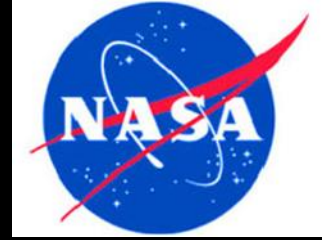


The Challenge of In Space Propulsion

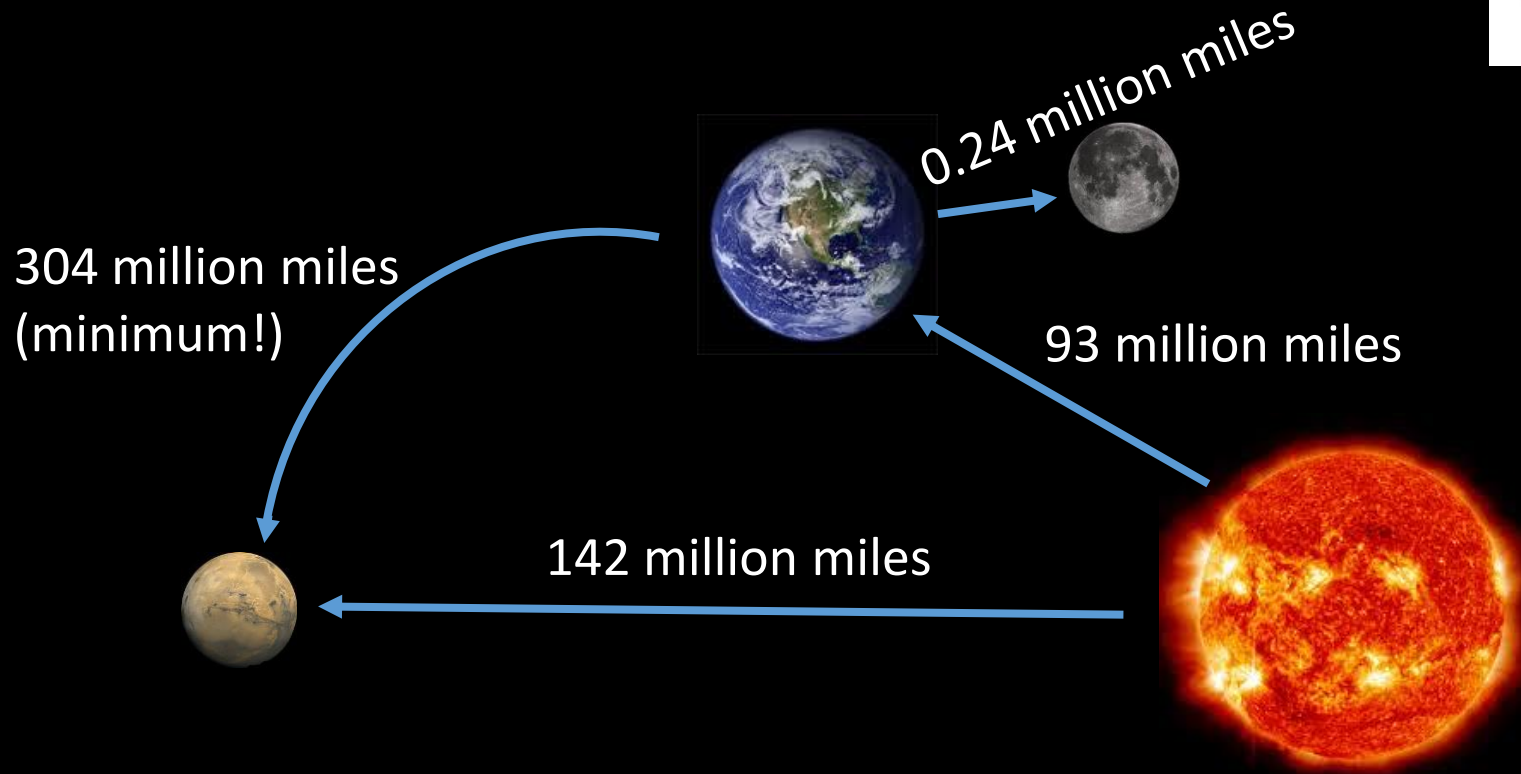
Les Johnson

Tom Percy

NASA George C. Marshall Space Flight Center (MSFC)

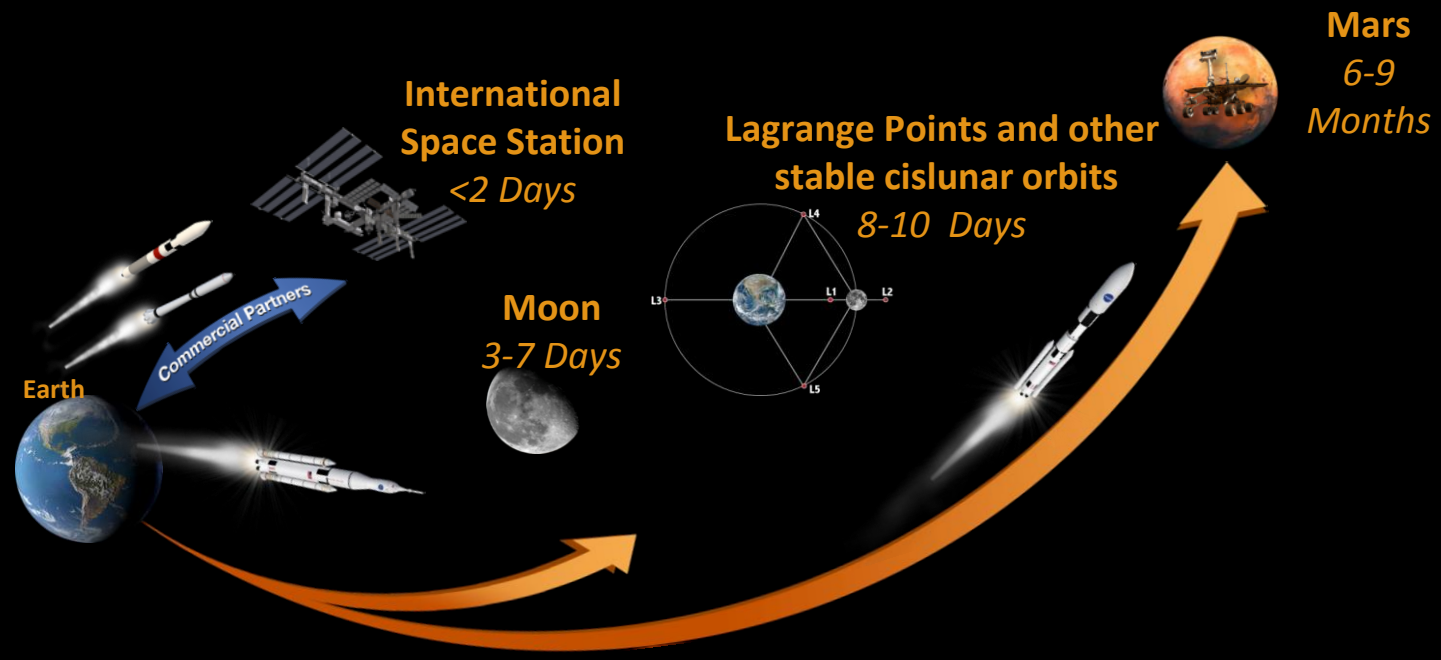


The First Problem is Distance

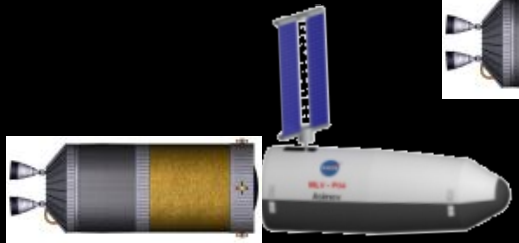


And then there is time

One-way transit times to destination



Mars Mission Elements

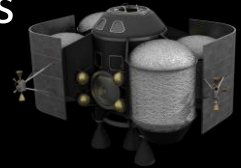


Cargo to Mars

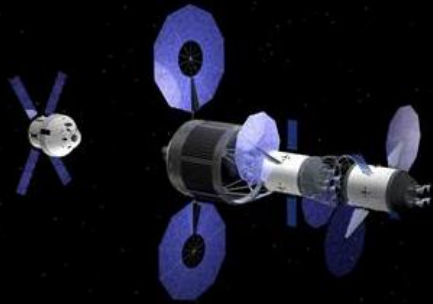


Crew To & From Mars

Land on and Launch From Mars

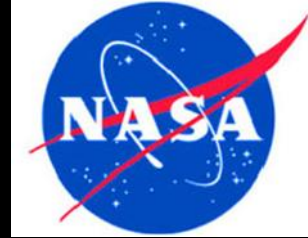


Launch from Earth

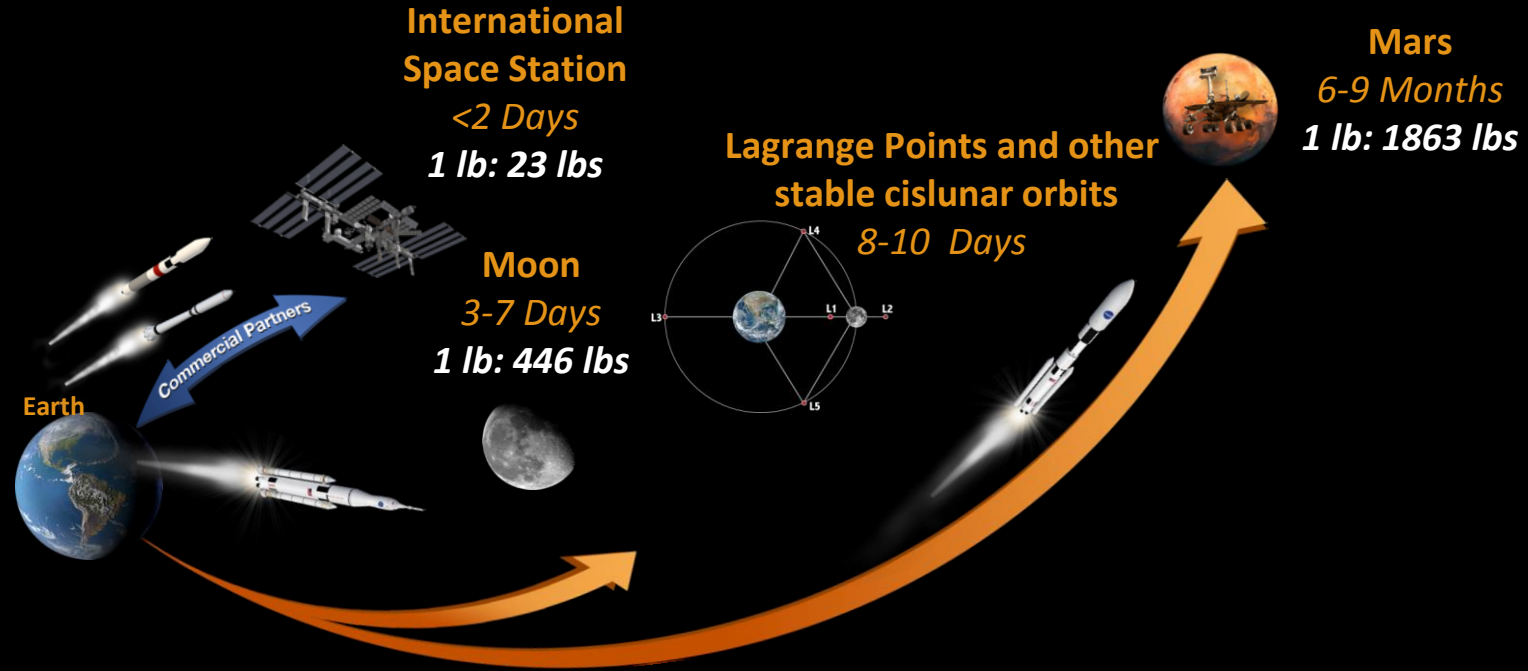


Habitat and Exploration Vehicles on Mars





And then there is time
 One-way transit times to destination
 And mass



Ibs returned to Earth: Ibs on the launch pad at Earth