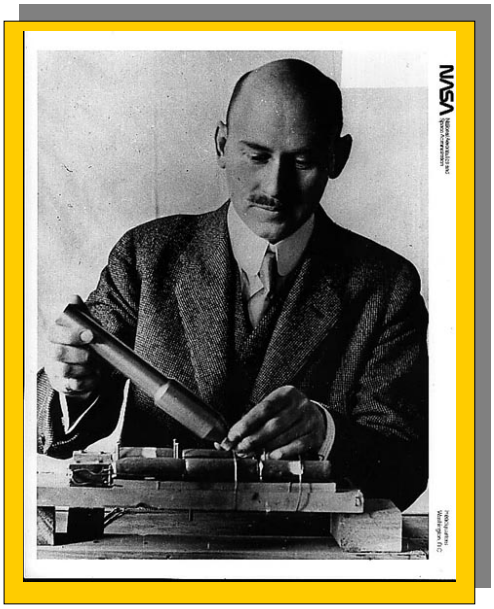
Dynamic Design: Launch and Propulsion

The History of Rocketry

TEACHER GUIDE

BACKGROUND INFORMATION

Rockets are the oldest forms of self-contained vehicles in existence. The designs of today's rockets are a result of thousands of years of experimentation and research. Beginning two thousand years ago as a steam-powered toy, rockets have evolved into sophisticated vehicles capable of launching spacecraft out into the solar system. In this activity students create a multiple tiered timeline on the history of rocketry.



Robert Goddard is considered one of the fathers of modern rocketry.

NATIONAL SCIENCE STANDARDS ADDRESSED

Grades 5-8

Science As Inquiry
Understandings about Scientific Inquiry

Science and Technology
Understandings about science and technology

Science in Personal and Social Perspectives
Science technology and society

History and Nature of Science
History of science

Grades 9-12

Science As Inquiry
Understandings about Scientific Inquiry

Science and Technology
Understandings about science and technology

History and Nature of Science
Historical Perspectives

(View a full text of the National Science Education Standards.)

HISTORY STANDARDS ADDRESSED

Historical Understanding Standard, 6-8
Standard 1: Understands and knows how to analyze chronological relationships and patterns
Benchmark 2: Knows how to construct and interpret multiple tier time lines.

(View a full text of the McREL Compendium of Standards and Benchmarks for K-12 Education)

MATERIALS

- Student Activity, "Anatomy of a Liquid Propellant Rocket"
- *History of Rocketry:* Chapters 1-6 available online from Spaceline at http://www.spaceline.org/rockethistory.html
- Construction paper, meter sticks, markers (Optional)

PROCEDURE

1. Hand out the liquid propellant rocket worksheet. Explain that spacecraft are lifted into space using rockets and that current rocket design is the result of thousands of years of experimentation and research. Ask students to complete the Anatomy of a Liquid Propellant Rocket worksheet either alone, in groups, or as an entire class.

2. Divide students into groups of six. Give each student a copy of *History of Rocketry*. Assign a different chapter of *History of Rocketry* to each of the students. Ask them to read their chapter and to create a timeline of the ten to fifteen important events in their own chapter. On one side of the timeline, have students record important events in the scientific knowledge about rockets. On the other side have them identify important events of how scientists applied that knowledge (e.g., the first launch of a liquid fueled rocket).

3. After students have shared their completed timelines within their group, ask them to create another timeline that has the fifteen-to-twenty most important events in the history of rocketry. Again have students in each group cover the entire history of rocketry.

4. Ask the entire class to create a single time line of the ten to twenty most important events in the history of rocketry. Again ask them to record important developments in the knowledge of rocketry on one side and important events in the application of that knowledge.

5. Ask groups what events they chose and why. Explore with them why they chose some events and not others.

GOING FURTHER

- Ask students to write an essay on the history of rocketry.
- Have students write a report on a specific event in the history of rocketry.
- Ask students to identify other events that occurred in the same year as an important event in the history of rocketry.
- Ask students to prepare a report on the use of rockets since the creation of NASA.

TEACHER RESOURCES

Web sites

http://history.msfc.nasa.gov/rocketry/index.html
Rocketry Through the Ages

http://spacelink.nasa.gov/Instructional.Materials/NASA.Educational.Products/Rockets/
Rockets: A Teacher's Guide with Activities in Science, Mathematics, and Technology

http://www.genesismission.org/people/biographies/index.html
Historical Biographies

http://www.hq.nasa.gov/office/pao/History/SP-4406/contents.html
Orders of Magnitude: A History of the NACA and NASA, 1915-1990

Alternate Strategy Tip

Expand this activity by incorporating another timeline showing what was happening in Europe, Asia and other parts of the world at the times when significant rocketry events were occurring.

The Anatomy of a Liquid Propellant Rocket

Combustion Chamber	1. Cavity inside the rocket where the fuel and oxidizer are combined.
Pumps	2. Forces the oxidizer and fuel under high pressure from the storage tanks to the injectors.
Fins	3. Lightweight, streamlined appendages that help stabilize and control the rocket.
Injectors	4. Sprays and mixes the oxidizer and fuel into the combustion chamber.
Oxidizer	5. Storage tank that holds liquid oxygen that is mixed with the fuel and burned to power rockets.
Fuel	6. Storage tank that holds the chemical that is mixed with the air and burned to power rockets.
Payload	7. The equipment and instruments carried by a rocket in the nose cone.
Nozzle	8. The exit cone where the hot, fast moving gases generated in the combustion chamber escape providing thrust.