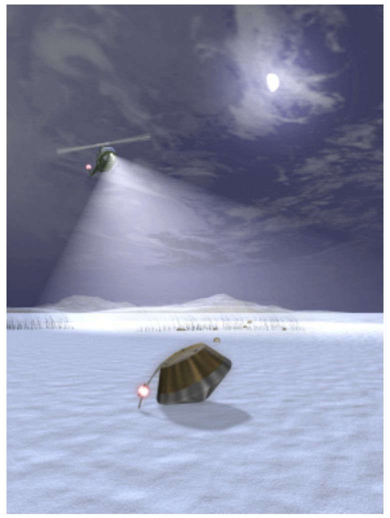


Recovery

Recovery begins a few hours before the capsule touches down. Retrieval is via ground transportation or helicopter. Given the small size and mass of the capsule, it is not expected that its recovery and transportation will require extraordinary handling measures or hardware other than a specialized handling fixture to cradle the capsule during transport.

The Stardust mission is managed for the Space Science Division of the National Aeronautics and Space Administration (NASA) by the Jet Propulsion Laboratory (JPL), a division of the California Institute of Technology (Caltech). Stardust is a collaborative partnership made up of the University of Washington, Lockheed Martin Space Systems, and JPL/Caltech. Stardust is the fourth mission selected in NASA's Discovery Program. These low-cost solar system projects were designed to perform focused science with fast turnaround times and cost less than $150 million in fiscal 1992 dollars to build. Discovery missions are joint efforts among industry, small businesses, and universities.

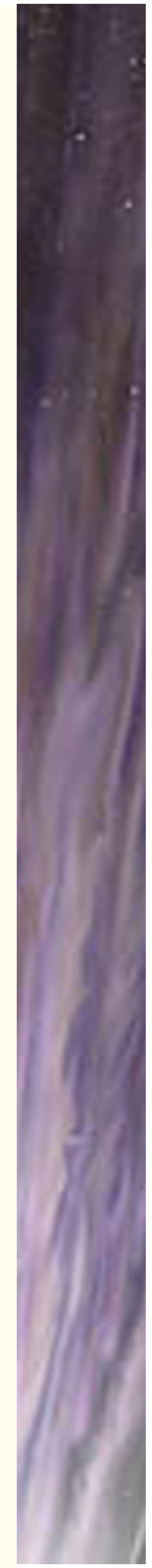
Catching Bullets in Space

Collecting interstellar dust grains and materials from a comet is no easy feat! During the spacecraft's flight past the comet, the impact velocity of the captured particles was as much as six times the speed of a bullet fired from a rifle. Although the captured particles are smaller than grains of sand, high-speed capture could have altered their shape and chemical composition or vaporized them entirely. To collect the particles without damaging them, Stardust used an extraordinary substance called aerogel, a silica-based solid with a porous, sponge-like structure in which 98 percent of the volume is empty space.

One thousand times less dense than glass, aerogel is often referred to as "blue smoke." When a particle impacts the aerogel, it creates a carrot-shaped path as it slows down and comes to a stop. Scientists will use these tracks to find the tiny particles.

Above: Particles captured in aerogel create visible paths. Left: Aerogel's unique qualities include excellent insulation properties.

Stardust's remaining science payload, which provides important context for the captured samples, includes a time-to-flight spectrometer that measured and monitored the amount of particles impacting the spacecraft at the time of encounter, a CCD camera for imaging of Wild 2's coma and nucleus, a transponder that provided two-way Doppler-shift data to estimate limits of the comet's mass, and instruments to measure integrated dust influence and sense the detection of large-particle impacts.



WANT TO KNOW MORE?

Visit the Stardust home page at

http://stardust.jpl.nasa.gov

or e-mail — stardust@jpl.nasa.gov

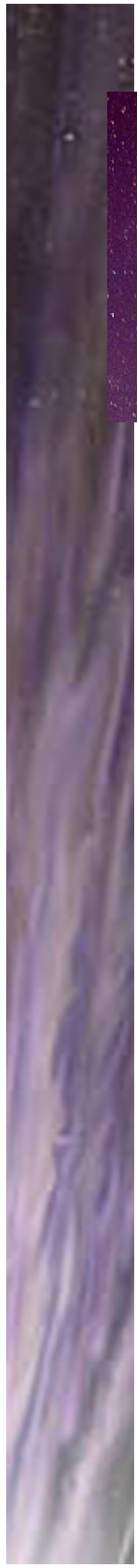
National Aeronautics and Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

JPL 400-XXXX 10/04

Stardust

Bringing Cosmic History to Earth

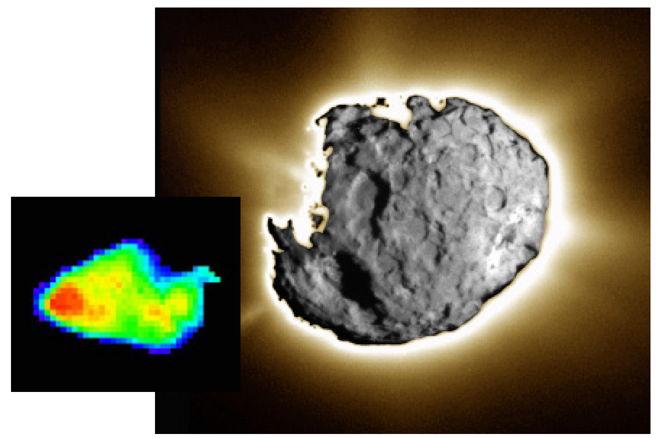


Billowing clouds of ice, dust, and gases, wanderers of the solar system, voyagers from places only dreamed of by humans — these are comets. The keys that unlock the mystery of the early evolution of Earth may be found in comets. Striking Earth many times throughout its history, comets created changes to our atmosphere and climate, while at the same time introducing carbon-based molecules, fundamental components for life on this planet. Cataclysmic changes caused by comets and other bodies striking Earth may be responsible for the extinction of the dinosaurs and other species. By investigating comets, we can explore the mystery of life and the wonders of the universe.

In January 2004, the Stardust spacecraft flew by comet Wild 2 (pronounced "Vilt 2") and collected cometary materials. Pristine samples of these materials will be brought back to Earth. Stardust also collected and will return grains from a newly discovered stream of particles coming into the solar system from interstellar space. These samples will provide a window into the distant past, helping scientists around the world to unravel other mysteries surrounding the birth and evolution of the solar system.

HOW CLOSE CAN YOU GET TO A COMET?

On January 2, 2004, the Stardust spacecraft flew within 236 kilometers (147 miles) of the nucleus of its target, comet 81P/Wild 2.



Stardust's primary mission was to collect interstellar and cometary dust particles. The captured micrometer-sized particles represent the building blocks of the solar system as well as samples of stars.

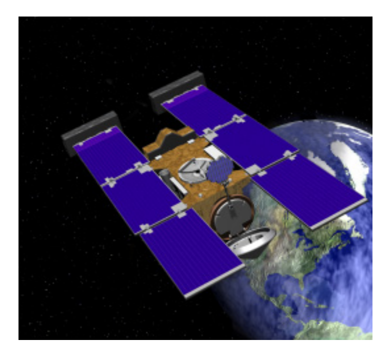
Particles were collected in an extremely low-density, microporous silica material called aerogel. By using aerogel, the mission could capture particles at relatively slow velocities. Most previous cometary encounters occurred at much higher relative velocities, so mission engineers designed an orbital path to ensure that Stardust experienced a slow encounter. Traveling at 13,000 miles (20,921 kilometers) per hour, Stardust took 72 spectacular photographs of comet Wild 2's surface features as it flew past the nucleus.

Stardust's navigation camera took this composite image during close approach to comet Wild 2. Inset: Rehearsing for its comet encounter, Stardust imaged asteroid Annefrank; false colors show brightness variations.

About a year before its encounter with comet Wild 2, Stardust had the unique opportunity to conduct an engineering test as it flew by asteroid Annefrank, preparing the mission team for the January 2004 encounter and testing the science instruments, navigation, and communications. In addition to collecting comet particles, Stardust collected interstellar dust particles several times throughout its seven-year journey. The spacecraft, with its intriguing cargo, is scheduled to return to Earth in January 2006.

EARTH RETURN OF STARDUST SAMPLES

This phase of the Stardust mission begins two weeks before Earth reentry and ends when the sample return capsule is transferred to its ground-handling team. The planned landing site is the Utah Test and Training Range. Following touchdown, the capsule will be recovered by helicopter or ground vehicles and transported to a staging area for retrieval of the sample canister. The canister will then be transported to a dedicated Stardust handling and curation laboratory at NASA Johnson Space Center. The sample return phase is divided into four parts:

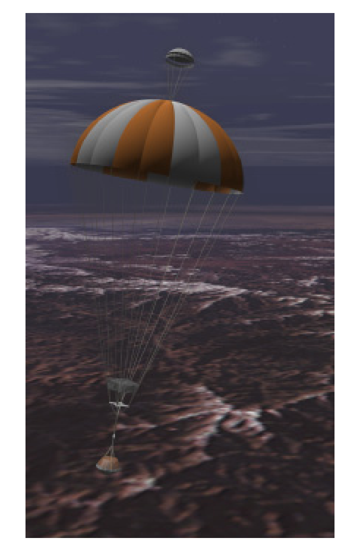


Earth Approach

Earth approach begins with an increased tracking frequency of one eight-hour pass per day, during which three trajectory-correction maneuvers are performed. The sample return capsule will be released to enter the atmosphere soon after the last maneuver. The spacecraft then performs a divert maneuver to avoid entering Earth's atmosphere.

Entry

Entry begins when the spacecraft reorients for capsule release and ends with parachute deployment. The capsule will be released from the spacecraft approximately four hours before entry. The capsule will perform a direct entry at Earth. After entry the capsule will free-fall until approximately 3 kilometers (1.8 miles), at which point the parachute deployment sequence will initiate. Elapsed time from entry to parachute deployment will be approximately 10 minutes.



Terminal Descent

Descent begins when the parachute deployment sequence initiates and continues until the capsule/parachute system has descended into the recovery zone at the Utah Test and Training Range. The velocity of the capsule must be reduced from the initial entry velocity of 12.8 kilometers (8 miles) per second to a level that permits soft landing.