

GENERAL SCIENCE NOTES

NASA'S NEXT INTERPLANETARY MISSION

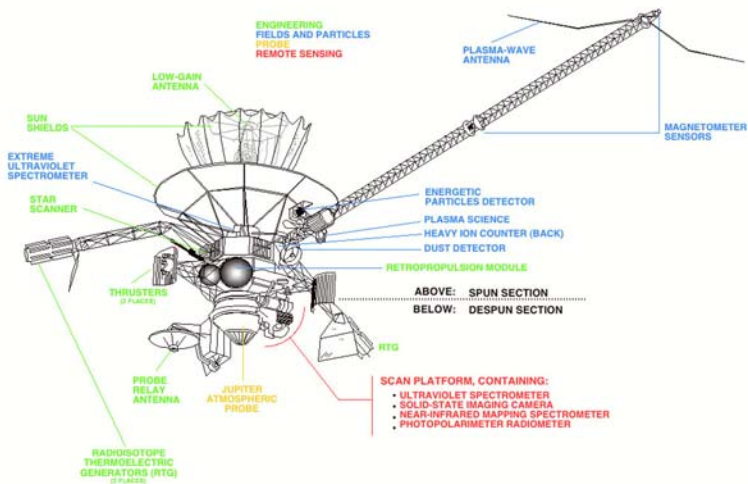
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Mission Galileo, assigned to Caltech's Jet Propulsion Laboratory, is a NASA project to orbit the planet Jupiter and send an instrumented probe into the giant planet's atmosphere. The spacecraft (Figure 1) is virtually completed, and the instrument testing began in September 1984.

Galileo is scheduled to be launched in May 1986 with the scientific objectives of studying 1) the chemical composition and physical state of Jupiter's atmosphere and selected Jovian satellites, and 2) the dynamics of the Jovian magnetosphere.

The spacecraft will be carried to Earth orbit by the space shuttle and from there the 2½ ton Galileo will be sent toward Jupiter by a modified Centaur. About 150 days before arrival (August 1988) the probe will separate from the orbiter and follow an independent path to Jupiter. The orbiter will fly within 1000 km of the volcanic satellite Io, making close observations of this unique moon.

FIGURE 1. Schema of the Galileo Spacecraft identifying the main components. Figure courtesy of NASA and the Jet Propulsion Laboratory.



At about the time Galileo begins orbiting Jupiter, the probe will strike Jupiter's upper atmosphere at about 180,000 km/hour, decelerating rapidly and deploying a parachute. While penetrating the atmosphere containing clouds of water and ammonia, the probe will be sampling and relaying the data to Earth through the orbiter. After about 60 minutes the pressure (15-20 Earth atmospheres) and temperature is expected to crush and finally vaporize the probe.

The orbiter is scheduled to complete 11 orbits of Jupiter in 20 months and make a close flyby of at least one Galilean satellite on each orbit. It carries 11 scientific instruments:

- ◆ a new camera system, a solid-state charge-coupled device with resolution 20 to 300 times better than that of the cameras on Voyager.
- ◆ a near-infrared mapping spectrometer which will also measure heat from Io's volcanoes.
- ◆ an ultraviolet spectrometer to study the composition and structure of the atmospheres and the cloud of charged atoms injected into the magnetosphere by Io.
- ◆ a photopolarimeter-radiometer.
- ◆ a magnetometer to measure the magnetic fields and their changes due to interactions of the satellites.
- ◆ a plasma instrument to study energetic particles in the magnetosphere.
- ◆ an energetic-particle detector for high-energy particles trapped in Jupiter's magnetic field.
- ◆ a plasma-wave instrument that will investigate waves radiated from lightning discharges.
- ◆ a dust-detection instrument to identify dust and micrometeorite sources, and perhaps the source of the ring discovered by Voyager.
- ◆ an instrument to measure the gravity fields and gravity waves.
- ◆ a radio propagation experiment using radio signals from the orbiter to probe the structure of the atmospheres and the ionospheres.

The probe will also carry seven additional instruments: a neutral mass spectrometer, a helio-abundance interferometer, a nephelometer, a net-flux radiometer, a lightning and radio-emission instrument, another energetic particle detector, and an atmospheric composition and structure analyzer.

This can be considered a multinational mission, because the teams comprise a total of 114 scientists from 10 nations who are assembled to interpret the data from these instruments.

WHY SCIENTISTS ARE SO INTERESTED IN THIS MISSION

Jupiter is similar to a “mini-solar system” with its 16 revolving satellites. It is different from the terrestrial planets in its major constituents; like the Sun, it is mainly composed of hydrogen and helium. Jupiter’s magnetosphere is the largest object in the solar system and, with the exception of the Sun, is the noisiest source of radio signals. The storms that appear at the tops of Jupiter’s clouds seem to come from deep within the planet. Major unanswered questions are: Does Jupiter have a rock core? Why do two of the planets have retrograde (spin opposite from the Sun) orbits?

Another reason for this mission is dominant in the minds of many scientists, especially those who believe in strictly naturalistic origins for our system. These scientists consider Jupiter to be made of the same original material from which our Sun was made. They expect close-range studies of Jupiter to provide information about the birth and development of our solar system. Also there is the lingering and seldom expressed hope of some space scientists that Io, with its 8 volcanoes, may nurture some type of life, in spite of the evidence from previous planetary probes for a sterile extraterrestrial environment.

The scientist who believes in a Divine-fiat cosmogony also has an intense interest in the Jupiter missions. Jupiter’s retrograde moons are one of the evidences for the inadequacy of a simple LaPlacean theory of cosmogony. Why are all the other planets lifeless and marked with scars of a convulsed past? Are they similar to our planet a few millennia ago when it was “without form, and void,” with “darkness ... upon the face of the deep” (Genesis 1:2)? If so, why? *Mission Galileo* may yield information pertinent to these great concerns.