

# Out of this World Rocketry

## Lesson 3 History of Rocketry



### Materials

- a copy of the short history of rockets
- a copy of the student observation sheet
- internet access

### Introduction

Rockets have played a very important role in the history of not only space travel but also in the development of many new technologies. This lesson will help students understand the history of rocket development.

### Activity

1. Present the power point to your group.
2. Have students break into groups of four and take turns reading the shorter history of rockets.
3. After students have read the history, they should complete the student observation sheet which refers to *History of Rockets*.

### Apply

1. Have students visit the Web sites listed on the student observation sheet.
2. Then have students create several questions about rockets from the Web site they visited.
3. Conduct a discussion on what the students discovered about rockets. The following are some possible discussion questions:
  - a. How do rockets affect your everyday life?
  - b. How have rockets changed and why?
  - c. What are rockets used for today?
4. What are some products we use in our everyday lives that were developed by NASA as part of the space program.

### NOTES:

1. Review the attached histories of rocketry and determine which is appropriate for students.
2. The amount of time for internet exploration will vary.
3. An extension of this activity would be to have students search for additional sites containing information about rockets.





## **Student Observation Sheet**

*Part I. Answer the following questions about the history of rockets.*

1. Why were rockets first developed? Who built the first rockets?
2. What was Robert Goddard's main contribution to rocketry?
3. What did Kinstantin Tsiolkovsky do in 1896? What was the significance of this event?
4. Name several of Wernher von Braun's greatest contributions to rocketry.
5. How have rockets changed the world?

*Part II. Create 10 questions that you could ask your fellow students using the Web sites listed below. The answers to your questions must be found on the Web sites.*

<http://kids.msfc.nasa.gov/>  
<http://users.commkey.net/Braeunig/space/>  
<http://www.spacekids.com/>  
<http://liftoff.msfc.nasa.gov/toc.asp?s=Spacecraft>  
<http://www.astronautix.com>  
<http://kevin.forsyth.net/delta>  
<http://www.thespaceplace.com/history/space.html>

- 1.
- 2.
- 3.
- 4.
- 5.



**KEY** Part I. Answer the following questions about the history of rockets.

1. Why were rockets first developed? Who built the first rockets?  
Chinese “fire-rockets” were first used to scare away evil spirits. They were developed between the 3<sup>rd</sup> Century B.C. and 1<sup>st</sup> Century A.D.
2. What did Konstantin Tsiolkovsky do in 1896? What was the significance of this event?  
He wrote “Outside the Earth”. The article described large rocket sho[s] with liquid fueled engines.
3. What was Robert Goddard’s main contribution to rocketry?  
He developed a liquid rocket and launched it on March 16, 1926. This rocket was the first liquid rocket to take flight.
4. Name several of Wernher von Braun’s greatest contributions to rocketry.  
Worked under Walter Dornberger, the head of army rocket projects in Germany.  
Helped develop the German A-1, A-2, A-3, A-4 and A-5.  
Led the U.S. rocket program and worked on the Apollo Program.
5. How have rockets changed the world?  
Have enabled humans to orbit the Earth and explore planets.  
Helped humans predict weather, communicate and study the universe.



## History of Rockets

By Tad Theno

It is rather uncertain when rockets were actually first used as rockets. However, the use of the action-reaction theory (later to become Newton's Laws) has been around for quite some time.

Stories from around 400 B.C. tell of a Greek named Archytas who propelled wooden pigins along a wire with escaping steam. In the first century B.C. in a book titled *Pneumatica*, the Greek, Hero of Alexandria described what he called an Aeolipile now called appropriately a "Hero Engine". This device consisted of a sphere with two protruding L-shaped tubes all mounted on top of a water kettle. A fire below the kettle caused steam, which came forth from the tubes causing the whole assembly to rotate.

Some time between the 3rd century B.C. and the 1st century A.D. the first solid propellant rockets originated in China. In ancient China, bamboo tubes filled with saltpeter, sulphur and charcoal and capped at both ends were thrown into ceremonial fires in the belief that the explosions they produced would scare away evil spirits. It is likely that some of these first 'fire crackers' failed to explode but instead blew out one of the end caps and shot out of the fire, propelled by the combusting chemicals.

The further development of the rocket is not well-documented. It is sure that the Chinese began to experiment with rocketry. By 1232 the Chinese were using "fire arrows" against Mongol invaders at the Battle of Kai-fung-fu. These rockets were simple tubes capped at one end and filled with gunpowder. This simple engine was attached to an arrow-like stick to provide guidance. By the time the British invaded China in the 1840s the original fire arrows were still the only rockets China possessed and they were said by the British to be more of a pretty show or an annoyance than a threat. Due to their belief in the "Yin and Yang", the Chinese never developed an understanding of the action-reaction principle, and certainly did not understand the processes of combustion. Thus their serendipitous discovery of the rocket was most likely never really improved upon.

The Mongols were responsible for acquainting the rest of the old world with rockets, having acquired the technology from China. In 1241, the Mongols used rockets in their many sieges in eastern Europe, the Middle East and India. For example, in 1258 Mongols used rockets in their capture of Baghdad. The other nations of Europe and Asia were quick to learn that they were out of their league militarily and quickly tried to develop rockets. It is certain that by the year 1300, rockets were in use in Europe's major arsenals. Throughout the 15th, 16th and 17th centuries, spawned by constant warfare and later the development of Newton's laws, the European nations made many advances in rocket technology.

New forms of propellant were developed, as well as new ways of building rockets. The Englishman Roger Bacon improved the chemical formulation of gunpowder making it more powerful. Jean Froissart of France developed the idea of launching rockets through tubes to increase accuracy. A German fireworks maker, Johann Schmidlap, invented the "step rocket" now familiar to us as staging, using many smaller rockets stacked one on top of the other to allow the dead weight of the used portion of the rocket to be jettisoned in flight. By the early 18th century most



European powers were sporting artillery rockets of many sizes, some over 120 pounds.

It is in the battle for control of India that rocket artillery really began to flourish. The British were on the receiving end of massive rocket barrages in two major battles against Tippoo, Sultan of India in 1792 and 1799. Impressed by the Sultan's rocket artillery and excited by rockets since a child, an artillery officer named William Congreve, began to build barrage rockets for the British Army. Soon, Congreve was producing rockets anywhere from 1 to 300 pounds with ranges of up to 2,750 meters (about 2 miles). Rockets started to be used in service almost immediately. In 1807, 300 of Congreve's rockets were used to obliterate nearly three fourths of the Danish city of Copenhagen. In the War of 1812, it was Congreve's rockets that prompted Francis Scot Key to write "...and the rockets red glare.." in the poem known as the Star Spangled Banner, eventually to become the National Anthem of the United States of America.