

# **JPL Technologies & The Future**

**A Presentation to the Maine Space Grant Consortium**

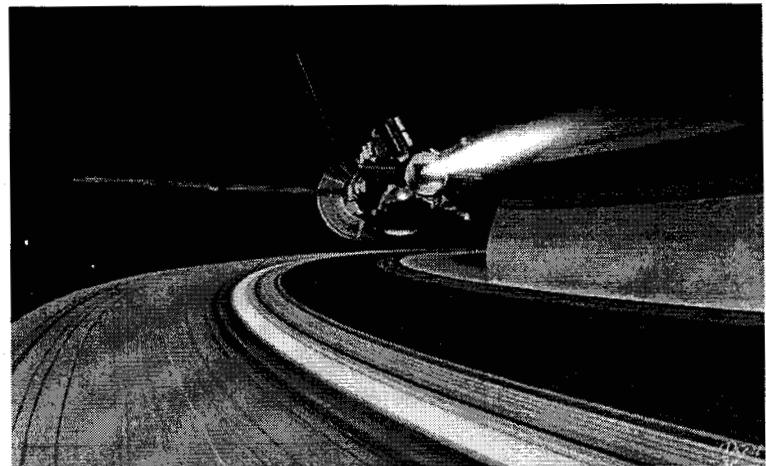
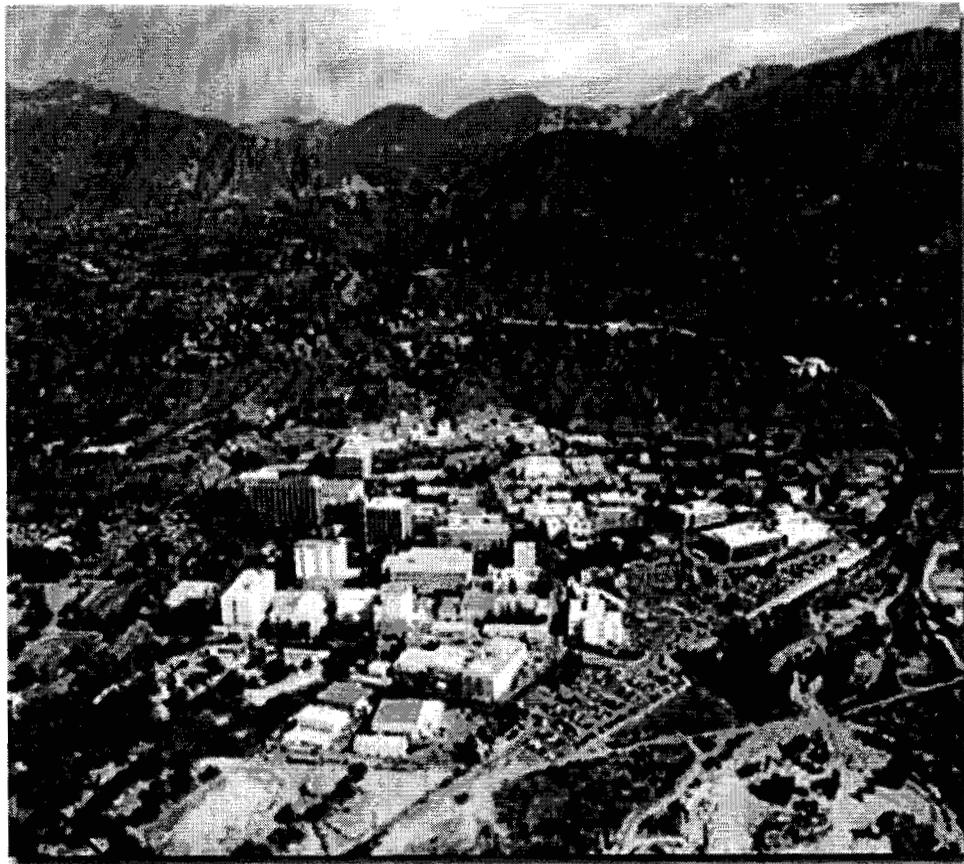
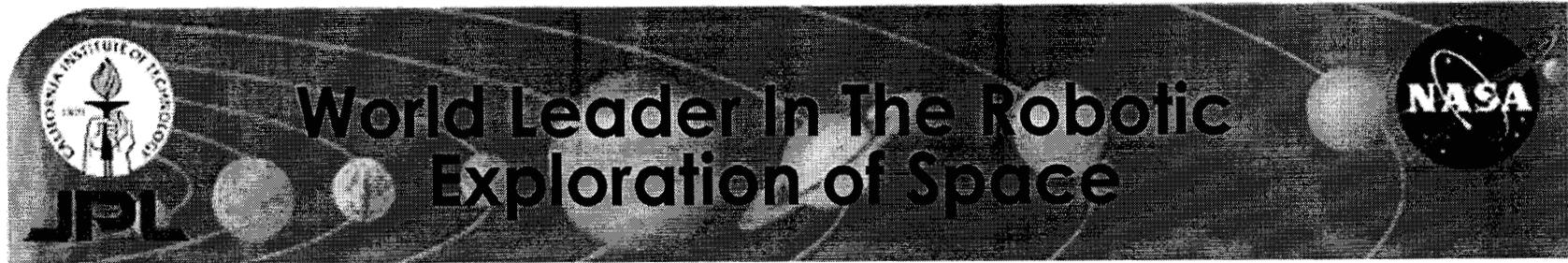
**By**

**Jim Rooney**

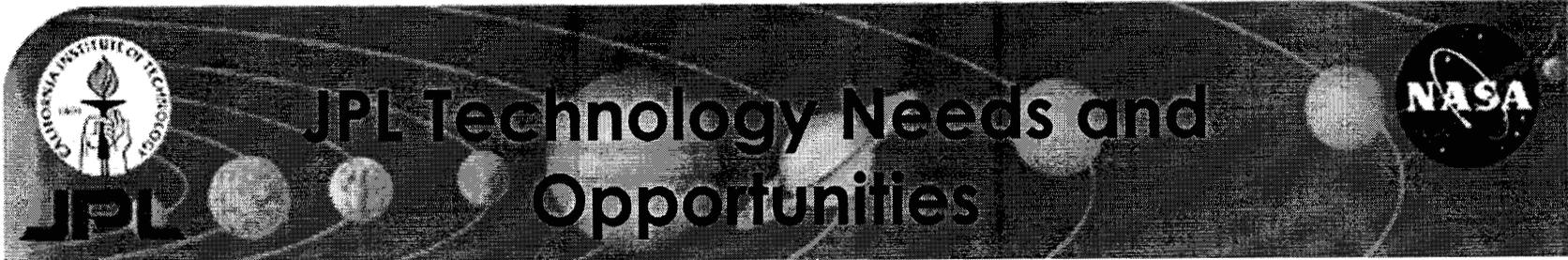
**Jet Propulsion Laboratory**

**California Institute of Technology**

**October 4, 2002**



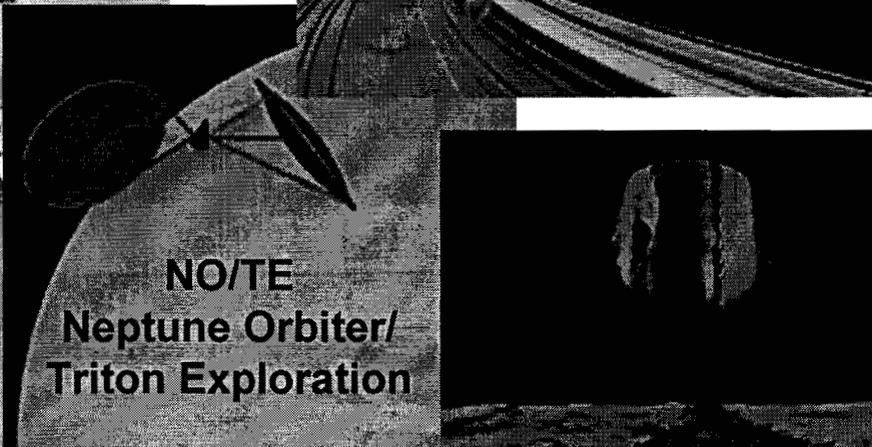
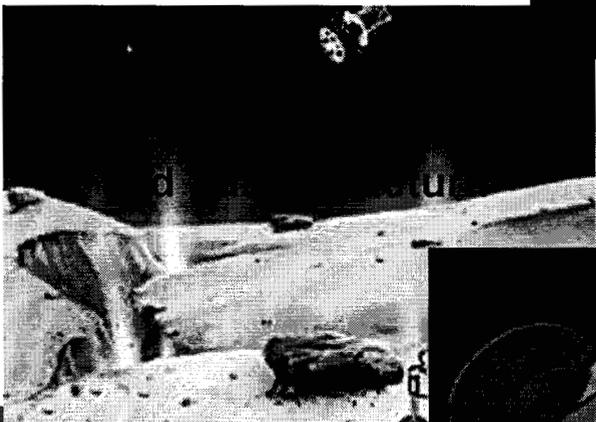
- **Founded in the 1930's when Caltech Professor Theodore von Karman conducted pioneering work on rocket propulsion.**
- **Chartered to Conduct Solar System Exploration, Earth Science, Astrophysics, and Technology Development**
- **Annual Budget - Over \$1 Billion**
- **5200 Employees**
- **Federally Funded R&D NASA Facility operated by the California Institute of Technology**



- **What drives JPL**
- **What technologies are important to JPL's future**

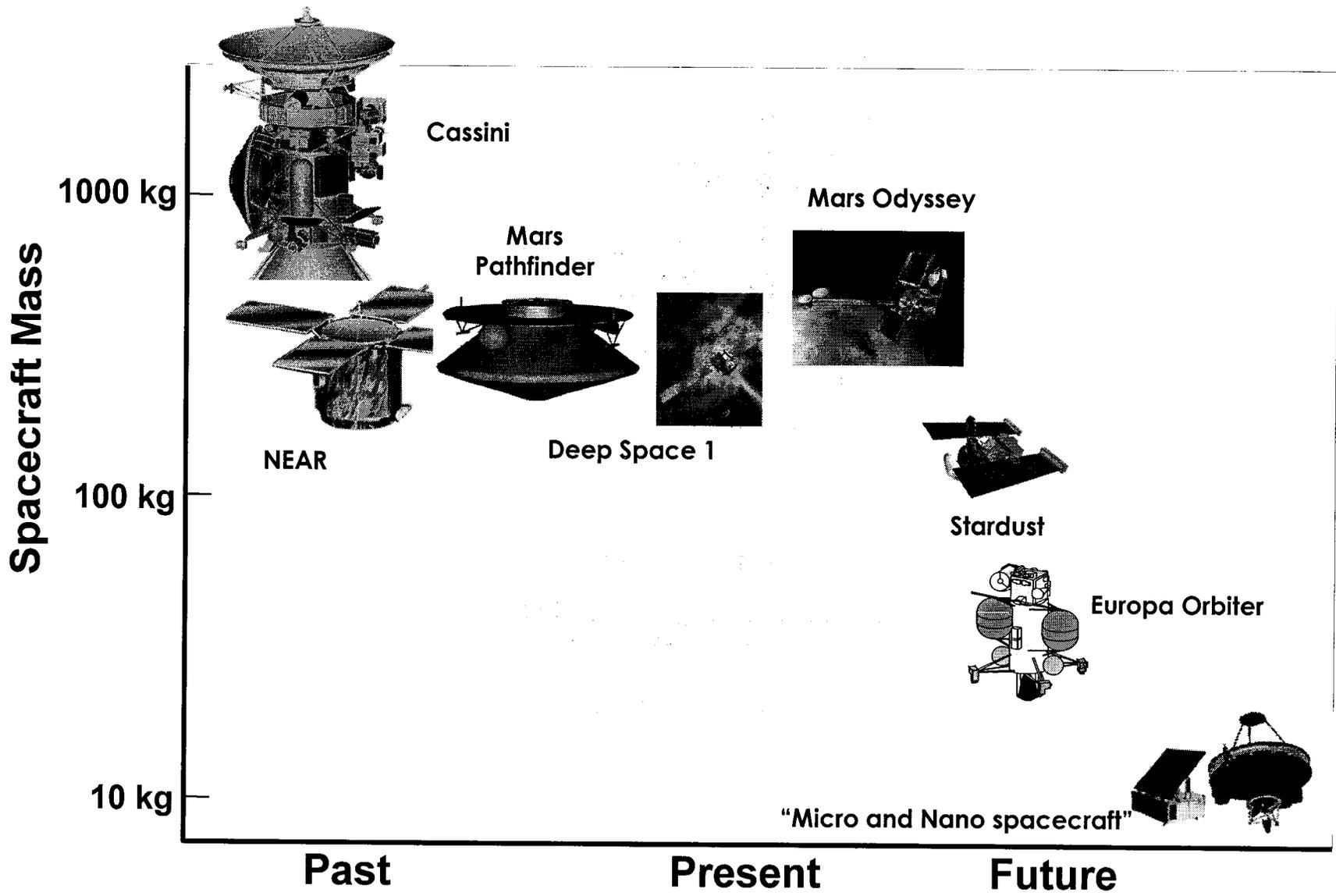


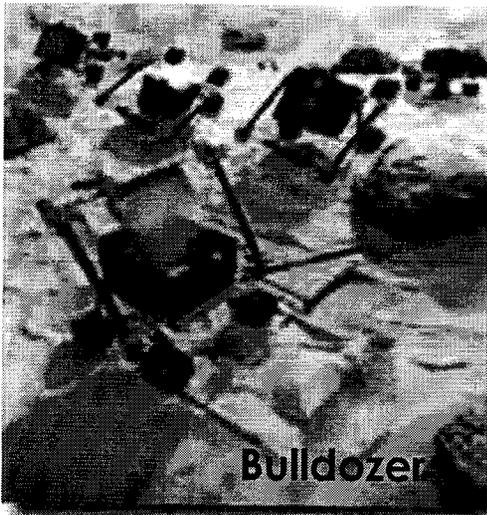
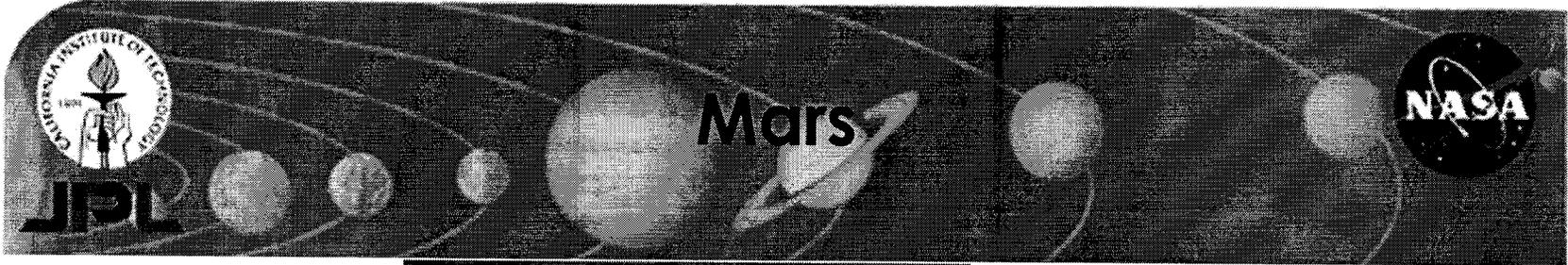
**Need advanced capabilities in many diverse systems:  
Orbiters, Landers, Probes,  
Rovers, Penetrators,  
Aerobots, Aircraft, Sub-surface, Submarine, ...?**



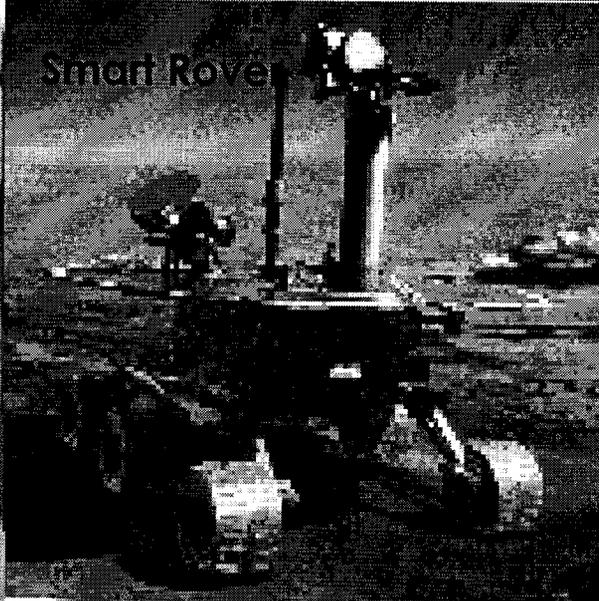


# The Trend Towards Smaller Spacecraft

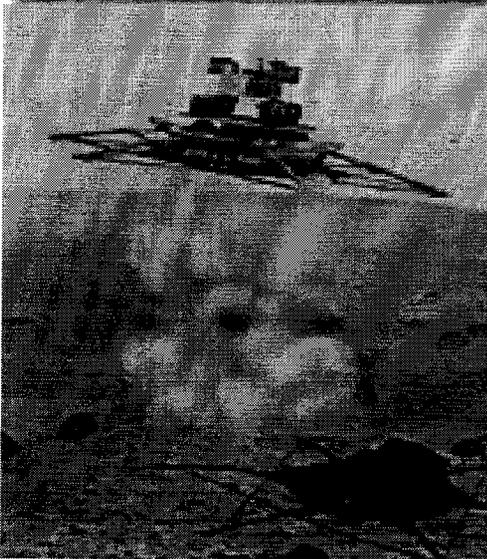
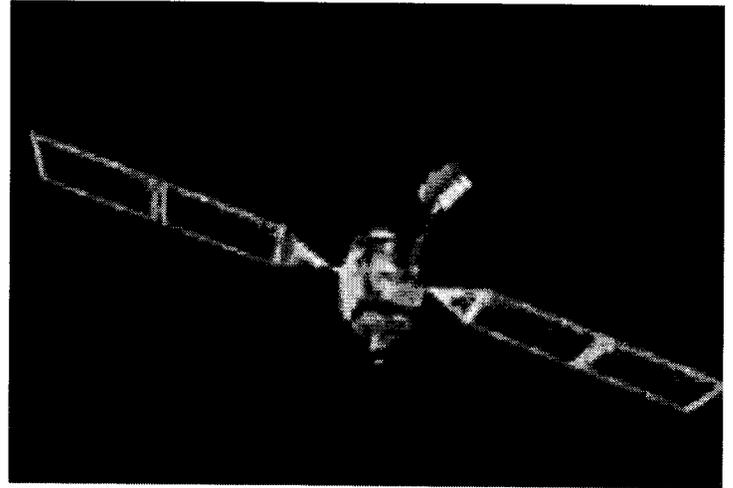





Bulldozer

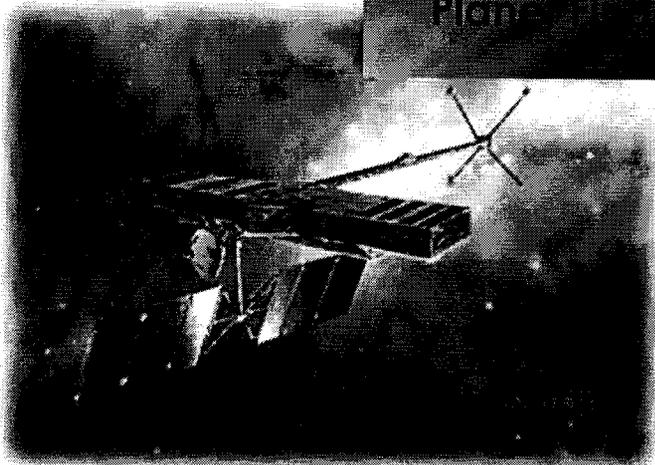
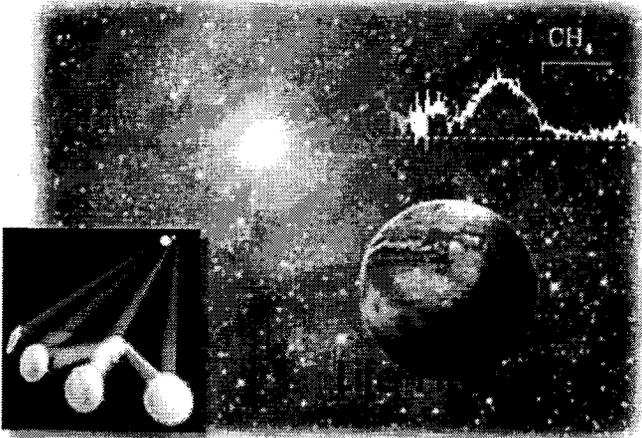
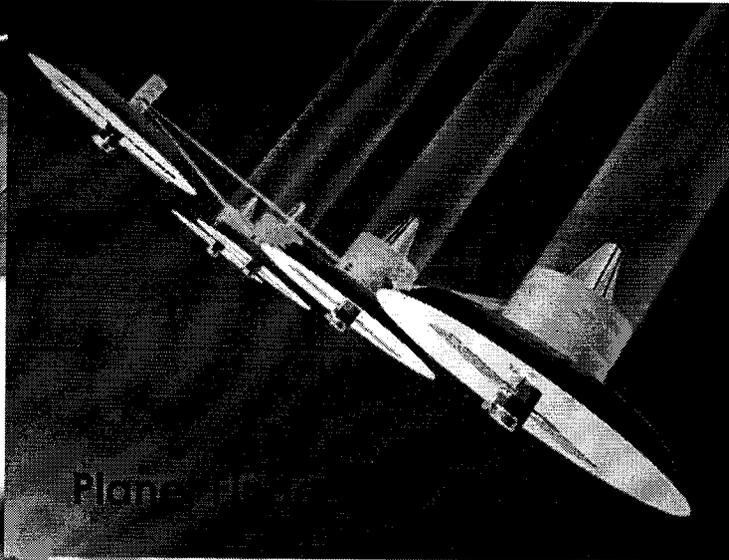
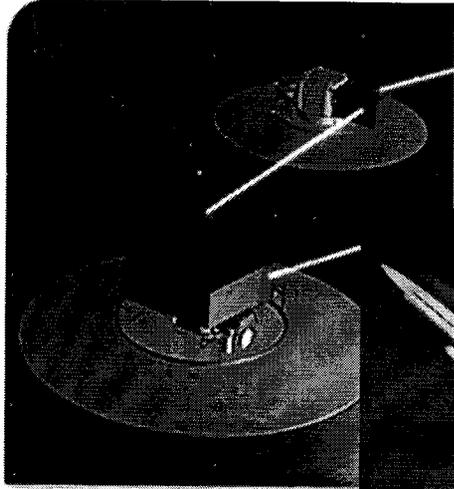


Smart Rover

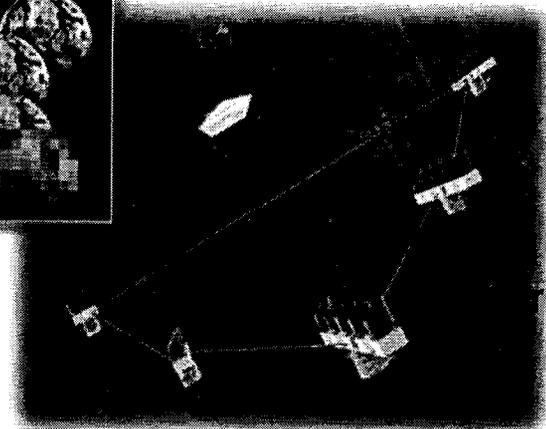


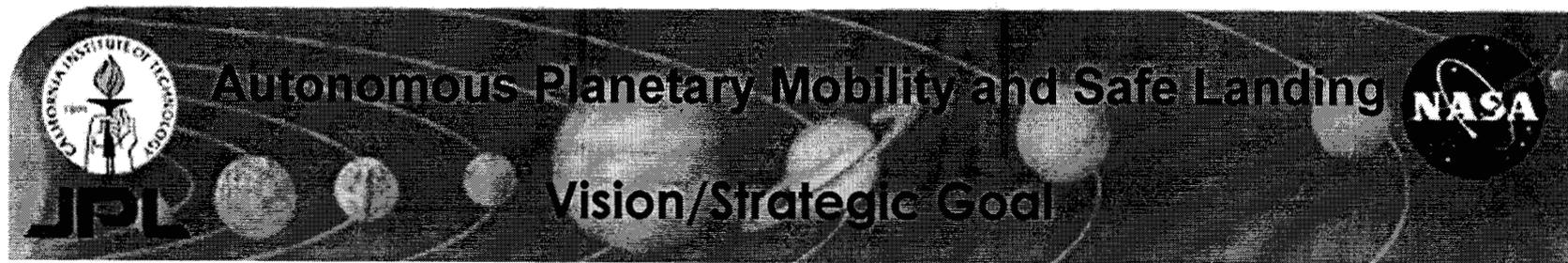
Smart Lander



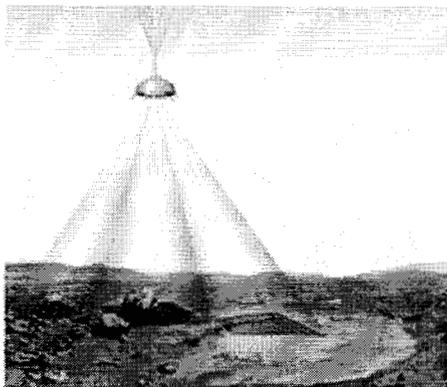


RESEARCH CENTER





**Develop the technology for safe landing and autonomous mobility in planetary environments thereby enabling breakthrough scientific measurements.**

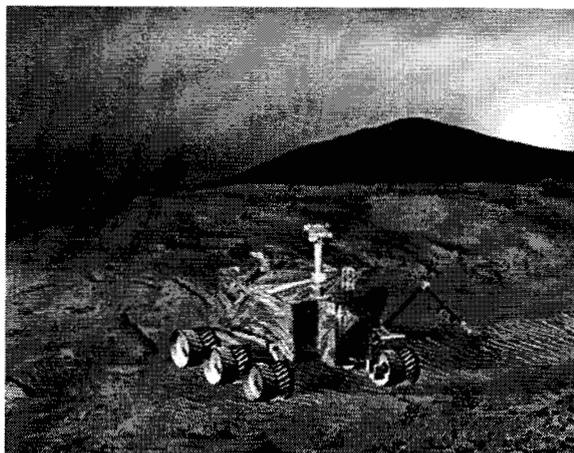


**Descent to the Surface**

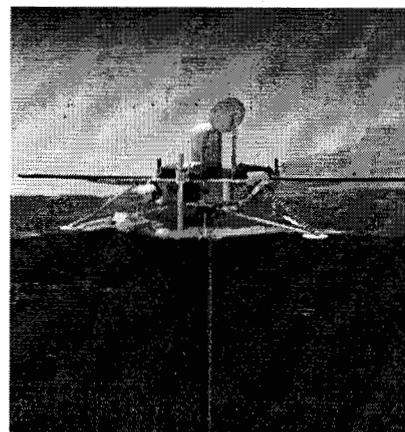


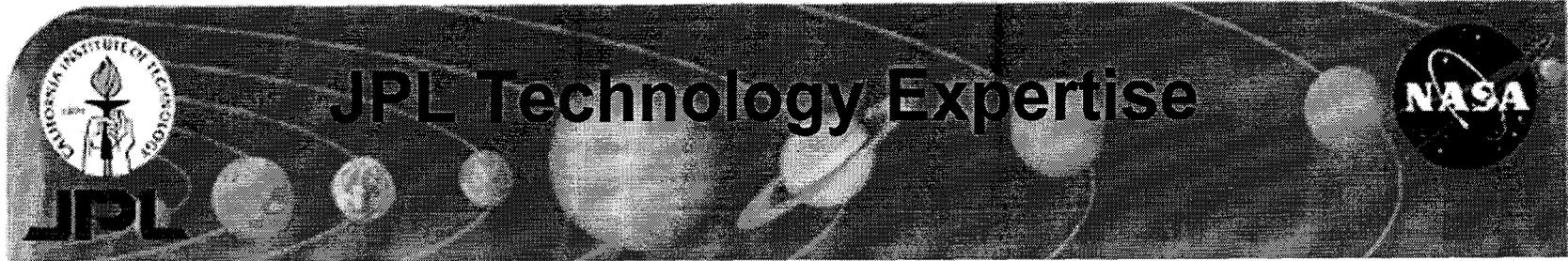
**Mobility in the Atmosphere**

**Mobility on the Surface**



**Access Beneath the Surface**





**•SPACE SYSTEMS**

Large Space Optics  
 Space Inflatable Structures  
 PicoSat Development  
 Rendezvous, Docking and Transfer Technology  
 Adaptive Optics  
 Large Ground Antennas

**•OPTICS & OPTOELECTRONICS**

Electro-Optics & Infrared-Optics  
 Optical Devices & Systems  
 Vision/Physiological Optics  
 Optical Systems Engineering

**•SENSORS & MICRO DEVICES**

Quantum Well Infrared  
 Photodetector Technology  
 MEMS Gyro  
 Reversal Electron Attachment  
 Detector "READ" Sensors  
 Carbon Nanotube Array  
 Applications

**COMMUNICATIONS**

Antennas  
 Coding & Compression  
 Networking  
 Sensor Webs  
 Optical Communications  
 •Signal Propagation  
 Signal Processing & Control

**QUANTUM TECHNOLOGY**

Algorithm Development & Computing  
 Signal Processing  
 Gravity Gradiometers  
 Gyroscopes  
 Clock Synchronization  
 Atomic Clock on a Chip

**INFORMATION SYSTEMS**

Graphics & Image Processing  
 •Fusion Of Multi-Sensor Data  
 Integrated Informatics Data Architectures  
 Knowledge Engineering Systems  
 Interplanetary Internet Technology  
 Networking in Extreme Environments  
 Fault Tolerant Networks  
 Security and Survivability of IT Systems

**ROBOTICS & AUTONOMOUS SYSTEMS**

Robotic Machine Vision  
 Robotic Mobility Systems  
 Software for Distributed Robotics  
 Formation Flying Technology  
 Autonomous Navigation Technology  
 Development for Multiple Robotic Vehicles

•Subsurface Drilling Technology

**•DETECTOR SYSTEMS**

Active (Radar) & Passive (Hyperspectral, Optical) EM Detectors

**COMPUTING**

Advanced High-End Computing  
 Adaptive & Evolvable Computing Systems  
 Low-Power Computing Algorithms  
 Neural Net Computing Architectures

**•POWER & PROPULSION**

Ion Propulsion  
 Micro Thrusters  
 Photovoltaic Design & Testing  
 Thermoelectric Power Devices  
 Direct Methanol Fuel Cells

**•MECHANICAL & THERMAL SYSTEMS**

Smart Structures  
 Electro active Polymer Devices  
 Acoustics  
 Cryogenics  
 Heat Transfer & Fluid Dynamics  
 Active Vibration Isolation

**AUTONOMOUS SYSTEMS**

Computer Vision  
 Human Factors & Psychophysics  
 Machine Intelligence  
 Machine Perception  
 Optical Processing  
 Robotics & Tele-Operation  
 Fault Detection and Prognosis



# Industry Partnership Strategies



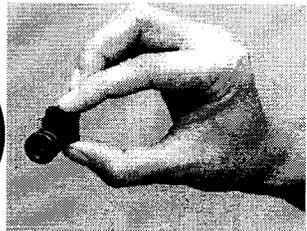
**Technology Affiliates Program**



**Company Funded**

- Technology Solutions
- Access To Unique Facilities

**Strategic Alliances/  
Technology Cooperation  
Agreements/  
Teaming Agreements**



- Joint Development with Industry
- Joint Proposal Submissions



**Small Business Innovation Research**

**Technology Dissemination**

**Patents And Licenses**

**NASA Funded Research**

**Small Business Technology Transfer  
Advanced Technology Program**

**JPL Spin-off Companies**

- Caltech
- NASA
- Companies

**JPL As A Collaborator on  
Company-Led Proposals**

*Photobit, Hightower,  
ViaSpace, Oakgrove*