Update: Huygens Probe Set to Detach From Cassini Orbiter Tonight

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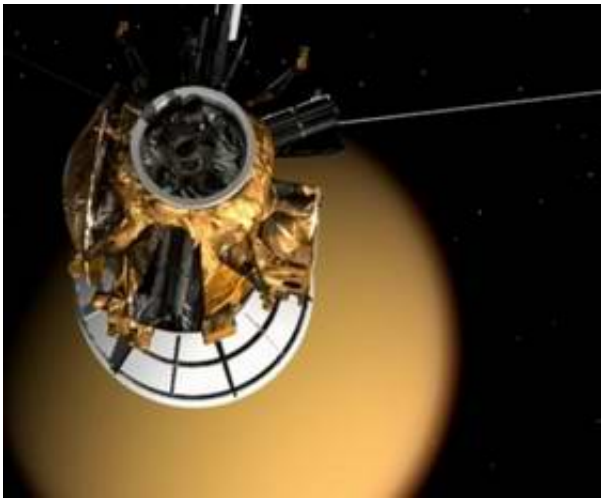

The highlights of the first year of the Cassini-Huygens mission to Saturn can be broken into two chapters: first, the arrival of the Cassini orbiter at Saturn in June, and second, the release of the Huygens probe on Dec. 24, 2004, on a path toward Titan. (read PhysOrg story)

The Huygens probe, built and managed by the European Space Agency (ESA), is bolted to Cassini and fed electrical power through an umbilical cable. It has been riding along during the nearly seven-year journey to Saturn largely in a "sleep" mode, awakened every six months for three-hour instrument and engineering checkups. In three days, it will be cut

loose from its mother ship and will coast toward Saturn's moon Titan, arriving on Jan. 14, 2005.

Launched Oct. 15, 1997, on a journey covering 3.5 billion kilometers (2.2 billion miles), Cassini is the most highly instrumented and scientifically capable planetary spacecraft ever flown. It has 12 instruments on the Cassini orbiter and six more on the Huygens probe. The cost of the Cassini mission is approximately $3 billion.

Many of these sophisticated instruments are capable of multiple functions, and the data that they gather will be studied by scientists worldwide.

Aerosol Collector and Pyrolyser (ACP) will collect aerosols for chemical-composition analysis. After extension of the sampling device, a pump will draw the atmosphere through filters which capture aerosols. Each sampling device can collect about 30 micrograms of material.

Descent Imager/Spectral Radiometer (DISR) can take images and make spectral measurements using sensors covering a wide spectral range. A few hundred metres before impact, the instrument will switch on its lamp in order to acquire spectra of the surface material.

Doppler Wind Experiment (DWE) uses radio signals to deduce atmospheric properties. The probe drift caused by winds in Titan's atmosphere will induce a measurable Doppler shift in the carrier signal. The swinging motion of the probe beneath its parachute and other radio-signal-perturbing effects, such as atmospheric attenuation, may also be detectable from the signal.

Gas Chromatograph and Mass Spectrometer (GCMS) is a versatile gas chemical analyser designed to identify and quantify various atmospheric constituents. It is also equipped with gas samplers which

will be filled at high altitude for analysis later in the descent when more time is available.

Huygens Atmosphere Structure Instrument (HASI) comprises sensors for measuring the physical and electrical properties of the atmosphere and an on-board microphone that will send back sounds from Titan.

Surface Science Package (SSP) is a suite of sensors to determine the physical properties of the surface at the impact site and to provide unique information about its composition. The package includes an accelerometer to measure the impact deceleration, and other sensors to measure the index of refraction, temperature, thermal conductivity, heat capacity, speed of sound, and dielectric constant of the (liquid) material at the impact site.

"As partners with ESA, one of our obligations was to carry the Huygens probe to Saturn and drop it off at Titan," said Robert T. Mitchell, Cassini program manager at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "We've done the first part, and on Christmas Eve we will release Huygens and tension-loaded springs will gently push it away from Cassini onto a ballistic free-fall path to Titan."

Once freed from Cassini, the Huygens probe will remain dormant until the onboard timer wakes it up shortly before the probe reaches Titan's upper atmosphere on Jan. 14. Then it will begin a dramatic plunge through Titan's murky atmosphere, tasting the chemical makeup and composition as it descends to touch down on its surface. The data gathered during this 2-1/2 hour descent will be transmitted from the probe to the Cassini orbiter. Afterward, Cassini will point its antenna to Earth and relay the data through NASA's Deep Space Network to JPL and on to ESA's Space Operations Center in Darmstadt, Germany, which serves as the operations center for the Huygens probe mission. From this

control center, ESA engineers will be tracking the probe and scientists will be standing by to process the data from the probe's six instruments.

Currently, both the orbiter and the probe are on an impact trajectory with Titan. This is the only way to ensure that Cassini delivers the probe in the right location. A confirmation of successful release is expected to be received from NASA's Deep Space Network tracking stations at Madrid, Spain and Goldstone, Calif., shortly before 8:00 p.m. PST on Dec. 24. A team of JPL engineers and ESA mission managers will be monitoring spacecraft activities at JPL during the release phase of the mission.

On Dec. 27, the Cassini orbiter will perform a deflection maneuver to keep it from following Huygens into Titan's atmosphere. This maneuver will also establish the required geometry between the probe and the orbiter for radio communications during the probe descent.

Two of the instruments on ESA's Huygens probe, the descent imager and spectral radiometer camera and the gas chromatograph-mass spectrometer, are contributions from NASA and American academia.

The imaging camera will take advantage of the Huygens probe's rotation, using two imagers to observe the surface of Titan during the late stages of descent for a view of the regions around the impact site. A side-looking imager will view the horizon and the underside of any cloud deck. More than just a camera, the instrument is designed to measure concentrations of argon and methane in the atmosphere and determine the size and density of particles. The instrument will also determine if the local surface is a solid or liquid, and if solid, its topography. The principal investigator is Dr. Martin G. Tomasko of the University of Arizona, Tucson, Ariz.

Although Titan's atmosphere is primarily nitrogen and methane,

scientists believe it contains many other gases that are present only in small amounts. These trace gases can reveal critical details about the origin and evolution of Titan's atmosphere. Because trace gases are rare, they are difficult or impossible to observe remotely, so direct measurements must be made.

The gas chromatograph-mass spectrometer instrument will sample gas directly from Titan's atmosphere as the Huygens probe descends by parachute. Data from the instrument will allow researchers to investigate the chemical composition, origin and evolution of the atmosphere of Titan. The instrument was designed and built by NASA's Goddard Space Flight Center, Greenbelt, Md., and is led by the principal investigator, Dr. Hasso Niemann.

Source: NASA