Mars 2020 Project Status

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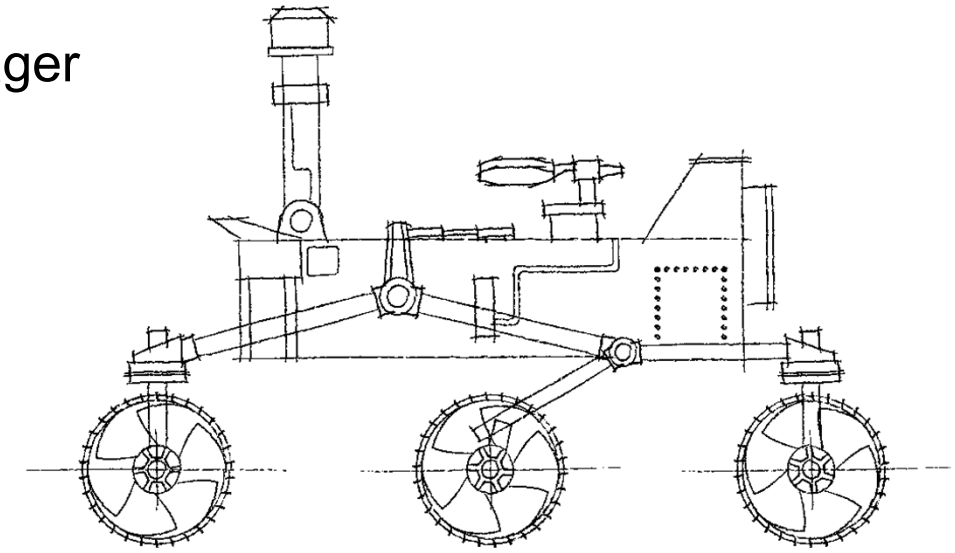
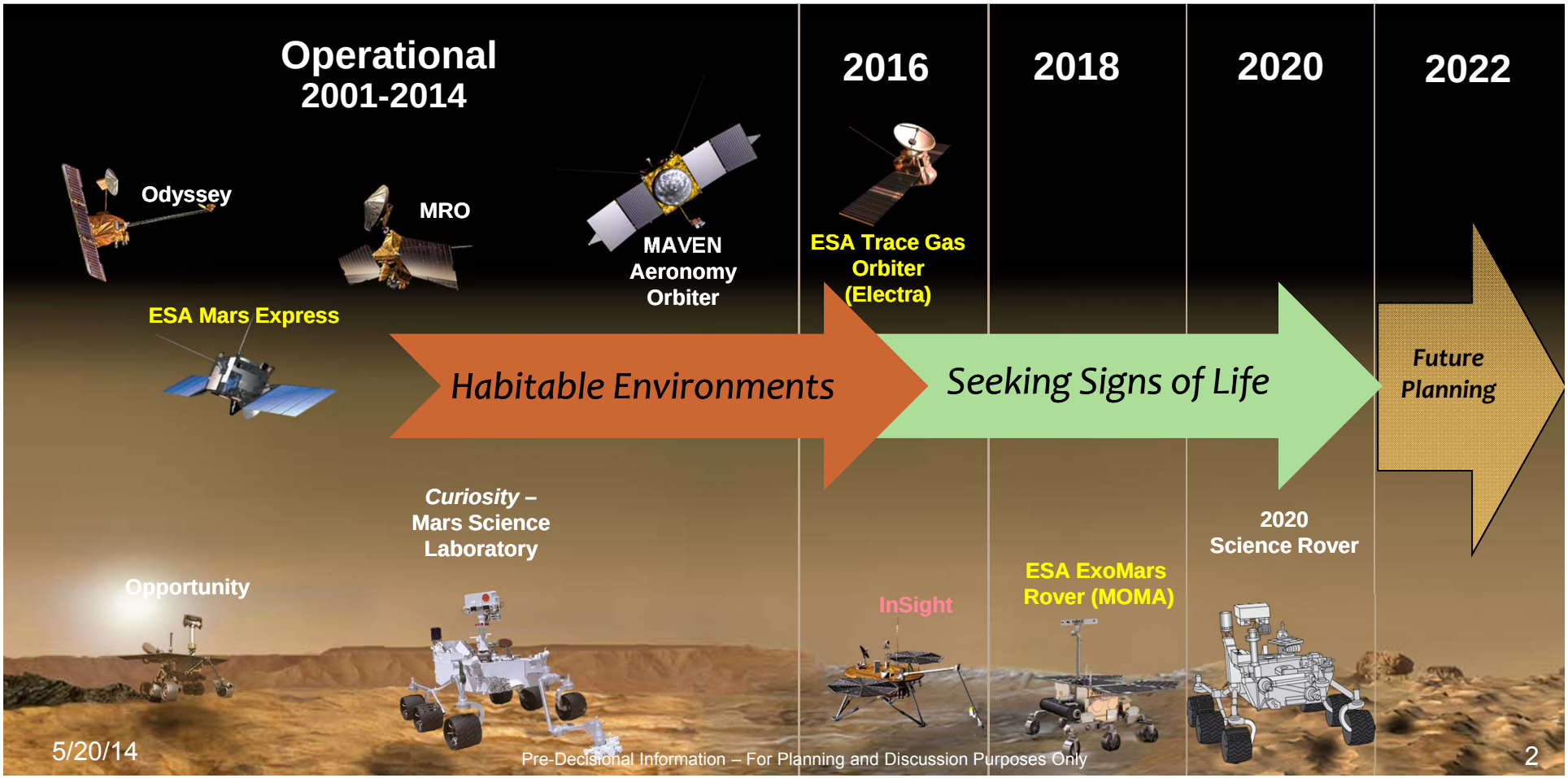


Mars 2020 Project

Mars Exploration in This Decade

Baseline Mars 2020 mission:

- Leverages MSL design, residual hardware, and experienced team
- Builds on MSL/Curiosity results by investigating bio-signature preservation in geologic context
- Provides opportunities for HEOMD and STMD contribution
- Provides opportunities for international collaboration



Mars 2020 Science Definition Team Mission Objectives

From SDT Report

A. Explore an astrobiologically relevant ancient environment on Mars to decipher its geological processes and history, including the assessment of past habitability.

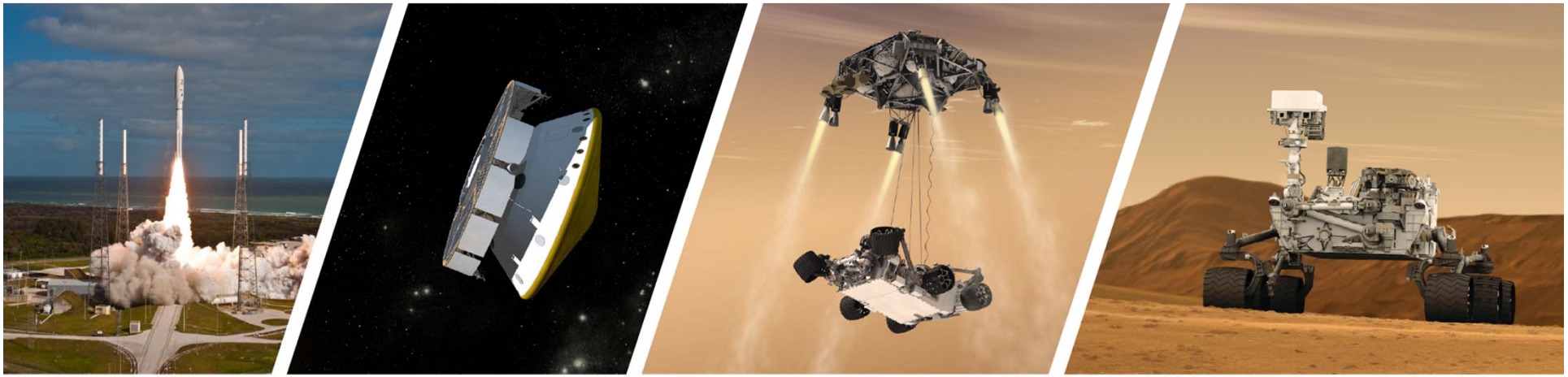
B. Assess the biosignature preservation potential within the selected geological environment and search for potential biosignatures.

C. Demonstrate significant technical progress towards the future return of scientifically selected, well-documented samples to Earth.

D. Provide an opportunity for contributed Human Exploration & Operations Mission Directorate (HEOMD) or Space Technology Program (STP) participation, compatible with the science payload and within the mission's payload capacity.

Final mission objectives to be refined through payload selection

Mission Overview



LAUNCH

- MSL Class/Capability LV
- Period: Jul/Aug 2020

CRUISE/APPROACH

- 7.5 month cruise
- Arrive Feb 2021

ENTRY, DESCENT & LANDING

- MSL EDL system: guided entry and powered descent/Sky Crane
- 25x20km landing ellipse
- Access to landing sites ±30° latitude, ≤0.5 km elevation
- ~950 kg rover

SURFACE MISSION

- Prime mission of one Mars year
- 20 km traverse distance capability
- Seeking signs of past life
- Returnable cache of samples
- Prepare for human exploration of Mars

http://mars.jpl.nasa.gov/mars2020/

Mars 2020 Status

- Project began Phase A November 12, 2013 with a successful Agency Program Management Council Key Decision Point-A gate
- Project continuing to move ahead with heritage and long-lead builds
- AO evaluations proceeding as scheduled.
  - TMC panel plenary scheduled for weeks of April 14 and 21.
  - Merit panel plenary scheduled for week of April 28.
  - Selection targeted for mid-July
- Sampling & caching system architecture workshop held Feb 25
- Organic contamination panel held kickoff meeting March 12.
- Sample quality workshop held March 16
- MEDLI Directorate Program Management Council (DPMC) held on March 25 finalized augmentations to be funded (MEDLI 2.2)
- Flight System Baseline Workshop held April 29-30

Upcoming Events

- 15 Jan 2014 - AO proposals received - COMPLETED
- 18 Feb 2014 - Acquisition Strategy Meeting – COMPLETED
- 25 Mar 2014 - MEDLI DPMC - COMPLETED
- 30 April 2014 - Flight System Baseline Workshop
- ***14 May 2014*** - ***1st Landing Site Workshop***
- 06 June 2014 - Draft Environmental Impact Statement (EIS) released
- July 2014 - Instrument investigations selection
- Aug-Oct 2014* - EDL, Costing, Surface Operation, Sampling Reviews
- Oct 2014* - System Requirements Review / Mission Definition Review
- Dec'14/Jan'15* - Key Decision Point - B (Phase B start)
- Dec'14/Jan'15 - Final EIS publication

* Pending completion of the AO selection; date and subsequent reviews/contracting dates and accommodation study schedule being assessed.

Spacecraft Build Approach

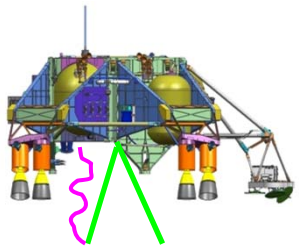
- **Mission concept is predicated on high heritage. More than 90% of the spacecraft (by mass) has identical requirements to MSL architecture**
- The Project has pursued implementation approaches that ensure manufacturing, personnel, standards, etc. are replicated on inherited systems, including vendor and build organizations with following considerations.
- ~$200M of residual hardware. Includes flight spares, engineering units, electronic parts, testbeds, and support equipment.
- Project completed a sole source justification for top ~25 MSL vendors
  - All MSL major vendors are judged “healthy” for the 2020 launch opportunity.
- Limited obsolete parts & all have form/fit replacements so far (assessment nearly complete).
- MSL closeout documentation was exceptional. No threat to rebuild capability.
- MSL has had good post-launch performance, limited number of anomalies that need to be addressed. Comprehensive Change Control process established to assess any proposed modifications.
- Project has been provided with substantial FY13/14 funding to support early hardware procurements for high-heritage systems to avoid parts obsolescence, vendor availability, and to de-conflict these activities with new developments (sampling, instruments).

Acquisition Plan Summary
Baseline—MSL Bus Rebuild

Launch Vehicle
- KSC/Launch Services Program procurement

- Built in-house at JPL
- Lowest cost and risk per make-buy study and industry RFIs

- Built by Lockheed-Martin/Denver
- Procure as sole source—most cost effective



- Built in-house at JPL
- Major industry subcontracts/components
- Rebuild in-house due to criticality of EDL and rover interface

MMRTG
- DoE procurement to industry

Science & Exploration Technology Investigations
- Source per proposals via AO selection

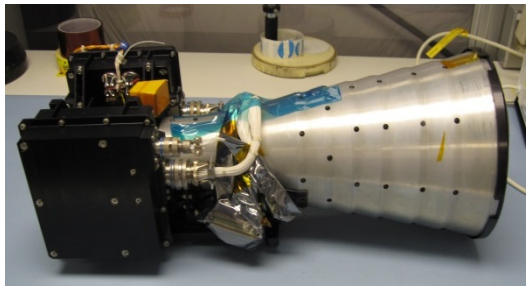
- Built in-house at JPL
- Major industry subcontracts/components
- Potential international contributions
- Rebuild in-house due to complexity of vehicle, residual hardware, criticality of EDL and rover interface, operations experience

MEDLI
- NASA Centers (LaRC, ARC, and JPL)

- Built by Lockheed-Martin/Denver
- Procure as sole source—most cost effective

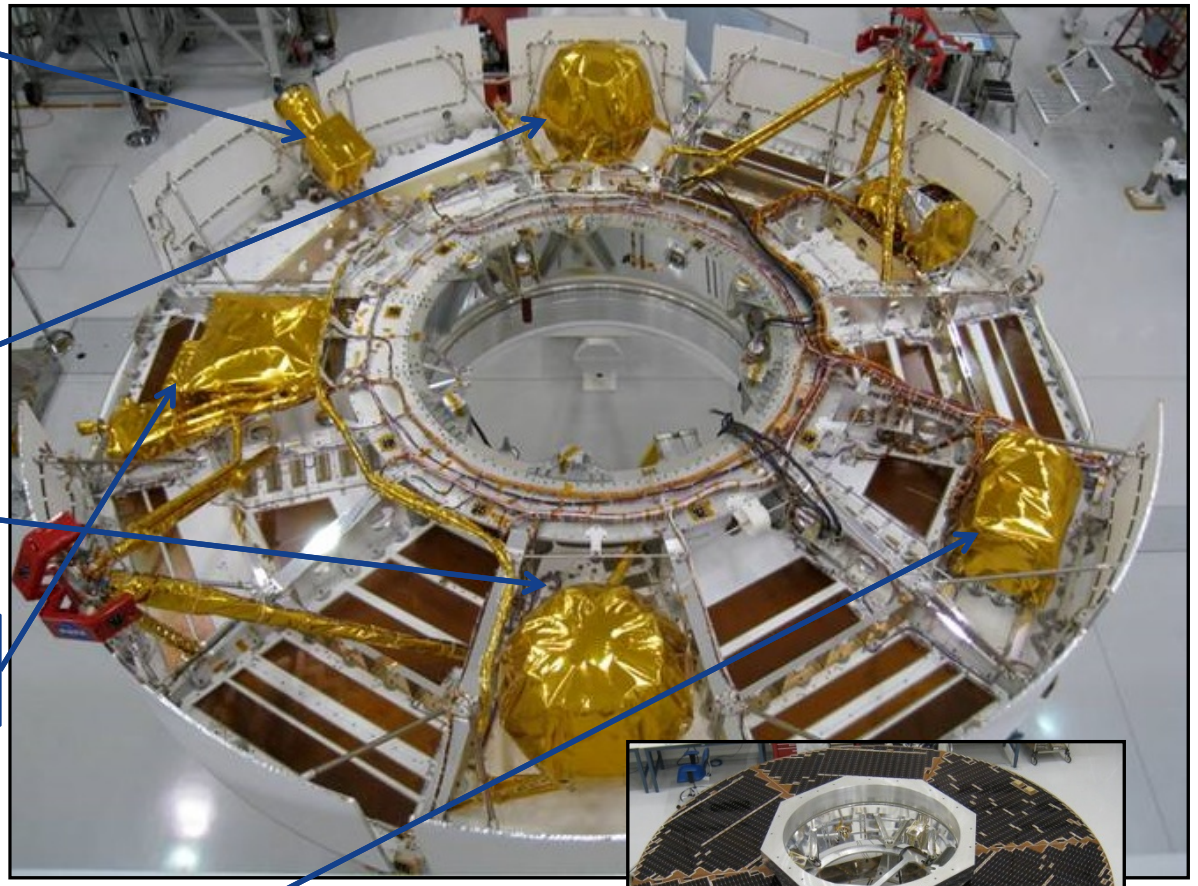
Cruise Stage

Star Scanners
- Residual HW (under test)

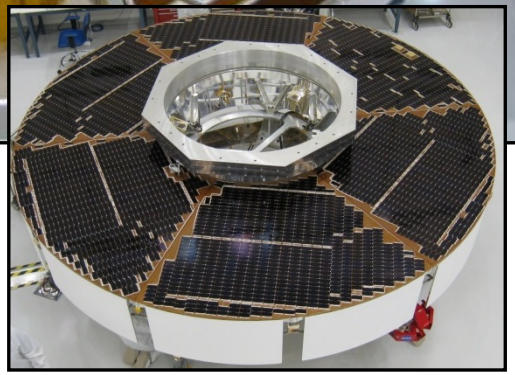


Propellant tanks
- Under contract

Cruise Heat Rejection Pump Assembly
- Under contract



Cruise Power Assembly and Power Analog Modules
- Parts Procured, build begun

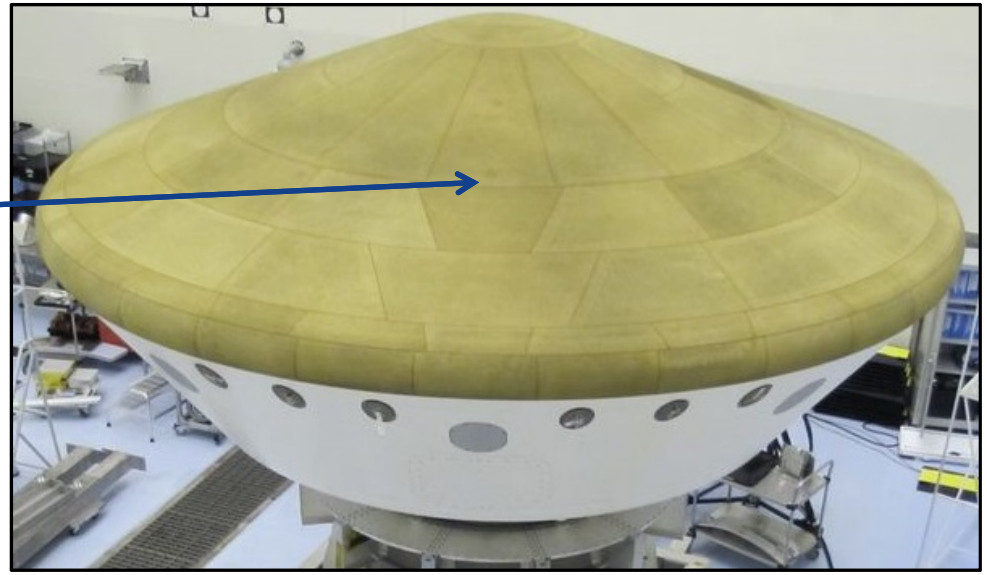


Aeroshell

Heatshield (currently in bldg 179)
- Residual HW

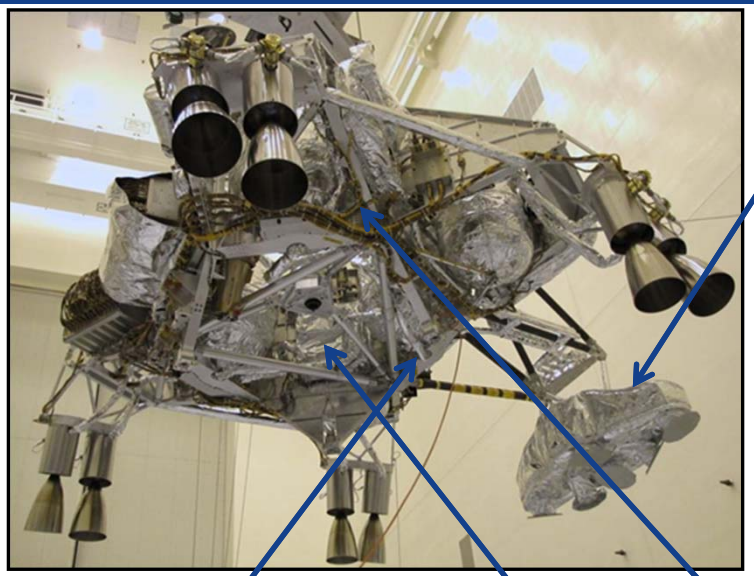
MEDLI-2
- MEDLI reflight approved with some improvements

PICA Tiles
- Residual bulk material in bldg 245
- New material procured (in-hand)
- SWO for machining into tiles on hold

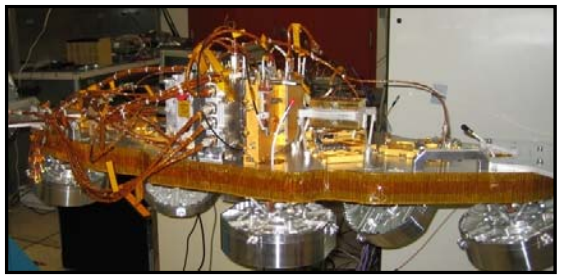


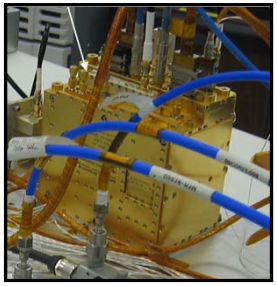
Descent Stage

X-band Radio
- Under contract

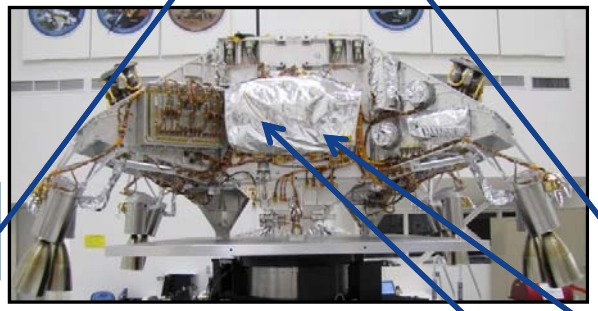


Radar
- Flight Antennas
  - Under contract
- Transmit/Receive Modules
  - Completing MSL build; testing



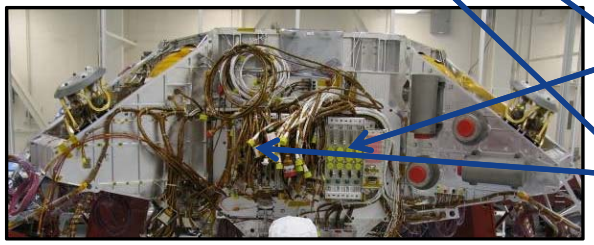


Inertial Measurement Unit
- Contract in negotiation



Primary Structure
- MSL DTM

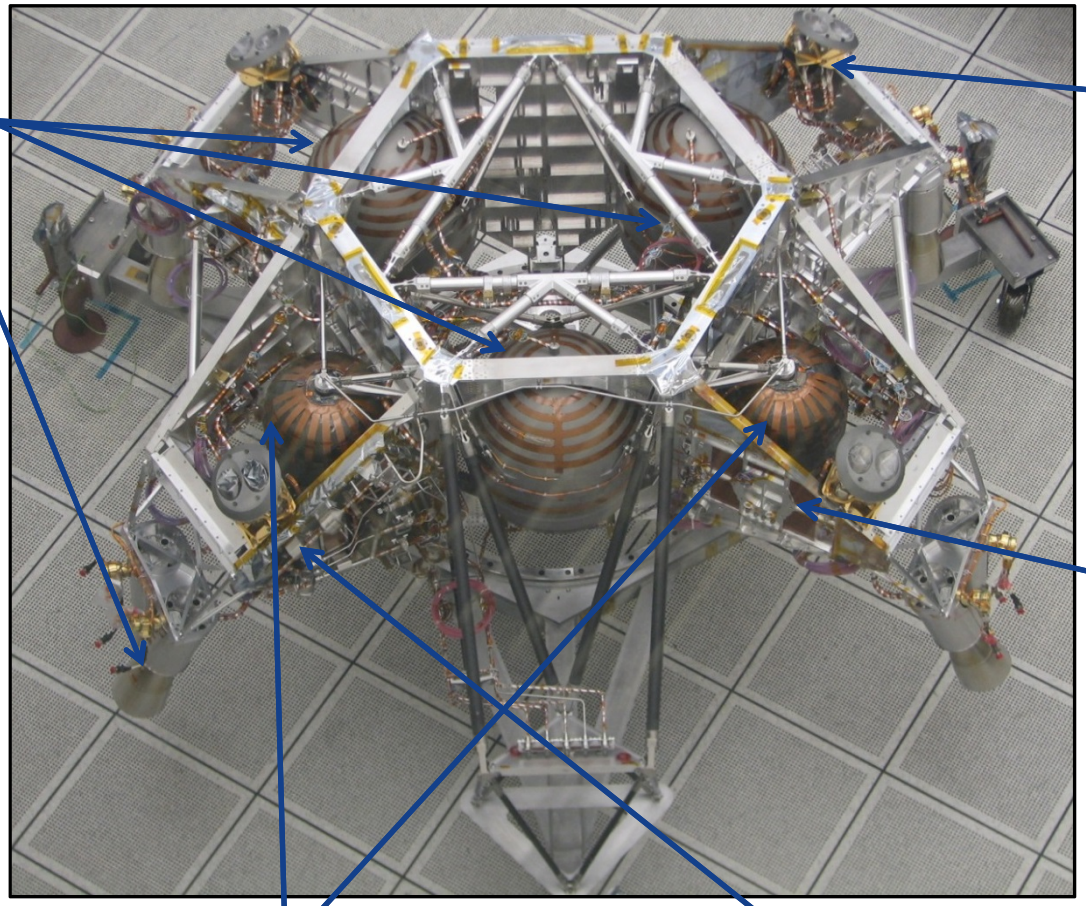
Descent Stage Brake
- Contract in negotiation



Descent Power Assembly
- Residual flight HW

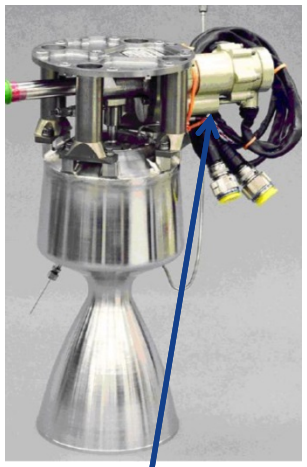
Descent Power Analog Modules
- Parts Procured, build begun

Descent Stage Propulsion

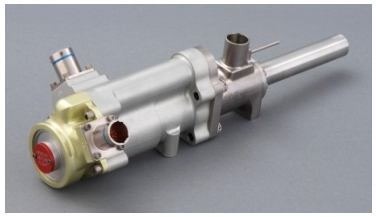


Propellant Tanks
- Under contract

Mars Landing Engines
- Under contract



Throttle Valve
- Under contract



Pressurant Tanks
- Under Contract

HFPR Flight Spares
- Contract in negotiation

DRCS Thrusters and Valves
- Under contract

Pyro valves
- Under Contract

Rover

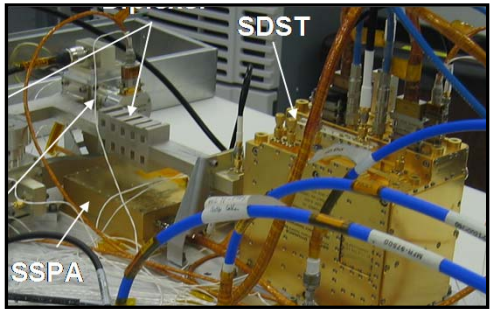
Pyro Firing Assembly
- Residual parts

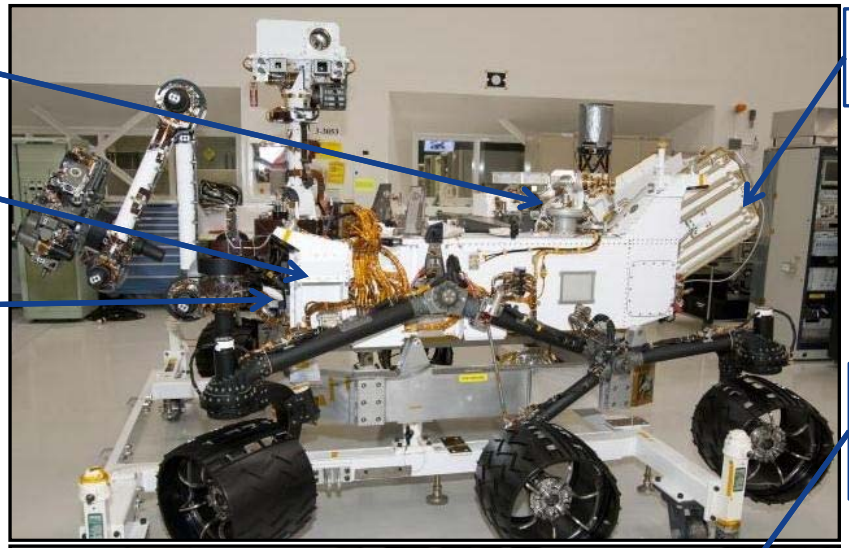
Rover Chassis
- Residual parts

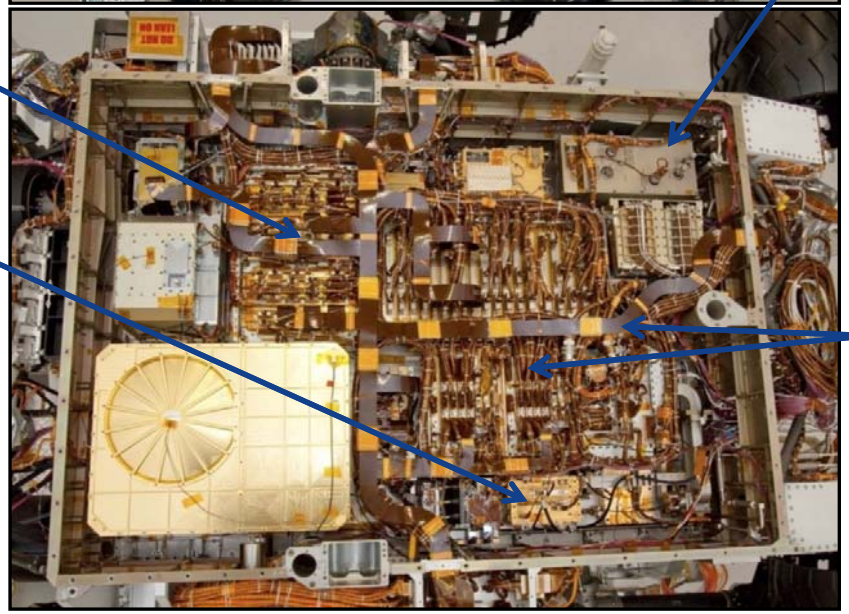
Rover Engineering Cameras
- New build (FMs); MSL residual CCD work begun

Rover Compute Elements
- Parts Procured, build begun

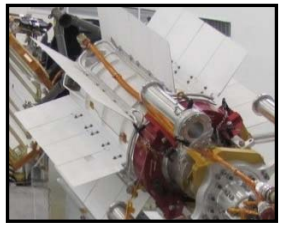
X-band Radio
- Under contract
- Spare MSL unit







MMRTG
- Residual (F2) flight unit

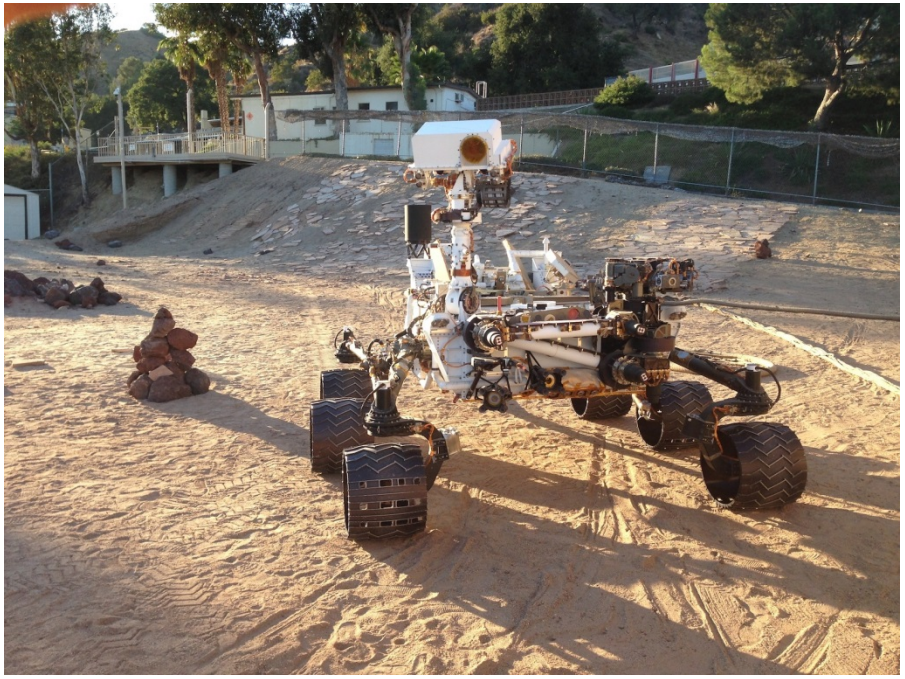


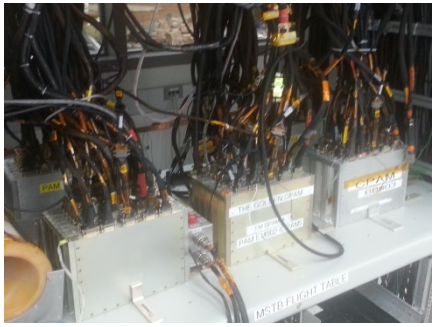
Rover Heat Rejection Pump Assembly
- Under Contract

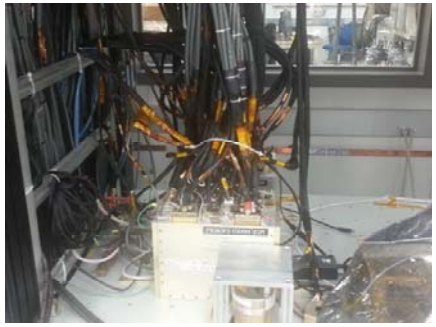
Rover Power Assembly and Power Analog Modules
- Parts Procured, build begun

MSL Testbeds

- Active MSL testbeds will transition to M2020







Payloads – AO Selected

Schedule

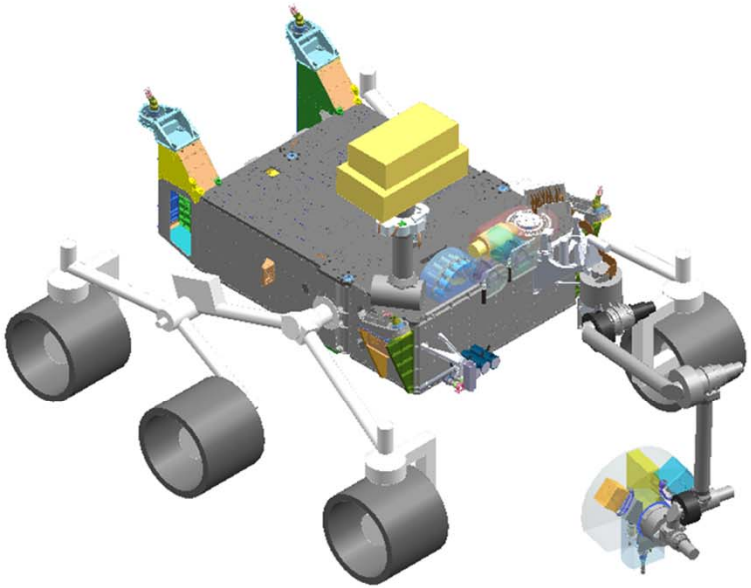
- Sep ’13 AO Released
- Jan ’14 Proposals Received
- Jul ‘14 Targeted Selection

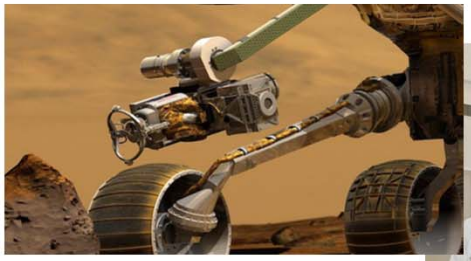
Solicitation

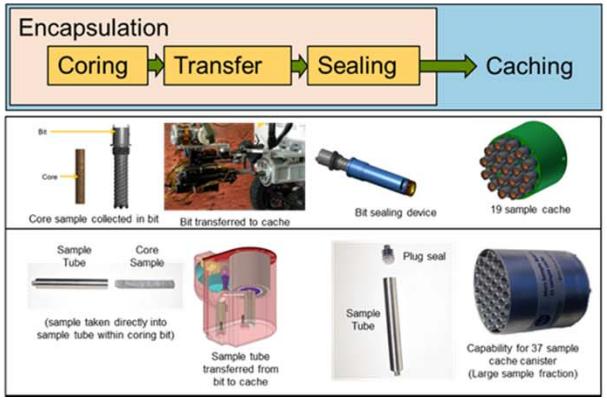
- Solicit Principal Investigator (PI)-led surface science and exploration technology investigations for the Mars 2020 rover mission.
- Allocated Phase A-D cost for all the SMD-funded investigations selected is approximately $100M, with ~$60M for Phase E
- Exploration technology investigations jointly funded by HEOMD and STMD may be selected at a total Phase A-E cost of approximately $30M
- SMD, HEOMD, & STMD will participate in the proposal evaluation and selection process as described in the AO
- International participation in cooperative, no-exchange-of-funds basis

Sampling System

- New development with potential for some MSL inheritance
- Will support arm-mounted in-situ instruments selected per AO
- Provide abrading / brushing for contact and remote sensing payloads
- Enable core acquisition and caching







International Contributions

Engineering Systems

- Project has ongoing discussions with Canadian Space Agency (CSA) on contributions associated with sampling system and surface telecommunications.

- Project has ongoing discussions with Center for the Development of Industrial Technology (CDTI) / Spanish industry on possible surface telecommunication contributions.

Instruments

- All international contributions associated with science and technology payloads will be considered through the AO submittal and selection process.

Mars 2020 Project Summary

- Mars 2020 Project approved for Phase A in November 2013
- The heritage hardware (representing ~90% of the flight system by mass) is essentially in Phase C/D
- Parts buys and procurements for heritage items with low risk of change are proceeding at a fast pace
- The competitive Announcement of Opportunity (AO) for the Mars 2020 payload was released 9/24/13, 58 proposals received on 1/15/14; the targeted selection date is mid-July 2014
- The Phase A work plan is balanced between 1) continued funding to heritage elements in order to buy down obsolescence risk, and 2) significant funding to the new payload elements and the sampling and caching system

Planetary Protection Activities (1)

- Project leadership and technical teams have been aggressively working PP/CC issues for more than a year.
- Established monthly management meetings with PPO, numerous face-to-face meetings, and supporting reviews.
- Requested/supporting independent Organic Contamination Panel (OCP) to establish science-based requirements on sample chain.
- Significant early focus on Sample Caching System
  - Extending program technology investments in ‘clean’ architectures compatible with future containment requirements
  - Funded early contamination transport analysis to assess heritage system compatibility
  - Working to achieve unprecedented pre-launch cleanliness that approaches Adventitious Carbon physical limits

Planetary Protection Activities (2)

- Applying MSL Lessons Learned
  - Working to establish PP organization with senior leadership at project-level
  - Separating requirements and implementation efforts with localized accountability.
  - Applying disciplined systems engineering practices to requirements flow-down and verification.
  - Intend to preserve exceptional forward contamination levels achieved on MSL / Curiosity