SMASH LAB
Runaway Trailer
Teacher's Guide

Grade Level: 9–12 **Curriculum Focus:** Science **Running Time:** 41 minutes

Program Description

A team of engineers hypothesize that they can create brakes for a heavy trailer with rockets. They create three different designs and then test them, hoping to find a practical solution that accounts for the impact of drag and velocity.

Learning Objectives

After viewing the program and participating in discussion, students will be able to:

- Describe the danger and unreliability of rockets;
- Understand the importance of research before experimenting;
- Consider the impact of drag and how the effect could slow down a vehicle;
- Identify how a control group in an experiment is necessary to collect accurate data;
- Explain how science experiments drive scientific progress.

Classroom Connections

What are rockets most commonly known for? How do rockets work?

Describe the trike test. What was being tested? Which rocket braking option worked the best? What were the concerns with the best option?

Explain what drag is. How could drag slow down a vehicle if a rocket was used as a brake?

The rockets the team wanted to use as brakes cost $21,000 each. Is this economical for this experiment? Could this system be used in a real-life application?

Explain the outcome of this experiment.

Classroom Activities

Set up an experiment that will allow students to experience the power of rockets on a much smaller scale. Have ready water, clear or white film canisters, Alka-Seltzer tablets, and safety goggles. Start by breaking a tablet into four pieces. Fill the film canister about halfway with water. Students should place one piece of tablet into the water—do not put the lid on—and time how long before a chemical reaction occurs. Then students should repeat the experiment with the lid on and document what happens. With the remaining pieces of tablet, let students experiment with water amounts, with or without a lid, or with shaking. They should record their observations. After the experiment, students should question why the canister is exploding. They should review CO_2 build-up, pressure, and physical versus chemical change. After discussion, compare these mini explosions to those of a combustible fuel rocket.

Target Vocabulary*

accelerometer - an instrument for measuring acceleration or for detecting and measuring vibrations

combustion - an act or instance of burning

drag - motion effected with slowness or difficulty

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Academic Standards

National Academy of Sciences
The National Academy of Sciences provides guidelines for teaching science in grades K–12 to promote scientific literacy. To view the standards, visit this Web site:
http://books.nap.edu/html/nses/html/overview.html#content.

This lesson plan addresses the following national standards:

- Physical science
- Science as inquiry
- Science and technology
- Science in personal and social perspectives