Key Figures in Human Space flight

LEARNING OBJECTIVES:

Objective: The objective of this Slide is to recognize those who where integral during the early stages of human spaceflight.

Purpose: The purpose of this Slide is to gain an appreciation for the talents required to send people into space, and that no single person was responsible for the successes or failures of human spaceflight.

Foundation: By understanding how people can recognize an opportunity to explore their dreams and challenge their senses, it is hoped that the Galaxy Explorer will recognize a similar ability.

Benchmark for grades 3-5:
Gains knowledge of the key contributors to human spaceflight within the context of the times. Also, the Explorer will appreciate the importance of building upon the successes of others and how teamwork is required when conducting activities in space.

Mission Team Leaders Notes. This mission is conducted with the Galaxy Explorers Key Figures in Human Space Exploration slide show.

Discussion: People often don't realize the effect they can have on the world. Just one person can change the future. And that does not have to be a big scientific discovery, daring achievement, or creating some new technology. Take for example the many people who have determined the future of our exploration of space. People have changed the course of history just by writing popular books or sharing their thoughts with the world.

Slide One
"Jules Verne"

- Jules Verne was born in 1828 in Nantes, France.
- Verne, who wrote such well-known books as *From the Earth to the Moon* (1865) and *A Voyage to the Moon* (1902), is often cited by spaceflight luminaries like Tsiolkovsky and Werhner von Braun as a major source of inspiration.
- Verne was fascinated by the idea of telling stories using science as a way to increase the level of realism, and thus the impact to the reader.
- The genre known as "science fiction" was first used to describe Verne's writings.
- Verne died in 1905.

Slide Two
"Konstantin Tsiolkovsky"

- Konstantin Eduardovich Tsiolkovsky was born in 1857 in Izhevskoye, Russia.
- Tsiolkovsky was particularly inspired by Verne and a fellow Russian Nikolai Fyodorov. Fyodorov developed the ideology known as "cosmism," which held that humanity's true home was not Earth, but space. Tsiolkovsky found the ideology to be compelling, and, after finishing the workday as a math teacher, he preceded to work on space problems in his workshop in Kaluga, Russia.
- Tsiolkovsky correctly forecast the effects of weightlessness on humans, such as the redistribution of body fluids. More importantly, however, Tsiolkovsky introduced what is known as the "Tsiolkovsky Formula," which allows an engineer to determine the amount of fuel needed to boost a payload into orbit. This formula is still used today.
- Tsiolkovsky also developed the idea of the rocket "train," whereby a rocket is composed of stages, each actually a tank with engines. As each stage depletes its fuel, it is discarded, and the overall weight of the rocket is diminished. As a result, less thrust is required to push the vehicle through the atmosphere and into orbit. This design concept is used today.
- Tsiolkovsky died in 1935.

Slide Three
"Robert Goddard"

- Robert Hutchings Goddard was born in 1882 in Worcester, Massachusetts.
- Goddard, often called the "**Father of American Rocketry**," successfully launched the world's first liquid-fueled rocket on March 16, 1926 from Auburn, Massachusetts. Goddard was inspired by the writings of Verne and H.G.Wells. Goddard and Tsiolkovsky never met, but both men independently developed theories about human spaceflight. Goddard, however, actually designed and built rockets. Developing and flying liquid fueled rockets is perhaps the single most identifiable event that brought in the space era.
- He moved to from Massachusetts to New Mexico because the local people in the town were forever teasing him and his family about his rocketry activities. His children suffered at the hands of local bullies and townspeople and police frequently harassed him. Goddard was also ridiculed in the press by professors that claimed he did not know even the most basic aspects of physics because rockets could never travel in space.
- In Roswell, New Mexico, eventually developing larger vehicles and securing hundreds of related patents for his inventions.
- Goddard's rockets were also largely ignored by the U.S. Government, but his activities were known by German rocket team led by Wernher von Braun during World War II. However, he did manage to secure a contract with the Army to provide rockets to assist airplanes when taking off.
- Goddard died in 1945.

Slide Four
"Hermann Oberth"

- Hermann Julius Oberth was born in 1894 in Hermannstadt, Transylvania.
- Oberth was another scientist inspired by the writings of Verne, and dedicated most of his life with the problems of developing efficient and powerful rockets capable of reaching orbit and the planets. He started off studying to be a doctor, but was consumed with the potential of human spaceflight.
- Oberth suggested using rocket-propelled artillery to the German leadership during World War I, but was ignored.
- He did contact Goddard in the 1920s for his input, but Goddard was suspicious of Oberth's intent. At the time, the U.S. considered Germany "war-like" and Goddard was concerned about other people "stealing" his ideas.
- Oberth wrote *The Rocket into Interplanetary Space* in 1923 and soon spread the word about spaceflight throughout Europe. Because Tsiolkovsky's writings were little known until well after his death, and Goddard kept mostly to himself, Oberth's book, and several follow-on works, made more of an impact worldwide.
- Oberth served as a technical advisor for a space film directed by Fritz Lang called *The Girl in the Moon*, the first science fiction film and among the first silent films ever made.
- Oberth had a great influence on Wernher von Braun, and von Braun considered Oberth his mentor.

- Oberth died in 1985.

Slide Five
"Sergei Korolev"

1. Sergei Pavlovich Korolev was born in 1907 in Zhitomir, Russia.
2. Korolev, unlike his rival Wernher von Braun, began his career designing aircraft. During the late 1920s, Korolev began to develop an interest in problems of spaceflight.
3. Recognizing the potential for human spaceflight, Korolev worked with rockets and was eventually tapped by Soviet leader Stalin to obtain information from the German rocket team in the spring of 1945. After Hitler's Germany was defeated, Soviet and American forces looked for and grabbed as much as they could about Wernher von Braun's V-2 rockets, and it was the U.S. that made off with most of it.
4. Korolev managed to work with the V-2 scraps left behind by the Americans, who arrived on the scene first. Stalin, and later Khrushchev, entrusted Korolev to develop missiles to counter the perceived U.S threat. Korolev's answer was eventually the R-7, which is still used in modified form today to launch people and supplies to the International Space Station. Korolev led the team that launched *Sputnik 1*, the first artificial object sent into space, on October 4, 1957. Korolev was also responsible for launching cosmonauts into orbit, including Yuri Gagarin, the first human to enter space (April 12, 1961).
5. Korolev ultimately developed a fascination with sending cosmonauts to Mars, and began developing plans to build a massive rocket. The plans for the rocket, called the *N-1*, was selected to counter the U.S. effort to send astronauts to the Moon. Unfortunately, the *N-1* program faltered soon after Korolev's death in 1966. The Soviets never succeeded at sending humans to the Moon, but came very close.
6. Korolev's efforts were also countered by another team in the Soviet Union. This team was run by Vladimir Chelomei, who developed the *Proton* rocket still in use today. The *Proton* was originally designed to send a crew to the Moon, and later to Mars.
7. The United States succeeded in sending humans to the Moon primarily because of money and good management. The Soviets did not have as much money, and the effort to go to the Moon was pursued by two separate groups. Resources were not managed well, and the Soviets lost the Moon Race in 1969 when the U.S. launched *Apollo 11*.

Slide Six
"Tsien Hsue-Shen"

1. Tsien Hsue-Shen was born in 1911 in Shanghai, China.
2. Tsien studied under Theodor von Karmann at CalTech, then studied at MIT.
3. Worked on rockets at JPL, where he met other key figures in American rocketry.
4. Became an Air Force colonel.
5. During McCarthy communist purges, Tsien was unjustly accused of being a communist. He was deported in 1955.

6. Tsien used his knowledge to erect China's space program. China's first satellite was launched in 1970.
7. Today, China has several different types of launch vehicles, thanks to Tsien's work. In fact, China is on the brink of launching its own astronauts by 2003, and accomplishment that will place China in league with the United States and Soviet Union/Russia as the third nation capable of launching people into space.
8. Tsien is still alive today, and has given presentations about his work from time to time.

Slide Seven
"Bernard Shreiver"

- Bernard Shriever was born in 1910 in Germany.
- As an Air Force officer, Shriever recognized the need for missiles because of the perceived Soviet threat. It was known that the Soviets were building heavy nuclear bombs and would probably try to stick them on top of rockets. In fact, by the mid-1950s, the Sergei Korolev succeeded in designing the R-7 for exactly that purpose. Because the Soviet bombs were so heavy, the R-7 was very robust. U.S. nuclear bombs were much smaller but just as lethal due to more sophisticated technology. The R-7, now called the Soyuz, continues to be the only way for people to reach orbit other than the Space Shuttle.
- He convinced President Eisenhower to forge ahead with a nuclear missile program, and was assigned responsibility for the Atlas program in 1954. The Atlas could not lift as much as the R-7, but it was theoretically powerful enough to send U.S. nuclear bombs to the Soviet Union. Later, the Atlas was configured to carry the Mercury astronauts (except Alan Shepard and Gus Grissom, who flew aboard the Redstone missile). This Atlas eventually led to the family of rockets used today, including the Atlas 5, the newest rocket in the American inventory.
- Shriever and his team successfully developed the Atlas missile, which were deployed beginning in 1961 at Vandenberg Air Force Base, California. The missile was not very effective, however, and was quickly replaced by other missiles. However, NASA converted some for the Mercury and Agena target missions.
- General Shriever still lives today, but leads a quite life away from military and space affairs.

Slide Eight
"Wernher von Braun"

- Wernher von Braun was born in 1912 in Germany
- Wernher von Braun professed to having been inspired by the writings of Jules Verne. He admitted that had it not been for Jules Verne, he might have done something else with his life. He worked with several key rocket pioneers while in his 20s. He was part of an amateur rocket society in Germany similar to those found in the Soviet Union, England, and the United States. Among the people von Braun work closely with is Hermann Oberth.

- Eventually, the German military, then led by Adolph Hitler, became interested in the rocket, particularly as a more robust piece of artillery. Germany immediately set up a division to research and develop rockets in Peenemunde in northern Germany. The division ultimately produced several thousand V-2 rockets.
- Brought to U.S. after fall of Hitler in Operation Paperclip with about 200 other scientists, engineers, and parts. The Soviets managed to get the remaining pieces of hardware and some scientists. Both countries' rocket programs would not have been as far ahead as they are now had it not been for the German V-2.
- Wernher von Braun became a U.S. citizen in 1955, and became a staunch advocate for human spaceflight until his death in 1977. Along with artist Chesley Bonestell, writer Wiley Ley, and producer Walt Disney, von Braun managed to convince most Americans in the 1950s that our future was in space. During this time, science fiction became a staple of literature, television, and film, a fact that helped the cause even more.
- Wernher von Braun headed U.S. human spaceflight efforts from Mercury through Apollo, but died shortly before the first U.S. Space Shuttle flight. Wernher von Braun and Sergei Korolev never met, but it is now accepted that both men were professional rivals that could have easily become fast friends. Both men dreamed of a flight to Mars, and their work was solely to realize this dream at virtually any cost.

Activity

Mission Team Leaders Notes

Mission Team members will create a series of overhead "slides" on themselves. The slides should be written as if the year 2101. A student in the future is writing a history project on famous person who helped to launch the new space era. Prepare several slides (can be paper or clear acetate sheets) that describe the following:

1. Describe your life
2. Describe your contribution to creating the new space era
3. Describe how your contribution effected humanity
4. What was it like living in those times

Have Mission Team members present their slide project to the Mission Team.