STARDUST Comet Wild-2 Encounter (artist rendition)

Aerogel

Key STARDUST Dates

1974	Comet Wild 2 orbit altered by Jupiter, bringing it into the inner Solar System in pristine condition
January 1978	Paul Wild discovers Comet Wild 2
1995	NASA selects STARDUST mission
February 7, 1999	STARDUST Launch
Mar - May 2000	First Interstellar Dust Collection
January 2001	Earth flyby
July - Dec 2002	Second Interstellar Dust Collection
January 2, 2004	Wild 2 Encounter
January 16, 2006	Sample Return Capsule returns to Earth

Launched in 1999, STARDUST is en route to an encounter with Comet Wild 2, (pronounced "Vilt" after its Swiss discoverer professor Paul Wild) in 2004. It is the first spacecraft to capture and return cometary dust to Earth for analysis.

The spacecraft was launched in February 1999 on board an expendable launch vehicle and will rendezvous with Comet Wild 2 in January 2004, coming within 150 kilometers (93 miles) of the comet's nucleus. The particles STARDUST will return are made of ancient material that formed our Sun and planets. What we learn about Comet Wild 2 will probably reshape our understanding of how our Solar System-and perhaps even life-formed.

The total weight of the spacecraft including the propellant needed for deep space maneuvers is 380 kilograms. The overall length of the main bus is 1.7 meters, about the size of an average office desk.

The primary objective of the Stardust mission is to capture both cometary samples and interstellar dust. Main challenges to accomplishing this successfully involve slowing down the particles from their high velocity with minimal heating or other effects that would cause their physical alteration. When the Stardust Spacecraft encounters the Comet Wild 2, the impact velocity of the particles will be up to 6 times the speed of a rifle bullet. Although the captured particles will each be smaller than a grain of sand, high-speed capture could alter their shape and chemical composition - or even vaporize them entirely.

To collect particles without damaging them, Stardust uses an extraordinary substance called aerogel. This is a silicon-based solid with a porous, sponge-like structure in which 99.8 percent of the volume is empty space. By comparison, aerogel is 1,000 times less dense than glass, which is another silicon-based solid. When a particle hits the aerogel, it buries itself in the material, creating a carrot-shaped track up to 200 times its own length. This slows it down and brings the sample to a relatively gradual stop. Since aerogel is mostly transparent - with a distinctive smoky blue cast - scientists will use these tracks to find the tiny particles.

Source: http://stardust.jpl.nasa.gov