

NASA

Mars Exploration Program Update to the MEPAG

Jim Watzin
Director MEP

March 2, 2016

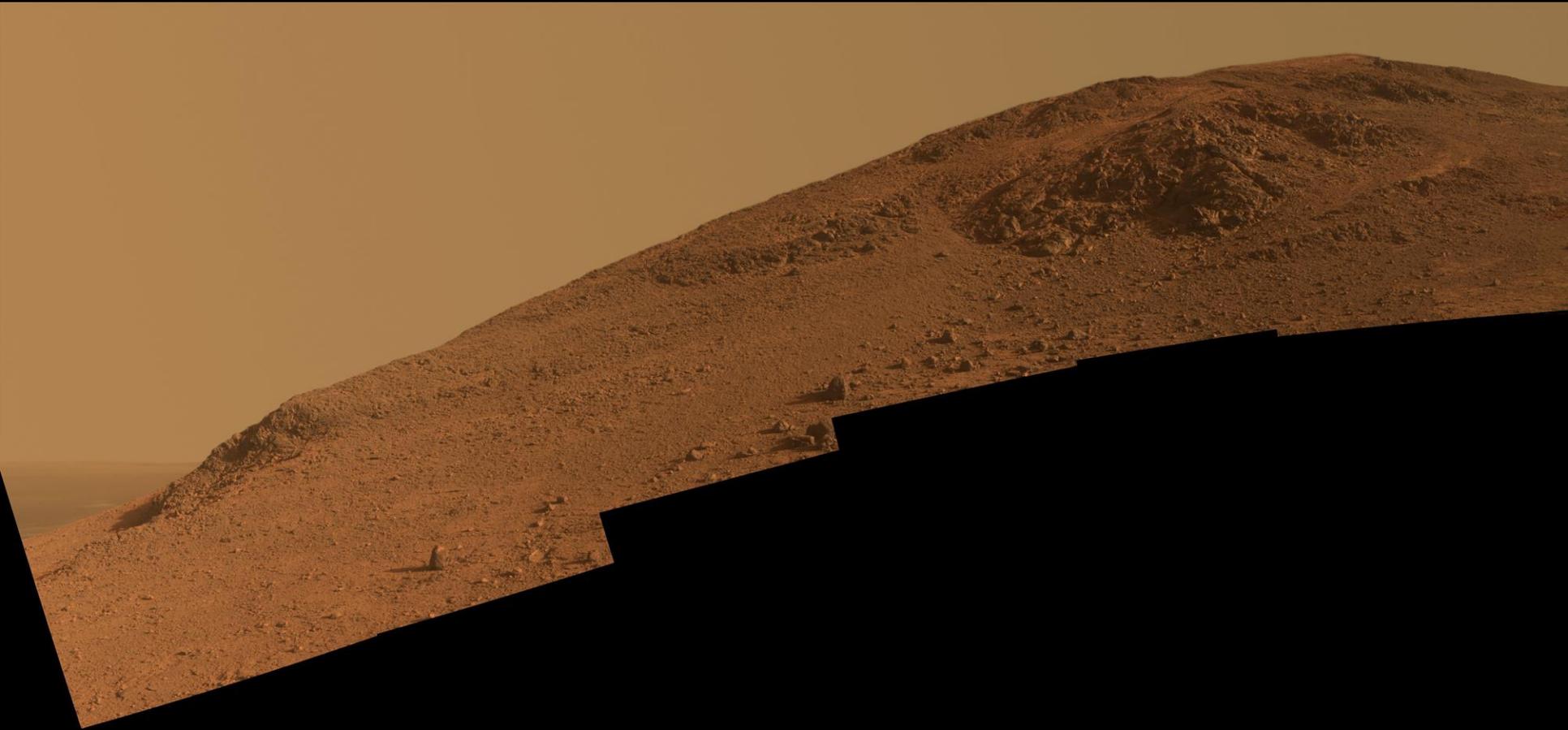


Foothills of Mount Sharp



“compliments of Curiosity rover - Sept 2015”

Knudsen Ridge atop Marathon Valley



“compliments of Opportunity rover - Oct 2016”

The state-of-the-MEP today

Our operational assets remain healthy and productive:

- ✓ MAVEN has successfully completed its prime science mission and is now continuing investigations in an extended mission
- ✓ Odyssey, our oldest Mars asset, continues to be healthy and contribute thermal imagery and data relay services
- ✓ MRO continues to provide invaluable reconnaissance imaging and mineralogical mapping, supporting science investigations, rover operations, and exploring potential human landing sites
- ✓ Opportunity continues to provide important ground truth data, recently scaling 30 deg slopes of Knudsen Ridge atop the southern flank of Marathon Valley, to investigate red zones
- ✓ Curiosity continues exploring Gale Crater, generating important insights into Martian chemistry
- ✓ Mars Express continues operating our collaborative deep radar sounder (MARSIS)

M2020 development on-track and proceeding well:

- ✓ PDR successfully completed Feb 2016
- ✓ Heritage H/W fabrication underway; some delivered
- ✓ Sampling system development labs up and running

We are meeting our foreign commitments:

- ✓ Our two Electra payloads on the TGO are ready for flight
- ✓ MOMA is proceeding in development for the ExoMars Lander

Financially, the program is doing well:

- ✓ This fiscal year all our planned activities are funded
- ✓ Earlier this month the President's FY17 budget was released and Mars fared well again, supporting our development, operational, and future mission activities

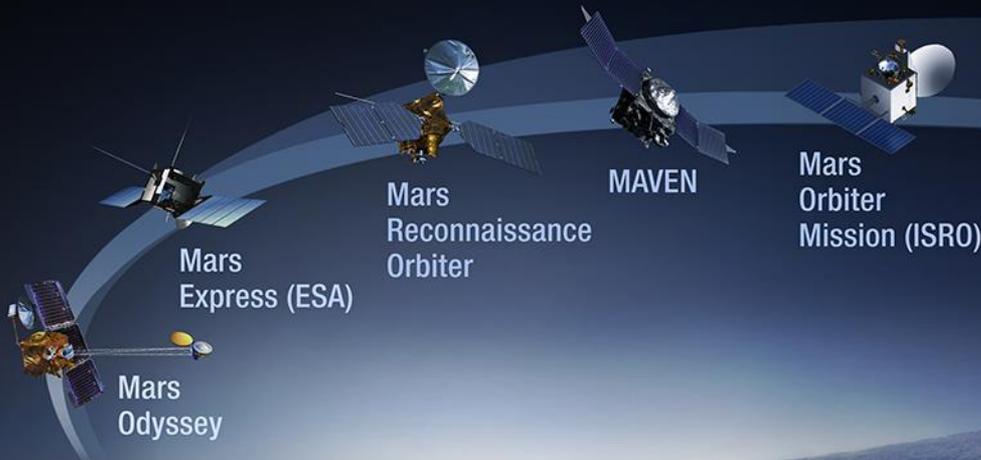
Overall, the state-of-the-MEP is good

Operational 2001–2015

2016

2018

2020



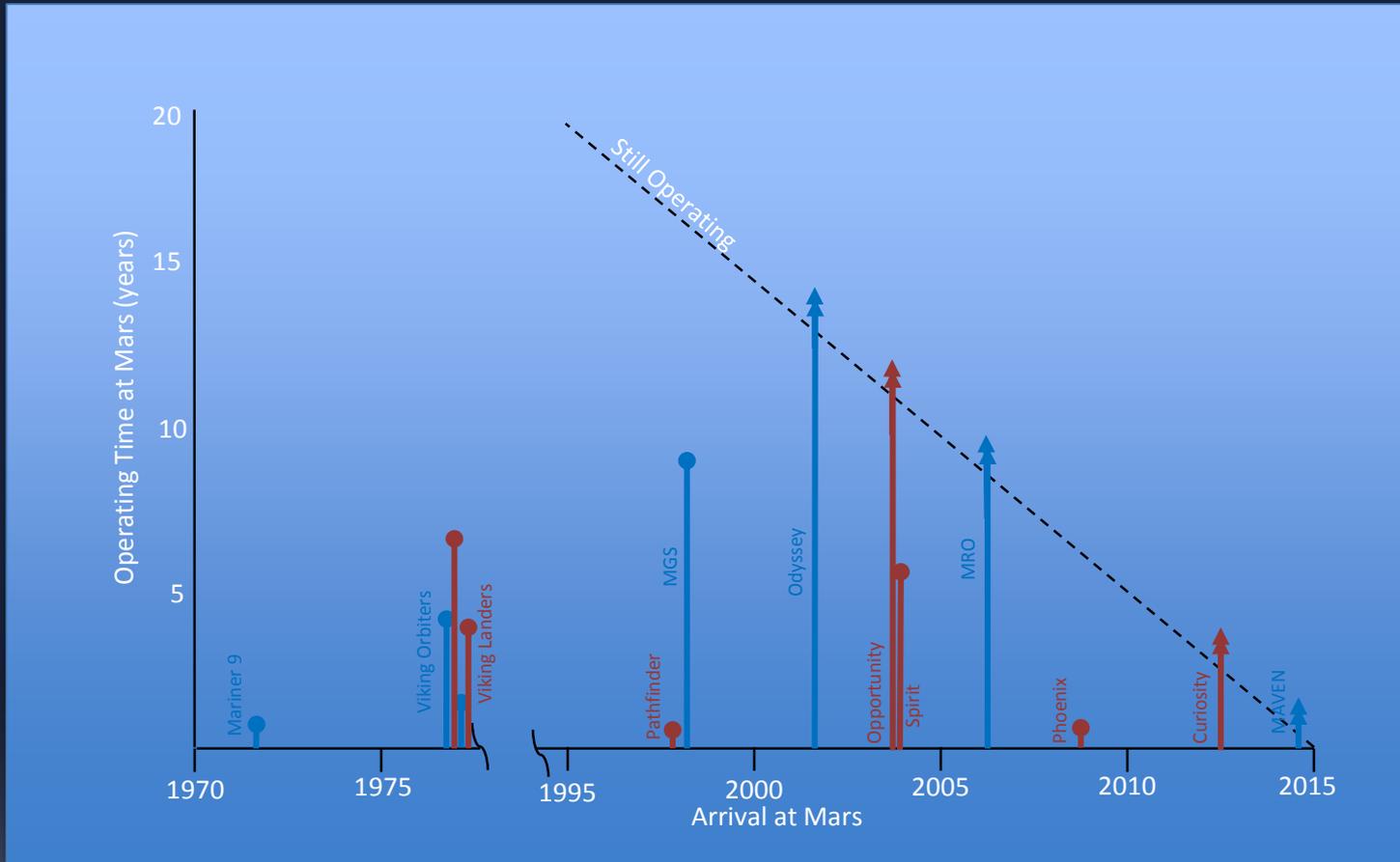
Follow the Water

Explore Habitability

Seek Signs of Life

Prepare for Future Human Explorers

Operating At and Around Mars



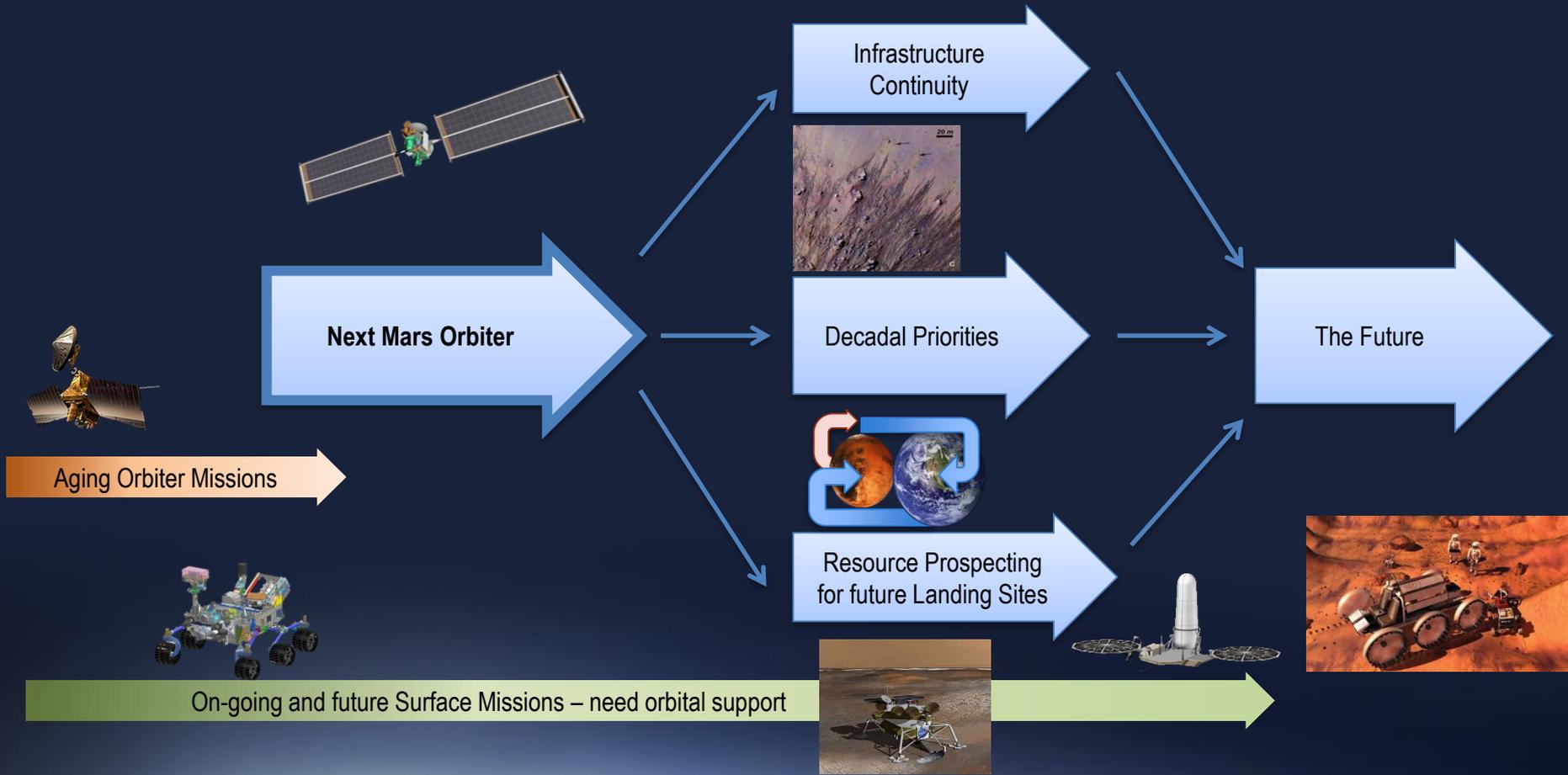
MEP has operated successfully and with longevity, but our infrastructure is aging, placing the decade of the 2020s at risk

Strategic View Forward

- US National Research Council (NRC) Planetary Science Decadal Survey (2012) gave the highest priority to “elements of the Mars Sample Return Campaign”
- The Mars 2020 mission and its payload begin this process with the characterization of a site and the careful selection and documentation of a suite of samples acquired and encapsulated for return
- The President’s NASA Budget Request for FY2017 provides funding to begin development of future Mars missions beyond 2020 – with an emphasis on emplacing the infrastructure for the next decade

MEP planning strives to integrate these realities into a viable plan for the future

Next Orbiter Can Provide Capabilities that enable Many Future Pathways



Timely Renewal and Enhancement of Infrastructure is needed to Support Future Missions

Desired Orbiter Capabilities

Renew and Update Aging Communications Infrastructure

- Essential to the future of Mars exploration; Laying the foundation for missions to come, while supporting ongoing missions in the early 2020's

Provide Continuity of High Resolution Imaging

- Scientific Investigations for Landing Site Certification

Emplace Essential Orbital Support for Sample Return

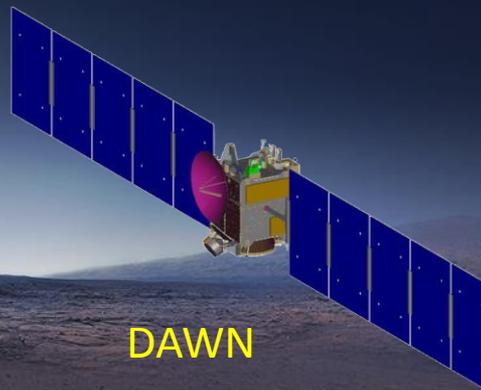
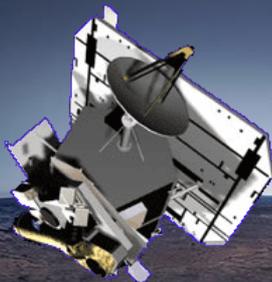
Opportunity for Resource Prospecting for future Landing Sites and Exploration planning

Other Relevant Remote Sensing Opportunities

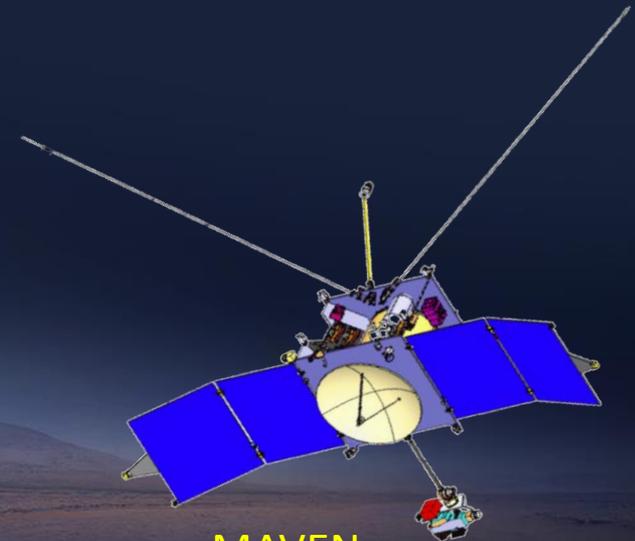
Building from a Modest (Discovery-Class) Core Vehicle

- Many basic spacecraft examples are architecturally flexible and adaptable to a wide range of missions
 - Provide Core Technical Functionality
 - Capable of Operating in Deep Space
 - Long Lifetime
 - Autonomous Operations
 - 3-axis pointing for imaging and communications
 - Adaptable to Solar Electric Propulsion, providing mission flexibility
 - Lowest cost launch vehicle
 - Increased mass delivery capability
 - Return to Earth capability

Deep
Impact



DAWN



MAVEN

MARS

2/17/16

Next Steps – Path to Orbiter Phase A

Establish Partnerships

- Communication with iMEWG and MEPAG
- Identify Candidate Partnerships

by May 2016

Prepare for MCR

- Establish baseline project architecture
- Establish key partnerships
- Refine technical trades
- Conduct ORDT

Summer 2016

Concept Refinement

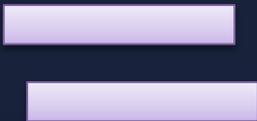
- Detailed spacecraft studies, assess available aerospace capabilities
- Proceed with Phase A implementation

Fall 2016+

ORDT (Objectives & Requirements Definition Team)

Orbiter Project - Lifecycle Planning Timeline

FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24
Pre-A	Phase A	Phase B	Phase C	Phase D	Phase E			
▲	▲	▲	▲	▲	▲	▲	▲	▲
MCR	P/LAO	SRR/MDR	PDR	CDR	SIR	Launch	Arrival	Science Orbit


 Payload / Bus Acquisition
 Activities before KDP-B
 (FY '17 start)


 2022
 Opportunity

Phase A start in 2017 is essential to supporting 2022 opportunity

Enduring Interest in MSR Partnerships

MEP has always strived to maintain strong international relationships and partnerships

- Welcome Partnership Interest in the next Orbiter
 - Infrastructure Elements
 - Communication
 - Reconnaissance
 - Sensors for Rendezvous and Capture System
 - Remote Sensing Instruments
- Welcome additional partnerships for future mission elements in support of sample return