Jet Propulsion Laboratory
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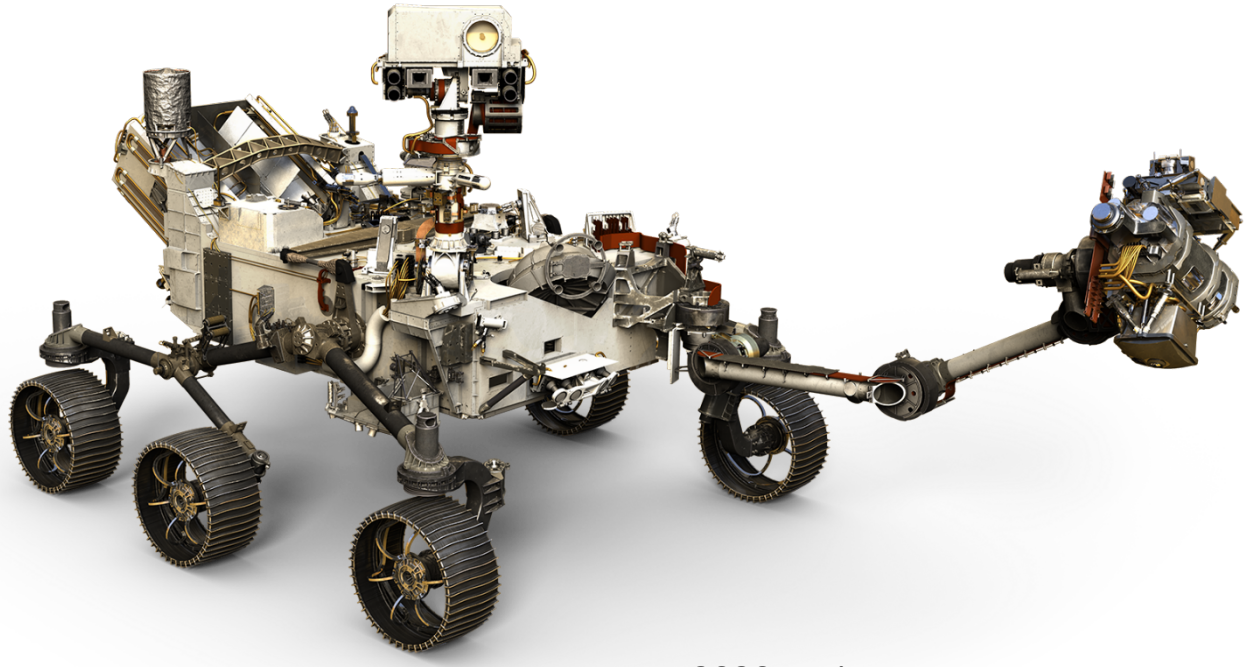
Mars 2020 Contamination Knowledge

Lauren White



Mars 2020 Project

The decision to implement Mars Sample Return will not be finalized until NASA's completion of the National Environmental Policy Act (NEPA) process. This document is being made available for information purposes only

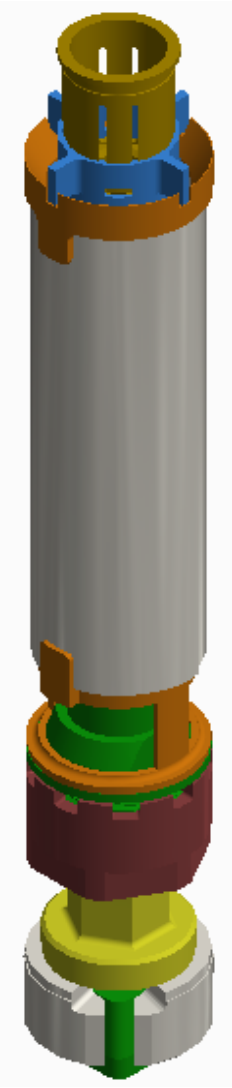
Introduction

- Mars 2020 is collecting contamination knowledge (through several pathways throughout the life of the project:
  - Witness Tube Assembly
  - QM and EM testing (pre-flight)
  - Witness plates throughout Assembly, Test, & Launch Operations (ATLO)
  - Direct hardware sampling throughout ATLO
  - Drillable blank

Witness Tube Assembly (WTA)

Witness Plate

- Honeybee robotics will be supplying a witness plate assembly (WPA) which will be installed into a number of sample tubes that will be placed in several strategic locations within the ACA
- Fits into a sample tube such that it can go through all processes a sample would accept for direct coring (sample tube exchange into bit, bit exchange to mars surface, etc)
- Contains a variety of materials each uniquely capable of acting as a “getter” to capture numerous types of expect contamination
- Materials included are similar to sample tube and hermetic seal materials
- Cleaning and assembly are performed exactly similar to sample intimate hardware for ACA (same cleaning procedures, environments, combustion cleaning, etc.)
- Materials are sealed in a non-activated state until ready for use



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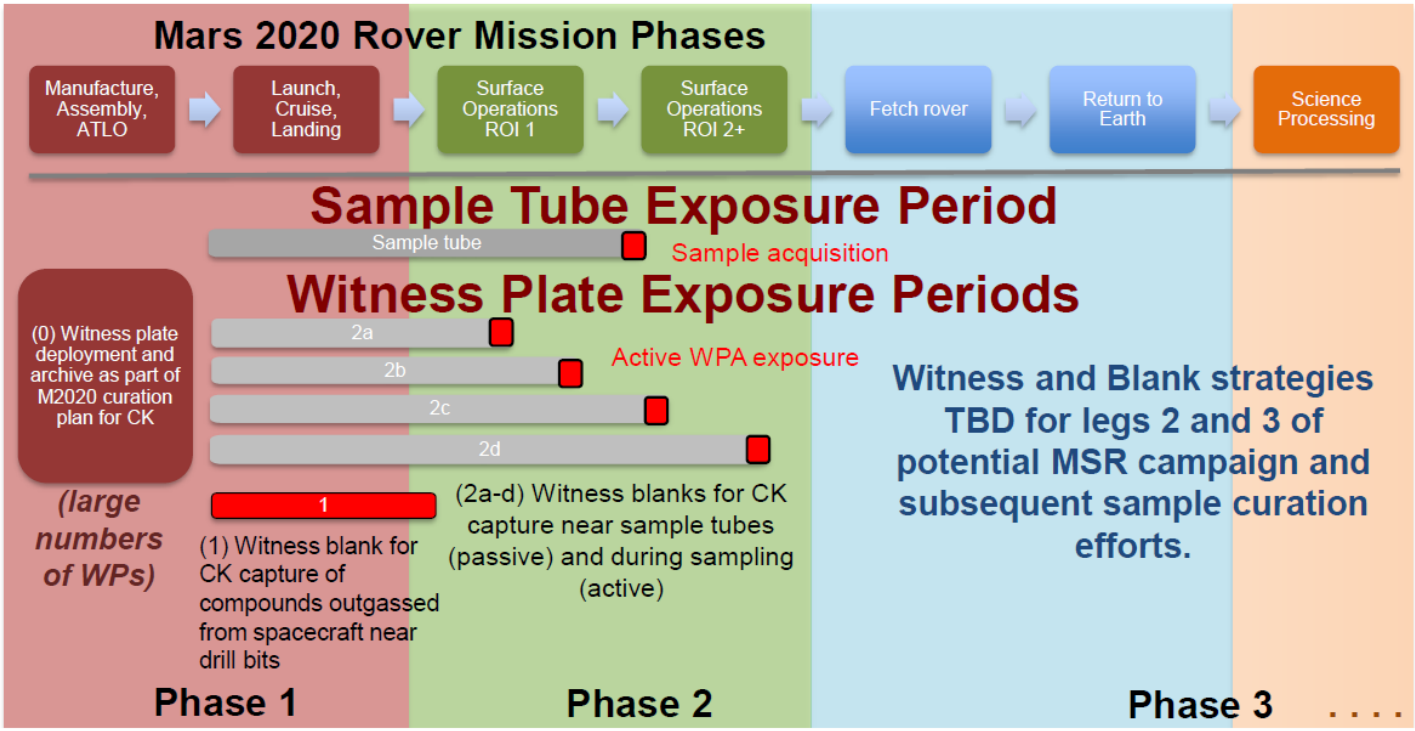
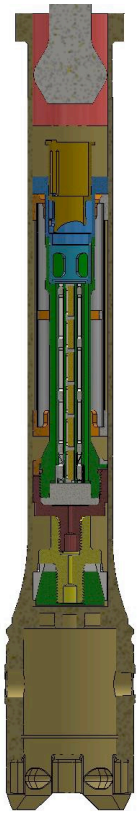
Witness Plate Assembly

- WPA's inside of a sample tube (WTA) can be activated at strategic points in the mission
  - Bit Carousel witness
    - Capture contamination from ATLO through cruise and landing (active witness, no FMPB barrier)
  - Sample storage witnesses:
    - Capture contamination from ATLO through cruise and ops (analog to TiN of a sample tube: Passive witness (behind FMPB), gray bar)
    - Capture contamination during core acquisition and handling (analog to rock sample: Active witness, red bar)





CC/PP Witness and Test Campaign

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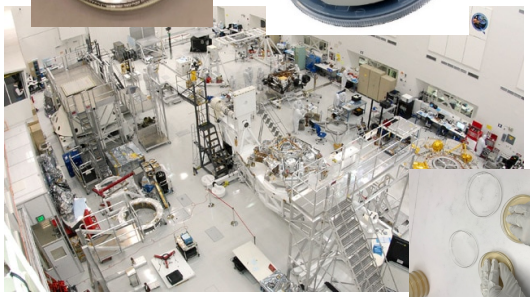
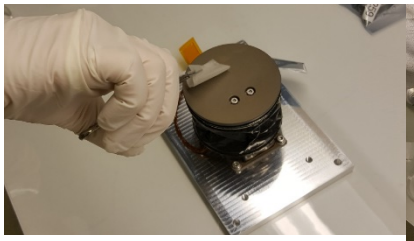
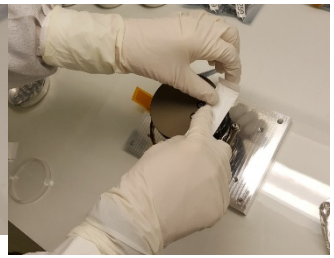
Examples of CK in ATLO

Witness Plates for OC, IOC, particulate and bio contamination for all hardware in all environments (follows the hardware)

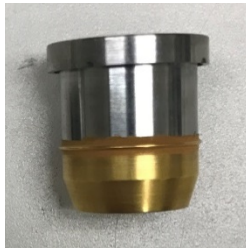


Direct sampling of flight hardware wherever possible

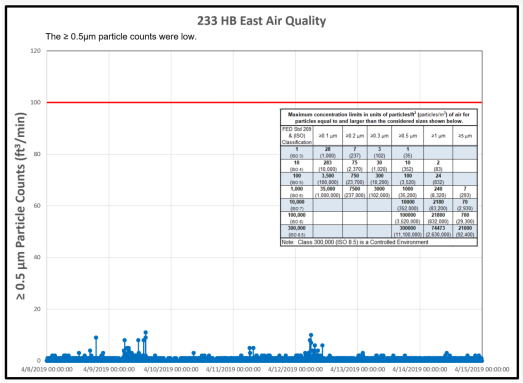




Proxy hardware (flight like) for direct analysis (treated/processes with flight)



Particulate and Bio monitoring in assembly facilities



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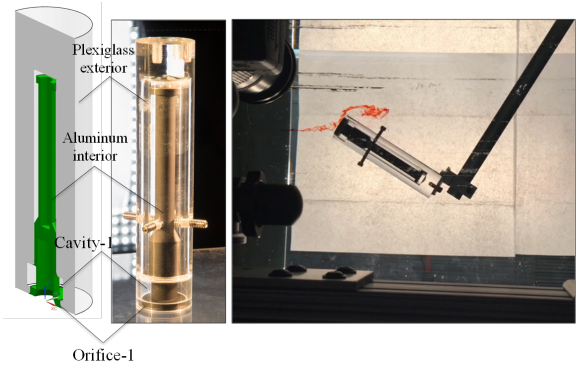
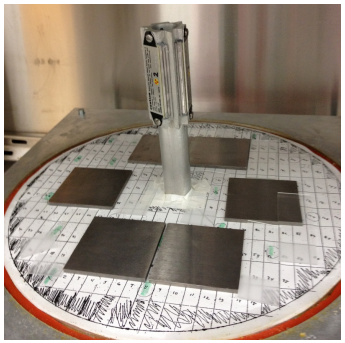
Examples of Testing for CK in ATLO

Early testing of FMPB design

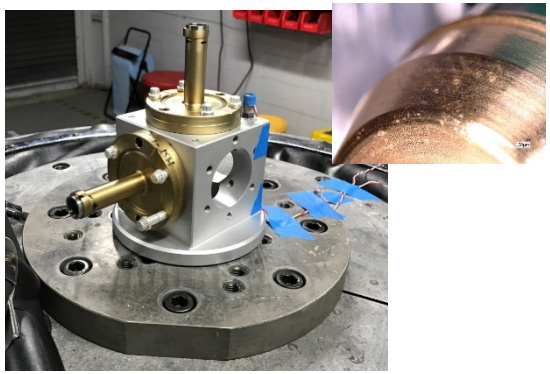


Bio challenge to FMPB

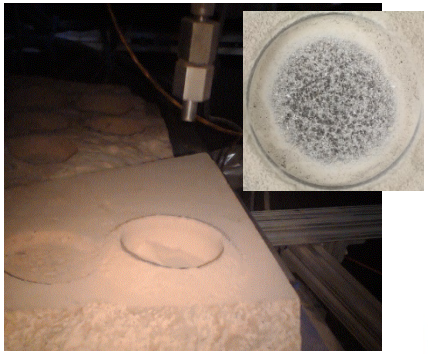


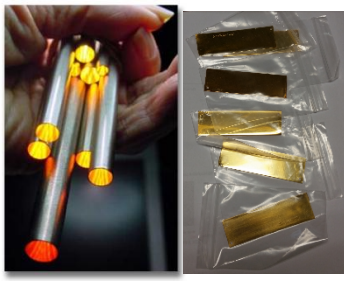
Coring/Drilling tests for rock to bit contamination assessment

Debris/wear life testing of Sample intimate hardware



Testing with flight quality hardware to measure biological, inorganic and organic contamination





Cleaning, and chemical analysis on flight material coupons

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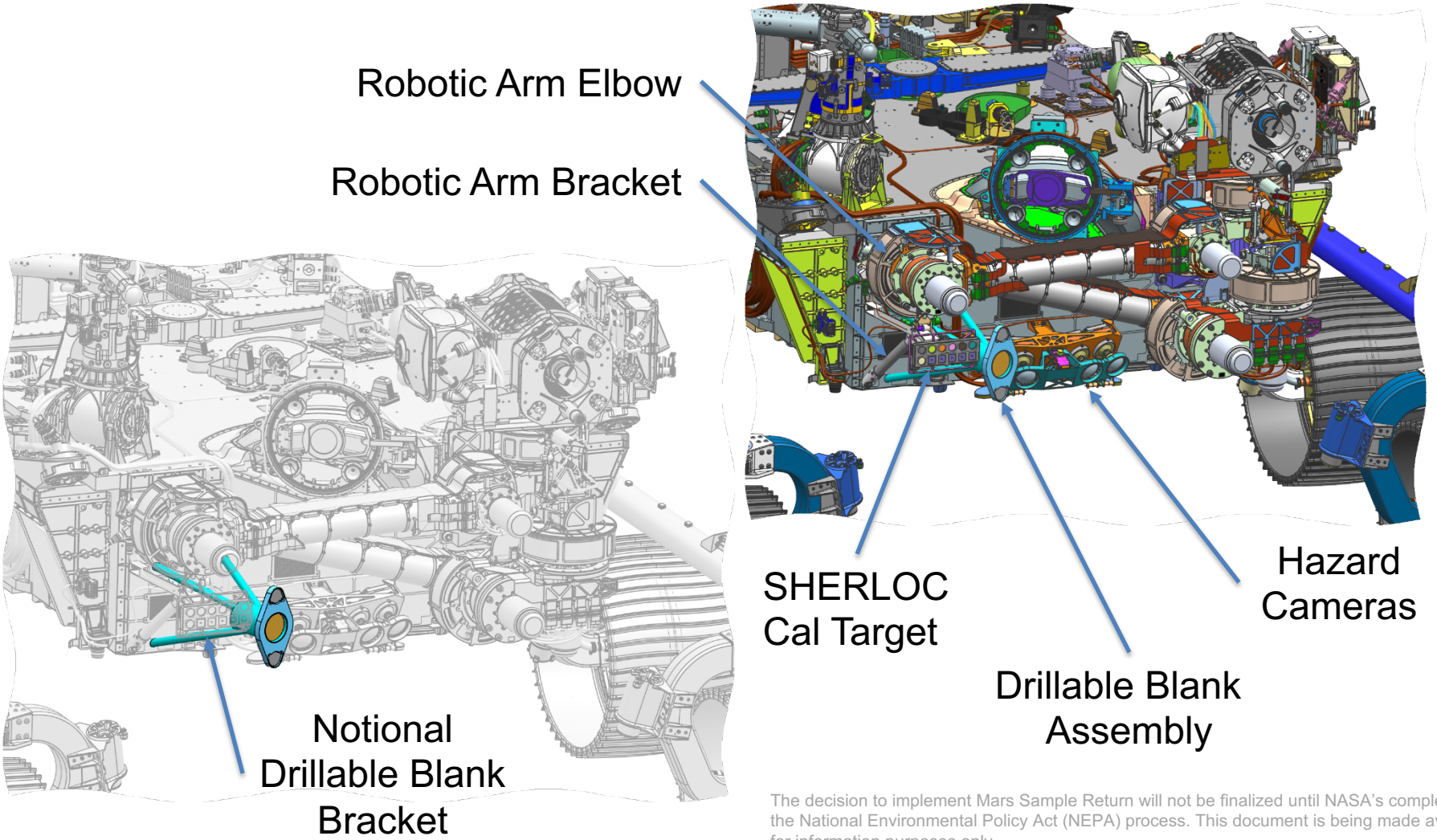
- Intended to capture contamination knowledge of bit to rock interactions on mars



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