

Assignment Discovery Online Curriculum

Lesson Title: Milestones in Human Spaceflight

Grade level: 6-8, 9-12

Subject Area: Earth Science

Duration: Two class periods

Objectives:

Students will do the following:

- Learn about major events in the history of the National Aeronautic and Space Administration (NASA)
- Create a visual timeline of the goals, heroes, and outcomes of select missions.

Materials:

- Newsprint
- Paper and markers (for each group)
- Internet access
- Print resources about NASA's history and its various programs, from Mercury to the International Space Station

Procedures:

1. Ask students to brainstorm names of astronauts from NASA space missions. For each astronaut, ask students if they know why his or her flight was significant.
2. It might be helpful to give students some background on the Cold War before continuing the lesson. Explain that the Cold War was not actually a war but a pervasive tension that existed between the United States and the Soviet Union for several decades following World War II. The primary source of conflict and tension between the two countries was rooted in the United States' distrust of communism, the Soviet form of government. When communism ended in the Soviet Union, the Cold War ended, as well. Ultimately, the Soviet Union itself dissolved, leaving independent nations, the largest of which is Russia.
3. Explain to students that NASA was founded in 1958, one year after the Soviets launched Sputnik 1, the world's first artificial satellite. During this period, the U.S. and the former Soviet Union had been engaged in the Cold War, so Americans saw Soviet advances in this "space race" as a dangerous technological gap between the two nations. Throughout its history, NASA has made many achievements in aeronautics, space science, and space applications, but perhaps it is best known for its history of human spaceflights. Since NASA's inception, there have been seven major manned space programs, each with its own unique set of missions.

U.S. Manned Space Programs

- Mercury: the first U.S. program for human spaceflight
 - Gemini: the first two-man crews, longer missions
 - Apollo: the first spaceflights to the moon
 - Skylab: a place where humans live and work in space for extended periods of time
 - Apollo-Soyuz: first international manned spaceflight
 - Space shuttle: the first reusable low-cost spacecrafts
 - International Space Station: an effort to create a permanent orbiting laboratory in space
4. Divide students into seven groups, and assign each group one of the manned space programs above. Have each group use the Web sites below to write a paragraph to answer each of the following questions about their assigned program:
- What were the program's main objectives?
 - What years did the program run?
 - What type of vehicle was used for this program?

Have students record basic facts about one or two of the most significant missions of the program. Using one index card for each mission, record the following facts: name, dates, goals, heroes, and outcomes. Encourage students to print out or sketch images of spacecraft, astronauts, and any other pictures from each mission.

Students will find information for each program and its mission at the following Web sites:

NASA Human Spaceflight Programs History

<http://www.hq.nasa.gov/office/pao/History/humansp.html>

NASA Space Flight History

<http://www.spaceflight.nasa.gov/history/>

Image and Media Gallery

<http://spaceflight.nasa.gov/gallery/index.html>

For details about specific missions, see the following:

Chronology of U.S. Astronaut Missions (1961-1972)

http://nssdc.gsfc.nasa.gov/planetary/chrono_astronaut.html

NASA's First 100 Human Space Flights

<http://www-pao.ksc.nasa.gov/kscpao/factoids/hundred.htm>

The Apollo Program

<http://www.nasm.edu/apollo/>

5. When groups present their reports to the class, encourage all students to present a different part. For example, one or two students in the group should give an overview of the program, other students present information on the individual flights, and others present and describe the images from the missions.

6. Create a timeline on a bulletin board that spans the years from 1961 to the present. Have students hang their one-paragraph overviews for each program above the timeline in the appropriate periods. Then, at specific years of the timeline, have students post their index cards and images about individual missions.
7. End the lesson with a class discussion about how human spaceflight has evolved over the past 40 years. Which events do they believe were the most important achievements in the space program? What were some of the major challenges? How do they envision the next 40 years of human spaceflight?

Discussion Questions:

1. Describe how the Cold War influenced the development and early goals of NASA.
2. What were the major accomplishments of the Apollo program?
3. Describe how spacecraft evolved from the U.S. Mercury to contemporary space shuttles.

Extension:

NASA Enterprises and Centers

Show students the NASA online map titled “Where We Work” at http://www.nasajobs.nasa.gov/Work_4_NASA/where_we_work.htm. This map shows the location of NASA centers. Ask students to brainstorm what they know about any of these centers. (For example, they may know that Kennedy Space Center is where spacecraft are launched, or that the Mission Control Center is at Johnson Space Center in Houston.) Explain that to understand the purpose of each center, it is important to understand NASA's five strategic enterprises, or areas of research and development. Those enterprises are

- Aerospace Technology
- Biological and Physical Research
- Earth Science
- Human Exploration and Development of Space
- Space Science

Have students visit the following site to learn about the goals of each enterprise:

<http://www.nasa.gov/enterprises.html>. Next, have students visit the NASA organization chart at <http://www.hq.nasa.gov/hq/orgchart.htm>, where they'll learn which centers fall under each enterprise. Divide the students into 10 groups of two or three and assign each group one of the following centers.

- Ames Research Center
- Dryden Flight Research Center
- Goddard Space Flight Center
- Jet Propulsion Laboratory
- Johnson Space Center
- Kennedy Space Center
- Langley Research Center
- Lewis Research Center
- Marshall Space Flight Center

- Stennis Space Center

Using the “Where We Work” map from the NASA Web site (address given above), have groups link to overviews and program Web pages to research the location, goals, past accomplishments, and current projects taking place at that center. In addition, have students explain how each center relates to one of the five enterprises established by the NASA space program. Each group should present a poster presentation for each center.

Evaluation:

Use the following three-point rubric to evaluate how well students participate in class discussion, complete their research, and create their presentations on the U.S. manned space programs.

Three points: active participation in class discussion; above-average research and writing skills; clear, thorough presentation including several details about their assigned space program.

Two points: average participation in class discussion; on-grade level research and writing skills; complete presentation including some details about their assigned space program.

One point: little participation in class discussion; below-average research and writing skills; incomplete presentation with few or no details about their assigned space program.

Suggested Reading

Astronauts: Training for Space

Michael D. Cole. Enslow Publishers, 1999.

Enter the world of astronauts and learn what it takes to become one! Chapters explain the qualities needed to become an astronaut as well as the rigorous training involved. Color photographs accompany the text, along with chapter notes, a glossary, and a short bibliography.

Back in Orbit: John Glenn’s Return to Space

Scott Montgomery and Timothy R. Gaffney. Longstreet Press, 1998.

One of the original Mercury astronauts, John Glenn, made history again when he flew back into space in 1998 at age 77, becoming the oldest astronaut. Weaving Glenn’s history with the Mercury rocket program with an account of his most recent flight into space, this book covers a lot of ground. Many photographs, both black-and-white and color, help tell the story of this amazing man.

Vocabulary:

aeronautics

Definition: Science dealing with the operation of aircraft.

Context: Astronauts and other scientists who work at NASA have training in **aeronautics**.

astronaut

Definition: A person who pilots a spacecraft or works in space; a space traveler, particularly one from the United States.

Context: Alan Shepard became the first U.S. **astronaut** to enter space in 1961.

Johnson Space Center

Definition: The headquarters for all U.S. manned spacecraft projects conducted by NASA; the location of the Mission Control Center for manned space flights.

Context: After a spacecraft launches from Kennedy Space Center, the Mission Control Center at **Johnson Space Center** monitors the systems that keep the spacecraft functioning.

Kennedy Space Center

Definition: The launch facility for all U.S. space missions that carry crews.

Context: **Kennedy Space Center** is located in Cape Canaveral, on the east coast of Florida.

launch vehicle

Definition: A powerful rocket used to launch a spacecraft or satellite into space.

Context: A **launch vehicle** is powerful enough to help a spacecraft overcome gravity.

NASA (National Aeronautical and Space Administration)

Definition: The government agency whose mission is to research and develop safe and meaningful ways to explore space.

Context: **NASA** employs a variety of scientists who work together to ensure safe and productive spaceflight missions.

orbit

Definition: The path of a spacecraft or a heavenly body as it revolves around a planet or other body.

Context: In 1962 John Glenn Jr. became the first American astronaut to **orbit** Earth.

space shuttle

Definition: A reusable space vehicle that takes off like a rocket and lands like an airplane.

Context: The first **space shuttle** to orbit Earth was Columbia, launched in 1981.

space station

Definition: An orbiting spacecraft designed to be occupied by teams of astronauts or cosmonauts over a long period.

Context: Skylab, the first U.S. **space station**, launched into orbit in 1973.

Academic Standards:

This lesson adheres to the National Science Education Standards for students in grades 5-8:

- History and Nature of Science
- Earth Science

- Space Science

Credit:

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This lesson was developed in consultation with Lee Ann Hennig, an earth science and astronomy teacher.

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