

Mars Sample Receiving Project

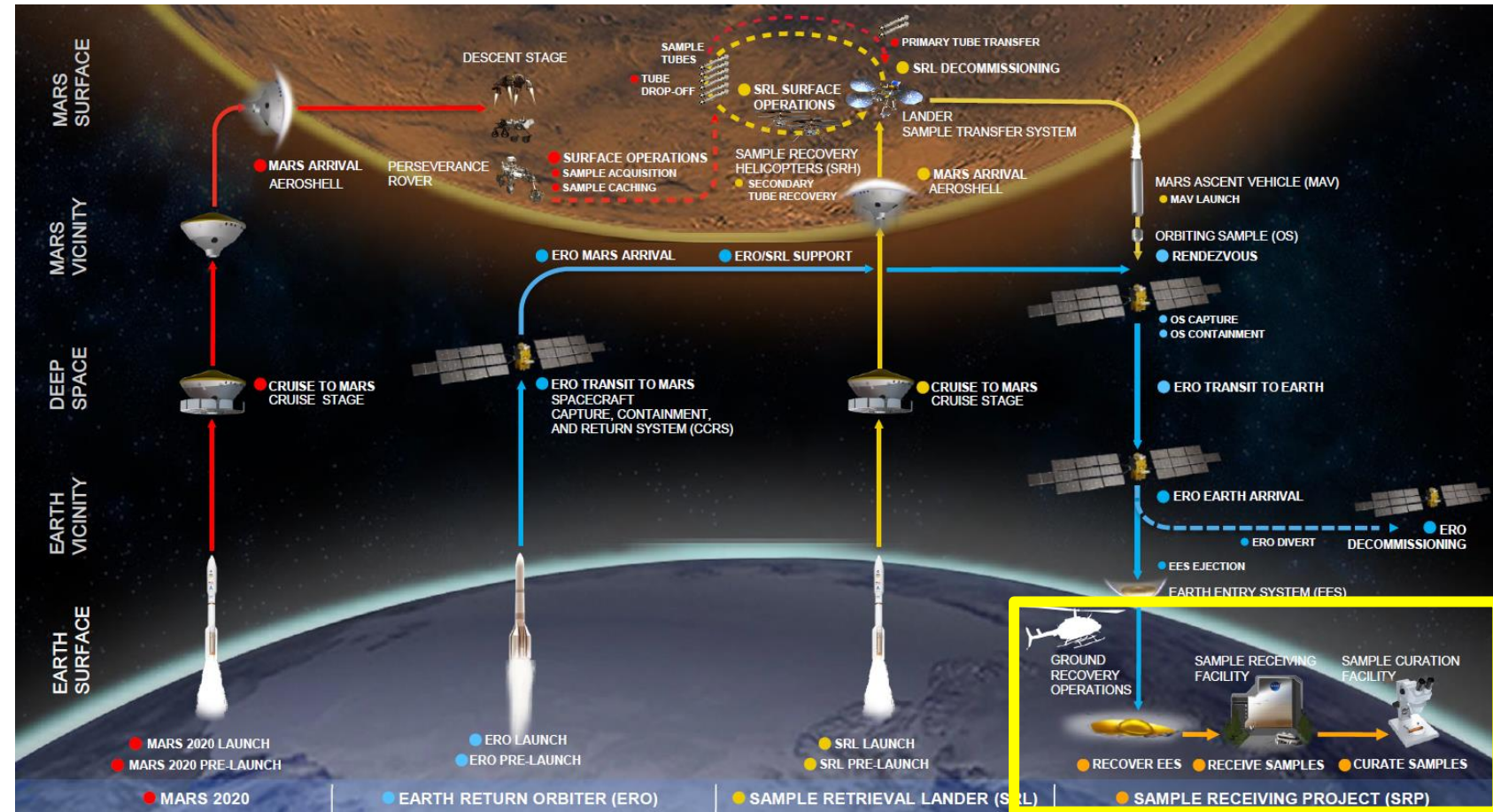


MARS SAMPLE RETURN CONTAMINATION KNOWLEDGE COLLECTION

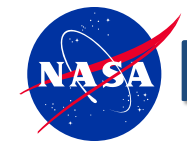
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- Mars Sample Return (MSR) is a joint venture between NASA and ESA.
- MSR is classified as a Class V Restricted Earth Return mission.
- The Campaign will notionally return between 10-26 geologically diverse samples (plus witness tubes) able to answer an array of science objectives.
- The Sample Receiving Project (SRP) is the last component of the MSR Campaign with operations beginning when the samples arrive on Earth.
- The NASA Curation Office will take formal custody of the samples when they arrive on Earth (TBC) and the collection will be jointly managed by NASA and ESA.



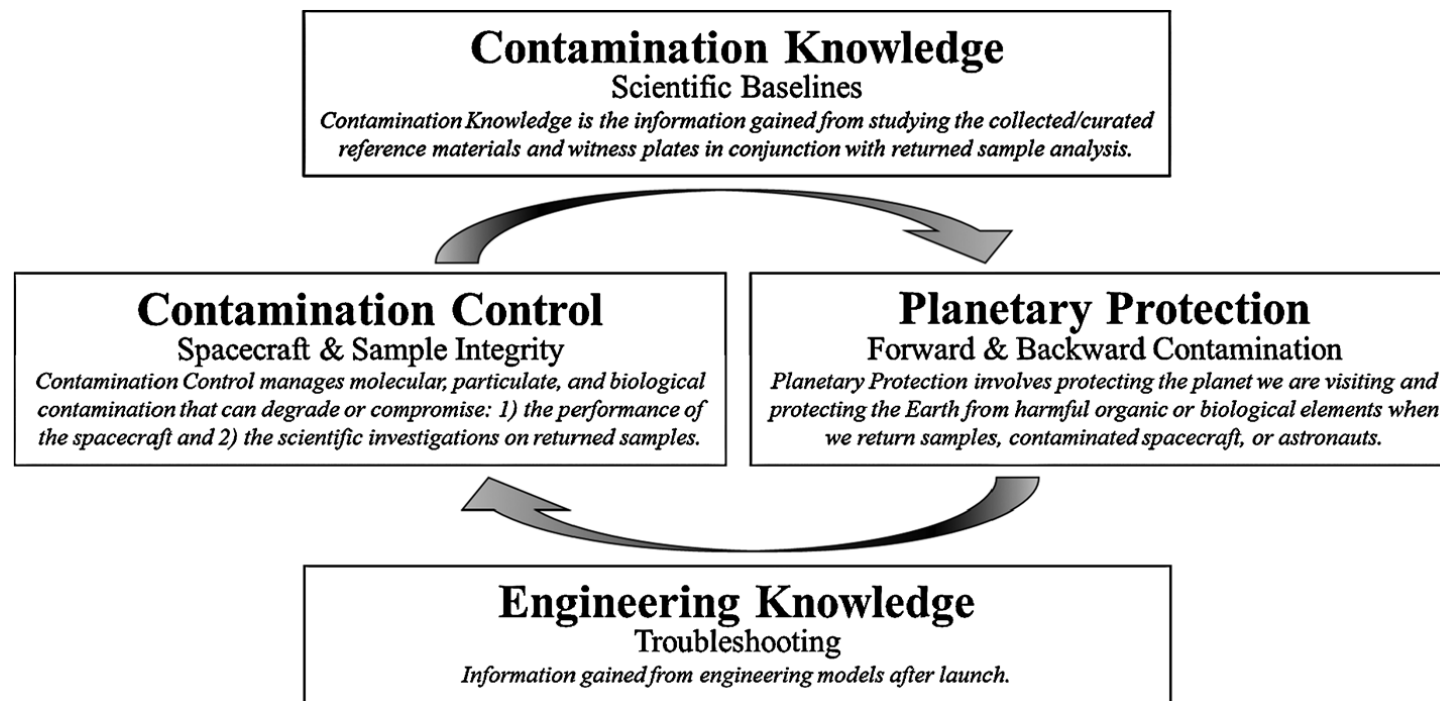
MSR Campaign Architecture under evaluation



MSR CONTAMINATION KNOWLEDGE COLLECTION

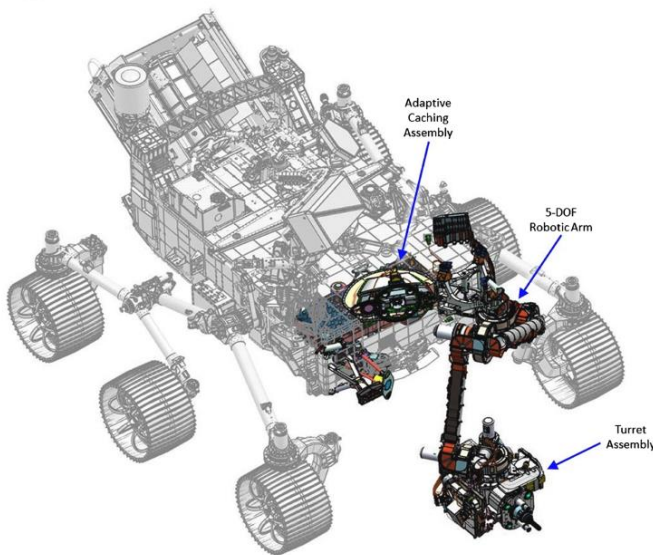


- The Contamination Knowledge (CK) Collection for MSR will be comprised of flight replicates, reference materials, witness items, and flown-hardware from all missions within the MSR campaign.
- Due to the anticipated campaign architecture, it is estimated that 50+% of the MSR CK Collection will have been collected during Mars 2020 Perseverance Mission Assembly, Test, and Launch Operations (ATLO).
- The science goals, associated contamination control guidelines, and planetary protection requirements of MSR increase the complexity of the MSR CK Collection.



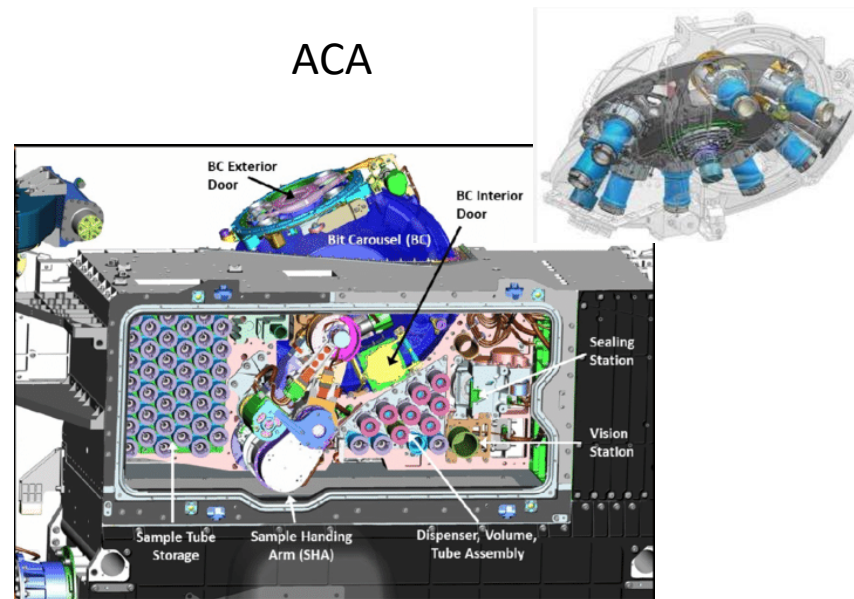
- The focus of the collection is capturing CK sample in proximity to the Sampling and Caching Subsystem (SCS) with the Adaptive Caching Assembly (ACA), Sample Handling Assembly (SHA), Sample Intimate Hardware (SIH).
- All flight reference materials are treated like flight spares (i.e., fully cleaned flight components ready for assembly onto the spacecraft).

Perseverance and SCS



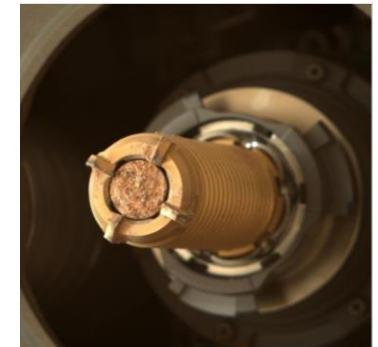
(NASA/Caltech)

ACA



(NASA/Caltech)

SIH

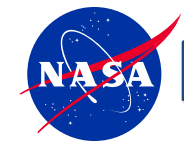


(NASA/Caltech)

Mars Sample Receiving Project

- Flight hardware reference materials collected for Sample Intimate Hardware (SIH) and select line-of-sight materials.
 - SIH: Hardware which comes into contact with a scientific sample collected from Mars (e.g., sample handling assembly, sample tubes, tube storage, seal dispenser, seal storage, bits, and volume probe).
 - Line-of-Site Materials: Hardware or materials that represent a potential contamination risk due to physical or chemical features and proximity to SIH, sampling areas, or the samples themselves.
 - Flight and non-flight reference materials and other materials from spacecraft assembly (e.g., lubricants, paints and gases) of sample return missions that could have the potential to cross-contaminate a present or future NASA astromaterials collection (e.g. samples, sample containers, cache hardware, and sample acquisition hardware).
 - Primarily collected during ATLO and after flight during the recovery and curation phase.
- Witness items include environmental witness plates, swab, and rinse samples collected on or around non-flight, flight-like, and flown hardware.





- Non-flight reference materials: All facility tools, equipment, and environmental components used during the fabrication, part processing, precision cleaning, and assembly that are considered a potential contamination risk to the collected samples, sample containers, cache hardware, and sample acquisition hardware; the SCS.
- ***Non-flight reference materials*** include the following:
 - Facility Tools for Assembly of the Sample Containers, Sample Cache, and Sample Acquisition Hardware; this includes the all components for the assembly and fabrication of the SCS.
 - Precision Cleaning Processing Tools, Solutions, and Gases used for Cleaning the Sample Containers, Sample Cache, and Sample Acquisition Hardware
 - Outgassing Materials in the Assembly and Cleaning Facility
 - Processing Gases Used During the Assembly of the Spacecraft and Rover
 - Personnel Garment Coupons (including gloves) used During Assembly of the Sample Containers, Sample Cache, and Sample Acquisition Hardware
 - Associated Part Containers, Coverings, and Assembly Stands used for Assembly of the Sample Containers, Sample Cache, and Sample Acquisition Hardware
 - Containers, Bags, Covers, and Other Curation Tools for Storing and Handling Reference Materials

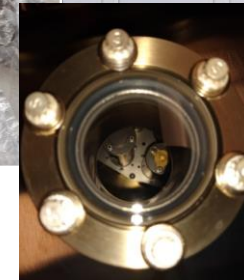
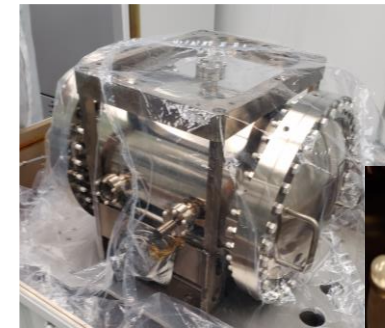


- Determine line-of-sight flight hardware and components on the Master Equipment List (MEL) that have the potential to contaminate.
- An all-encompassing Master Materials List (MML) of all components on the spacecraft during launch, cruise, Mars entry/decent, and the rover.
 - Used to determine the selection of materials that have any potential to shed particulates and/or outgas molecular organics, directly or indirectly impacting the SCS.
- The Mars 2020 mission MEL and MML used to generate a list of collected flight reference materials to be curated for Mars 2020 mission CK.
 - Used to segregate outgassing and non-outgassing parts, determine particulate shedding components, and line-of-sight materials with the SCS.



- Entirety of the Mars 2020 CK Collection is housed in the Curation Office

- Biological CK
 - Swabs
 - Wipes
- Flight Vacuum Bake-Out Witness Plates
- Flight Replicates
 - Sample Tubes
 - Drill Bit
 - Coring Bit
 - Abrading Bit
 - Drillable Blank
- Environmental Witness Plates & Foils
 - SIH Flow Benches
 - Assembly Rooms
 - Organic
 - Inorganic
- SIH Witness Items
 - Gloves
 - Wipes
- Flight Replicates
 - SHERLOC Cal Target
 - 7 Sample Tube Assemblies
 - 7 Glove Assemblies
 - 7 Sample Tube Storage
 - Volume Station Assembly
 - Seal Dispenser Assembly
 - 7 Hermetic Seal Assemblies
 - 2 Cover Assemblies
 - 2 Witness Tube Assemblies
- Material Samples
- Final Solvent Rinses
 - Hexane
 - Isopropanol
 - Acetone
 - Ethanol
 - DI Water



- New CK Laboratory Suite in upcoming B31 Annex
 - ISO 7 Storage Room with ISO 5 Stainless Steel Flow Bench
 - ISO 6 Ultra-Clean Storage Room with Custom Designed Low-Organic Outgassing Desiccators/Isolators
 - ISO 5 Ultra-Clean/Low-Organic Outgassing Processing Room with Additional Glovebox
 - ISO 6 Biological Storage with a BSCII Cabinet for Processing Allocations
- Developing the database for the CK Collection catalogue
 - Includes cross-referencing and cataloguing ~1TB of data provided by the project (pertinent sample data tracking flight items from manufacturing to cleaning to installation)
- Developing CK collections with the contamination control leads for the upcoming missions within the MSR Campaign

Isolation Cabinets



MSR CK (JSC)

