THE EXPLORATION OF COMETS

Comets remain one of the most elusive bodies within our Solar System. Though scientists have speculated about their evolution and composition, there has been little conclusive data to definitively suggest or support any particular theories. Recently, scientists have begun to aggressively investigate comets, resulting in several NASA missions aimed at collecting data from various comets orbiting within our Solar System. By continuing the investigation of comets and other small bodies, we can explore the mystery of life and the wonders of the universe.

Comet Halley: Credit NASA

Scientists have long wanted to study comets in detail, tantalized by a few 1986 images of Halley's nucleus, NASA's began to aggressively explore these extraordinary bodies in hopes of better understanding them. In 2001, NASA's Deep Space 1 spacecraft flew by Comet Borrelly and photographed it nucleus, which was determined to be about 8 kilometers (5 miles) long.

Stardust spacecraft on launch pad at NASA's Kennedy Space Center in February 1999. Credit: NASA/KSC

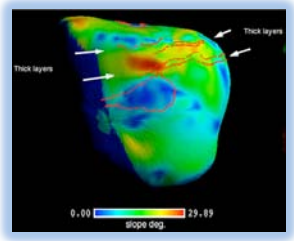
In 2004, the Discovery mission Stardust successfully became NASA's first spacecraft solely to explore the nucleus of Comet Wild 2 (pronounced Vilt 2), flying within 236 kilometers (147 miles) of the comet while taking photographs at a close range of 251 kilometers (156 miles) of its nucleus for data comparison and return particles from that comet to Earth for further analysis.

The Stardust sample return capsule after it was contained in the Utah Test and Training Range after being jettison from the spacecraft bus.

Another comet bound mission, Deep Impact, consisted of a flyby spacecraft and an impactor. In July 2005, the impactor was released into the path of Comet Tempel 1 in a planned collision, which vaporized the impactor and ejected massive amounts of fine, powdery materials from beneath the comet's surface. En route to impact, the impactor's camera imaged the comet in increasing detail. Two cameras and a spectrometer recorded the dramatic excavation that revealed the interior composition and structure of the nucleus.

Image taken from Deep Impact spacecraft just before impact. Credit: NASA/JPL-Caltech

The Deep Impact and Stardust spacecraft's are healthy and have been retargeted. Deep Impact's mission, EPOXI (Extrasolar Planet Observation and Deep Impact Extended Investigation), comprised of two projects: the Deep Impact Extended Investigation (DIXI) will encounter Comet Hartley 2 in November 2010 and the Extrasolar Planet Observation and Characterization (EPOCh) investigation will search for Earth-sized planets around other stars. NASA returns to Comet Tempel 1 in February 2011, when the Stardust New Exploration of Tempel 1 (NExT) mission will observe changes since Deep Impact's 2005 encounter.

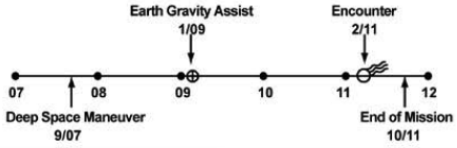


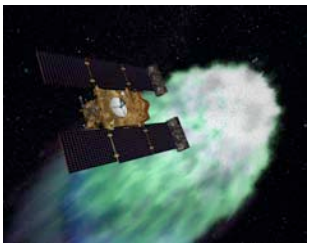
Layered images of Tempel 1 provide clues to accretion and subsequent processing on Comet Temple 1. Credit: NASA/Deep Impact

STARDUST New Exploration of Tempel 1

On January 15, 2006, the Stardust spacecraft completed one history-making mission and began another. Returning from a rendezvous with Comet Wild 2, the spacecraft approached Earth and jettisoned the capsule containing particles collected directly from the comet as well as interstellar dust medium. The capsule landed safely and on-target, southwest of Salt Lake City, Utah, completing the world's first sample return from a comet.

Now this spacecraft is on a new record-setting mission: a visit to Comet Tempel 1, the comet that was the previous target of the Deep Impact mission making it the first-ever follow-up mission to a comet.

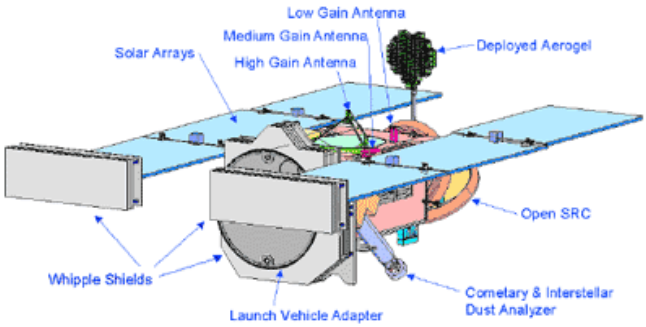




Artist rendering of the Stardust-NExT spacecraft encounter comet Tempel 1. Credit: LMSS

SPACECRAFT:

The STARDUST-NExT spacecraft is derived from the Space Probe deep space bus developed by Lockheed Martin Astronautics in Denver, Colorado. This new lightweight spacecraft incorporates components, virtually all of which are either currently operating in space or are flight qualified and manifested to fly on upcoming missions.



MISSION "FIRSTS"

- First mission to document the surface changes on a comet's nucleus between successive perihelion's passages.
- First to measure the dust properties of two separate comets (Wild 2 and Tempel 1) with the same instruments for accurate data comparison.
- Improve upon the existing data set gathering in 2005 by the Deep Impact (DI) mission and provide additional information on enigmatic layering and flow features previous discovered by DI.

ENCOUNTER STRATEGY:

The Stardust-NExT camera will detect the nucleus approximately 60 days before encounter:

- 60 days to 1 day before encounter: Imaging refines position of comet and monitors nucleus activity.
- During encounter the on-board camera images nucleus surface and jets at a high resolution.
- After encounter the camera continues to monitor jets and coma activity

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STARDUST NEW EXPLORATION OF TEMPEL 1