Champollion/Deep Space 4: A Comet Lander and Sample Return Technology Demonstration Mission

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The Champollion/Deep Space 4 mission will perform the first landing of scientific instruments on the surface of a cometary nucleus, and will demonstrate technologies for collecting and returning extra-terrestrial samples to Earth. The mission will be launched in May 2003, using a solar-electric powered carrier spacecraft to take Champollion to a rendezvous with periodic Comet Tempel 1 in December 2005. Flight time is 2.6 years. Rendezvous occurs at 2.0–2.5 AU, approximately 5 months after the comet has passed through perihelion. Following mapping of the cometary nucleus and determination of the comet's mass and gravity harmonics from orbit, the 76-kg Champollion lander will descend to the surface. The spacecraft will use advanced autonomous navigation to manuever to the chosen landing site. At touchdown an explosive, deployable harpoon will anchor the spacecraft to the comet to permit drilling operations. The Champollion payload includes a narrow angle, high resolution camera for orbital mapping, panoramic and near-field cameras, a combined infrared spectrometer/microscope, a gas chromatograph/mass spectrometer, a physical properties experiment, and a one-meter drill for obtaining samples at depth (opportunities for additional scientific instruments may be available). Following 84 hours of surface operations, the Champollion lander will collect an approximately 100-gram sub-surface sample, detach itself from the anchor, take off, and rendezvous with the carrier spacecraft. The cooled cometary sample will then be returned to Earth for analysis in terrestrial laboratories, with arrival in June 2010.

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