MEPAG
Mars Exploration Program Analysis Group

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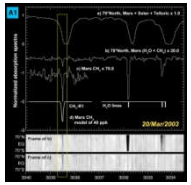
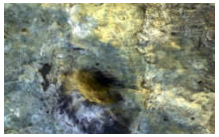
Mars Exploration Program Architecture: Science Goals/Drivers

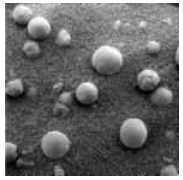
Methane



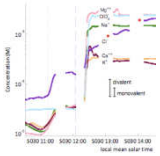
Martian Surface Diversity



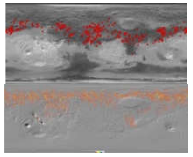
Water, Water, Water



Perchlorate



Salt Deposit



Prepare for Human Exploration

Seek Signs of Life

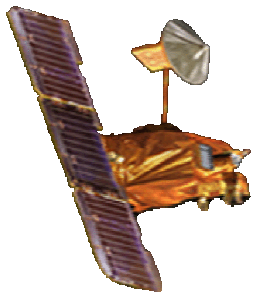
Understand Trace Gas Origin: Detection, Characterization, Localization

Habitability in Diverse Martian Environments

Martian Interior Structure/Composition

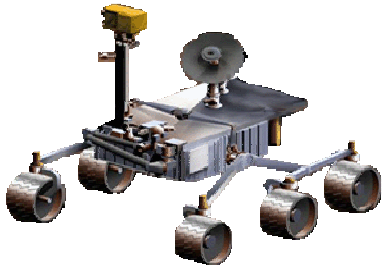
Analyses of Returned Martian Sample

Mission Concepts to Address Key Science/Program Drivers: Building Blocks for Program Architecture



Trace Gas Orbiter

- Detect a suite of trace gases with high sensitivity (ppt)
- Characterize their time/space variability & infer sources
- Replenish orbiter infrastructure support for Program

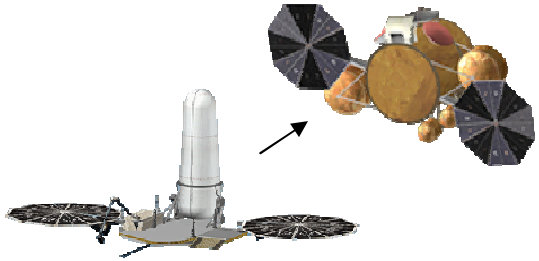


Mid-Range Rover

- Explore Mars habitability in the context of diverse aqueous environments provided by a new site
- Select and prepare samples for return

Network Landers

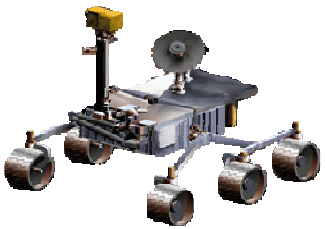
- Determine the planet's internal structure and composition, including its core, crust and mantle
- Collect simultaneous network meteorological data on timescales ranging from minutes to days to seasons

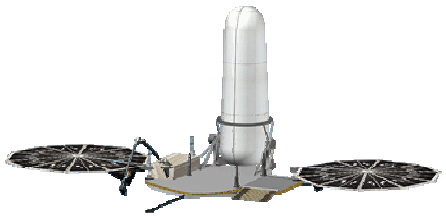


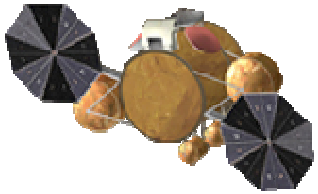
Mars Sample Return

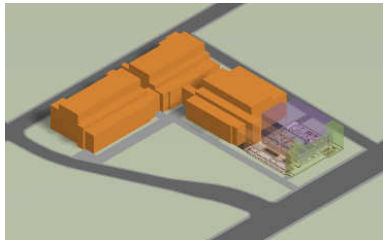
- Make a major advance in understanding Mars, from both geochemical and astrobiological perspectives, by the detailed analysis conducted on carefully selected samples of Mars returned to Earth

A Potential Multi-Element Campaign for Returning Samples From Mars









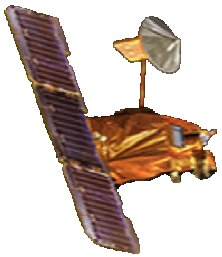
Sample Caching Rover
- Acquire/encapsulate scientifically exciting samples for return
- Conduct scientific exploration of Mars habitability

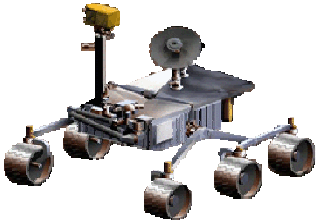
Mars Sample Return Lander
- Retrieve sample cache/ additional sampling
- Launch sample container into Martian orbit

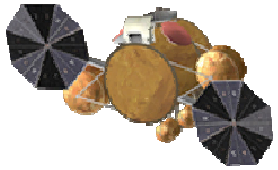
Mars Sample Return Orbiter
- Capture sample container
- Return sample container to Earth

Mars Sample Receiving and Curation Facilities

Mars Sample-Focused Program Architecture Options







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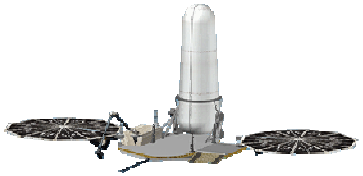

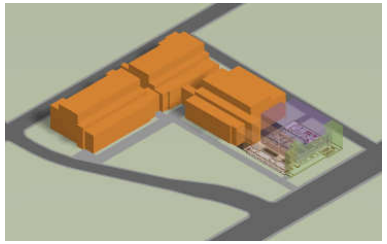

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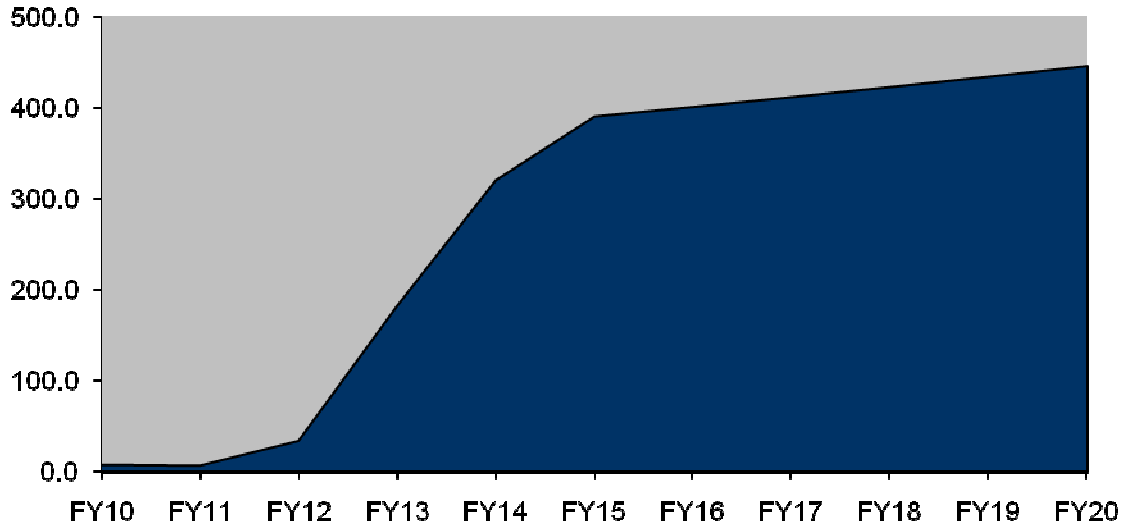
Potential Program Approach for Next Decade and beyond

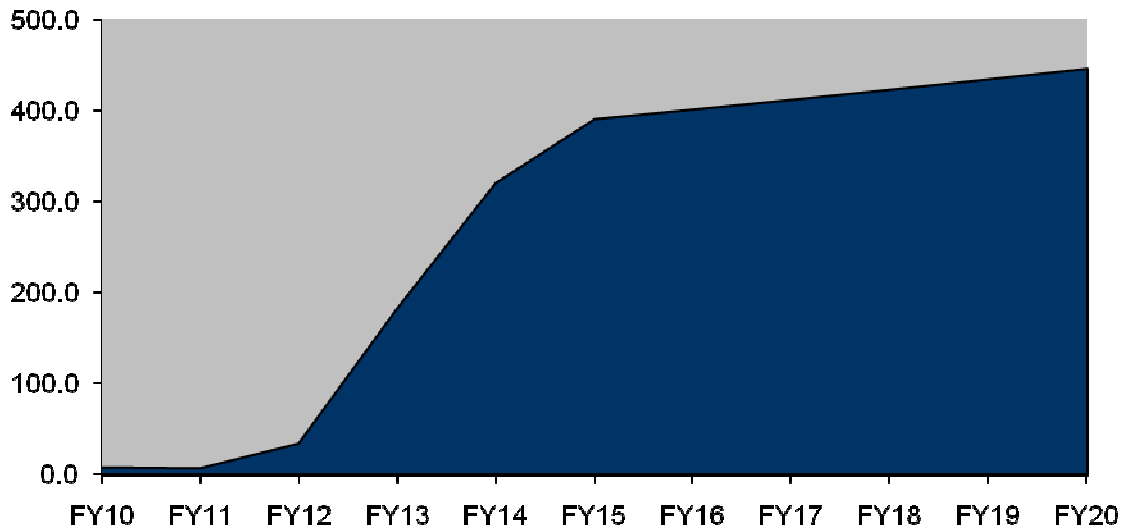
Future mission funding wedge



- '16 Trace Gas Obiter
- '15-'20: Mars sample return technology development
- '20 Mid-range rover/sample caching
- '24 Mars sample return orbiter
- '26 Mars sample return lander

Potential Program Approach at an accelerated pace with international partnership

Future mission funding wedge



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