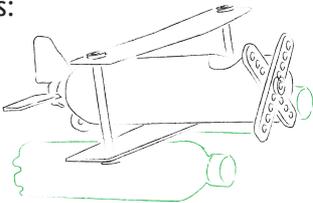
What happens when you wind the propeller and then let go?

- 3) What toys or items in your house have a motor that makes a part spin? Can they help you spin the propeller?

IMPORTANT NOTE: You can change the biplane build however you want. In fact, you will probably need to alter it in order to solve the challenges.

6. ENGINEERING TIPS:

- 1) What object is the body of the plane made from? Can that object float if you remove the plane's wheels?
- 2) Try this:

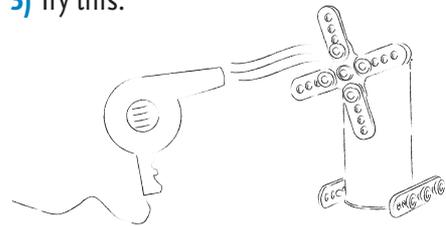


- 3) Can you make the plane's wings and tail out of a material that is waterproof? What household materials can you think of that will work?

IMPORTANT NOTE: You can change the biplane build however you want. In fact, you will probably need to alter it in order to solve the challenges.

7. ENGINEERING TIPS:

- 1) Think about what you learned from the earlier challenges. Can any of the same methods be used to solve this challenge?
- 2) Think about the angle of the windmill's propeller blades. If the blades were attached to the axle at a slight angle, what would happen on a windy day?
- 3) Try this:

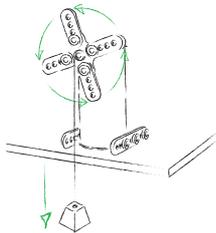


IMPORTANT NOTE: You can change the windmill build however you want. In fact, you will probably need to alter it in order to solve the challenges.



8. ENGINEERING TIPS:

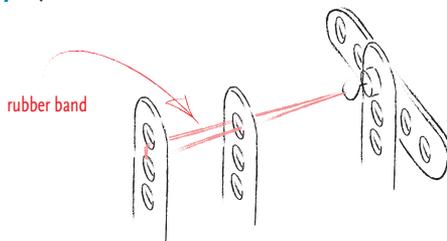
- 1) Think about how you can you extend the axle of the windmill to come out the opposite side of the tower to power the wheel.
- 2) Windmills were used before electricity to generate power from the wind. What else could your windmill power?
- 3) Try this:



IMPORTANT NOTE: You can change the windmill build however you want. In fact, you will probably need to alter it in order to solve the challenges.

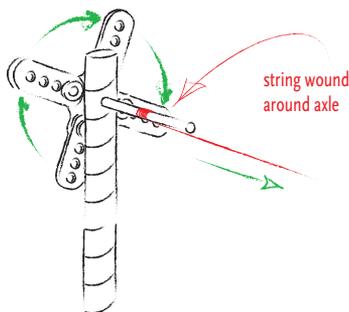
9. ENGINEERING TIPS:

- 1) Now that you've learned numerous ways to power a propeller, choose the method you like best to power the airboat's fan.
- 2) Research airboats used in the Florida Everglades. Do you want your airboat to use two smaller pontoons or one larger flat-bottom boat? What household objects can you find that will float and are waterproof?
- 3) Try this:



10. ENGINEERING TIPS:

- 1) Now that you've learned numerous ways to power a propeller, choose the method you like best to power the hand-held fan.
- 2) Think about different types of handles. How can you build a handle for your fan that is both comfortable and strong enough to support your fan?
- 3) Try this with a string:



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