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THE MEDIAN MARS MISSION USING IMPACTORS – SEARCHING FOR LIFE ON MARS

Abstract

As a secondary mission, Mars Median (Methane Detection by In-Situ Analysis with NanoLanders) needed a landing method that did not use stored energy for the safety of the primary. A non-traditional approach had to be taken to land the experiments on Mars and ensure that all essential parameters are met. That is by impactor probes. Design and testing must ensure that a wide range of experiments can be landed on Mars as part of the Median probes. This includes methane detection, subsoil analysis, atmospheric analysis, and weather observations in a local area from multiple impactors.

This study investigates the survivability of impactors by utilising a variety of slowing mechanisms and G-force reduction by inertial shock suppressing systems. This will build on the work already done by analysis of fluid dynamic studies and data from previous impactor studies – theoretical and practical. Testing will be done by using a fully enclosed gas gun with a slowing chamber. 4Kg test probes 1m long will initially be impacted at 100m/s with a set of XYZ sensors on board, high speed cameras to view the impact. The target chamber will utilise a variety of Mars Regolith simulants. Eventually the impactors will be 2m long, 4Kg and will impact at 200m/s – a little above the expected impact velocity on Mars. Probes will be also dropped from helicopters onto salt lakes and other ground to more accurately simulate the probable survivability of the probes. ie on sandy ground, regular soil and rocky ground.

For 100m/s impacts the desktop study has revealed that impacts at this speed are easily survivable. Early experiments and indications from aircraft impacts also reveal many electronics parts not manufactured for such impacts survive. Further tests and designs that lower g-forces on the experiments should let us exceed the 200m/s impact required.

The significance of these results and successful future results will allow the creation of a network on Mars with solar power that can analyse over time a wide range of important characteristics and possible location of methane vents. Relay will be via Satellite. A rover can then locate the vent and analyse the gas to test its origin. Future nano-lander experiments can utilise this landing method.

Further research will be needed to integrate with the ride to Mars.