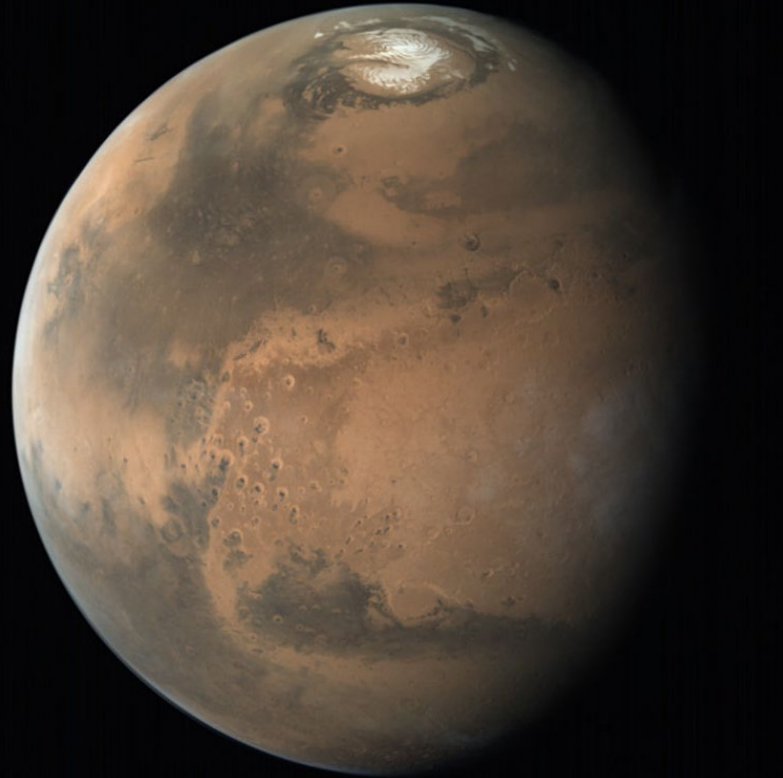


Mars Transit Lessons Learned

Hoppy Price
Jet Propulsion Laboratory
California Institute of Technology

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Mars Transit Lessons Learned from Robotic Missions

- Propulsion
 - Trade-offs between performance, complexity, heritage, cost, and risk
 - Electric propulsion needs to include margins for thrust vs. non-thrust periods
- Telecommunication
 - Functional redundancy can be mission saving
 - Different antenna types and frequency bands
 - Solar conjunction periods with impaired communication must be planned for
 - Speed of light time lag for comm must be planned for
- Fault protection and safe modes
 - Keep it simple and avoid complexity (be wary of unintended consequences)
 - Plan for safe modes, failure responses, and contingencies (off-nominal testing)
 - Crew intervention could mitigate adverse fault protection responses
- In-flight reconfigurations of vehicles add complexity and risk
 - Additional analyses and test complexity increases cost
 - Multiple dockings and undockings with different vehicles are planned to be tested by the Artemis Program
- Planetary protection and orbital debris issues must be taken into account for discarded elements
 - Propulsion stages, discarded modules, trash