PROJECT GALILEO: FAREWELL TO THE MAJOR MOONS OF JUPITER

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After a six year odyssey, Galileo has completed its survey of the large moons of Jupiter. In the four years since the end of the primary mission, Galileo provided new insights into the fundamental questions concerning Jupiter and its moons and magnetosphere. Longevity, changing orbital geometry, and multiple flybys afforded the opportunity to distinguish intrinsic versus induced magnetic fields on the Galilean moons, to characterize the dusk side of the magnetosphere, to acquire high resolution observations supporting the possibility of subsurface water within Europa, Ganymede, and Callisto, and to monitor the highly dynamic volcanic activity of Io. In January 2002, a final gravity assist placed the spacecraft on a two-orbit trajectory culminating in a Jupiter impact in September 2003.

With the successful completion of the Io encounters, plans are being made for the final encounter of the mission. In November 2002, the spacecraft will fly one Jupiter radius above the planet's cloud-tops, sampling the inner magnetosphere and the gossamer rings. The trajectory will take Galileo close enough to Amalthea, (a small inner moon) to obtain the first gravity data for this body. Because a radiation dose of 73 krads is expected on this encounter, which will bring the total radiation dose to greater than four times the spacecraft design limits, the command sequence has to account for the possibility of subsystem failure and the loss of spacecraft control after this perijove passage.

One of the primary objectives this year has been to place the spacecraft on a trajectory to impact Jupiter on orbit 35. Galileo's discovery of water beneath the frozen surface of Europa raised concerns about forward contamination by inadvertently impacting that moon and resulted in an end of mission requirement to dispose of the spacecraft. A risk assessment of the final two Io encounters was performed to manage the project's ability to meet this requirement.

Radiation affected the extended mission through damage to electronic parts in the attitude control subsystem, the computer memory and some science instruments and by causing transient bus reset indications. Software patches and changed operating strategies were implemented to work around most of the radiation effects. Recovery efforts to enhance the robustness of the Solid State Imaging camera paid off in the acquisition of images at both Io 32 and Io 33. Data on spacecraft performance in the harsh jovian environment may be useful to designers of future missions to Jupiter and its moons.