

Cassini Mission. Deep Space Telecommunications Into the Next Century.

ABSTRACT

in late 1997 an unmanned spacecraft will begin a seven year voyage to the vicinity of the planet Saturn. Upon arrival it will tour the Saturnian system for nearly four years. This mission is named *Cassini* in honor of the French-Italian astronomer, Jean Dominique Cassini. A variety of scientific instruments will probe, sample, observe and listen to the environment of the planet, its rings, some of its icy moons and its largest moon Titan.

Cassini is an international cooperative mission of NASA, ESA, and the Italian Space Agency. NASA is providing the tracking network, the orbiter spacecraft, the launch vehicle, and overall project management. ESA is providing the Huygens Probe and ASI is responsible for the spacecraft's radio antenna as well as portions of three scientific instruments.

The task of capturing on Earth the enormous amount of information collected by three dozen scientific instruments is a formidable one. Stations of NASA's Deep Space Network, are scheduled to provide reception of the vital planetary scientific information as well as spacecraft health monitoring during the entire mission.

The spacecraft is carrying a four meter diameter antenna, which together with two smaller lower gain antennas provide all communications paths with Earth for radio command, radio navigation and radio telemetry. This large antenna also provides the reception of information from the Huygens Probe during its descent to the Titan surface. In addition, this antenna is used by the Titan mapping RADAR of the orbiter which has the capability to pierce the veil of haze of Titan and produce images of the surface.

At X-Band the electronics of the Radio Subsystem provides multiple telecommunications functions. Commands beamed from Earth, radio tracking signals to determine spacecraft position and velocity, as well as engineering and scientific information for Earth bound observers are all processed within this subsystem.

Radio Science observations use the X-Band capability of the Radio Subsystem but also utilize S-Band and Ka-Band to search for gravitational waves in the universe, and study the atmosphere, rings, and gravity fields of Saturn and its moons.

Designed as part of the four meter antenna is a five-beam feed array. This array enables the Ku-Band mapping RADAR to collect Titan imaging, altimetry, and surface radiance information during close flybys over the four year tour.

At the present time (late 1995) the designs of the Cassini Systems and subsystems are complete. Fabrication of flight and spare hardware is underway. The system test program is about to begin leading to the launch, just two years away. But the launch is just another beginning. The seven year voyage is filled with activities to enable the spacecraft to safely arrive at Saturn in mid 2004. It is then that the real excitement of discovery begins once again.