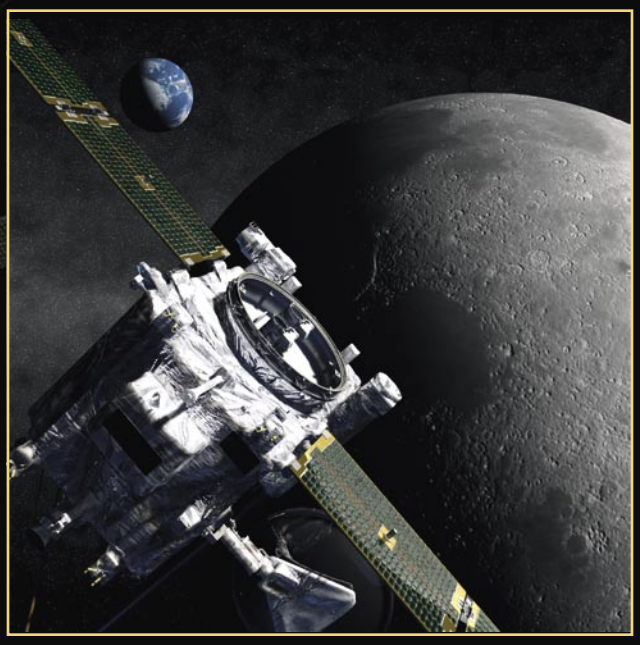
STEREO

Solar TErrestrial RElations Observatory

The Sun in 3-D: A New Frontier in Solar Research

STEREO Views of the Sun

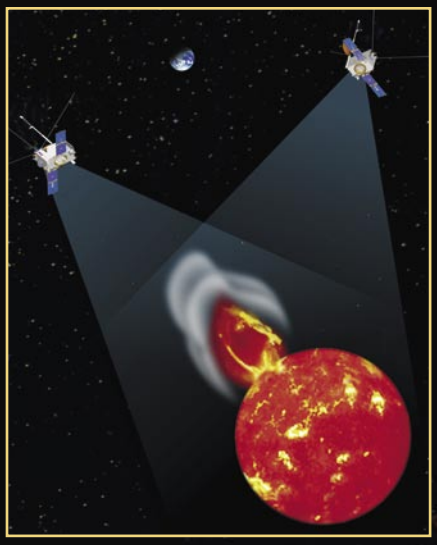
STEREO is a 2-year mission employing two nearly identical space-based observatories to provide the first-ever, 3-D "stereo" images of the sun to study the nature of coronal mass ejections. These powerful solar eruptions are a major source of the magnetic disruptions on Earth and a key component of space weather, which can greatly affect satellite operations, communications, power systems, the lives of humans in space, and global climate.



STEREO is the third mission in NASA's Solar Terrestrial Probes Program. The twin observatories are scheduled to launch aboard a single Delta II rocket from Cape Canaveral Air Force Station, Fla., in early 2006.

Capturing the Sun in 3-D

The twin observatories will fly as mirror images of each other to obtain unique "stereo" views of the sun's activities. They must be placed into a rather challenging orbit where they're offset from one another. One observatory will be placed ahead of Earth in its orbit around the sun and the other behind. Just as the slight offset between your eyes provides you with depth perception, this placement will allow the STEREO observatories to obtain 3-D images and particle measurements of the sun.



Placing STEREO into Orbit

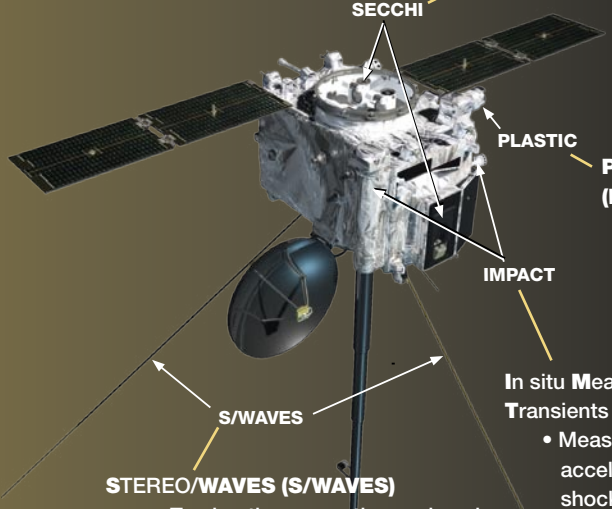
STEREO mission designers determined that the most efficient and cost-effective way to get the twin observatories into space was to launch them aboard a single rocket and use lunar swingbys to place them into their respective orbits. This is the first time lunar swingbys have been used to manipulate orbits of more than one spacecraft. Mission designers will use the moon's gravity to redirect the observatories to their appropriate orbits – something the launch vehicle alone can't do.

After launch, the observatories will fly in an orbit from a point close to Earth to one that extends just beyond the moon. Approximately two months later, mission operations personnel at the Johns Hopkins University Applied Physics Laboratory (APL), in Laurel, Md., will synchronize spacecraft orbits, directing one observatory to its position trailing Earth in its orbit. Approximately one month later, the second observatory will be redirected to its position ahead of Earth.

Seeing with STEREO

Each twin STEREO observatory will carry two instruments and two instrument suites. This combination provides a total of 16 instruments per observatory. APL is designing and building the spacecraft platform housing the instruments. When combined with data from observatories on the ground or in low-Earth orbit, STEREO's data will allow scientists to track the buildup and liftoff of magnetic energy from the sun and the trajectory of Earth-bound coronal mass ejections in 3-D.

Observatory Design



Sun **E**arth **C**onnection **C**oronal and **H**eliospheric **I**nvestigation **(SECCHI)**
- Studies 3-D evolution of coronal mass ejections (from their origin on sun's surface to their impact at Earth)
- Principal Investigator: Russell Howard, Naval Research Laboratory, Washington, D.C.

PLAsma and **S**upra**T**hermal **I**on and **C**omposition **(PLASTIC)**
- Studies coronal-solar wind and solar wind-heliospheric processes
- Principal Investigator: Antoinette Galvin, University of New Hampshire

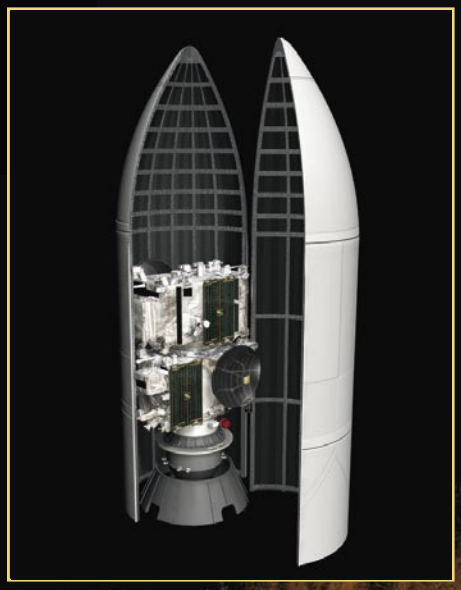
In situ **M**easurements of **PA**rticles and **C**ME **T**ransients **(IMPACT)**
- Measures energetic ions and electrons accelerated in coronal mass ejection shocks and in solar flares
- Principal Investigator: Janet Luhmann, University of California, Berkeley

STEREO/**WAVES (S/WAVES)**
- Tracing the generation and evolution of traveling radio disturbances from the sun to Earth's orbit
- Principal Investigator: Jean-Louis Bougeret, Paris Observatory, Meudon

Mission Management

NASA Program Scientist
Madhulika Guhathakurta
NASA Project Manager
Nick Chrissotimos
APL Project Manager
Edward Reynolds

Launch Configuration



A spacecraft separation system allows one STEREO observatory to sit atop the other within the third stage of the Delta II launch vehicle.

Key STEREO Characteristics

Mass: 1,364 pounds (620 kilograms)
Dimensions (in deployed configuration):
14.4 feet (4.3 meters) high
21.2 feet (6.4 meters) wide
8.5 feet (2.6 meters) deep

In their launch configuration, each observatory is about the size of a large, old-fashioned wooden desk; with solar arrays deployed, about the length of a large school bus.

http://stereo.jhuapl.edu
http://stereo.gsfc.nasa.gov

STEREO is sponsored by NASA's Science Mission Directorate, Washington, D.C. NASA Goddard Space Flight Center's Solar Terrestrial Probes Program Office, in Greenbelt, Md., manages the mission, instruments and science center. The Johns Hopkins University Applied Physics Laboratory, in Laurel, Md., is designing, building and will operate the twin observatories for NASA during the 2-year mission.

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