THREE Ds OF SPEED

LESSON PLAN 1: DRAG

START YOUR ENGINES

TIME REQUIRED: 1½ hours, plus time for optional extension activity

MATERIALS: Recycled or reused paper (2 sheets), racecar templates (1 per student), card stock (1 sheet per student), scissors, tape, markers, round hard candies with a hole in the middle (4 per student), index cards (1 per student), ruler, plastic straw (1 per student) *Note: Test that the straws fit in the holes of the candies before the lesson. After the Drag activity, save the leftover piece of straw and the card stock for Lesson 2.*

ACTIVITY AND RESOURCE SHEETS: Assembly Sheet A, Drag Activity Sheet, Resource Sheet A, Resource Sheet B. **Download additional sheets as needed at scholastic.com/nascarspeed.**

VIDEOS: View the *Start Your Engines* and *What Is Drag?* videos at **scholastic.com/nascarspeed.**

BEFORE YOU BEGIN: Have students complete the pre-assessment. Save the pre-assessments until the end of the unit to measure the growth in student knowledge.

PRE-ASSESSMENT ANSWER KEY:
1. C; **2.** B; **3.** A; **4.** C; **5.** A; **6.** A; **7.** A; **8.** B; **9.** E; **10.** D

THINK

Central question:
What is the science of aerodynamics?

Introduce **aerodynamics**—the study of the movement of air, specifically how it flows around objects such as cars and airplanes. Explain that NASCAR engineers study aerodynamics to improve the speed and safety of racecars.

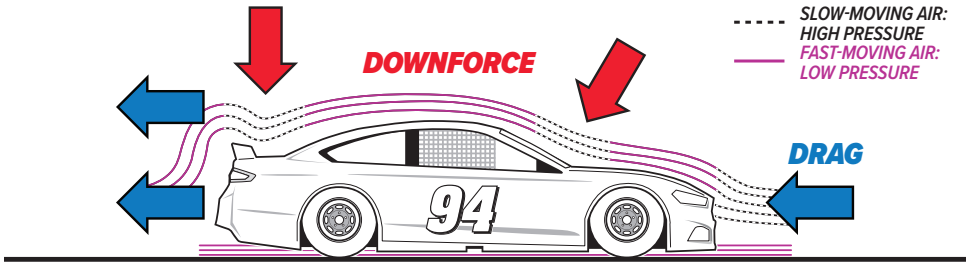
Video Connection

Complete the unit introduction by showing students the *Start Your Engines* video at **scholastic.com/nascarspeed**.

MOVE

Central question:
How does the science of aerodynamics work?

1. Call on three volunteers. Have one student drop a flat sheet of paper from about three feet up, while another times how long it takes to hit the floor.
2. Have the third volunteer crumple the paper into a ball and repeat the experiment. Ask students to explain what happened. Note that the object's shape affected how it moved through the air. The flat sheet of paper met resistance and moved slowly. Crumpling the paper into a ball reduced its surface area and caused it to drop more quickly to the ground.
3. Explain that aerodynamics doesn't apply only to objects. Ask students if they can think of sports in which people might bend to give their bodies less surface area or spread their bodies to make more surface area. You may show images of downhill skiers and speed skaters (smaller surface area); skydivers and hang gliders (larger surface area). Ask: *Why might speed be desired in some sports and moving more slowly be desired in others?*



BUILD

Central question:
What is drag?

1. Point out that NASCAR engineers not only make cars superfast—they also make them safer. Explain that **drag**, or air resistance, is a force that occurs when air pushes against an object as it moves, slowing it down.

Video Connection

Show students the *What Is Drag?* video at **scholastic.com/nascarspeed**.

2. Pair students into pit crews of two. Hand out the car templates, *Assembly Sheet A,* and the *Drag Activity Sheet*. Have students assemble the cars and complete the experiment. Emphasize that the candies are only to be used as wheels and should not be eaten. You can print out more car templates as needed using the template provided at **scholastic.com/nascarspeed**.
3. Hand out *Resource Sheet A* to support groups in answering the Conclusion questions. To wrap up, explain that, much like the index card in the experiment, the spoilers on NASCAR racecars create drag to slow them down and make them safer to operate.

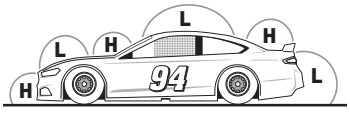
TEAM UP

Central question:
How does a racecar's design make it more aerodynamic?

PIT CREW CHALLENGE (OPTIONAL)

1. Give each group a copy of *Resource Sheet B*. Instruct students to read the introduction, then mark three areas where air moves slowly around the car with an "H" for high pressure; and mark three areas where air moves quickly around the car with an "L" for low pressure.

ANSWER KEY:



2. To wrap up, challenge each group to write an explanation of how one of the features labeled on *Resource Sheet A* increases or decreases drag.