

LESSON: Solid Rocket Boosters

Title: Solid Rocket Boosters
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Lesson Overview:

While the solid rocket boosters are essential to the Space Shuttle's design and a key to the Kennedy Space Center, they do not have a console in the KLASS simulation. Yet rockets are an exciting concept to learn about in middle and high school. Thus, this lesson is designed more for stimulating our future mechanical, electrical, and aeronautical engineers than getting the students ready for KLASS.

Suggested Classroom Time: 120-240 minutes

Grade Levels: 6-10

KLASS Module: 2-Orientation

Topic/Console: Solid Rocket Boosters

Materials Needed:

Activity	Documents	Other Materials
1	Background information: http://spaceflight.nasa.gov/shuttle/reference/basics/srb/index.html http://science.ksc.nasa.gov/shuttle/technology/sts-newsref/srb.html RDG_SRB-Additional (Folder of documents)	Demonstration computer with Internet connection
2	PRES_SRB.ppt PRES_SRB.doc (Optional, text only)	Microsoft PowerPoint, student computers with Internet connection and RealPlayer
3	RDG_SRB.doc ACT_SRB.doc KEY_SRB.doc	Writing tools

National Standards/Objectives:

Discipline	Standard	Objective
Science	B. Physical Science	Students study motions and forces, as well as structure and properties of matter.
Technology	Social, ethical, and human issues	Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
Math	Data Analysis & Probability	Students formulate questions that can be addressed with data, and collect, organize, and display relevant data to answer them.
Math	Measurement	Students understand measurable attributes of objects and the units, systems, and processes of measurement.

Desired Results:

Students will be able to answer these essential questions

- How do the solid rocket boosters help to launch the Space Shuttle?
- What Shuttle operations are necessary to build, stack, launch, and recover the SRBs?

Students will know

- Basic terminology related to solid rocket boosters.
- The role the SRB plays in the Space Shuttle launch.
- The SRB is reusable.

Students will be able to

- Represent large SRB statistics with scientific notation.
- Label the parts of the SRB.
- Discuss, in general, SRB Shuttle operations.

Learning Plan/Activities:**1. Introducing the Lesson.**

Script: “When you look at a Space Shuttle launching, it is hard to imagine how it defies gravity and travels so quickly through the atmosphere. So how does it do it? The solid rocket boosters (SRB) operate in parallel with the main engines for the first two minutes of flight to provide the additional thrust needed for the orbiter to escape the gravitational pull of the Earth. In addition to the solid rocket motor, the booster contains the structural, thrust vector control, separation, recovery, and electrical and instrumentation subsystems. The solid rocket motor is the largest solid propellant motor ever developed for space flight and the first built to be used on a manned craft. The huge motor is composed of a segmented motor case loaded with solid propellants, an ignition system, a movable nozzle, and the necessary instrumentation and integration hardware.”

2. Presenting and Exploring Information.

Load the *Solid Rocket Boosters* presentation (PRES_SRB.ppt) on your teacher station and briefly discuss each slide, encouraging students to ask questions as they arise. There are several links to videos so test the presentation before students arrive to be sure the videos run correctly on your computer.

Pass out *The Solid Rocket Booster* reading (RDG_SRB.doc) and either do a group choral reading exercise, or have them read silently to themselves. If reading aloud, be sure to guide them in reading the statistical information correctly, as scientists and mathematicians do.

Some of the statistics in the reading are slightly contradictory due to rounding of large numbers. Challenge the students to find and explain these discrepancies.

3. Evaluating the Lesson.

Assign the *Solid Rocket Boosters* activity (ACT_SRB.doc) for students to complete independently. Provide feedback as they complete the exercises. While the first portion of the document may seem like busy work, it is designed for the students to accurately record statistical information and to reinforce the new vocabulary terms from this lesson. Full credit should be given for accurate answers only.

Assessment Evidence:

Performance Tasks

1. Collect and evaluate the student work on the *Solid Rocket Boosters* activity (ACT_SRB.doc). Students should make accuracy their goal.

Other Evidence

1. Perform classroom observation and reinforce technical accuracy when students read and record scientific data.

Extensions and Going Further Resources:

- Very technical information is available from the *NSTS Shuttle Reference Manual* pages found online. Class activities for advanced students could be derived from this technical information that delves deeper into rocket design and thrust.
http://science.ksc.nasa.gov/shuttle/technology/sts-newsref/sts_asm.html#srb_mod_propellant
- Using the measurements given for the SRB, have students create 'to scale' versions on graph paper or with modeling clay.
- Have students research or revisit Newton's Third Law.
- Ask students to use the data presented in the reading to formulate questions that can be addressed with data, and collect, organize, and display relevant data to answer them.
- Be sure to check for student opportunities, additional educational resources and more at:
<http://www.nasa.gov/education>