

Exploration of Mars (08)
Mars Sample Return and Human Exploration (2)

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IS MARS SAMPLE RETURN REQUIRED PRIOR TO SENDING HUMANS TO MARS?

Abstract

We present here the case for returning samples from Mars prior to embarking on a plan to send humans to Mars. There are two issues that are central to this argument. First, in order for humans to explore Mars and return to Earth safely, it would be necessary to ensure that the astronauts are not exposed to martian materials that are harmful to Earth-based biota. This is because astronauts on the martian surface inevitably would be exposed to martian dust. Since the plan is to return the astronauts to Earth at the end of the mission, the astronauts would be therefore a potential vector for the transport of martian dust. It is crucial that the dust must be shown in advance to be sufficiently safe. Second, as a one-way trip to Mars would not be the baseline for human exploration of Mars, the significant challenges associated with lifting from the surface of Mars should be overcome before proceeding with sending humans to Mars. The current proposed Mars Sample Return (MSR) design involves returning a 500 g sample from the planetary surface, and many of the technologies that would be needed to return humans from Mars could be tested in Mars Sample Return. Therefore, portions of the MSR campaign might even be viewed as a risk reduction exercise for the human exploration program.

We will address these issues in further detail, walking through issues related to both planetary protection and technology development that relate to both MSR and potential human exploration of Mars.