Mars Scout 2007: A Current Status

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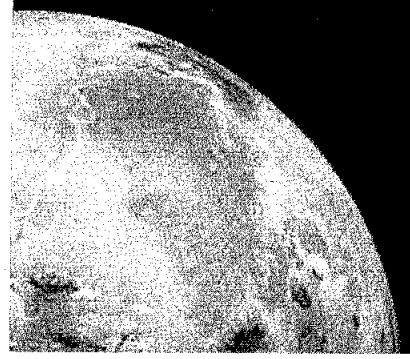
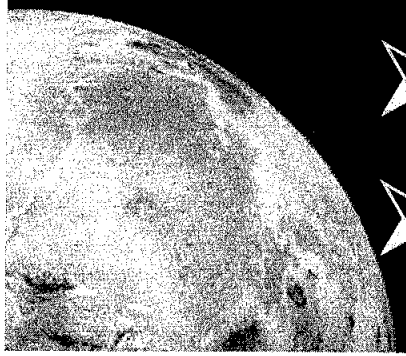


The work described here was performed at the Jet Propulsion Laboratory, California Institute of Technology under contract with the National Aeronautics and Space Administration.

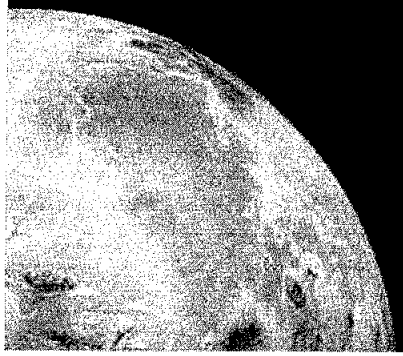
Outline

- Why Mars Scouts?
- What are Mars Scouts?
- When is a Scout likely to launch?
- Summary of Concepts to Date
  - ✓Pre-AO Studies
  - ✓Proposals in Response to AO
- Scout Technologies
- Future Work



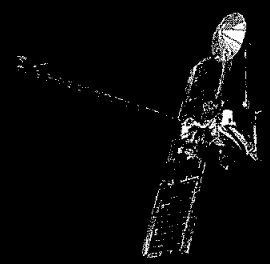
Why Mars Scouts?

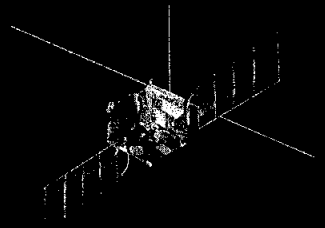
- Achieve program science goals not otherwise covered in the baseline plan.
- Optimize the use of limited resources to accomplish the best science.
- Provide the flexibility to quickly respond to discoveries at Mars.

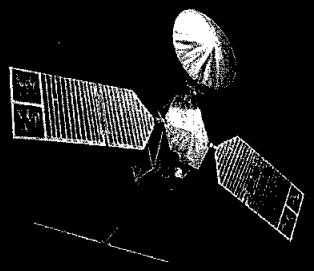


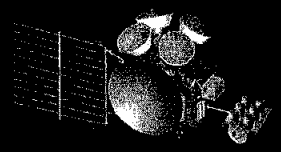
Where Does Scout '07 Fit?

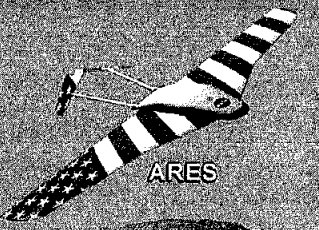
2001	2003	2005	2007	2009
MARS ODYSSEY	MARS EXPRESS (ESA)	MARS RECONNAISSANCE ORBITER	MARVEL	MARS TELESAT ORBITER







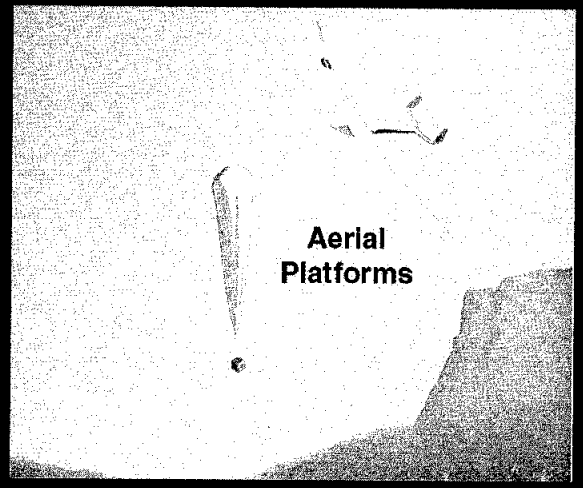


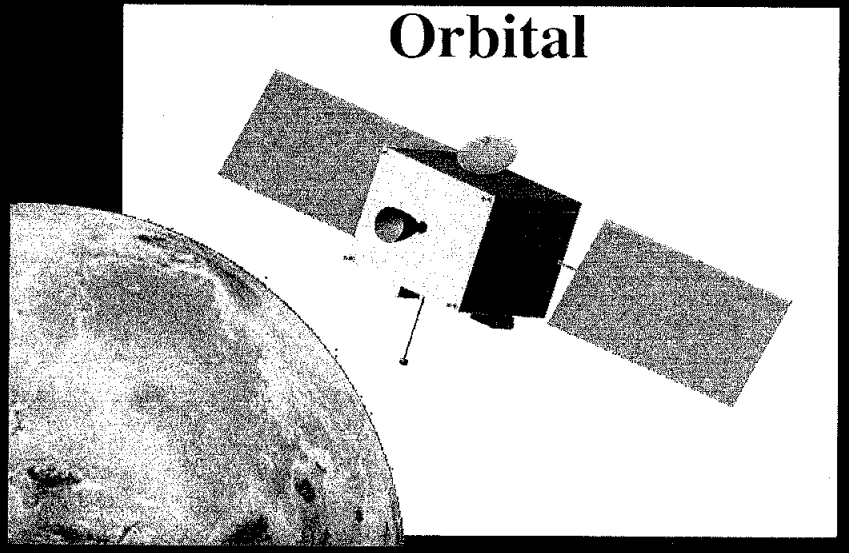


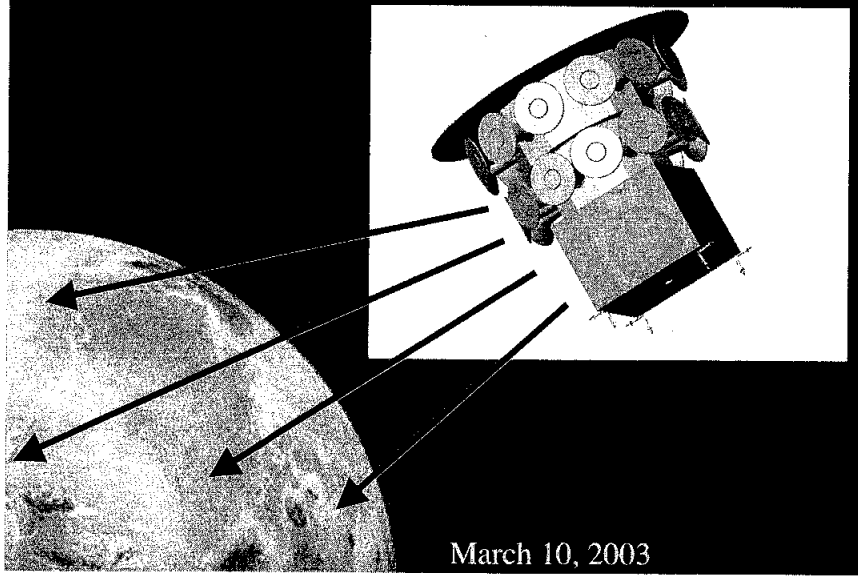
One of these Four

What are Mars Scouts?

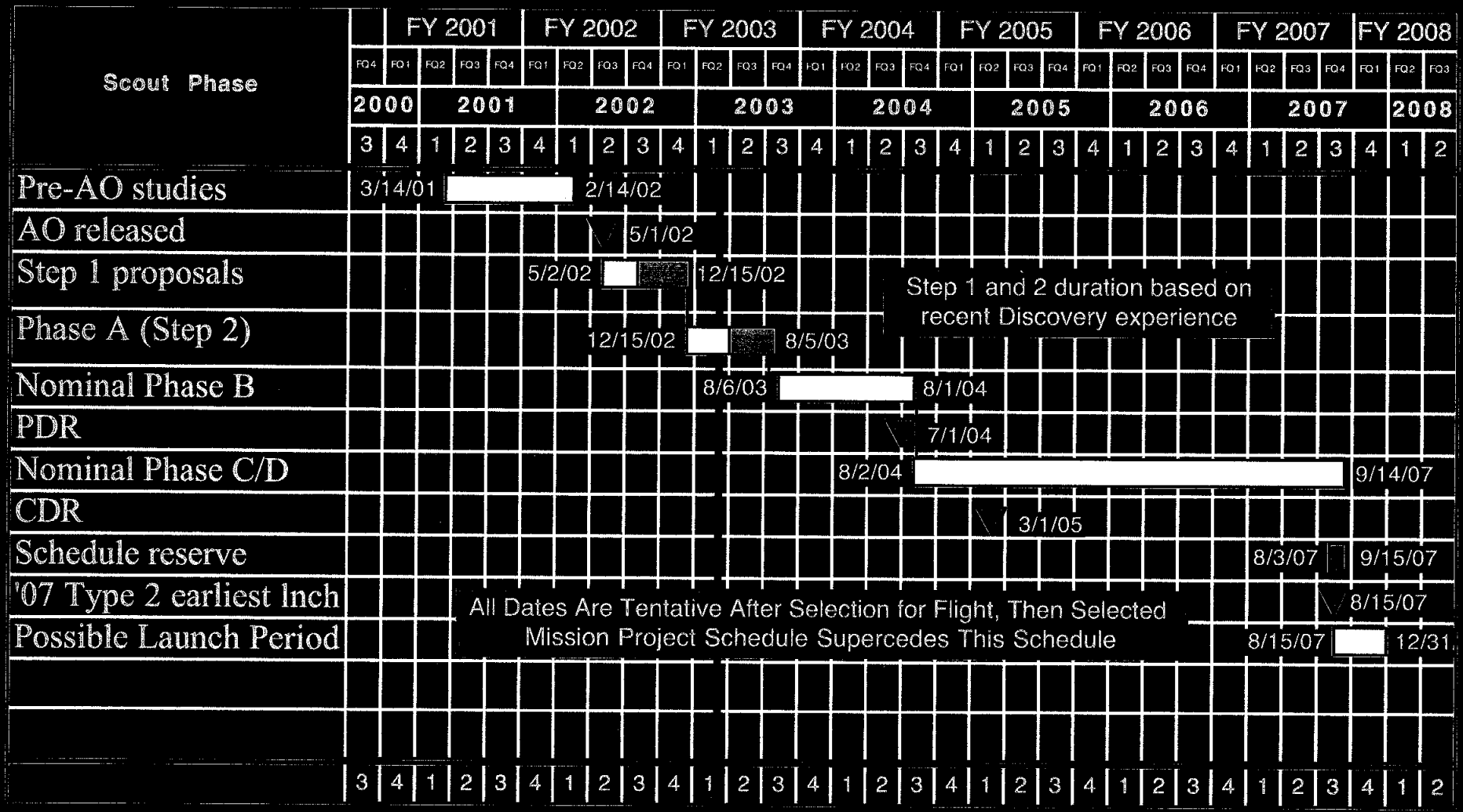
PI-led missions:





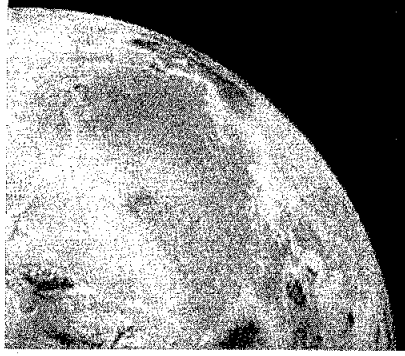


When is a Scout Going to Launch?

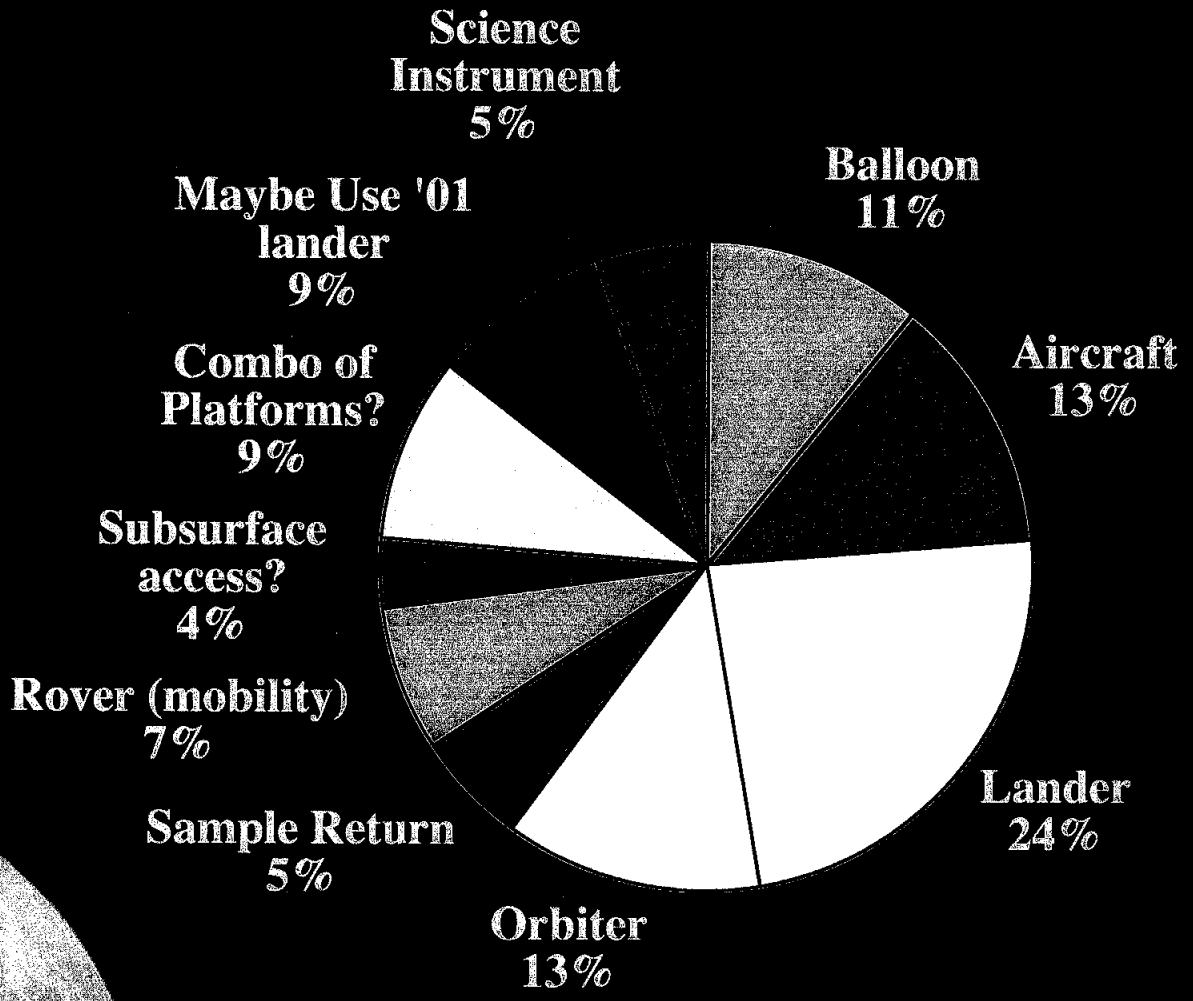


May '01 Scout Workshop

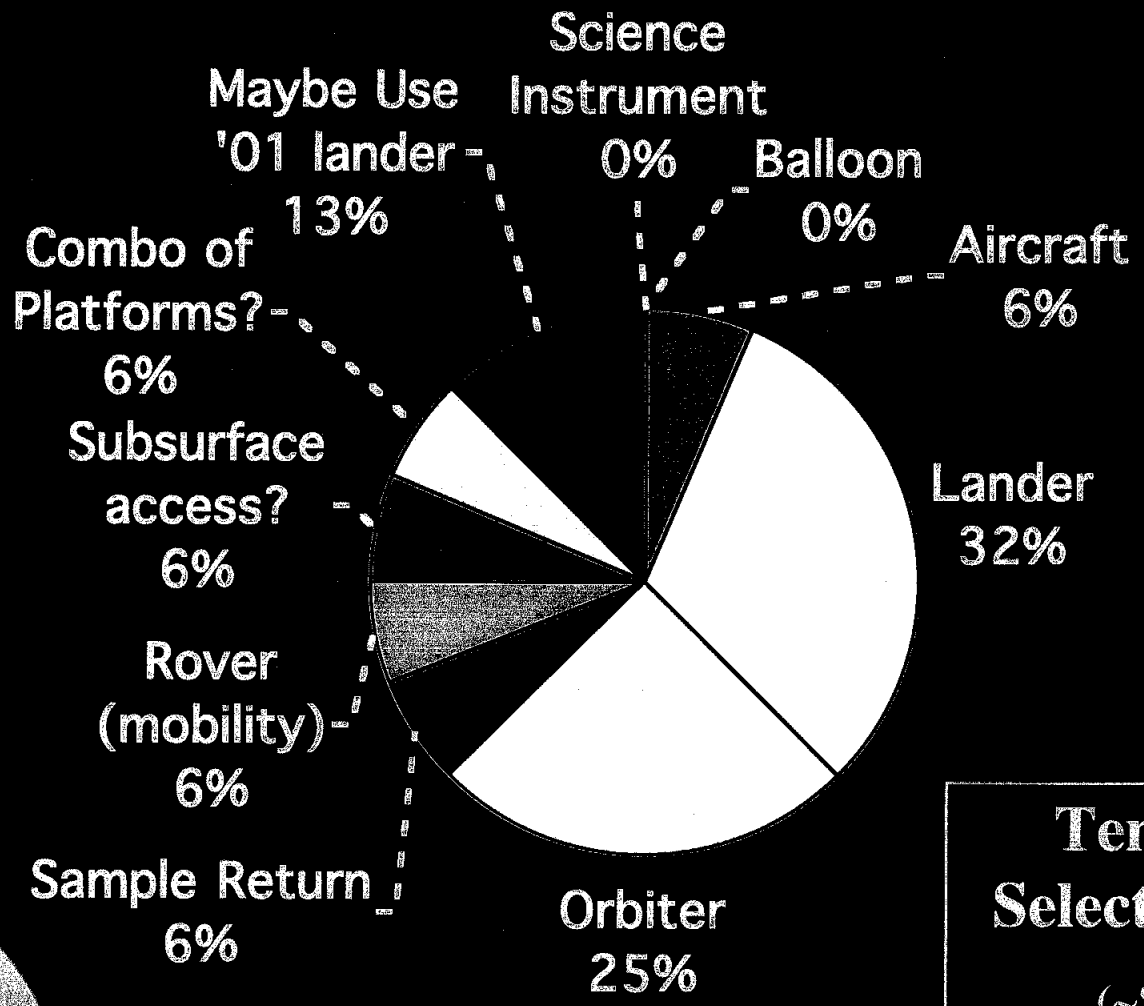
- Encourage Community Cross-Fertilization
- Select 6-10 Concepts for Further Study
- Selected Concepts Help Scope '02 AO
  - ✓Possible Science
  - ✓Needed Technology
  - ✓Cost/Schedule/Risk
- 43 Concepts Submitted, 10 Selected
- Selected Concepts DO NOT Prejudice AO



Summary of May Workshop Concepts



Summary of Pre-AO Study Areas



Ten Concepts Selected for Study

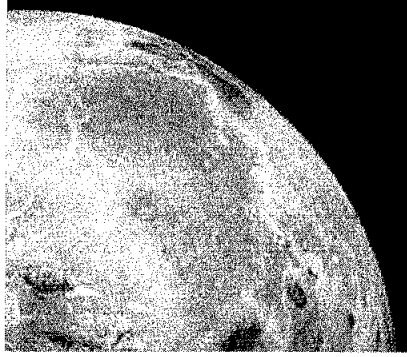
(~$150K each)

Ten Selected Scout Studies

Area	Study Title	PI (institution)	Short Description
Landers/Rovers	The Urey Mission	Plescia (USGS)	Lander/Rover for age dating.
	The NAIADES	Grimm (Blackhawk Geoservices)	Low-frequency electromagnetic sounding for groundwater.
	Artemis	Paige (UCLA)	Multiple polar small landers to the north and south poles.
	Cryoscout	Carsey (JPL)	North Polar probe melts into ice.
	PASCAL	Haberle (ARC)	Global meteorology network.
Orbiters	Mars SAR	Campbell (Smithsonian)	Global imaging radar from orbit.
	Mars Atm Const Obs	Kursinski (UA)	Radio sounding of Mars atmosphere from multiple orbiters.
	Mars Env Obs	Janssen (JPL)	Orbital observation of Mars' atmosphere.
Aerial	KittyHawk	Calvin (UNR)	Multiple gliders observing Valles Marineris.
Sample Return	SampleCollection for Investigation of Mars	Leshin (ASU)	High altitude Martian dust collection and return to Earth via Mars atmospheric flyby.

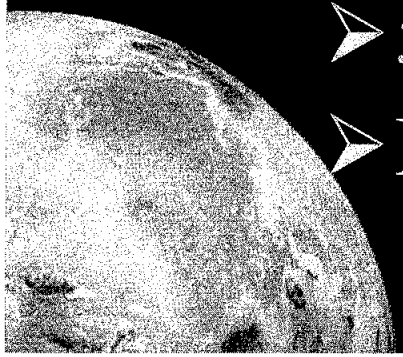
Scout '07 AO Summary

- $325M (FY '03) Cost Cap
- Launch by Dec. 31, 2007
- Full Missions
- Missions of Opportunity
- Selected mission(s) reside in the Mars Exploration Program



Scout '07 Proposal Summary

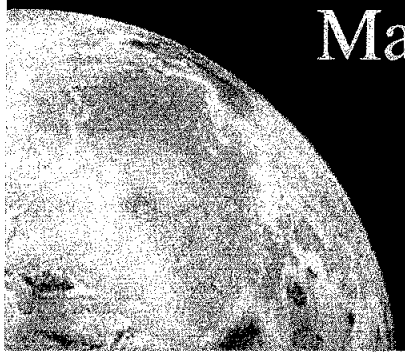
- 18 Full Mission Proposals (2 non-compliant)
  - ✓2 Orbiters
  - ✓4 Landers
  - ✓2 Networks
  - ✓5 Rovers
  - ✓4 Aerial
  - ✓1 Atm/Dust Sample Return
- 5 Mission of Opportunity Proposals
- MOO cancelled (CNES Premier orbiter cancelled)



Step 2 Scout Selections

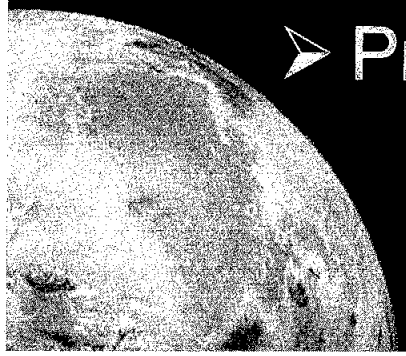
(alphabetical order)

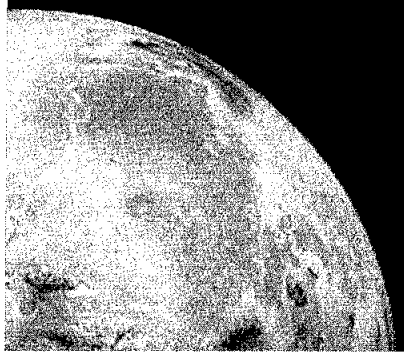
- ARES (Aerial Regional-scale Environmental Survey), Joel Levine, NASA LaRC
- MARVEL (Mars Volcanic Emission and Life Scout), Mark Allen, NASA JPL
- Phoenix, Peter Smith, Univ. of Arizona
- SCIM (Sample Collection for Investigation of Mars), Laurie Leshin, Ariz. State Univ.



ARES Summary

- Fly up to 850 km at ~1.5 km altitude in the Mars southern highlands atm.
- Investigate the Mars magnetic field.
- High spatial resolution surface spectroscopy.
- Direct measurement of water vapor and chemically active gas concentrations in the near- surface Mars atmosphere.
- Investigation of chemical coupling between the atmosphere and surface.
- Precise measurement of isotopic ratios.



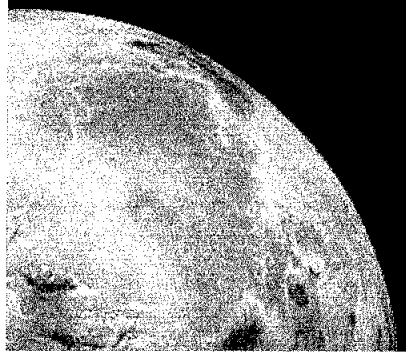


ARES Flight Animation

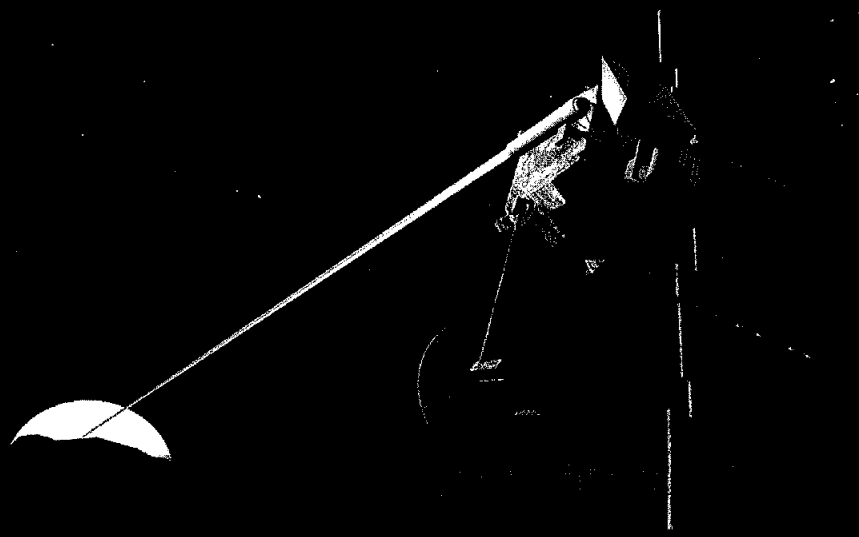
(courtesy of Joel Levine)

MARVEL Summary

- Global survey of Martian atmosphere photochemistry to search for emissions that could be related to active volcanism or microbial activity
- Track the behavior of water in the atmosphere across a full annual cycle

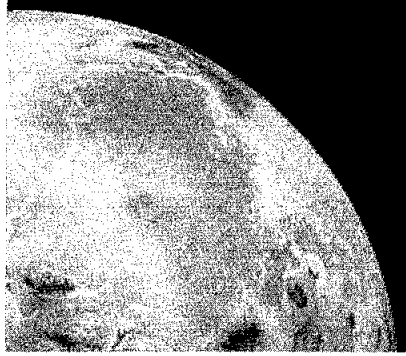


MARVEL

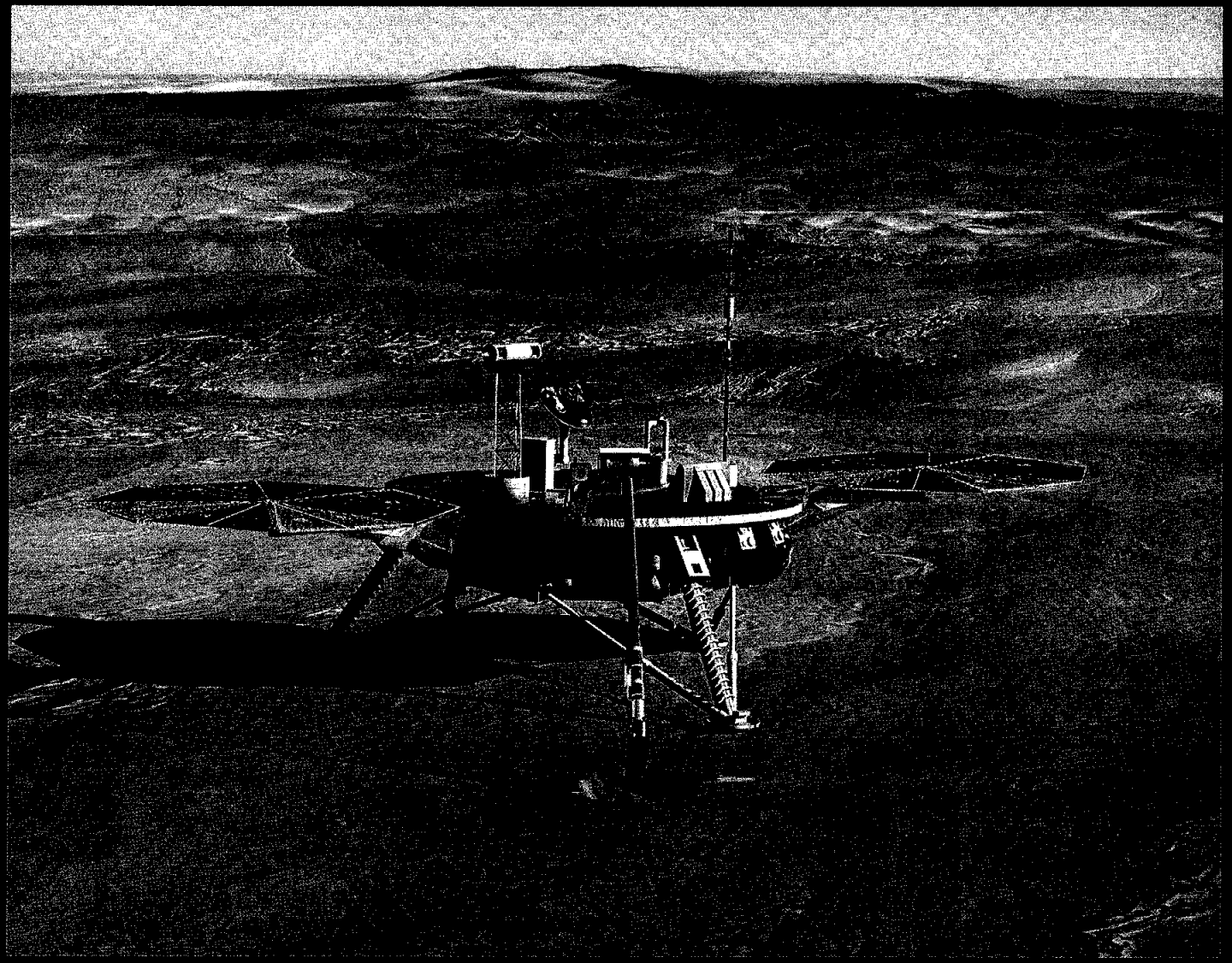


Phoenix Summary

- "Follow the Water" by:
  - ✓Landing where water ice is easily accessible (60°-75° North) with a non-mobile lander (using lander from Mars 2001) carrying a robotic arm capable of digging to 1 meter
  - ✓Dig a trench to verify, to provide samples for in-situ analysis, and to characterize the ice

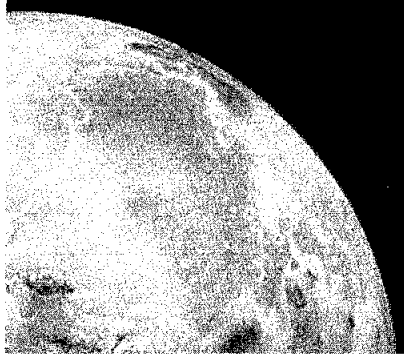


Phoenix



SCIM Summary

- Perform a Mars aeropass to an altitude of ~37 km
- Collect millions of Martian dust particles, with at least 1000 particles with diameters of ~10 μm
- Collect ~ 1000 cm^3 STP of Martian atmosphere

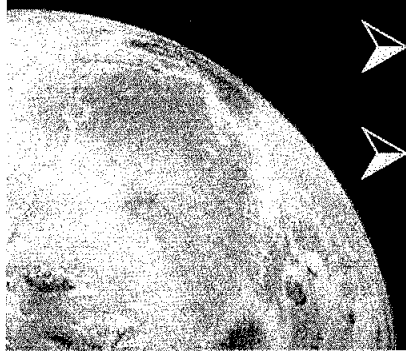


SCIM Mission Animation

(courtesy of Laurie Leshin)

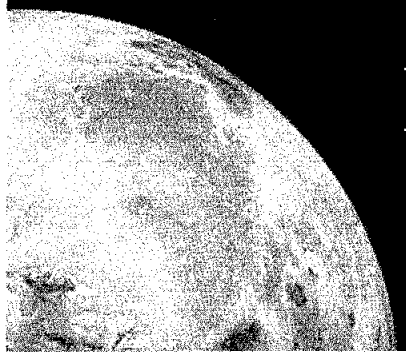
General Scout Technologies

- Lightweight Propulsion Components
  - ✓ Tanks
  - ✓ Filters, Regulators, Valves
  - ✓ Thrusters (Low Min Impulse Bit [mN])
- Lightweight telecomm components
  - ✓ Antennas
  - ✓ Transmitters
  - ✓ Receivers
- Power Generation (lightweight, long-life, small volume)
- Minimum mass structures
- Low mass, low power, small volume instruments



Future Work

- Get 2007 Flight Mission Selected
- Difficult Choice!!!
- Begin Preparation for Competed Scout Technologies for post-2007 Scouts
- Lessons Learned / Technology Workshop (Late this year, early next year)
- FY '05 Pre-AO Studies (like the '01/'02 Scout Studies)
- 2006 AO for 2011 Opportunity



Mars Scouts are an Exciting Addition to the Mars Program!