Resources for Touch the Sun and Earthrise Topics

Touch the Sun

Background information on the Parker Solar Probe is from http://parkersolarprobe.jhuapl.edu

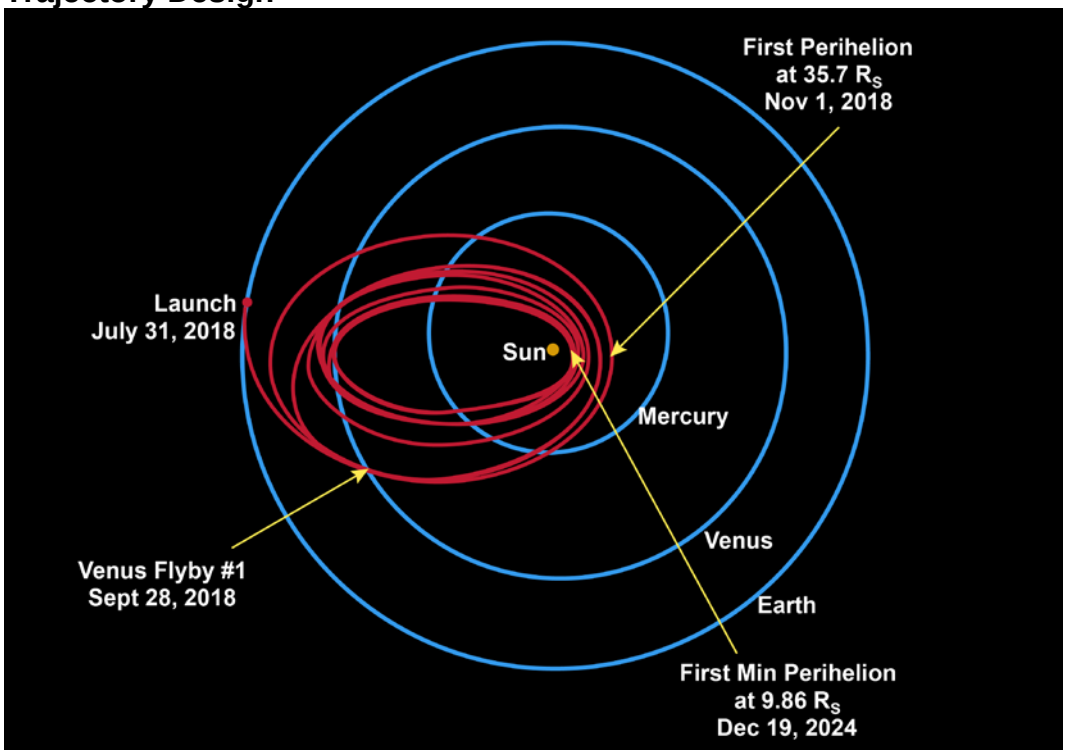
NASA's Parker Solar Probe mission will revolutionize our understanding of the sun. Parker Solar Probe will provide new data on solar activity and make critical contributions to our ability to forecast major space-weather events that impact life on Earth.
In order to unlock the mysteries of the corona, but also to protect a society that is increasingly dependent on technology from the threats of space weather, we will send Parker Solar Probe to touch the sun.
The primary science goals for the mission are to trace the flow of energy and understand the heating of the solar corona and to explore what accelerates the solar wind. Parker Solar Probe provides a statistical survey of the outer corona.
Parker Solar Probe has three detailed science objectives:

- Trace the flow of energy that heats and accelerates the solar corona and solar wind.
- Determine the structure and dynamics of the plasma and magnetic fields at the sources of the solar wind.
- Explore mechanisms that accelerate and transport energetic particles.

More details about the Solar Probe

- Measurements from within the region where all the action happens
- On the final three orbits, Parker Solar Probe will fly to within 9 solar radii of the sun's "surface" 9 solar radii is 9 times the radius of the sun, or about 3.9 million miles. That is about seven times closer than the current record-holder for a close solar pass, the Helios spacecraft.
- At closest approach, Parker Solar Probe will be hurtling around the sun at approximately 450,000 miles per hour! That's fast enough to get from Philadelphia to Washington, D.C., in one second.
- At closest approach to the sun, while the front of Parker Solar Probe' solar shield faces temperatures approaching 1,400° Celsius, the spacecraft's payload will be near room temperature.
- Orbit period: 88 days
- See timeline at http://parkersolarprobe.jhuapl.edu/The-Mission/index.php#Science-Objectives

Trajectory Design



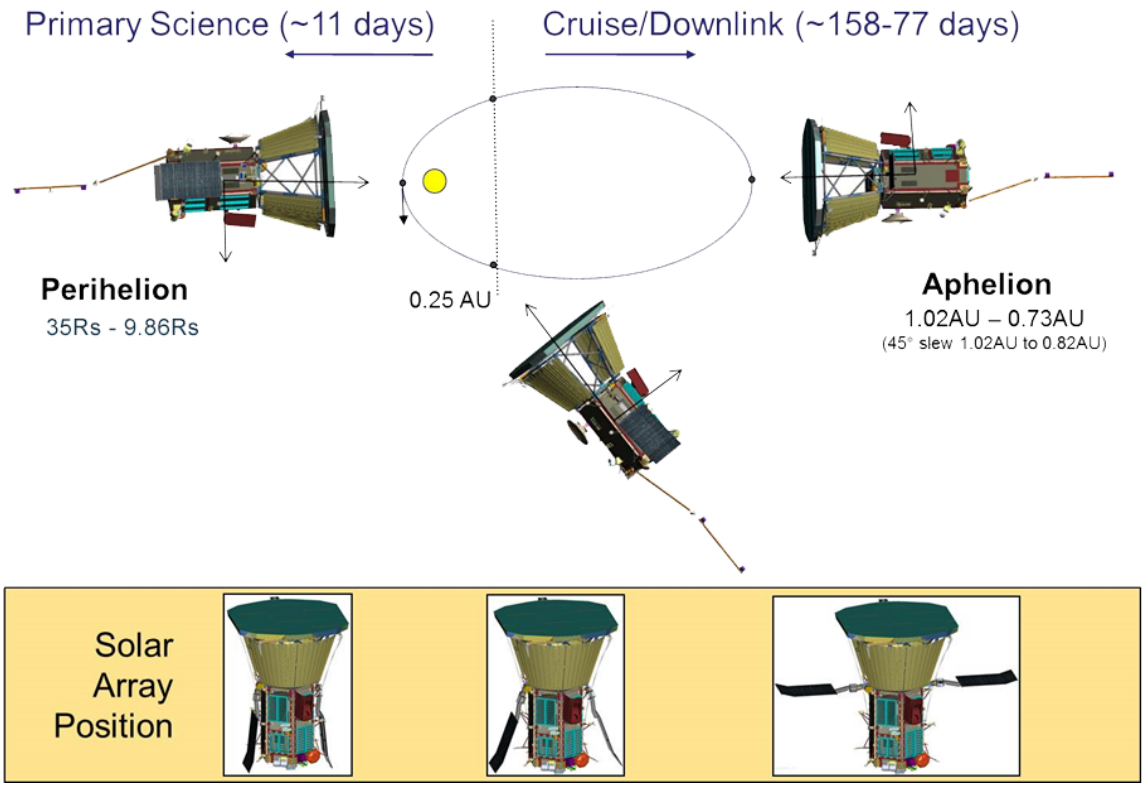
Spacecraft

Extreme Engineering

To perform these unprecedented investigations, the spacecraft and instruments will be protected from the Sun's heat by a 4.5-inch-thick (11.43 cm) carbon-composite shield, which will need to withstand temperatures outside the spacecraft that reach nearly 2,500 degrees Fahrenheit (1,377 degrees Celsius).

Animations available at
http://parkersolarprobe.jhuapl.edu/Multimedia/Animations.php

Video segments available at the parkersolarprobe site under Multimedia:
Main Flight Harness Installation (2m50s)
Top Deck Cooling System Installation (3m28s)
Parker Solar Probe Trailer (2m6s)
Parker Solar Probe and the August 21, 2017 Solar Eclipse (1m42s)


Primary Science (~11 days)
Cruise/Downlink (~158-77 days)
Perihelion
35Rs - 9.86Rs
0.25 AU
Aphelion
1.02AU – 0.73AU
(45° slew 1.02AU to 0.82AU)
Solar
Array
Position

PARKER SOLAR PROBE

A NASA Mission to Touch the Sun

Launch Window: July 31 – August 19, 2018

NASA's Parker Solar Probe mission, which is scheduled to launch in July 2018, will come within 3.9 million miles (6.2 million kilometers) of the sun – seven times closer than any other spacecraft ever has.

The specially shielded Parker Solar Probe will have to endure temperatures up to 2,500 degrees Fahrenheit (1,370 degrees Celsius) and solar radiation intensities 475 times higher than we're used to here on Earth.

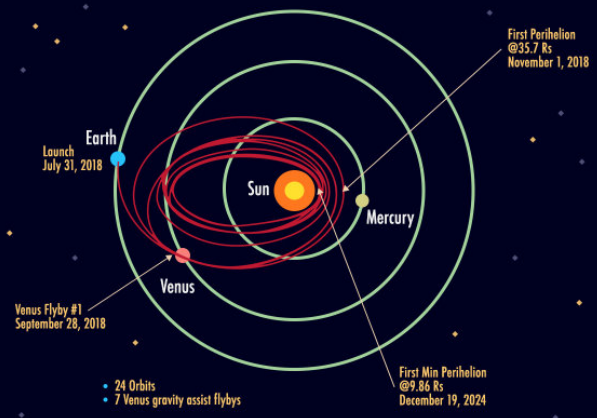
SCIENCE OBJECTIVES

- Trace the flow of energy that heats and accelerates the solar corona and solar wind.
- Determine the structure and dynamics of the plasma and magnetic fields at the sources of the solar wind.
- Explore mechanisms that accelerate and transport energetic particles.

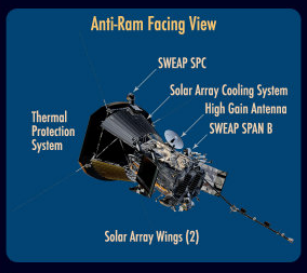
THE CORONA

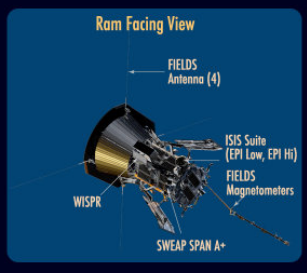
The third layer of the sun's atmosphere is the corona. It can only be seen during a total solar eclipse. It appears as white streamers or plumes of ionized gas that flow outward into space. Temperatures in the sun's corona can get as high as 3.5 million degrees Fahrenheit (2 million degrees Celsius). As the gases cool, they become the solar wind.

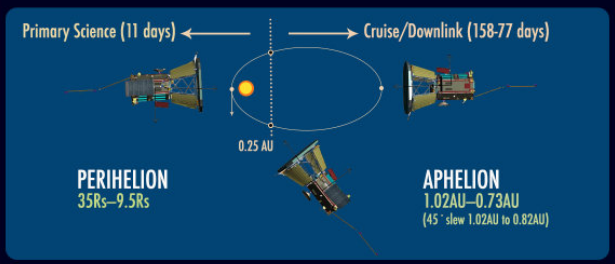
TRAJECTORY DESIGN



SPACECRAFT







SPACE.com

Credit: NASA

Earthrise

Earthrise is 50th Anniversary of the First Manned Mission to Orbit the Moon (Apollo 8)

Images from: https://www.nasa.gov/mission_pages/apollo/index.html

Apollo 8 Launch December 21, 1968

View of the Earth December 29, 1968

Earthrise, taken from **Apollo 8** by William Anders on December 24, 1968. **Apollo 8**, was launched on December 21, 1968, and became the first manned spacecraft to leave Earth orbit, reach the Earth's Moon, orbit it and return safely to Earth.

Image from https://airandspace.si.edu/multimedia-gallery/5390640jpg?id=5390

Apollo 8 crew. From left: Commander Frank Borman, Lunar Module Pilot William Anders, and Command Module Pilot James Lovell.

Apollo 8 was the first mission to send humans around the Moon and back. An important prelude to actually landing on the Moon was testing the flight trajectory

and operations for getting there and back. Apollo 8 did this and achieved many other firsts including the first manned mission launched on the Saturn V, first manned launch from NASA's new Moonport, first pictures taken by humans of the Earth from deep space, and first live TV coverage of the lunar surface.

Apollo 8 was launched from Cape Kennedy, Fla., at 7:50 a.m., EST, on December 21, 1968. Two hours 50 minutes later, translunar injection was performed; and astronauts Col. Frank Borman, the commander; Capt. James A. Lovell, Jr., the command module pilot; and Major William A. Anders, the lunar module pilot, were on their way to the Moon.

The Spacecraft was placed in an elliptical lunar orbit at 69 hours 8 minutes after liftoff. Images of the lunar surface were transmitted for live television broadcast on Earth. A nearly flawless mission was completed on the morning of December 27 when splashdown occurred in the Pacific Ocean after a total elapsed time of 147 hours.

Information about Apollo 8 retrieved from: https://airandspace.si.edu/explore-and-learn/topics/apollo/apollo-program/orbital-missions/apollo8.cfm

Apollo 11: The First Manned Mission to Land on the Moon

Image from https://www.nasa.gov/apollo11-gallery

On July 16, 1969, the huge, 363-feet tall Saturn V rocket launched on the Apollo 11 mission from Kennedy Space Center, at 9:32 a.m. EDT. Onboard the Apollo 11 spacecraft were astronauts Neil A. Armstrong, commander; Michael Collins, command module pilot; and Edwin E. Aldrin Jr., lunar module pilot. Apollo 11 was the United States' first lunar landing mission. While astronauts Armstrong and Aldrin descended in the Lunar Module "Eagle" to explore the Sea of Tranquility region of the moon, astronaut Collins remained with the Command and Service Modules "Columbia" in lunar orbit.

Apollo 11's historic mission to the lunar surface almost 50 years ago blazed a new trail for human exploration beyond our home planet.

An estimated 530 million people watched Armstrong's televised image and heard his voice describe the event as he took "...one small step for a man, one giant leap for mankind" on July 20, 1969.

Armstrong and Aldrin spent 21 hours, 36 minutes on the moon's surface.

Video about Apollo 11 https://www.youtube.com/watch?v=U6qqcao4NOk (3 min)
https://www.youtube.com/watch?v=raN5VLEro1w (15 min)
https://www.youtube.com/watch?v=9jI8Uqip60w (4 min)

Interesting facts about Apollo 11
http://www.armaghplanet.com/blog/11-strange-facts-you-didnt-know-about-the-first-moon-landing.html