

HISTORY OF SPACE EXPLORATION TIMELINE

Name _____ Class _____ Date _____

Space Exploration History is a fascinating topic! This timeline will help you to sort out the most important events! Fill in the missing information and answer the questions below.

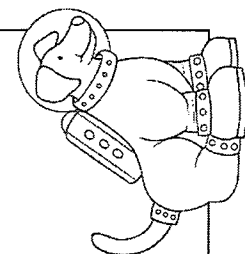
January 31, 1958
Explorer 1 Takes Off and the Van Allen Belt is Discovered
 Name of the "father of rocket technology": _____
 How far above Earth was the Explorer 1? _____
 How long was it in space? _____
 What was the big discovery associated with the Explorer 1? _____

January 31, 1961
 Event: _____
 Name of the chimp: _____
 What did the chimp do onboard? _____
 How long was the chimp in space? _____

Date: _____
First American in Orbit
 Name of astronaut: _____
 How many times did he orbit? _____
 What was he the first American ever to do? _____
 When did he return to space? _____

1950's

Date: _____
First Animal in Orbit
 Name and type of animal: _____
 What happened to her? _____



_____ 1958
NASA Created
 What does NASA stand for? _____
 Under which U.S. President was NASA created? _____

1960's

April 12, 1961
 Event: _____
 Name of first human in space: _____
 What signified that the Soviets were ahead in the Space Race? _____
 How did he make his landing? _____

Date: **June 16, 1963**
 Event: _____
 Name of cosmonaut: _____
 How many times did she orbit? _____
 What became her title in the Soviet Union? _____

Date: _____
First American Space Walk

Name of the astronaut:

How did the astronaut move?

How long was the space walk?

What was he wearing for protection?

Date: _____

Apollo 11: First Manned Moon Landing

Name of the astronauts who walked on the moon:

What was the name of the place where the Eagle landed?

What famous quote was spoken?

Date: July 26 - August 7, _____

Apollo 15: The Rover Mission

What were the nicknames of the lunar vehicle?

What is a rille?

How far and for how long did the astronauts travel in the rover?

Date: July 15 - 24, 1975

Event: _____

What was the joint mission?

What did the two crews do during the mission?

Date: December 21 - 27, 1968

Event: _____

The astronauts were the first humans to:

What two things was this mission the first to do?

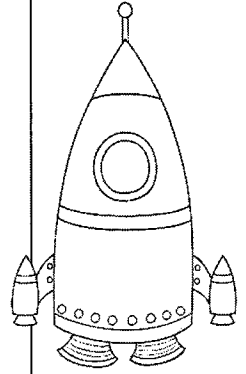
What funny statement was made after the lunar orbit?

Date: April 11 - 17, 1970

Event: _____

What was the mission supposed to do?

How did the astronauts survive the situation?



Date: May 14, 1973

Event: _____

What was the name of the ship?

What happened during the launch?

How long was the station in orbit?

Date: _____

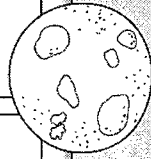
Viking 1 Explores Surface of Mars

What is the name of the area where the Viking 1 landed?

Why is Mars's surface the color red?

What two other things did the Viking mission confirm about Mars?

1970's



Date: August 20 and September 22, 1977

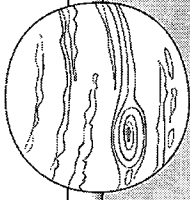
Event: _____

What were the Voyagers designed to do?

What was important about the timing of the launches?

What happened to Voyager 1 in 2012?

What is included onboard both Voyagers?



1980's

Date: _____

First American Woman in Space

How long had it been since the Soviets had first put a woman in space?

What was the name of the first American woman in space?

What were her duties on board?



Date: February 7, 1984

Event: _____

Who were the first astronauts to perform an untethered space walk?

How did they propel themselves?

How far did they travel away from the ship?

1990's

Date: _____

Challenger Explodes

Who was killed in the explosion?

What happened to the shuttle program as a result of the explosion?

Date: June 29, 1995

Event: _____

What three milestones were represented by this mission?

What was the goal of this series of missions?

Date: _____

Hubble Space Telescope Begins Observation

What size is the Hubble Space Telescope?

What flaw did the telescope have?

What major breakthrough was made because of the Hubble?

Date: _____

Mars Pathfinder Lands

How long did it take to reach Mars?

What was the name of the

Pathfinder's rover and how long did it rove?

What were many Martian rocks named after?

What did the rover data suggest about Mars?

Date: December 4 - 15, 1998

Event: _____

Where does the ISS orbit?

Can you see the ISS from the Earth's surface?

How many times per day does the ISS orbit?

How many countries have visited the ISS?

Date: _____

Cassini-Huygens Arrives at Saturn

How long did it take the Cassini spacecraft to reach Saturn's rings?

Where did the Huygens probe explore?

When and why was the Cassini spacecraft purposefully crashed into Saturn?

Date: March 7, 2009

Event: _____

What is Kepler's mission?

What is the habitable zone?

How many planets has Kepler discovered?

What is a circumbinary system and where has this been found?

Date: _____

Columbia Tragedy Upon

Re-Entry

Where did the Columbia shuttle explode?

Why was the shuttle in space?

How many astronauts died?

Date: _____

Mars Reconnaissance Orbiter Enters Orbit

How long did it take the Orbiter to reach Mars?

What did the orbiter do for 5 months once it reached the planet?

What types of research equipment are on the Orbiter?

What kind of data do we receive from the Orbiter?

Date: August 6, 2012

Event: _____

What is the goal of the rover?

How was the rover placed on the planet?

When is the mission's end date?

Date: _____

New Horizons

Spacecraft Approaches

Pluto

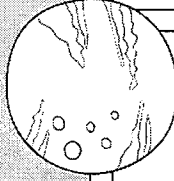
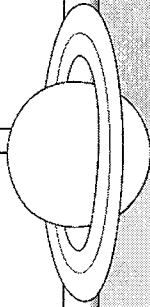
How many miles did the spacecraft travel?

What was this spacecraft the fifth spacecraft ever to do?

What is the Kuiper Belt?

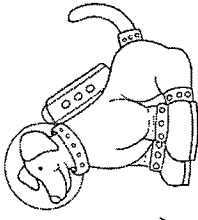
2010's

2000's



Now & the Future...

What's happening in space exploration?



Directions: Add at least 3 events to this section of the timeline (to 2015+) by researching online. Include the dates and key facts about each event or planned event. In the box at the bottom of the page, list the sources that you use to find your information.

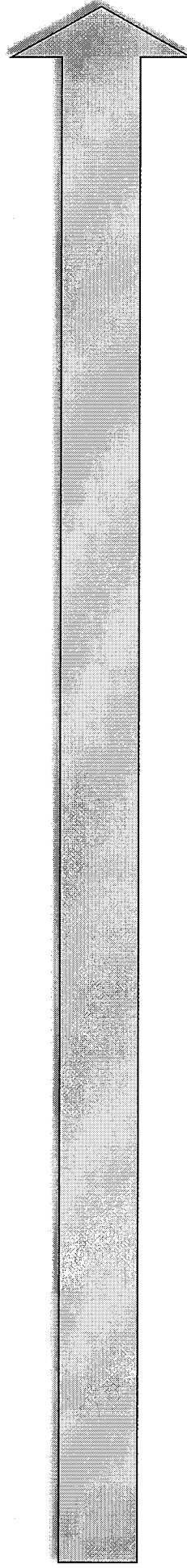
Start with one of these websites, or find one on your own!

<http://www.seasky.org/skyhtml>

<http://www.bbc.co.uk/science/space/>

<http://www.spacescoop.org/en/>

<https://www.space.com/>



Sources:

October 4, 1957

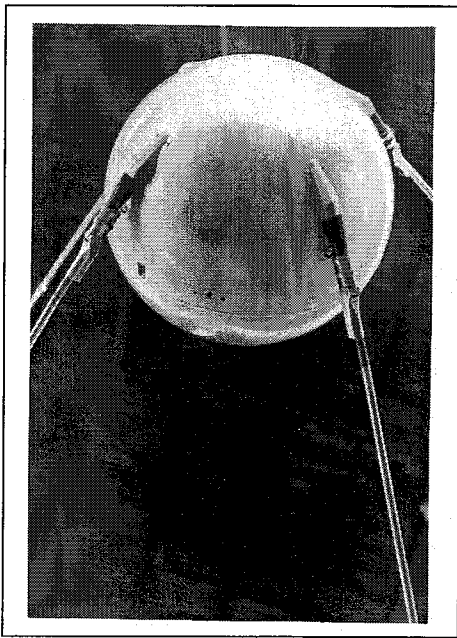
SPUTNIK 1 LAUNCHES

The Soviet Union launches the first man-made object into space—a smallish satellite created with the help of a rocket designer Sergei Korolev. The satellite's name was Sputnik 1 and it was an aluminum sphere the size of a beach ball and weighing about 184 pounds (83.5 kilograms).

For 21 days, scientists and amateur radio operators around the world were able to hear a beeping sound coming from Sputnik's transmitter.

Sputnik's launch, referred to by some in the United States as "the Sputnik crisis," turned out to be the start of the 'Space Race'.

A month later, on November 3, Sputnik 2 launched, along with Earth's first living creature to go into space—a dog named Laika, Russian for "barker." Monitoring equipment showed the launch had minimal effects on Laika, and the weightlessness had no adverse effects. However, Laika did not survive the return to Earth.



History changed on Oct. 4, 1957, when the Soviet Union successfully launched Sputnik from the Baikonur Cosmodrome in Kazakhstan. The world's first artificial satellite was about the size of a beach ball, about 23 inches in diameter and weighing less than 190 pounds. It took about 98 minutes to orbit the Earth on its elliptical path. That launch ushered in new political, military, technological, and scientific developments. While the Sputnik launch was a single event, it marked the start of the Space Age and the U.S.-U.S.S.R. Space Race.

Image and Caption Credit: NASA

© Sunrise Science

January 31, 1958

EXPLORER 1 TAKES OFF AND THE VAN ALLEN BELT IS DISCOVERED

Rocket scientist Wernher von Braun, a German-born American scientist who is known as the father of rocket technology, was given permission to build a satellite and rocket launcher following the Soviet Sputnik launches.

Von Braun had the help of the University of Iowa's James Van Allen and the director of the Jet Propulsion Laboratory, William Pickering.

On January 31, 1958, the United States launched Explorer 1, a 31-pound (14-kilogram) bullet-shaped satellite. Explorer broke the altitude records of Sputnik 1 and 2, traveling 1,529 miles (2,461 kilometers) into space. It remained in orbit until 1967.

A Geiger tube radiation detector, designed by Van Allen and carried onboard Explorer, discovered a region, or belt, of intense radiation encircling Earth. The discovery contributed to the International Geophysical Year, a worldwide venture of scientists from 66 countries who set out to research the Earth's climate and atmosphere. The region is still referred to as the Van Allen belt.



A model of Explorer 1, held by JPL's Director William Pickering, scientist James Van Allen and rocket pioneer Wernher von Braun (from left to right). The team was gathered at a news conference at the National Academy of Sciences in Washington, D.C., to announce the satellite's successful launch. America's first satellite, Explorer 1 had launched a few hours before.

Image and Caption Credit: NASA/JPL-Caltech

© Sunrise Science

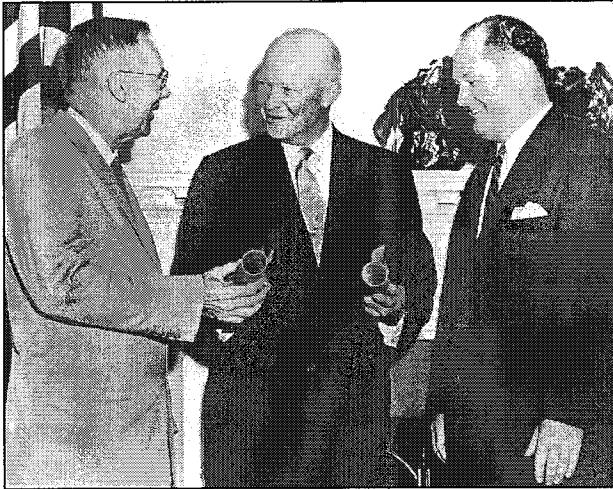
October 1, 1958

NASA CREATED

In response to the Soviet Union's launch of Sputnik, President Dwight D. Eisenhower commissions the National Aeronautics and Space Administration (NASA), an agency for research on spaceflight and aeronautics.

The National Advisory Committee on Aeronautics (NACA), the agency for flight technology research started by President Woodrow Wilson in 1915, became a part of NASA. It supplied a workforce of about 8,000 people.

On October 7, six days after its creation, NASA initiated Project Mercury, the first American human spaceflight program.



NASA was created on Oct. 1, 1958, to perform civilian research related to space flight and aeronautics. President Dwight D. Eisenhower commissioned Dr. T. Keith Glennan, right, as the first administrator for NASA and Dr. Hugh L. Dryden as deputy administrator.

Image and Caption Credit: NASA

© Sunrise Science

April 12, 1961

FIRST HUMAN IN SPACE

Soviet cosmonaut Yuri Gagarin, flying aboard Vostok 1, is the first person in space.

Fifteen minutes into flight, a monitoring post off Alaska detected a conversation between Gagarin and the Baikonur launch facility in Soviet Kazakhstan. The space-to-Earth conversation confirmed the Soviet Union had again beaten the United States in the race to space.

Vostok 1 orbited Earth one time before Gagarin parachuted safely back after being in space for one hour and 48 minutes.

Gagarin never flew to space again, but remained an important contributor to the Soviet space program until his death in 1968 during a routine training flight.



Yuri Gagarin from the Soviet Union was the first human in space. His vehicle, Vostok 1 circled Earth at a speed of 27,400 kilometers per hour with the flight lasting 108 minutes. Vostok's reentry was controlled by a computer. Unlike the early U.S. human spaceflight programs, Gagarin did not land inside of a capsule. Instead, he ejected from the spacecraft and landed by parachute.

Image and Caption Credit: NASA

© Sunrise Science

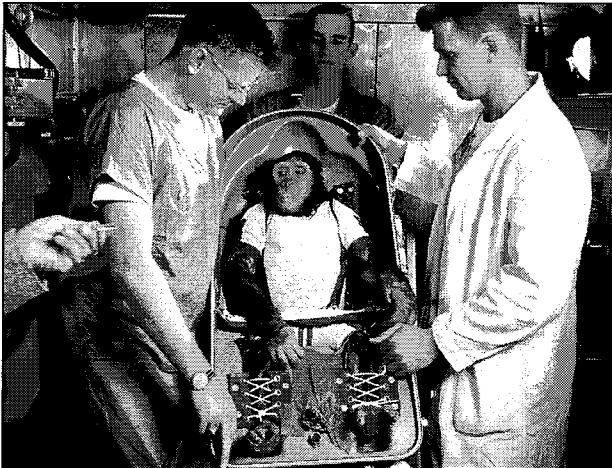
January 31, 1961

USA PUTS CHIMP IN SPACE

Ham, a chimpanzee, is sent to space aboard U.S. test flight Mercury 2.

During the suborbital flight, Ham successfully pulled a lever with his right hand when prompted by a white light, and he pulled a lever with his left hand when prompted by a blue light.

After reaching an altitude of about 157 miles (253 kilometers), the Mercury capsule descended to Earth and splashed into the Atlantic Ocean. Ham was rescued, unharmed. He had been in space for about 16.5 minutes.



A three-year-old chimpanzee, named Ham, in the biopack couch for the MR-2 suborbital test flight. Ham's training took place, in part, at Cape Canaveral's Hangar S.

On Jan. 31, 1961, a Mercury-Redstone launched from Cape Canaveral carrying the Ham over 400 miles down range in an arching trajectory that reached a peak of 158 miles above the Earth. Ham performed his lever-pulling tasks well in response to flashing lights.

NASA used chimpanzees and other primates to test the Mercury capsule before launching the first American astronauts.

Image and Caption Credit: NASA

© Sunrise Science

February 20, 1962

FIRST AMERICAN IN ORBIT

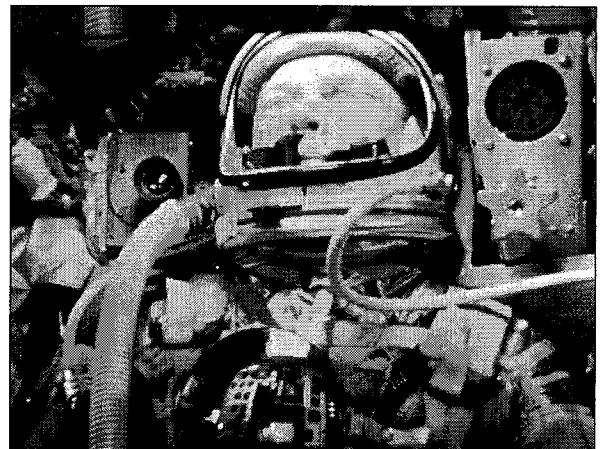
Astronaut John Glenn is the first U.S. astronaut to orbit Earth.

Glenn went around Earth three times in four hours and 55 minutes aboard Friendship 7. Prior to the launch, Glenn purchased a \$45 camera at a drugstore. He was the first American to take a photo of Earth from space.

Encouraged by President Kennedy to run for election, Glenn went on to become a U.S. Senator for his home state of Ohio, serving from November 1974 to January 1999.

On October 28, 1998, Glenn, at the age of 77, returned to space on a nine-day mission aboard the space shuttle Discovery. The crew members spent part of their time investigating spaceflight and the aging process.

On the first day in flight, shuttle commander Curtis Brown said, "Let the record show that John has a smile on his face and it goes from one ear to the other one, and we haven't been able to remove it yet."



A camera onboard the "Friendship 7" Mercury spacecraft photographs astronaut John H. Glenn Jr. during his historic flight on February 20, 1962.

Image and Caption Credit: NASA

© Sunrise Science

June 16, 1963

FIRST WOMAN IN SPACE

Aboard the last Vostok flight, Soviet cosmonaut Valentina Tereshkova, a former textile worker, is the first woman in space.

Tereshkova completed 48 orbits in 71 hours aboard Vostok 6.

Tereshkova, an amateur parachutist, had been selected from four female cosmonaut finalists. Nikolai Kamanin, the director of Cosmonaut Training and deputy chief of the Air Force, described her as "Gagarin in a skirt." (Referring to Yuri Gagarin, the first human in space).

Soviet leader Nikita Krushchev had beaten the Americans again by not only putting the first woman in space, but also having her out there longer than all the U.S. astronauts at the time put together.

Tereshkova was honored with the title Hero of the Soviet Union. She never went into space again, but became a spokesperson for her country.



Soviet cosmonaut Valentina Vladimirovna Nikolayevna-Tereshkova looks over the Apollo Command Module on exhibit in Building 2 during a tour of the Johnson Space Center in 1977 with astronaut Alan Bean. Tereshkova was the first woman to fly in space, launching on Vostok 6 on June 16, 1963.

Image and Caption Credit: NASA on The Commons

© Sunrise Science

June 3, 1965

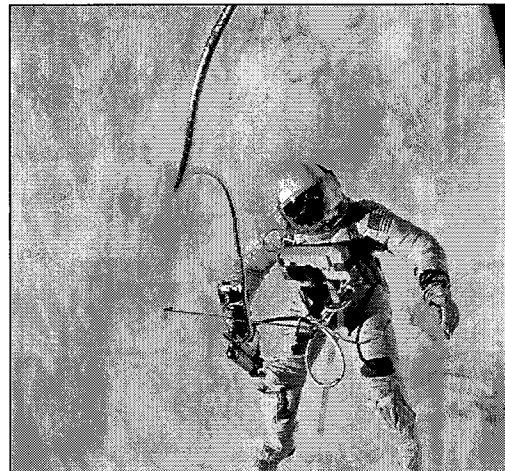
FIRST AMERICAN SPACE WALK

Astronaut Edward H. White executes the first American walk in space from Gemini GT-4.

White was attached to an oxygen cord 25 feet (7.5 meters) long and used a handheld maneuvering unit that ejected nitrogen gas to propel himself around (Newton's Third Law!). He spent about 23 minutes floating in space and taking pictures of Earth.

White described the end of his space walk as "the saddest moment of his life."

Early Bird, the world's first commercial communications satellite, broadcast White's spacewalk to the U.S. and 12 European nations. Millions tuned in by radio and television.



Astronaut Edward H. White II, pilot for the Gemini-Titan 4 (GT-4) spaceflight, floats in the zero-gravity of space during the third revolution of the GT-4 spacecraft. White wears a specially designed spacesuit. His face is shaded by a gold-plated visor to protect him from unfiltered rays of the sun. In his right hand he carries a Hand-Held Self-Maneuvering Unit (HHSMU) that gives him control over his movements in space. White also wears an emergency oxygen chest pack; and he carries a camera mounted on the HHSMU for taking pictures of the sky, Earth and the GT-4 spacecraft. He is secured to the spacecraft by a 25-foot umbilical line and a 23-foot tether line. Both lines are wrapped together in gold tape to form one cord.

Astronaut James A. McDivitt, command pilot, remained inside the spacecraft during the extravehicular activity (EVA).

Astronaut Edward H. White II died in the Apollo/Saturn 204 fire at Cape Kennedy on Jan. 27, 1967.

Image and Caption Credit: NASA

© Sunrise Science

December 21 - 27, 1968

APOLLO 8: FIRST LUNAR ORBIT AND THE 'DARK SIDE' OF THE MOON

The Apollo 8 crew (Frank Borman, James A. Lovell, Jr., and William A. Anders) flew the first lunar (moon) orbit mission. The men became the first people to see the backside of the moon and Earth in its entirety.

The flight was the first to go beyond Earth's gravitational field and be under the influence of the moon's gravity. It was also the first to launch using the Saturn V rocket, designed by the director of the NASA Marshall Space Flight Center, Wernher von Braun, and, to this day, the most powerful rocket ever built.

Considering the day of the year, after the crew made it around the moon, Lovell radioed, "Please be informed there IS a Santa Claus."

The successful six-day mission, televised to the world, indicated the United States' lead in the Space Race.



Taken aboard Apollo 8 by William (Bill) Anders, this iconic picture shows Earth peeking out from beyond the lunar surface as the first crewed spacecraft circumnavigated the Moon.

Image and Caption Credit: NASA

© Sunrise Science

July 20, 1969

APOLLO 11: FIRST MANNED MOON LANDING

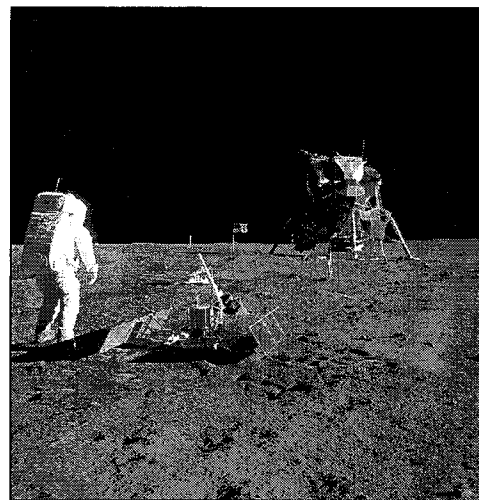
Astronaut Neil A. Armstrong, with the help of astronaut Edwin E. "Buzz" Aldrin, Jr., pilots the lunar module, Eagle, to the moon from Apollo 11's command module.

The Eagle landed safely on the moon in the Sea of Tranquility.

Six and a half hours later, Armstrong stepped onto the surface of the moon and proclaimed, "That's one small step for a man, one giant leap for mankind."

Aldrin followed Armstrong, and the two spent almost 90 minutes on the moon conducting science experiments, planting a U.S. flag, and speaking to President Nixon on the phone.

During the mission, pilot Michael Collins remained in the Apollo 11 ship.



On July 20, 1969, America's Apollo 11 landed on the moon, making history as the first humans set foot on another world.

Lunar Module pilot Buzz Aldrin was photographed during the Apollo 11 extravehicular activity on the moon by mission commander Neil Armstrong. Aldrin had just deployed the Early Apollo Scientific Experiments Package. In the foreground is the Passive Seismic Experiment Package; beyond it is the Laser Ranging Retro-Reflector (LR-3); in the far right background is the Lunar Module "Eagle."

Image and Caption Credit: NASA

© Sunrise Science

April 11 - 17, 1970

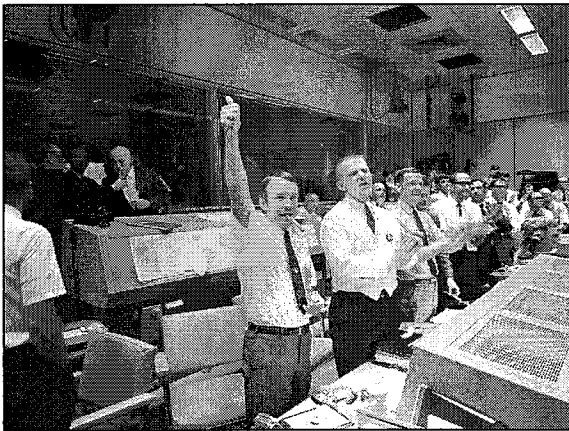
APOLLO 13: NEAR TRAGEDY

The Apollo 13 crew (James A. Lovell, Jr., John L. Swigert, Jr., and Fred W. Haise, Jr.) take off on April 11 with a mission to make a lunar landing.

But 56 hours into flight, an oxygen tank ruptured and damaged systems in the service module where the main engine, fuel cells, water, and other systems and supplies were located.

The astronauts survived by completing a circle around the moon while living in the lunar module, Aquarius. The crew had to ration oxygen and power to survive for 95 hours inside Aquarius, originally made to support two people for 50 hours, before abandoning the Aquarius module in space and landing in the Pacific Ocean in the command module, Odyssey.

The 1995 film Apollo 13, directed by Ron Howard, marked the 25th anniversary of Apollo 13's flight.



Three of the four Apollo 13 Flight Directors applaud the successful splashdown of the command module "Odyssey" while Dr. Robert R. Gilruth, Director, Manned Spacecraft Center (MSC), and Dr. Christopher C. Kraft Jr., MSC Deputy Director, light up cigars (upper left). The Flight Directors are from left to right: Gerald D. Griffin, Eugene F. Kranz and Glynn S. Lunney.

Image and Caption Credit: NASA

© Sunrise Science

July 26 - August 7, 1971

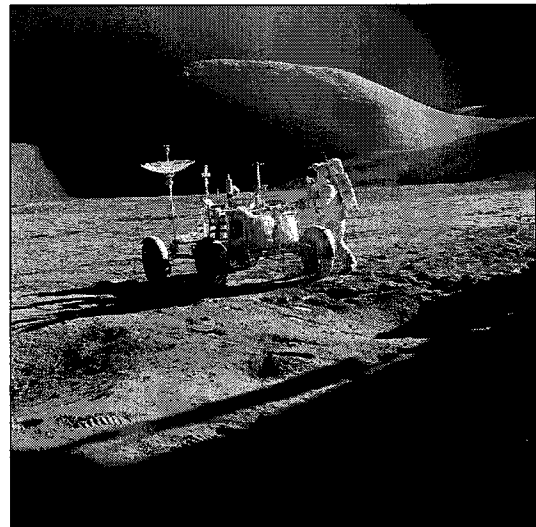
APOLLO 15: THE ROVER MISSION

Astronauts David R. Scott and James B. Irwin are the first to use the lunar rover vehicle, nicknamed the "Rover" and "the moon buggy".

The Rover, a four-wheeled electric car, took the astronauts over an area of the moon known as Hadley Rille. A rille is a long, canal-like depression in the moon's surface. The site is next to the moon's Appennine Mountains.

Scott and Irwin traveled 17 miles (27 kilometers) over three days while astronaut Alfred M. Worden remained in Apollo 15's command module.

The crew brought back a sample of lunar crust, called the Genesis Rock, along with 173 pounds (78 kilograms) of other moon rocks.



Astronaut James B. Irwin, lunar module pilot, works at the Lunar Roving Vehicle during the first Apollo 15 lunar surface extravehicular activity at the Hadley-Appennine landing site. The shadow of the Lunar Module "Falcon" is in the foreground. This view is looking northeast, with Mount Hadley in the background. The photograph was taken by astronaut David R. Scott, commander. Image and Caption Credit: NASA

© Sunrise Science

May 14, 1973

FIRST AMERICAN SPACE STATION

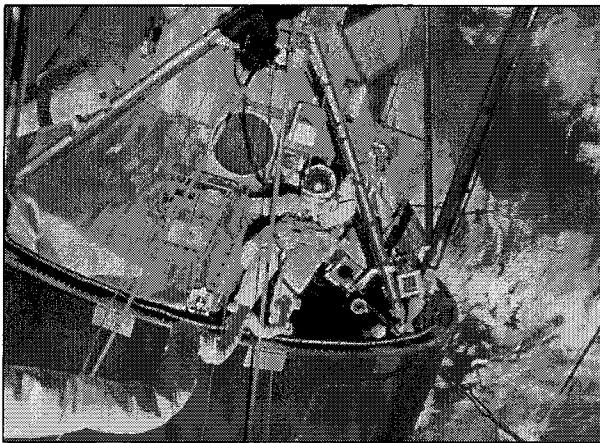
Skylab, the first U.S. experimental space station, launches almost two years after Salyut 1, the Soviet space station.

Sixty-three seconds into the launch, the hundred-ton (91 metric tons) orbital workshop lost its meteor shield, which was supposed to protect the station from the sun's rays. Skylab still achieved a near-circular orbit and the desired altitude of 270 miles (434.5 kilometers), but it had to undergo serious repairs to become habitable.

During a series of space walks, Skylab's second crew deployed a solar shield parasol, which eventually cooled the station to a temperature at which the crew could occupy it.

Astronauts occupied Skylab for six of the 75 months it was in orbit. The three separate crews traveled 70.5 million miles (113.5 million kilometers) over the 171 days they were onboard.

Debris from Skylab's return to Earth, in July 11, 1979, landed in a sparsely populated section of Australia. NASA was publicly criticized for putting people in danger. Hard hats were sold that read, "Skylab Survival Kits."



Scientist-astronaut Edward G. Gibson has just exited the Skylab extravehicular activity hatchway. Astronaut Gerald P. Carr, Skylab 4 commander, took this picture during the final Skylab spacewalk that took place on Feb. 3, 1974. Carr was above on the Apollo Telescope Mount when he shot this frame of Gibson.

Image and Caption Credit: NASA

© Sunrise Science

July 15 - 24, 1975

JOINT U.S.-SOVIET MISSION

The United States and Soviet Union work together to create the Apollo-Soyuz Test Project, the first international human space operation.

The project was designed to test the compatibility of docking two different systems during a meet-up in space. This mission opened up the possibility for an international space rescue.

A universal docking module, with both Apollo and Soyuz docking features, was created by NASA to connect the two spacecraft. The Apollo crew, Thomas Stafford, Vance Brand, and Donald "Deke" Slayton, carried the docking module with them into space.

On July 17, the spacecraft docked. On live TV, the two crews shook hands.

The crews visited each other's spacecraft and performed joint experiments for two days. The Soyuz crew, Aleksei Leonov and Valeri Kubasov, undocked on July 21. The U.S. crew returned to Earth on July 24..



The Apollo-Soyuz Test Project would send NASA astronauts Tom Stafford, Donald K. "Deke" Slayton and Vance Brand in an Apollo Command and Service Module to meet Russian cosmonauts Aleksey Leonov and Valeriy Kubasov in a Soyuz capsule. A jointly designed, U.S.-built docking module fulfilled the main technical goal of the mission, demonstrating that two dissimilar craft could dock in orbit. But the human side of the mission went far beyond that.

Image and Caption Credit: NASA

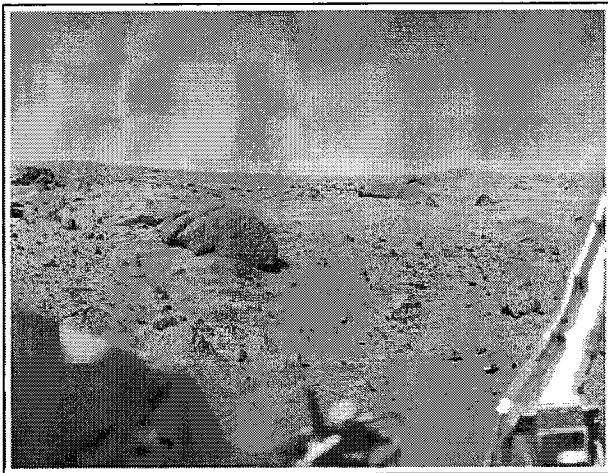
© Sunrise Science

July 20, 1976

VIKING 1 EXPLORES SURFACE OF MARS

Viking 1 completes the first successful soft landing on Mars. It landed on the western slope of Chryse Planitia, or the Plains of Gold. Within minutes, its cameras were sending images of Mars to Earth.

Viking 1 and Viking 2, which landed on September 3, 1976, confirmed the reason for the red on Mars's surface (the soil contains oxidized iron), the dryness of Mars's surface (drier than any of Earth's deserts), the carbon dioxide makeup of Mars's atmosphere (making it unsuitable for humans), and the existence of nitrogen, oxygen, carbon, and argon—elements that are required to sustain life.



The Viking 1 Lander and Orbiter were launched from a Titan IIIE-Centaur and traveled towards Mars. They separated when they reached the planet and the Lander made its descent to the Martian surface. For nineteen minutes, the team at the Jet Propulsion Laboratory (JPL) waited anxiously for a transmission. The team witnessed the first images of the Martian surface coming in at 16 kilobits per second. Operations of the Viking 1 ceased in 1983.

Image and Caption Credit: NASA

© Sunrise Science

August 20
and September 5, 1977

VOYAGERS 1 AND 2 LAUNCHED TOWARDS OUTER SOLAR SYSTEM

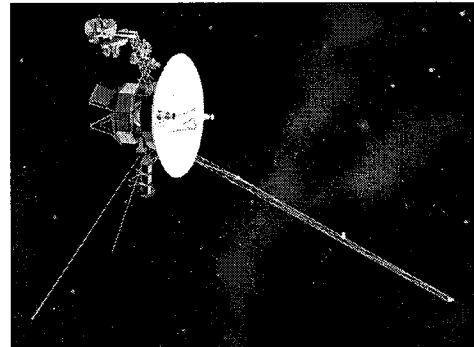
Twin spacecraft Voyager 1 and 2 are designed to conduct close-up studies of Saturn and Jupiter.

Voyager 1 was launched second because its route to Jupiter was more direct. It arrived on March 5, 1979, four months before Voyager 2.

The Voyagers were timed to arrive during a rare planetary alignment. The giant planets (Jupiter, Saturn, Uranus, and Neptune) were aligned so the spacecraft used the planets' gravitational fields to blast from one to the other like a slingshot! Without the alignment, which only occurs every 176 years, the probes' trips would have taken at least 30 years.

The Voyagers are still transmitting today. Voyager 1 reached interstellar space, the region between stars, in August 2012. Voyager 2's path included Uranus and Neptune and so it is further behind and has yet to reach interstellar space.

On both Voyagers, NASA included a metal plaque and gold-plated musical record containing messages, images, music, and natural sounds from Earth in case extraterrestrials come upon them.



Voyager 1 and Voyager 2 launched from NASA's Kennedy Space Center and traveled to explore the outer planets. Due to both Voyagers' successful encounters with Jupiter and Saturn, the mission was extended to include Neptune and Uranus in the mid 1980's. After their encounters with the outermost planets, both Voyagers moved towards the edge of our solar system. Voyager 1 is further from the Earth than its counterpart at about 18 billion kilometers away; a signal from Voyager 1 takes over 34 hours round trip. Voyager 1 became the first man made object to exit the solar system in August 2012 and is still supported by the Deep Space Network today.

Image and Caption Credit: NASA

© Sunrise Science

June 18 - 24, 1983

FIRST AMERICAN WOMAN IN SPACE

Twenty years after Valentina Tereshkova entered space, astronaut Sally K. Ride is the first U.S. woman in space aboard the shuttle Challenger.

Ride, a teaching assistant and researcher in laser physics at Stanford, was one of three mission specialists on the flight. The mission was the first to have a crew of five.

Ride served as a flight engineer and took part in the deployment of three satellites. She went on a second Challenger mission to space in October 1984.



Ride, shown here floating in the Challenger flight deck, later described the launch as "exhilarating, terrifying and overwhelming all at the same time."

Image and Caption Credit: NASA

© Sunrise Science

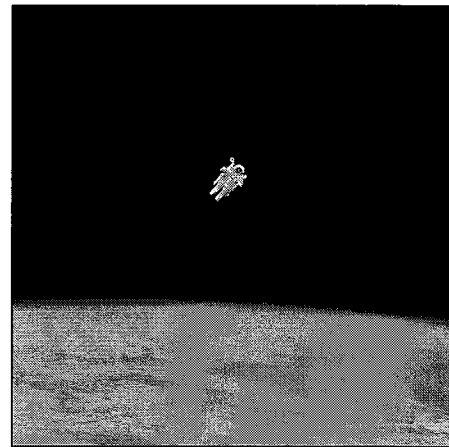
February 7, 1984

FIRST UNTETHERED SPACE WALK

The Challenger mission launched from Kennedy Space Center on February 3, 1984 with astronauts Vance D. Brand (commander), Robert L. Gibson, Bruce McCandless, Ronald E. McNair, and Robert L. Stewart.

On the fourth day of the mission, McCandless and Stewart performed the first ever untethered space walk. Using their hands and 300-pound nitrogen-propelled backpacks, unrestricted by tethers or umbilical cords, McCandless and Stewart ventured up to 320 feet (98 meters) from the orbiter for up to 6 hours and 17 minutes.

The Manned Maneuvering Units (the nitrogen-propelled backpacks) were not used again after this mission because NASA decided to perform only tethered space walks. However, new, smaller backpacks with similar technology are worn by all astronauts on the International Space Station for use during an emergency.



In this February 7, 1984 photograph taken by his fellow crewmembers aboard the Earth-orbiting Space Shuttle Challenger on the STS-41B mission, NASA astronaut Bruce McCandless II approaches his maximum distance from the vehicle. McCandless became the first astronaut to maneuver about in space untethered, during this first "field" tryout of a nitrogen-propelled, hand-controlled backpack device called the Manned Maneuvering Unit (MMU).

Image and Caption Credit: NASA

© Sunrise Science

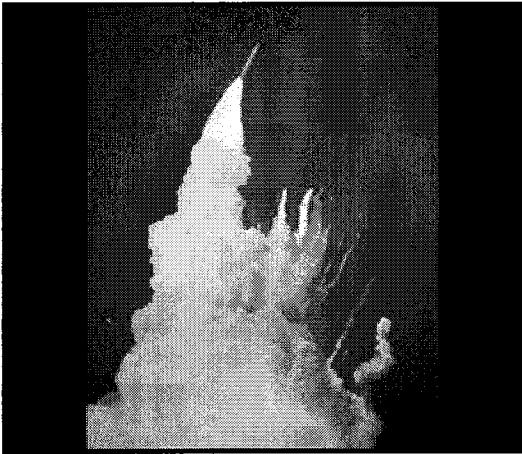
January 28, 1986

CHALLENGER EXPLODES

The space shuttle Challenger explodes during the launch from Kennedy Space Center at about 11:40 a.m. The crew of seven are killed, including civilian teacher Christa McAuliffe.

A leak in one of the solid rocket boosters ignited the main fuel tank, causing the explosion 73 seconds into the flight.

Challenger's flight was supposed to be the 25th shuttle mission. The shuttle program was suspended for two years following the accident.



*The space shuttle Challenger accident, January 28, 1986.
Image Credit: NASA*

© Sunrise Science

April 24, 1990

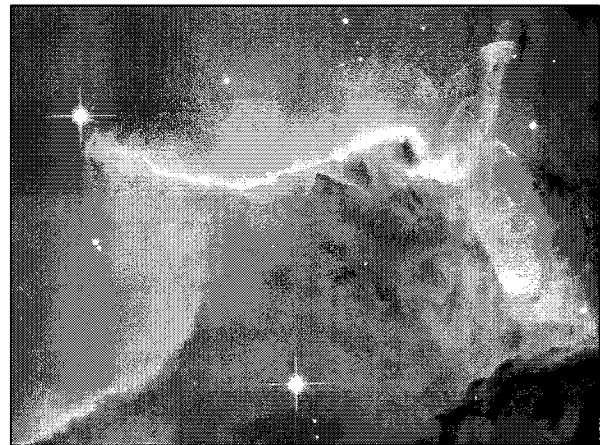
HUBBLE SPACE TELESCOPE BEGINS OBSERVATIONS

The space shuttle Discovery crew successfully deploys the railroad-car-size Hubble Space Telescope.

Hubble's mission was to take a closer look at our solar system, the Milky Way, and other galaxies. But soon after deployment, the controllers realized there was a flaw, referred to as a spherical aberration, which prevented the telescope from focusing all light to a single point.

Scientists found a way to work around the defect until early December 1993, when astronauts aboard Endeavour were sent to fix the optics and perform routine maintenance on the telescope. The crew, with help from the ground centers, completed all 11 planned servicing tasks during five space walks. The Hubble was back in orbit on December 10, 1993, operating with greatly improved optics.

The Hubble Space Telescope is known as one of the most vital research tools in science today because its imaging has led to breakthroughs in astrophysics, including determining the rate of expansion of the universe.



A detail of the Eagle Nebula shows a portion of a pillar of gas and dust in this photo from the Hubble Space Telescope. Light from nearby bright, hot, young stars is sculpting the cloud into intricate forms and causing the gas to glow.

Image and Caption Credit: NASA/ESA/Hubble Heritage Team

© Sunrise Science

June 29, 1995

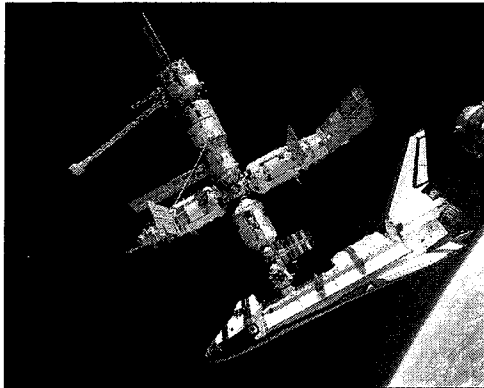
AMERICAN ATLANTIS DOCKS TO SOVIET MIR

Twenty years after the Apollo-Soyuz Test Project, the U.S. space shuttle Atlantis docks with Russian space station Mir.

The mission was the 100th U.S. human space launch, the first shuttle changeout of a Mir crew, and the first time an American (Norman Thagard) flew with a Russian crew.

During the nine-day mission, joint U.S.-Russian experiments were conducted, including biomedical investigations using a Spacelab module. The goal of the greater Atlantis-Mir cooperation mission was to conduct life science, environmental, and microgravity research to pave the way for the creation of the International Space Station.

There were eight more docking missions between 1995 and 1998.



NASA and the Russian space agency kicked off a new era in international space cooperation in June of 1995, when the Space Shuttle Atlantis docked with the Russian space station Mir for the first time. Atlantis' mission, STS-71, launched on June 27 and marked the 100th U.S. human space launch. Together, Atlantis and Mir became the largest combined spacecraft ever in orbit, totaling almost a half a million pounds.

Image and Caption Credit: NASA

© Sunrise Science

July 4, 1997

MARS PATHFINDER LANDS

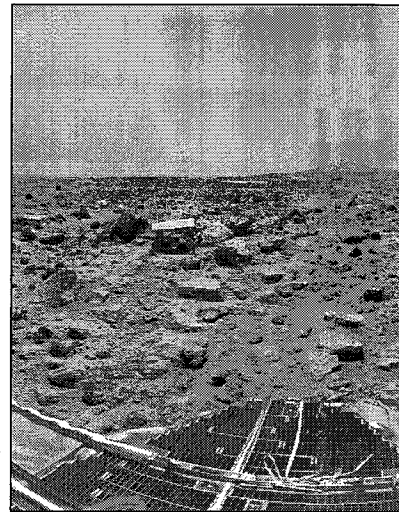
The U.S. Pathfinder probe lands on Mars exactly seven months after leaving Earth.

The Pathfinder lander dropped to the surface of Mars from a distance of 100 feet (30 meters) and bounced for several minutes before coming to a halt. The landing spot was Ares Vallis, an ancient Martian floodplain.

The rover vehicle, Sojourner, was the first man-made craft to travel on the surface of another planet. Even though it was designed to operate for a week, Sojourner explored Mars for almost three months.

Many rocks surrounding the lander and rover were named after cartoon characters like Barnacle Bill, Yogi, Scooby-Doo, Piglet, and Bullwinkle.

The Mars Pathfinder returned 2.3 billion pieces of information from the surface of Mars. Work done by scientists, with the help of the Pathfinder's data, suggests Mars was once warm and wet, with water existing in its liquid state.



Mars Pathfinder was launched on Dec. 4, 1996 on a Delta II rocket. After an uneventful journey, the spacecraft safely landed on the surface of Mars on July 4, 1997. The first set of data was received shortly after 5:00 p.m. followed by the release of images at 9:30 p.m. The Sojourner rover, with three Lewis components, then began its Martian trek and returned images and other data over the course of three months.

Image and Caption Credit: NASA/JPL

© Sunrise Science

December 4 - 15, 1998

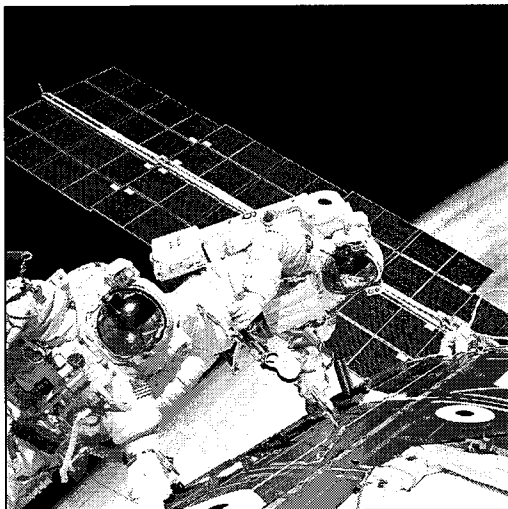
INTERNATIONAL SPACE STATION CREATED

The launch and joining of the Russian Zarya and U.S. Unity modules, the first two station components, marks the beginning of construction on the International Space Station.

The International Space Station (ISS) is a habitable artificial satellite that serves as a microgravity and space environment used for research in biology, physics, astronomy, and meteorology. The ISS orbits Earth in a low orbit of an average of 230 miles (370 kilometers) above Earth and can be seen with the naked eye from Earth's surface. It completes about 15.5 orbits per day.

The station's first crew, astronaut William Shepherd and cosmonauts Yuri Gidzenko and Sergei Krikalev, arrived aboard a Russian Soyuz spacecraft on November 2, 2000. The crew worked on assembly tasks and performed science experiments while living in the station for more than four months.

Since its induction, the ISS has been continuously occupied by up to 6 astronauts at a time, and it has been serviced and visited by spacecraft, astronauts, and tourists from 17 different countries.



*Here, astronauts Jerry Ross and James Newman work together on the final of the mission's three spacewalks to connect the Unity module to the Russian Zarya module. These two pieces of the space station had never been in the same hemisphere, but they were mated together perfectly.
Image and Caption Credit: NASA*

© Sunrise Science

February 1, 2003 COLUMBIA TRAGEDY UPON RE-ENTRY

The U.S. space shuttle Columbia breaks up during reentry over East Texas, killing all seven crewmembers, including the first Israeli in space, Ilan Ramon.

The shuttle was returning from a 16-day research mission, the 28th flight for Columbia. The space shuttle was 16 minutes short of landing at Kennedy Space Center.

About 38 percent of Columbia's dry weight, approximately 83,800 pieces of debris, was recovered and analyzed. It was determined that the cause of the accident was a breach that occurred during launch when falling foam from the external tank hit panels on the bottom of the left wing. During reentry the damage to the wing was penetrated by hot gases and destroyed the internal wing structure, causing the craft's breakup.



In memory of the Space Shuttle Columbia crewmembers who lost their lives on February 1, 2003, a massive collection of flowers, balloons, flags, signs, and other arrangements were placed at the Johnson Space Center sign at the Center's main entrance.

Image and Caption Credit: NASA on The Commons

© Sunrise Science

June 20, 2004

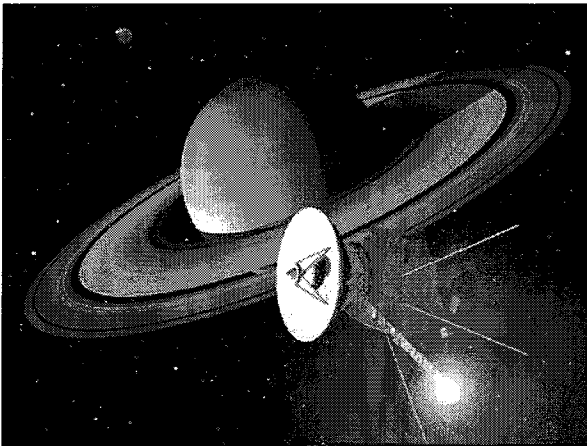
CASSINI-HUYGENS ARRIVES AT SATURN

After being launched from Cape Canaveral and traveling on a nearly seven year journey, the orbiter Cassini, built by NASA, the European Space Agency (ESA), and the Italian Space Agency, arrives at its destination: among Saturn's rings. It quickly begins shooting detailed photographs of the planet.

ESA's Huygens, a saucer-shaped probe, rode aboard Cassini. On Christmas Day 2004, Huygens was deployed for its three-week journey to Titan, one of Saturn's many moons.

On January 14, 2005, Huygens dove into the thick atmosphere of Titan, a moon larger than the planet Mercury. The probe's instruments provided scientists with data and images for 90 minutes before its batteries died.

Cassini was known as 'one of the most ambitious efforts in planetary space exploration'. The spacecraft continued to relay images of Saturn and its moons for almost 20 years until September 15, 2017 when it was purposefully plunged into Saturn's atmosphere to prevent any microbes on the spacecraft from contaminating Saturn's moons, which may have offered a habitable environment for life.



Artist's concept of Cassini at Saturn. The international Cassini-Huygens mission successfully entered orbit around Saturn. Flight controllers received confirmation that Cassini had completed the engine burn needed to place the spacecraft into the correct orbit. This begins a study of the giant planet, its majestic rings and 31 known moons.

Image and Caption Credit: NASA

© Sunrise Science

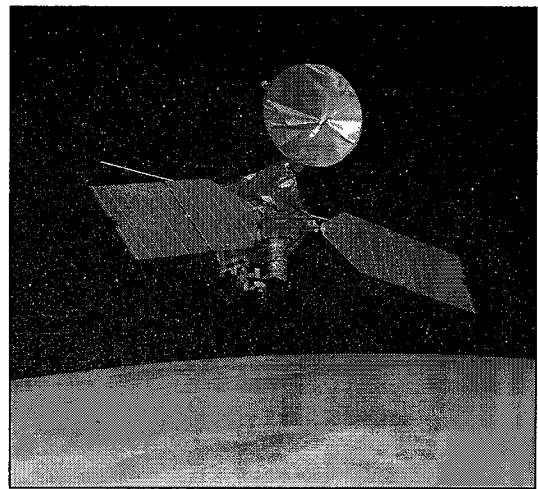
March 10, 2006

MARS RECONNAISSANCE ORBITER ENTERS ORBIT

The Mars Reconnaissance Orbiter (MRO) attains orbit around Mars after a seven-month long journey. It 'aerobrakes' for 5 months afterwards to reach the low orbit necessary to conduct its research— searching for evidence that water persisted on the surface of Mars for a long period of time.

The MRO contains many different types of research equipment including camera, spectrometers, and radar. These various instruments convey detailed observations of the Martian surface, weather patterns, subsurface and atmosphere. The MRO's telecommunications system has transferred more data back to Earth than all previous interplanetary missions combined. Learning more about the previous water and current conditions on Mars, including potential landing sites, will serve to inform future missions to the red planet.

The satellite will be able to continue functioning well into the 2030's.



MRO searches for evidence that water persisted on the surface of Mars for a long period of time. Past missions have shown that water flowed across the Martian surface, but it is still unknown whether water persisted long enough to provide a habitat for life. MRO's instruments analyze minerals, look for subsurface water, traces how dust and water are distributed in the atmosphere, and monitors daily weather in support of its science objectives.

Image and Caption Credit: NASA

© Sunrise Science

March 7, 2009

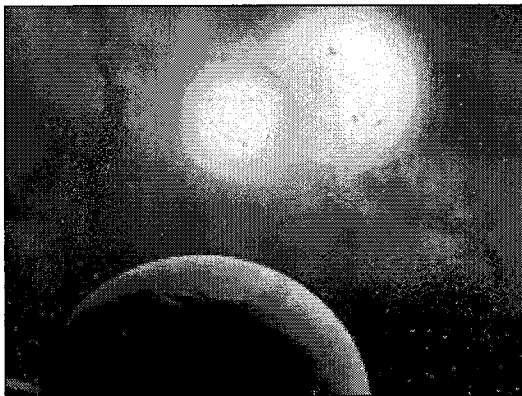
KEPLER TELESCOPE LAUNCHED

As part of NASA's Discovery program, the Kepler spaceborne telescope launches on its mission to hunt for habitable planets outside of our solar system.

The Kepler Telescope was designed to search the nearby region of our galaxy for Earth-size planets orbiting in the habitable zone of stars like our sun— it is an 'exoplanet hunter'. The habitable zone is the region around a star where temperatures permit water to be liquid on a planet's surface. It uses an instrument called a photometer to monitor the brightness of stars in the Milky Way galaxy and detect any dimming of the brightness caused by potential planets orbiting their host star.

Kepler has experienced two failed reaction wheels (of four) since its inception, but NASA figured out a way to salvage the mission and keep Kepler working for over five years longer than was originally planned. The telescope is expected to run out of fuel for its operations in 2018.

Kepler has discovered over 2300 confirmed planets, including many Earth-sized, rocky, and/or water-bearing planets that orbit their host stars in the habitable zone.



An artist's rendition of the Kepler-35 planetary system, in which a Saturn-size planet orbits a pair of stars. Kepler-35b orbits its host stars every 131 days, and the stellar pair orbits each other every 21 days.

NASA's Kepler mission was launched on March 7th, 2009 to discover Earth-like planets. Since then, it has discovered the first transiting circumbinary system -- multiple planets orbiting two stars -- 4,900 light-years from Earth in the constellation Cygnus, proving that more than one planet can form and survive in orbit around a binary star.

Image and Caption Credit: Lynette Cook from NASA on The

August 6, 2012

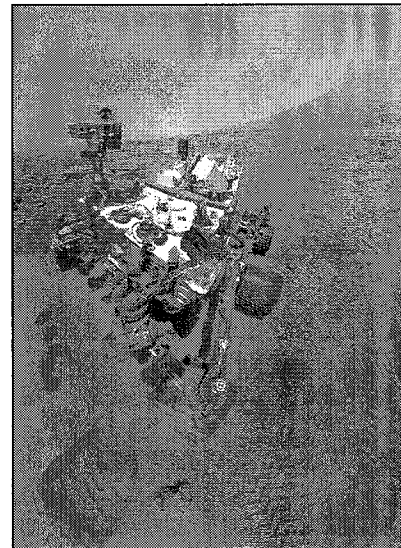
CURIOSITY ROVER LANDS ON MARS

As part of NASA's Mars Exploration Program, the Curiosity launches from Cape Canaveral and lands in Mars's Gale Crater. The goal of the rover was to assess whether Mars ever had an environment able to support micro-organisms.

The Curiosity delivered the most advanced, ground-breaking instrument ever to touch the Martian surface. The instrument can analyze the chemical composition of samples of soil and material from drilled rocks.

The spacecraft successfully landed on the planet using a parachute and lowering the rover down to the surface with a tether (like a sky crane). The rover is able to travel up to 295 feet (90 meters) per hour and to roll over obstacles up to 29 inches (75 centimeters) high.

The Curiosity mission does not have a defined end date and it is expected to continue roving for a long time as it sends important information back to Earth that is relevant for any potential human exploration or habitation of the planet.



When the Curiosity rover landed on Mars on August 6, 2012, it delivered a ground-breaking instrument to the planet's surface, which should allow for understanding of the modification of space radiation by the Mars atmosphere and albedo radiation from cosmic ray interactions with the Mars surface. Prior to the landing, the instrument collected important data on galactic cosmic rays and measured several solar particle events during most of the seven-month Earth-Mars cruise phase.

Image and Caption Credit: NASA

© Sunrise Science

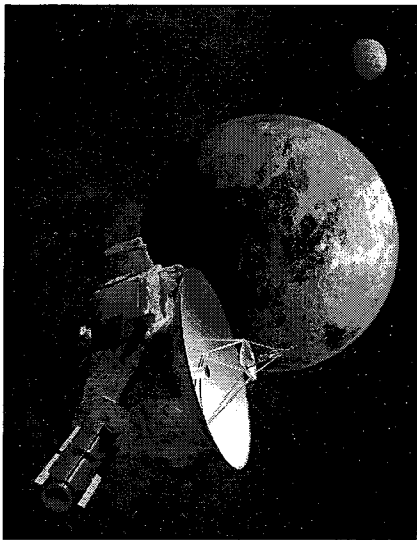
July 14, 2015

NEW HORIZONS SPACECRAFT APPROACHES PLUTO

Over nine years and three billion miles after its 2006 launch as part of NASA's New Frontier's Program, the interplanetary New Horizons space probe flies closer to Pluto's surface than any spacecraft before.

The spacecraft was engineered by the Johns Hopkins University Applied Physics Laboratory (APL) and the Southwest Research Institute (SwRI) and it is the fifth artificial object to achieve the escape velocity that will allow it to leave the Solar System.

Since its fly-by of Pluto, New Horizons is now headed for exploration of the mysterious Kuiper Belt, a thick ring of icy bodies orbiting a billion miles further than Neptune's orbit. It should fly by a Kuiper Belt object in early 2019. Scientists hope that a close-up of the objects orbiting this far out will help us to piece together the story of our solar system.



Artist's concept of the New Horizons spacecraft as it approaches Pluto and its largest moon, Charon, in July 2015. The craft's miniature cameras, radio science experiment, ultraviolet and infrared spectrometers and space plasma experiments will characterize the global geology and geomorphology of Pluto and Charon, map their surface compositions and temperatures, and examine Pluto's atmosphere in detail. The spacecraft's most prominent design feature is a nearly 7-foot (2.1-meter) dish antenna, through which it will communicate with Earth from as far as 4.7 billion miles away.

Image and Caption Credit: NASA

© Sunrise Science

