Pick Your Space Pioneer

Space Exploration Merit Badge - Requirement 2 | 26 choices on 2 printable pages

Digital PDF: click a pioneer name to open the biography

PICK ONE for your collector's card. Claim the name at Meeting 1 - no duplicate card subjects.

Scout: _____

Then choose FOUR other pioneers you can discuss with your counselor. A pioneer can be a flyer, engineer, programmer, scientist, writer or leader who made a "first" possible.

FOUNDATIONS & ENGINEERING #1

Katherine Johnson

NASA

NASA mathematician | U.S. | 1918-2020

Calculated flight paths for Alan Shepard, John Glenn and Apollo. Before Glenn flew, he specifically asked for Johnson to check the new electronic computer's orbital calculations by hand.

CARD ANGLE: Math that made human spaceflight possible ☐ MY CARD ☐ DISCUSS

FOUNDATIONS & ENGINEERING #2

Margaret Hamilton

NASA

Software engineer | U.S. | born 1936

Led the MIT team that developed Apollo guidance software. Her team designed software that could prioritize critical tasks when the Apollo 11 computer became overloaded during the lunar landing.

CARD ANGLE: How software helped save the Moon landing ☐ MY CARD ☐ DISCUSS

FOUNDATIONS & ENGINEERING #3

Robert H. Goddard

NASA

Rocket pioneer | U.S. | 1882-1945

Built and launched the first liquid-fueled rocket in 1926. He tested pumps, gyroscopes and steerable rocket systems long before spaceflight was practical, despite public ridicule of his ideas.

CARD ANGLE: The experiments behind modern rockets ☐ MY CARD ☐ DISCUSS

FOUNDATIONS & ENGINEERING #4

Konstantin Tsiolkovsky

Britannica

Rocket theorist | Russia | 1857-1935

Published the rocket equation in 1903 and showed mathematically why high-speed rockets need to throw mass backward. He also wrote about multistage rockets and living in space decades before they existed.

CARD ANGLE: The mathematics of reaching space ☐ MY CARD ☐ DISCUSS

FOUNDATIONS & ENGINEERING #5

Sergei Korolev

NASA

Chief rocket designer | Soviet Union | 1907-1966

Directed the program behind Sputnik, the first satellite, and Vostok 1, the first human spaceflight. During his lifetime the Soviet government kept his identity so secret he was known publicly only as the "Chief Designer."

CARD ANGLE: The hidden engineer behind major space firsts ☐ MY CARD ☐ DISCUSS

FOUNDATIONS & ENGINEERING #6

Wernher von Braun

NASA

Rocket engineer | Germany/U.S. | 1912-1977

Led development work that culminated in NASA's Saturn V Moon rocket. His earlier work on Nazi Germany's V-2 program, including its use of forced labor, makes his legacy scientifically important and morally difficult.

CARD ANGLE: Saturn V - and the complicated history behind it ☐ MY CARD ☐ DISCUSS

FIRST FLYERS & ASTRONAUTS #7

Yuri Gagarin

Britannica

Cosmonaut | Soviet Union | 1934-1968

Became the first human in space on April 12, 1961. Vostok 1 completed one orbit of Earth in about 108 minutes, proving a person could launch, experience orbit and return safely.

CARD ANGLE: The first human voyage beyond Earth ☐ MY CARD ☐ DISCUSS

FIRST FLYERS & ASTRONAUTS #8

Alan Shepard

NASA

Astronaut/test pilot | U.S. | 1923-1998

Became the first American in space on Freedom 7 in 1961. Ten years later he commanded Apollo 14, walked on the Moon and famously used a makeshift club to hit golf balls on the lunar surface.

CARD ANGLE: From a 15-minute flight to walking on the Moon ☐ MY CARD ☐ DISCUSS

FIRST FLYERS & ASTRONAUTS #9

John Glenn

NASA

Astronaut/test pilot | U.S. | 1921-2016

Became the first American to orbit Earth aboard Friendship 7 in 1962. He returned to space on the shuttle Discovery in 1998 at age 77, becoming the oldest space traveler at that time.

CARD ANGLE: Two spaceflights separated by 36 years ☐ MY CARD ☐ DISCUSS

FIRST FLYERS & ASTRONAUTS #10

Neil Armstrong

NASA

Astronaut/test pilot | U.S. | 1930-2012

Commanded Apollo 11 and became the first person to step onto the Moon in 1969. Before NASA he flew experimental aircraft as a test pilot; as a youth he earned the Boy Scouts' Eagle Scout rank.

CARD ANGLE: Test pilot, Eagle Scout and first Moon walker ☐ MY CARD ☐ DISCUSS

FIRST FLYERS & ASTRONAUTS #11

Gus Grissom

NASA

Astronaut/test pilot | U.S. | 1926-1967

One of the original Mercury Seven, Grissom flew Mercury-Redstone 4 and commanded Gemini 3. He and crewmates Ed White and Roger Chaffee died in the Apollo 1 ground-test fire, leading to major spacecraft safety changes.

CARD ANGLE: Exploration, risk and lessons from Apollo 1 ☐ MY CARD ☐ DISCUSS

FIRST FLYERS & ASTRONAUTS #12

Valentina Tereshkova

Britannica

Cosmonaut | Soviet Union | born 1937

Became the first woman in space aboard Vostok 6 in 1963. A former textile worker and amateur parachutist, she spent nearly three days in orbit and remains the only woman to have flown a solo space mission.

CARD ANGLE: The first woman - and a solo mission ☐ MY CARD ☐ DISCUSS

FIRST FLYERS & ASTRONAUTS #13

Sally Ride

NASA

Astronaut/physicist | U.S. | 1951-2012

Became the first American woman in space aboard Challenger in 1983. A physicist, she later served on the investigations of both the Challenger and Columbia accidents and became a major science-education advocate.

CARD ANGLE: Astronaut, physicist and safety investigator ☐ MY CARD ☐ DISCUSS

HOW TO CHOOSE YOUR FAVORITE

- Pick the person whose story you would actually enjoy telling.
- Look for a "first," a hard problem, a surprising fact or a major risk.
- Your card can focus on one achievement - it does not need their entire life.

Requirement 2: design one collector's card about your favorite space pioneer, share it, and discuss four other space pioneers with your counselor.

Pick Your Space Pioneer

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Digital PDF: click a pioneer name to open the biography

Continue your choices: mark one total as MY CARD and at least four total as DISCUSS.

Use the "Card angle" as a starting idea - you can choose any part of the pioneer's life or contribution that interests you.

FIRST FLYERS & ASTRONAUTS #14

Guion Bluford — *NASA*

Astronaut/aerospace engineer | U.S. | born 1942

Became the first African American in space aboard Challenger in 1983. An Air Force pilot and aerospace engineer, he flew four shuttle missions and helped establish a new era of more diverse astronaut crews.

CARD ANGLE: Engineering, flying and a barrier-breaking first ☐ MY CARD ☐ DISCUSS

FIRST FLYERS & ASTRONAUTS #15

Mae Jemison — *NASA*

Astronaut/physician | U.S. | born 1956

Became the first African American woman in space aboard Endeavour in 1992. She is also a physician who served in the Peace Corps and has worked to connect science, medicine, technology and education.

CARD ANGLE: A career combining medicine and spaceflight ☐ MY CARD ☐ DISCUSS

FIRST FLYERS & ASTRONAUTS #16

Ellen Ochoa — *NASA*

Astronaut/engineer | U.S. | born 1958

Became the first Hispanic woman in space in 1993. An electrical engineer and optical-systems researcher, she flew four shuttle missions and later became director of NASA's Johnson Space Center.

CARD ANGLE: From engineering laboratory to NASA leadership ☐ MY CARD ☐ DISCUSS

FIRST FLYERS & ASTRONAUTS #17

Eileen Collins — *Britannica*

Astronaut/test pilot | U.S. | born 1956

Became the first woman to pilot a Space Shuttle in 1995 and the first woman to command one in 1999. She later commanded the 2005 Return to Flight mission after the Columbia accident.

CARD ANGLE: Breaking barriers in spacecraft command ☐ MY CARD ☐ DISCUSS

MISSION BUILDERS & EXPLORERS #18

Steve Squyres — *NASA*

Planetary scientist | U.S. | born 1956

Led the science team for NASA's Spirit and Opportunity Mars rovers. Each rover was designed for about 90 Martian days, but Spirit worked for years and Opportunity explored Mars for nearly fifteen years.

CARD ANGLE: How a 90-day rover mission lasted for years ☐ MY CARD ☐ DISCUSS

MISSION BUILDERS & EXPLORERS #19

Homer Hickam — *HomerHickam.com*

Engineer/author | U.S. | born 1943

As a teenager in a West Virginia coal town, Hickam and his friends taught themselves to build rockets - the story told in Rocket Boys and the film October Sky. He later became a NASA engineer.

CARD ANGLE: A teenager building rockets on the way to NASA ☐ MY CARD ☐ DISCUSS

VISIONARIES #20

Jules Verne — *Britannica*

Novelist | France | 1828-1905

His 1865 novel From the Earth to the Moon imagined a crewed Moon voyage more than a century before Apollo. Some details were remarkably suggestive of the future, including a Florida launch region and ocean recovery.

CARD ANGLE: How imagination anticipated real spaceflight ☐ MY CARD ☐ DISCUSS

VISIONARIES #21

Arthur C. Clarke — *Britannica*

Writer/futurist | U.K. | 1917-2008

In 1945 Clarke described how satellites in geostationary orbit could relay communications around Earth. The concept became fundamental to modern satellite communications; he later wrote 2001: A Space Odyssey.

CARD ANGLE: Predicting the communications-satellite age ☐ MY CARD ☐ DISCUSS

VISIONARIES #22

Robert A. Heinlein — *Britannica*

Science-fiction writer | U.S. | 1907-1988

Heinlein wrote technically minded stories about rockets, lunar travel and future societies when human spaceflight was still imaginary. His books helped make space travel feel achievable to generations of young readers.

CARD ANGLE: How stories can inspire engineers and explorers ☐ MY CARD ☐ DISCUSS

COMMERCIAL SPACE #23

Burt Rutan — *Britannica*

Aerospace designer | U.S. | born 1943

Designed SpaceShipOne, which in 2004 became the first privately funded crewed spacecraft to reach space and won the Ansari X Prize. Its air-launched, reusable approach challenged traditional spacecraft design.

CARD ANGLE: The first privately funded crewed spacecraft ☐ MY CARD ☐ DISCUSS

COMMERCIAL SPACE #24

Elon Musk — *Britannica*

SpaceX founder | U.S. | born 1971

Founded SpaceX in 2002. Falcon 9 made landing and reflying orbital-class boosters a regular part of launch operations, while Dragon spacecraft began carrying cargo and astronauts to the International Space Station.

CARD ANGLE: Making orbital rocket reuse routine ☐ MY CARD ☐ DISCUSS

COMMERCIAL SPACE #25

Jeff Bezos — *Britannica*

Blue Origin founder | U.S. | born 1964

Founded Blue Origin in 2000 with a long-term goal of expanding human activity in space. The company developed reusable New Shepard suborbital vehicles and the much larger New Glenn orbital rocket.

CARD ANGLE: A different strategy for reusable spaceflight ☐ MY CARD ☐ DISCUSS

COMMERCIAL SPACE #26

Richard Branson — *Britannica*

Virgin Galactic founder | U.K. | born 1950

Founded Virgin Galactic to pursue commercial suborbital human spaceflight. In 2021 he flew aboard VSS Unity on a suborbital mission, becoming one of the company founders to fly on his own space system.

CARD ANGLE: Turning suborbital flight into a passenger experience ☐ MY CARD ☐ DISCUSS

FOR EACH OF YOUR FOUR OTHER PIONEERS

- Know what they did and why it mattered.
- Know one mission, invention, discovery or important event.
- Have one memorable fact you can explain in your own words.