

THREE DS OF SPEED

LESSON PLAN 3: AIRFLOW

TUNNEL TESTING

TIME REQUIRED: 1 hour, plus time for optional extension activity

MATERIALS: Assembled racecars from Lesson 1, small fan, straws, string, scissors, ruler, masking tape, pencil, and paper

ACTIVITY AND RESOURCE SHEETS: *Airflow Activity Sheet*

Download additional sheets as needed at scholastic.com/nascarspeed.

LEXILE SCORE: 1060L



Central question:
What are drag and downforce?

Have students recall the two forces they learned about in Lessons 1 and 2: drag and downforce. Call on volunteers to describe these forces for the rest of the class. Review how each force affects a racecar's speed.

- **Drag**, or air resistance, is a force that occurs when air pushes against an object as it moves. Drag slows racecars down.
- **Downforce** is a downward force created when there is high-pressure air above an object and low-pressure air below it. Downforce helps racecars stay on the track.



Central question:
How do engineers test the aerodynamics of racecars?

1. Hand out the *Airflow Activity Sheet*, which contains a reading passage about the use of wind tunnels to test drag and downforce. Read the introduction together as a class. Before students read the passage, discuss what it means to be an "active reader." Explain that reading is more than just following the words on a page. Active readers question, think, make connections, and form opinions about a text. That helps them better understand what they are reading.
2. On your whiteboard or chalkboard write the following questions. Tell students to record their answers to

these questions on a separate sheet of paper as they read the passage.

- What predictions can you make about the story before you begin reading?
 - What questions come to mind as you read?
 - What do you picture in your mind as you read?
 - Does the text make you think about anything you've already learned?
 - Are there any words in the text that you don't know?
3. Instruct students to answer the questions on the sheet to assess their reading comprehension. *(Answers: 1. Something that is not moving. 2. A wind tunnel is a large, narrow room with powerful fans at one end. They blow air over an object, such as a racecar, placed inside the tunnel. 3. Engineers use wind tunnels to study racecars' aerodynamics and improve their performance. 4. NASCAR designers use wind tunnels to learn about different forces and pressures on a car. 5. They might alter the car's body to give it a more aerodynamic shape. Or engineers might change the angle of a car's spoiler to increase downforce.)*
 4. After completing the activity sheet, show students a video of a real wind tunnel used to test NASCAR racecars: accelerationnation.com/fun-and-games/video/three-ds-of-speed/air-tunneling.html. Prompt students to compare how information is presented visually in the video versus the reading passage. Does the video help them better understand what they just read?



Central question:
How can engineers view airflow in a wind tunnel?

PIT CREW CHALLENGE (OPTIONAL)

1. Explain that streamers are another way engineers determine how air flows around objects in a wind tunnel. Provide pit crews with a straw and a four-inch piece of string. Have groups tape one end of the string to one end of the straw to create their own streamers.
2. Set up a fan on a table and mark a distance two feet away with a piece of masking tape. Have a pit crew place the car the team built in Lesson 1 on the piece of tape facing the fan. Turn the fan to a medium setting and make sure it is positioned so air is blowing at the car. Tell a crew member to hold the straw and place the end of his or her streamer on different points of the car, such as the front, sides, back, and top. The direction in which the string moves shows the direction that air is moving over the car's surface. If the string is straight, the airflow is steady—a sign of an aerodynamic design. The opposite is true if the string whips around wildly.
3. Instruct pit crews to draw a simple sketch of their car and label it with arrows to show which way air is flowing in different spots. Also have them label where the airflow is smooth and where it is turbulent.