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Co-Lead and speaker:

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Jet Propulsion Laboratory
Deep Impact Mission
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Pasadena, CA 91109
(818) 952-7135
(818) 952-7141 fax
mnkbrown@earthlink.net

Title: Taking Advantage of Space: NASA's Mission to Explore a Comet
Grade Level 5-8
Sciences: Life and Natural Sciences
- Geology, Chemistry, and Biology

Session:

Deciding what elements are necessary to travel billions and billions of kilometers into space is only part of NASA's and the Stardust mission goal. NASA has begun to explore a new area of space – that of space education. Recent surveys conducted by NASA's Educational Affairs Office (EAO) have revealed an increasing decline in students across the United States interested in science, mathematics, and technology regardless of their communities' exposure to the sciences and/or location throughout the US. Many theories exist to why the decline; which range from outdated textbooks; to lack of awareness of potential careers in the science and technology fields; to social issues.

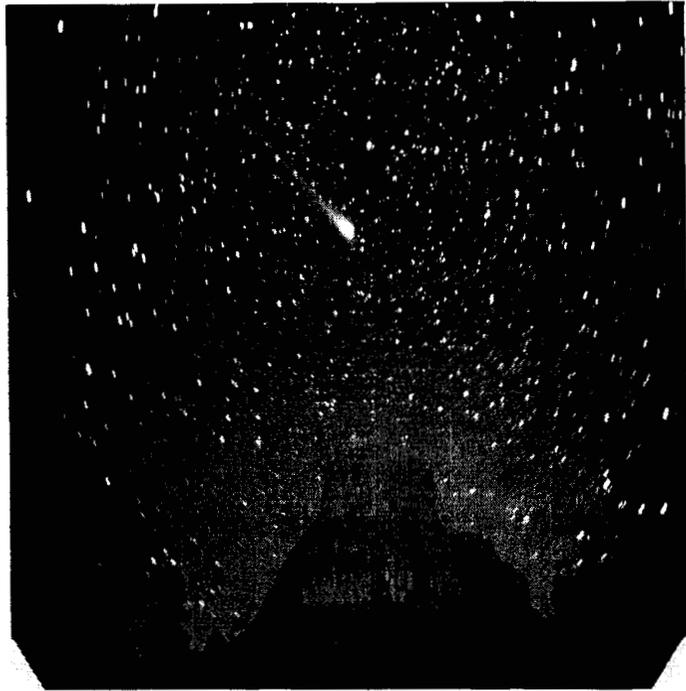
NASA's fourth Discovery Mission - Stardust is hoping to change all that! A major challenge of the mission was to develop a plan to engage not just students but the public-at-large of potential careers, technologies, and science gained by exploring our solar system. The Stardust mission is funded by the National Aeronautics and Space Administration (NASA) and managed by the Jet Propulsion Laboratory (JPL) for the California Institute of Technology (Caltech). Lockheed Martin Aeronautics and Operations, Denver was responsible for building the spacecraft and currently assists JPL with its multi-mission operations

and navigation. Stardust's Principal Investigator, Dr. Donald Brownlee resides at the University of Washington.

Through a series of educational and public partnerships, Stardust has developed a strong strategic education and public outreach plan. In addition, Stardust leads the way in the area of Technology Transfer, contributing in successful partnerships with universities and industry partnerships in an effort to provide technology applications and spin-off's as common household applications as well as creating awareness of a booming job market.

This session will provide a brief mission overview while reviewing career areas within the science and engineering fields that are available. Hand-on activities have been developed to provide educators, within grade 5-8, the opportunities to demonstrate components of a comet by "Cooking up a Kitchen Comet". The Stardust mission also provides both students and educators a hands-on-minds-on opportunity to explore just how NASA plans to collect comet particle and return them to Earth in 2006. Through an activity design for grades 5-8, Stardust demonstrates its use of aerogel (the lightest known solid to man). Stardust will use this unique material to collect particle as demonstrated in the "Aerogello" activity.

*All Stardust educational activities can be viewed at:
<http://stardust.jpl.nasa.gov/classroom/guides.html>



system preserving the earliest record of material from the nebula which formed the sun and the planets.

- * Bring volatile light elements to the planets, playing a role in forming oceans and atmospheres.
- * Are the most organic-rich bodies in the solar system providing ready-formed molecules possibly involved in the origin of life on Earth.
- * Impact the Earth and other planets at hyper velocities, causing major changes in climate and dramatically affecting the ecological balance, possibly including the extinction of the Dinosaurs.
- * Are the building blocks of planetary systems around other stars.

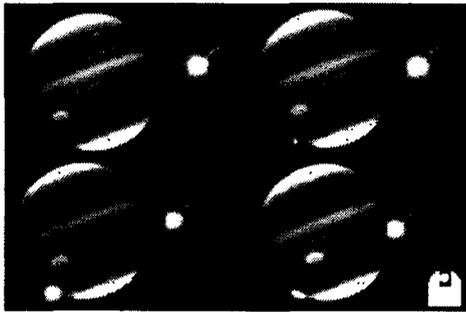


Stardust

"Bringing Back Cosmic History"

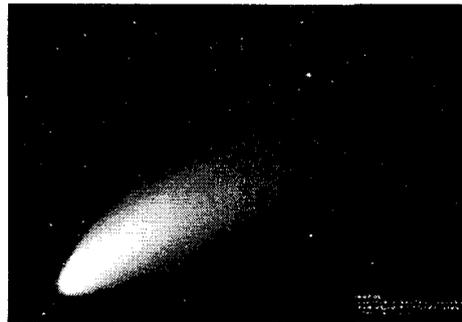
Interesting Comets

A bright comet will appear in our skies about once every 20 years on the average. We have been privileged to have recently witnessed two bright comets in years: Comet Hyakutake in 1996 and Comet Hale-Bopp in 1997. As an added bonus, the Comet Shoemaker-Levy 9 impacts into Jupiter in 1994 was literally a once in a millennium event!



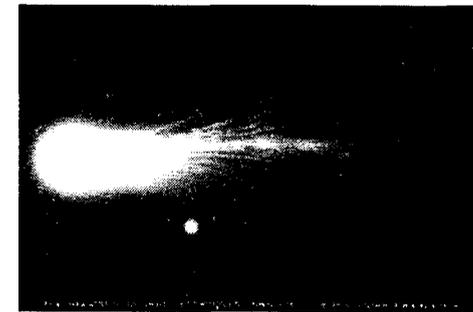
Comet Shoemaker-Levy 9

Comet Shoemaker-Levy 9 broke into 21 fragments and put on a spectacular show in the summer of 1994 when each fragment crashed into Jupiter.



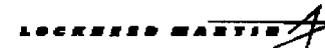
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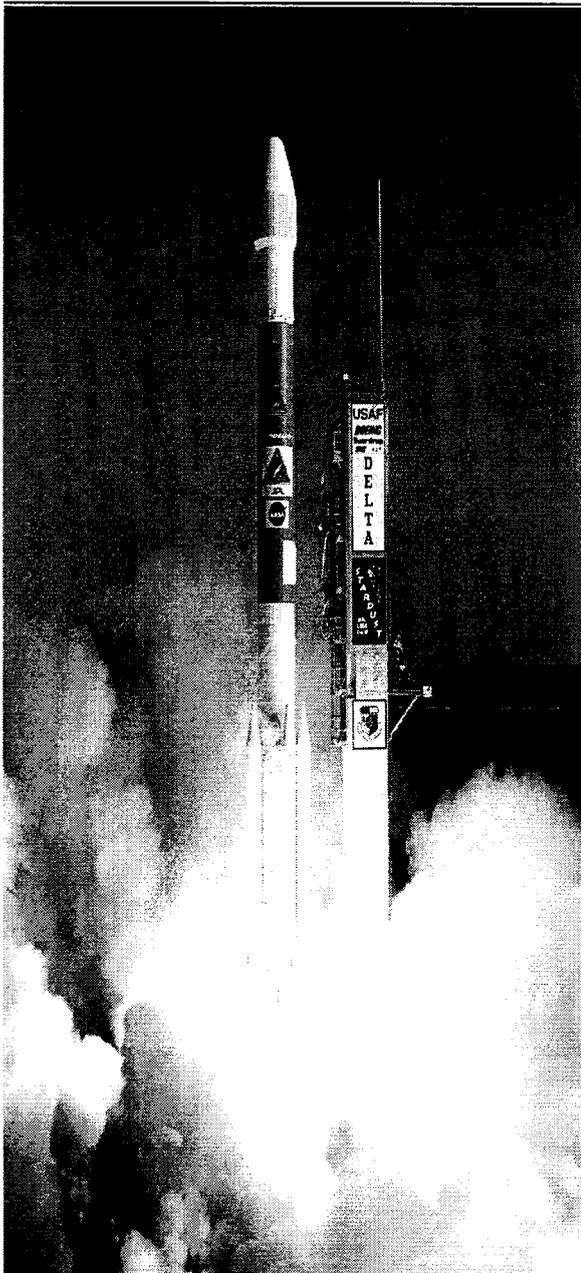


Comet Hyakutake

the spring of 1996, this small comet made a close flyby of Earth (0.10 AU) with a magnitude of 0. Comet Hyakutake also sported a 100 degree tail, the longest tail ever observed!



Stardust "Bringing Back Cosmic History"



Background/Philosophy:

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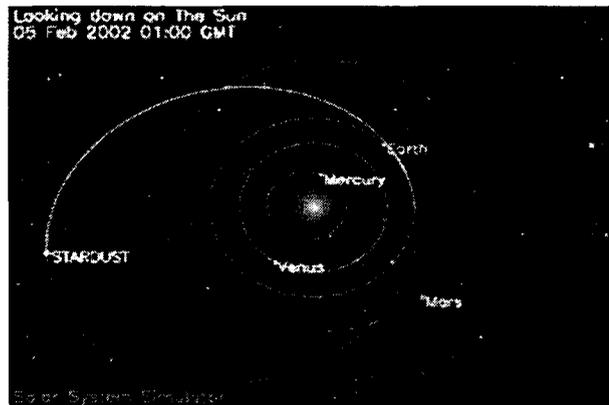
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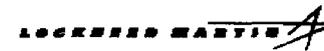
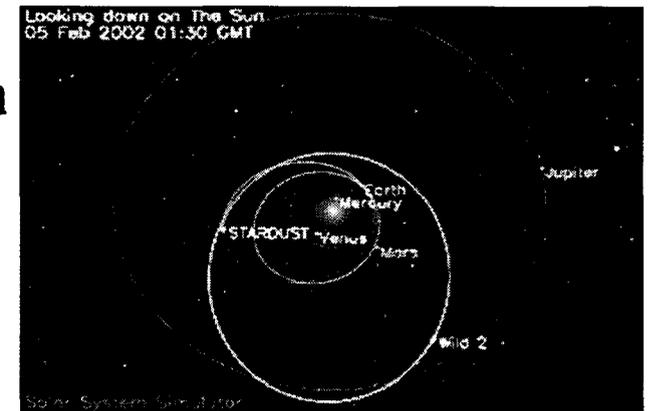
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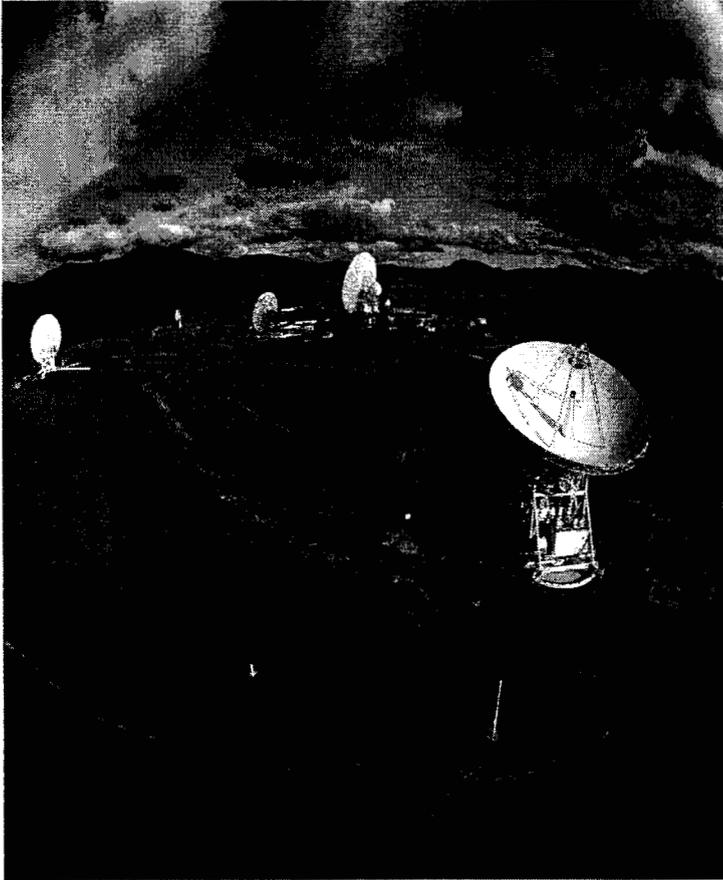


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Stardust

"Bringing Back Cosmic History"



Communicating with spacecrafts

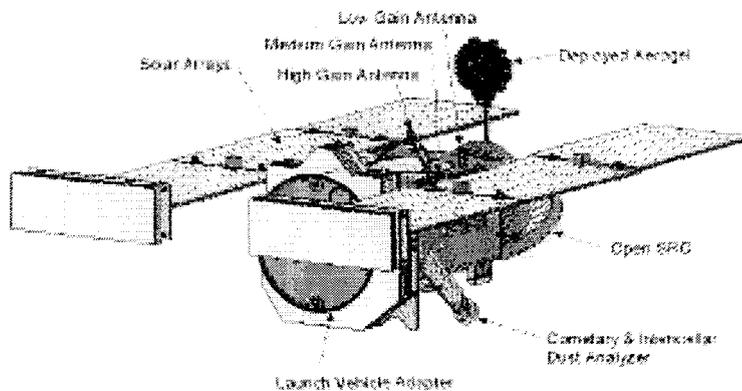
- NASA's Deep Space Network is the largest and most sensitive scientific telecommunications system and the most precise radio navigation network in the world.
 - Its principal responsibilities are to support interplanetary spacecraft missions and radio and radar astronomy observations in the exploration of the solar system and the universe.
- * The network is a separate facility of the NASA Office of Space Communications and is managed for NASA by the Jet Propulsion Laboratory (JPL) of the California Institute of Technology (Caltech) in Pasadena, California.



Stardust

"Bringing Back Cosmic History"

Encounter Configuration



Launch: February 7, 1999

Mass: 385 kilograms (848 pounds) total, consisting of 254-kilogram (560-pound) spacecraft and 46-kilogram (101-pound) sample return capsule, plus 85 kilograms (187 pounds) fuel

Science-related subsystems:

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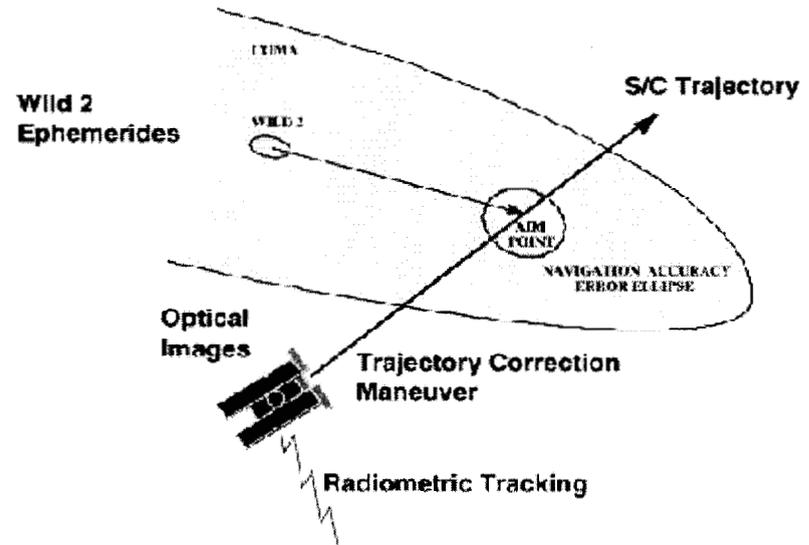
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Stardust "Bringing Back Cosmic History"

Important Questions:

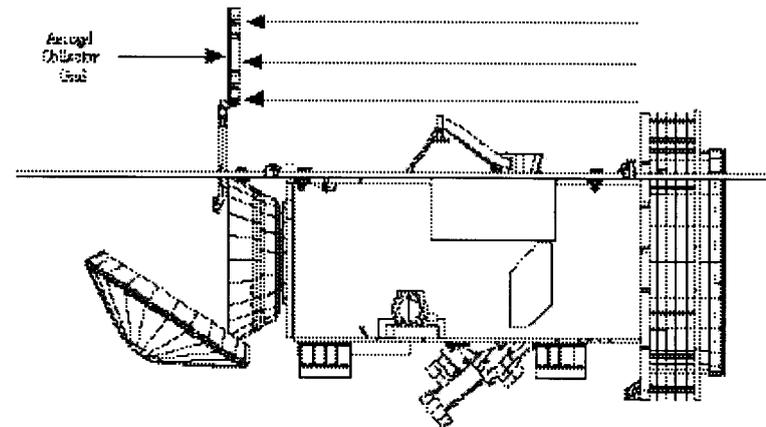
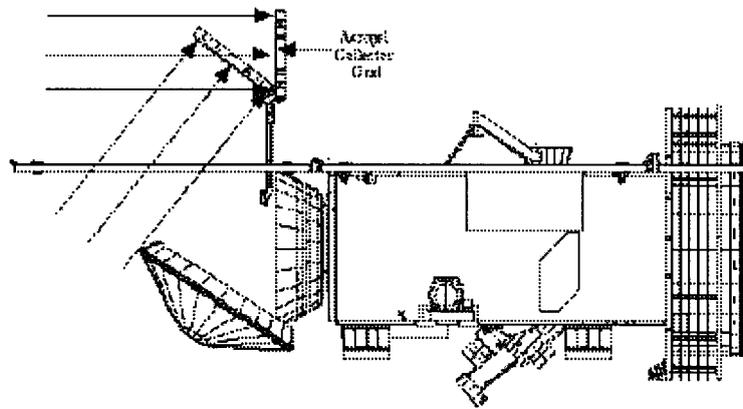
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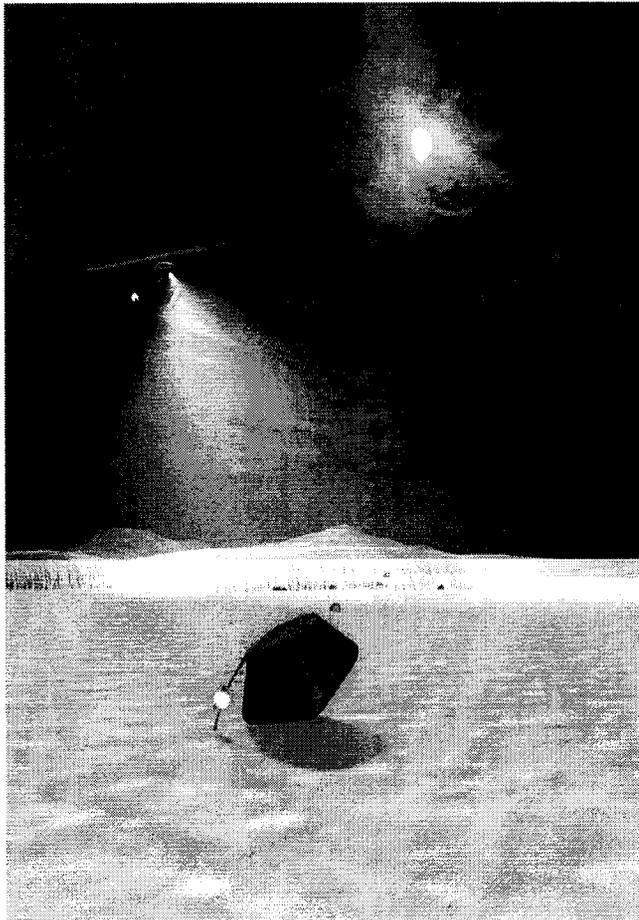
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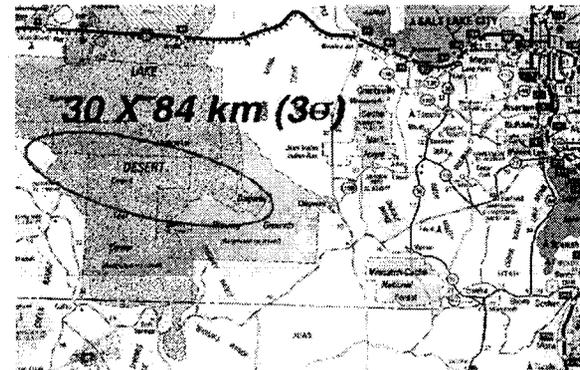
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Return to Earth: 2006

- Stardust spacecraft is designed with fault protection software to ensure a safe entry.
- Visible entry from California, Nevada and Utah.
- Assisted by the Air Force at the Utah Test and Training Range the Stardust Sample Return Capsule (SRC) will be recovered and transported to Johnson Space Center for further analyses.
- Expected time of recovery is 2-4 hours after entry.
- Studies to begin within hours of reaching curation facility at Johnson Space Center.



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Mass: 5,712 kilograms (12,593 pounds), consisting of 2,125-kilogram (4,685-pound) orbiter, 320-kilogram (705-pound) Huygens probe, launch vehicle adapter and 3,132 kilograms (6,905 pounds) of propellants

Science instruments: Orbiter optical camera system, imaging radar, radio science, ion and neutral mass spectrometer, visible and infrared mapping spectrometer, composite infrared spectrometer, cosmic dust analyzer, radio and plasma wave spectrometer, plasma spectrometer, ultraviolet imaging spectrograph, magnetospheric imaging instrument, dual technique magnetometer; Huygens probe descent Imager and spectral radiometer, atmospheric structure instrument, gas chromatograph and mass spectrometer, aerosol collector pyrolyzer, surface science package, doppler wind experiment

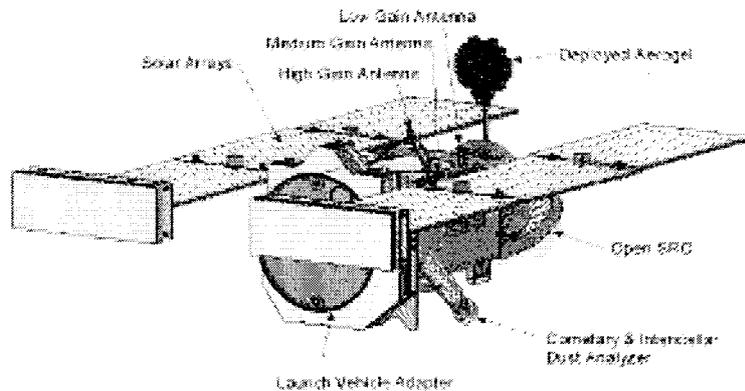


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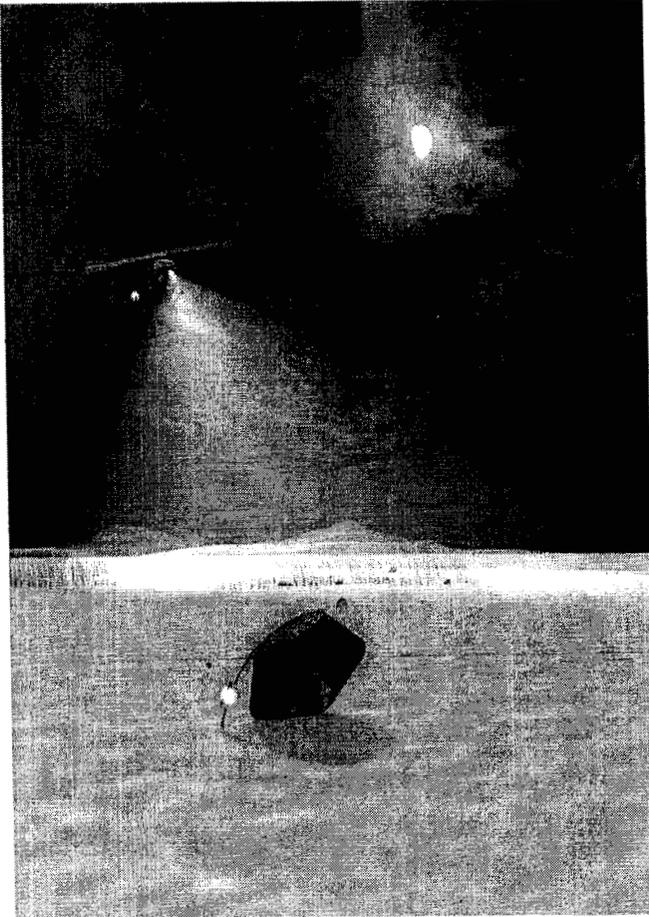
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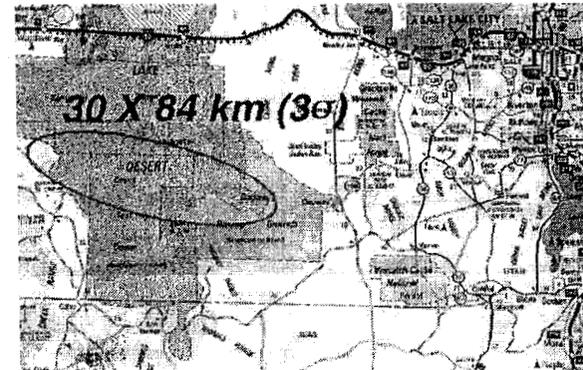
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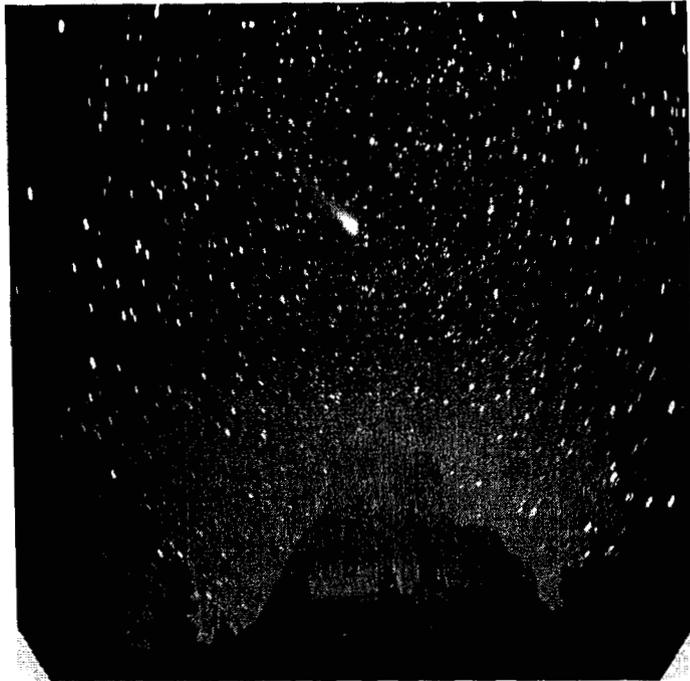
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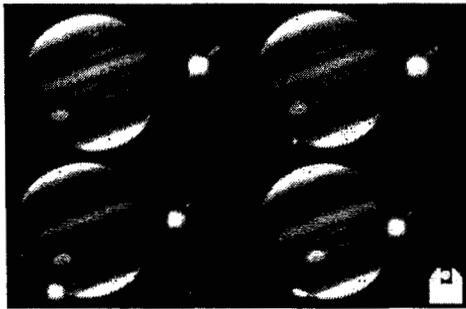


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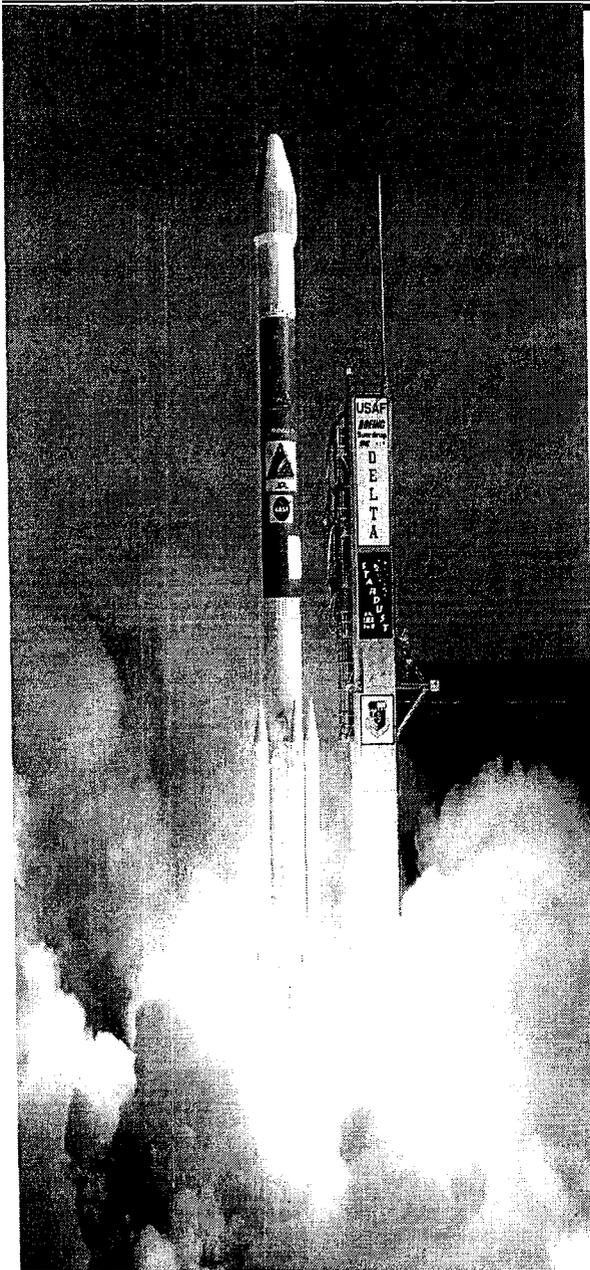


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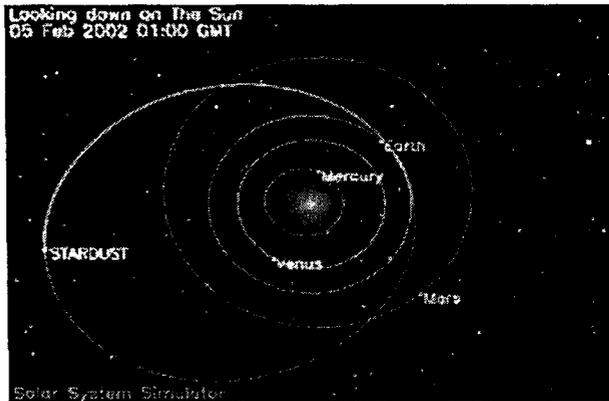
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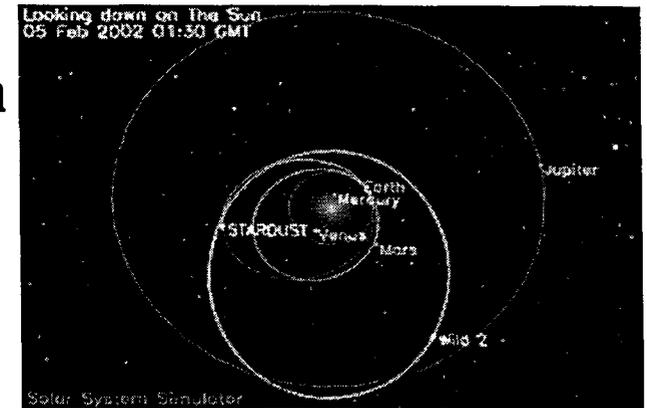
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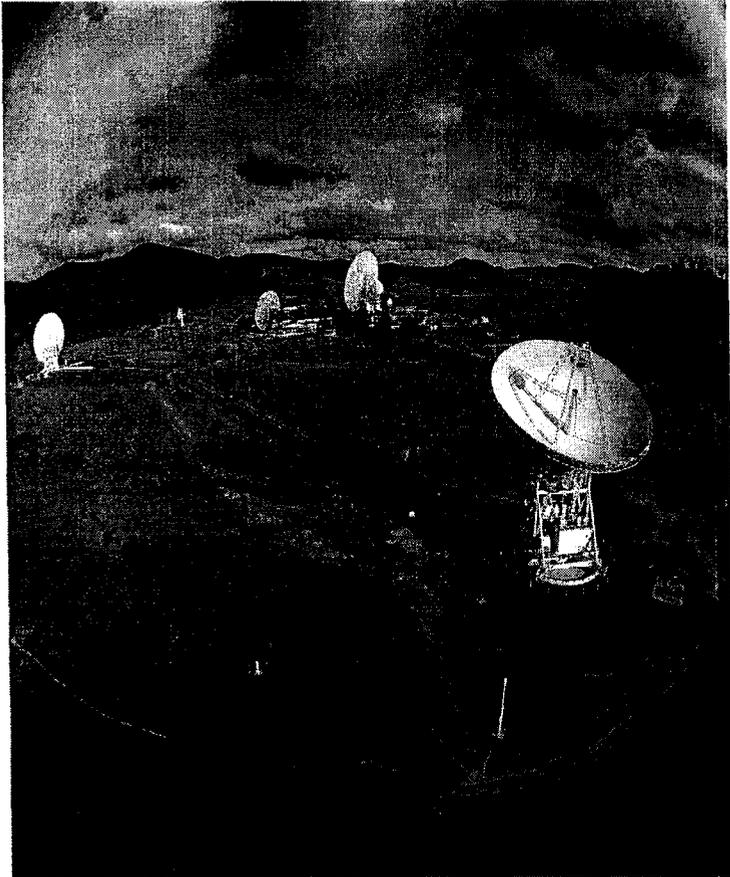


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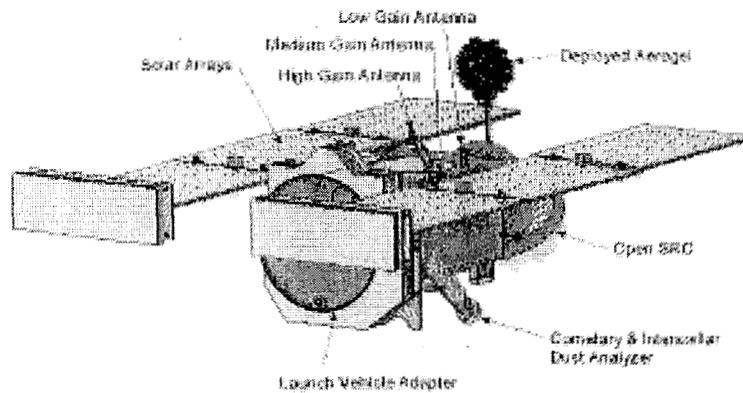
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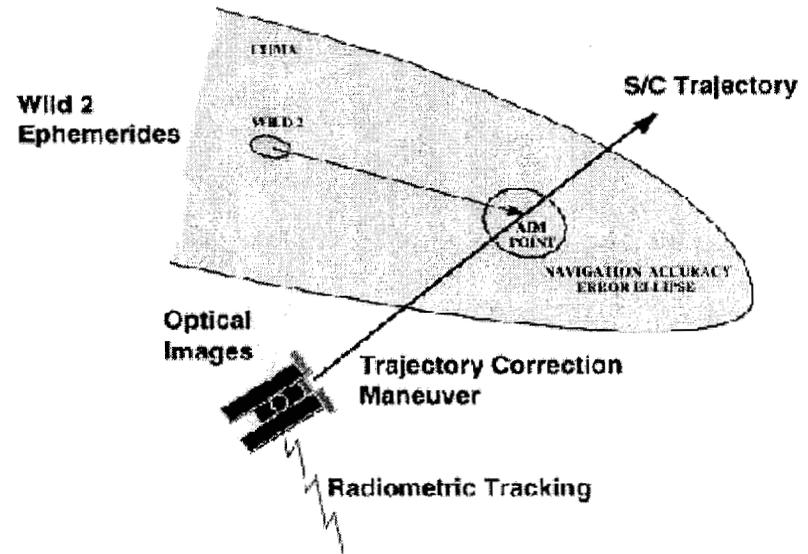


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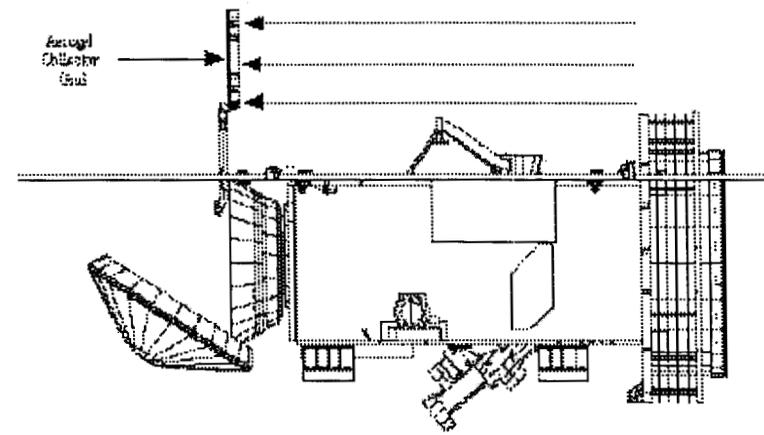
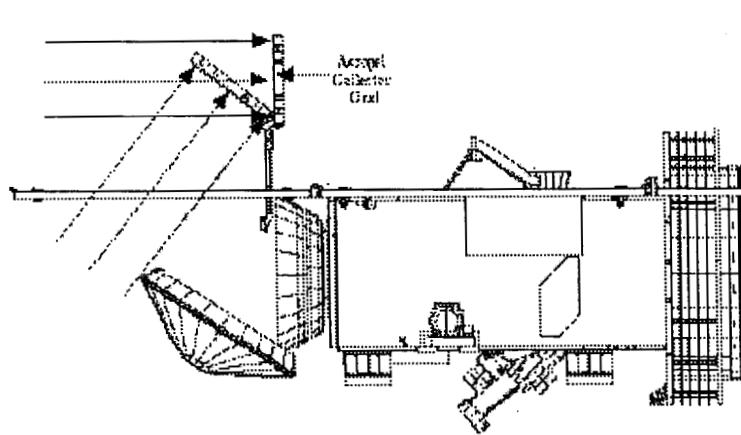
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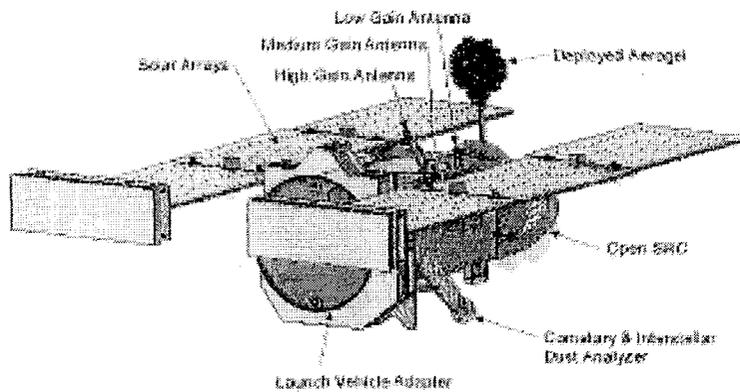


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