Science Enabled by an Orbital Mission to Mars

The Humans to Mars Summit 2019
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Cruise and Orbit

Access to a unique environment for long term studies of the human body

- Ionizing Radiation
- Microgravity
- Solar Energetic Particle Radiation
- Galactic Cosmic Rays

Graph showing dose equivalent (millisieverts) for different scenarios:
- Annual Cosmic Radiation (sea level)
- US Annual Average, All Sources
- Abdominal CT Scan
- DOE Radiation Worker Annual Limit
- 6 Months on ISS (average)
- 180-day Transit to Mars
- 500 Days on Mars

Microgravity

The Twins Study

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Other experiments taking advantage of access to deep space

- Growing micro and macro-organisms
- Space telescopes - spectroscopy beyond Earth’s atmosphere
- Capture of IDPs and space debris
Orbital Remote Sensing - Mars by the slice
Dust Devils and atmospheric phenomenon

Ice sublimation and transient water

Landing Site Assessment

Impact changes to surface and atmosphere

Discovery Driven Science including:
Leverage telerobotics and remote operation of surface assets
Mars2020 mission will cache samples for sample return via MAV to orbit and eventually to Earth. A well equipped lab on a human orbital mission could do initial analysis on these or other samples from the surface or moons.
FETCH!

NASA hopes to bring the first soil and rocks back from Mars. The process is set to begin in 2020, when the agency's next rover is slated to cache samples for return by two future missions, as-yet unplanned.

Sample-caching mission (to be launched by NASA in 2020)

Rover caches samples

Cache

Sample-fetching mission (date unknown)

Second rover fetches samples to be sent into orbit

Sample-return mission (date unknown)

Vehicle grabs orbiting samples and returns to Earth

Mars ascent vehicle