

Building Blocks To Space



Rome wasn't built in a day, and neither was America's space program. It took decades of study and exploration to reach the point where astronauts and cosmonauts could live together in space for months at a time as they do now on the International Space Station (ISS). The building blocks to get to this point came in the form of four space campaigns: Mercury, Gemini, Apollo, and Space Shuttle. The whole "space race" concept was underscored in a 1961 speech where president John F. Kennedy declared America's resolve to land a human on the Moon by 1970.

The **Mercury project** was a series of six manned flights that extended beyond Earth's atmosphere, taking place from 1961 through 1963. Though *the goal was to orbit the Earth*, the first two flights merely went to **suborbital** altitudes beyond our atmosphere. While Mercury astronauts learned first-hand of many space travel challenges, the issues were limited by the reduced mobility the astronauts endured. The astronauts were strapped on their backs for the entire flight, which ranged from less than a half hour to just over a full day.

Mercury flights were launched with Titan and Redstone rockets, and the astronauts splashed down in small recovery capsules slowed by parachutes. The process of getting up into space and back down onto Earth was a major undertaking in itself. Because it had never been done before, space vehicles had to be designed to overcome the intense heat that would come as the craft re-entered Earth's atmosphere. A lengthy debate ensued on the benefits of using a large, copper heat shield to diffuse the temperatures, versus **ablation**—the melting of a protective layer on the capsule—to safeguard the passengers. Ablation won, along with a change in design to create a blunt-ended capsule, which would better dissipate energy and heat.



The 10 manned flights of the **Gemini flight program** followed Mercury and extended from 1965 through 1966. Gemini built on the successes of Mercury, stressing the goals of *subjecting men to long-duration flights, and docking with other orbiting objects*. The longest Gemini flight lasted 10 days, and after several attempts, Gemini was able to dock and separate from Agena, an unmanned satellite. Astronauts participated in several **extra vehicular activities** (EVAs).

Apollo's 11 manned missions brought heightened notoriety to the American space program, which had been competition with Russia's corresponding agencies. In July 1969, an Apollo lunar lander became the first Earth craft to land a man on the Moon. While Apollo flights allowed humans greater mobility while in flight, astronauts were still strapped on their backs in a small capsule for re-entry into Earth's atmosphere and splash down into an ocean for helicopter rescue. The Apollo craft consisted of three elements: the command module, the crew's quarters and flight control section, and spacecraft support systems. An Apollo command module was just a bit larger than a compact car. Three men had to spend a week in these close quarters.

A part of the Apollo missions included the **Skylab project**, the first actual Space Station. Four teams of astronauts spent several days each onboard Skylab, an orbiting satellite, conducting numerous experiments that would have been impossible on Earth. In fact, just being on board Skylab was an experiment in itself. Skylab was launched in 1973 and was expected to stay in space for 10 years. An unstable orbit brought it to Earth in 1979.



Apollo flights also brought the **Apollo/Soyuz missions** of 1975. This was the first joint mission sponsored by two separate nations. The Russian and American flights launched from their corresponding countries, and docked to each other mid-flight. Apollo-Soyuz was much more than a foreign relations improver; it allowed for the exchange of information and technology from both nations and a spirit of cooperation that would continue for decades to come.

The current phase of space technology is the **Space Shuttle program**. Begun in 1981, there have been more than 100 Shuttle missions performed. One of Shuttle's biggest projects is the construction of the ISS by astronauts aboard the Shuttle.

Astronauts on the Space Shuttle have performed experiments, conducted **EVAs**, and researched the effects of microgravity on various life forms, including bacteria, plant life and humans. The Shuttle orbiter fleet currently consists of five vehicles, all named for pioneering sea vessels: Atlantis, Columbia, Discovery, Endeavour, and Enterprise.

The Space Shuttle project still continues during construction of the International Space Station (ISS).

What lies ahead? The future is never laid out with certainty, but some good guesses are aboard Starship 2040 (<http://www.starship2040.com>), a full-sized mock-up of a commercial passenger spacecraft as it might look in the year 2040. Starship is housed in a 48-foot tractor-trailer rig and travels the country showing its exhibit to illustrate how future space travel will look. Some exhibits focus on propulsion technology, and others showcase the expected living conditions of space travel 40 years from now.

Article Published by NASAexplores: June 7, 2001

What to do:

1. Fill in the data table with the appropriate dates from the article.
2. To label the timeline, subtract the ending date from the beginning date.

$$\begin{array}{r} 2040 \\ - \\ \hline 1960 \end{array}$$

3. Count the number of jumps between 1960 and 2040. Using your answer from the previous step, divide by the number of jumps.

This is the number of years represented by each jump.

4. Using your data table, label the significant events on the time line. Use a solid bar above or below the line to show how the missions or programs span several years.
5. Briefly describe the significance of each program or event.
6. The last two boxes on your data sheet are for you to predict future events in manned spaceflight. Use your space exploration timeline homework sheet.

Name _____

Program / Event	Dates
John F. Kennedy Speech -	
Mercury Program -	
Gemini Program -	
Apollo Program -	1968-1972
First Lunar Landing -	
Skylab -	
<i>Apollo/Soyuz Missions -</i>	
Space Shuttle Program -	
International Space Station -	1998-present

Name _____

