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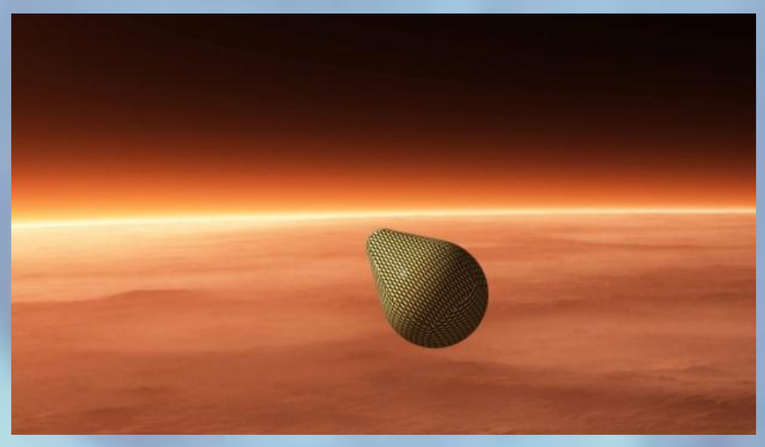
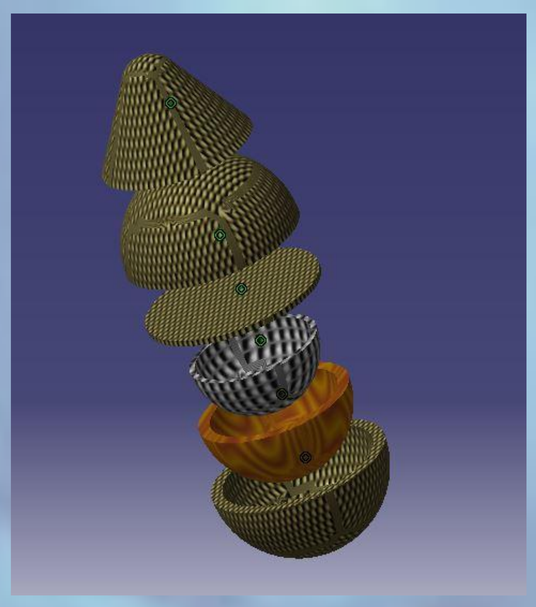
Aerodynamic Decelerator Atmospheric-entry Module (ADAM) for Mars

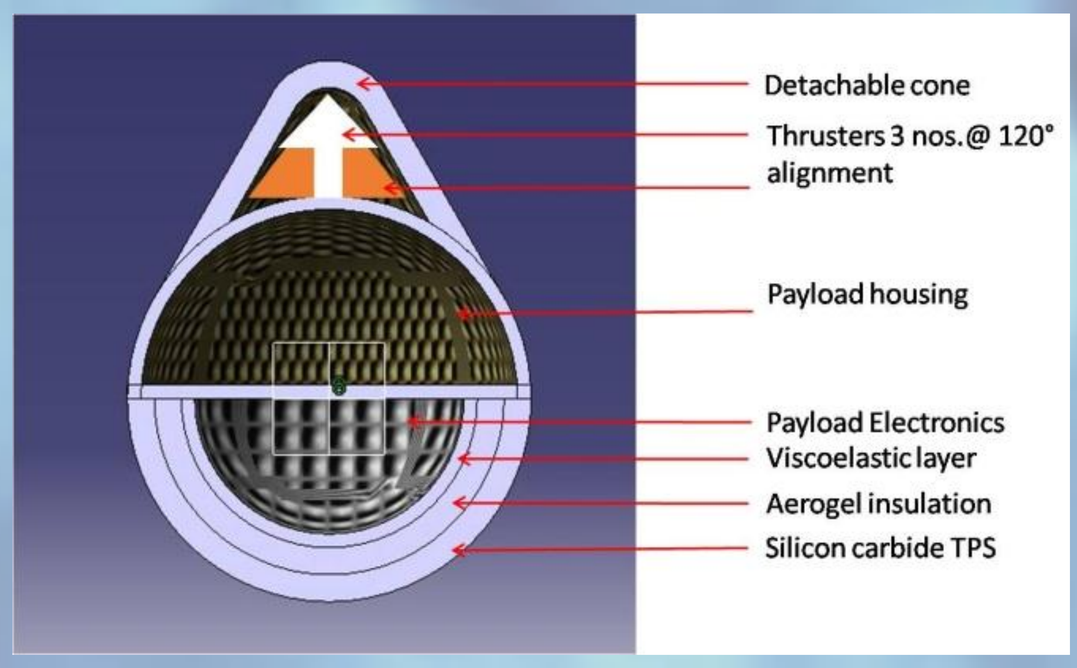
ARUN D I *, ARYADUTT OAMJEE #, PRAJITH KUMAR K P #a
* Vikram Sarabhai Space Centre, ISRO, Department of Space, Trivandrum
# Indian Institute of Space science and Technology, Department of Space, Valiyamala Trivandrum
a prajith.sc16m013@pg.iist.ac.in

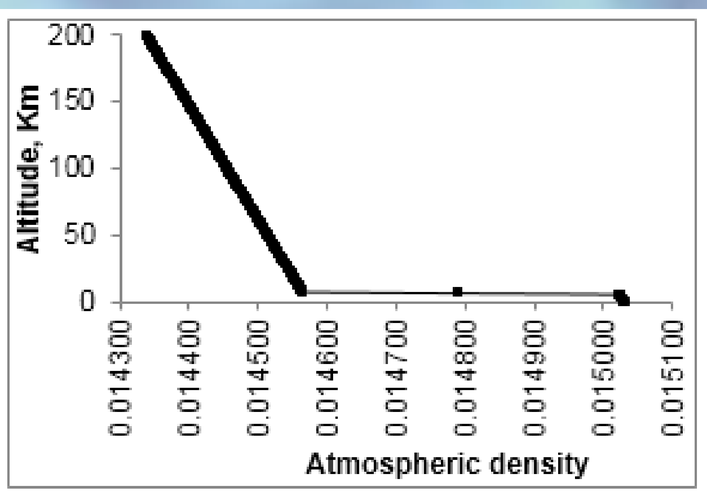
- ADAM is an atmospheric entry module that delivers safely micro/mini probes/payloads to Martian surface, weighing from minimum 5 kg to 15 kg net weight relevant for small scale researchers and explorers.
- Conceptualized as a stretched sphere (tear drop shape during its atmospheric entry) and the rear cone separates out during the parachute deployment transforming the module to a sphere.
- This sphere drops down decelerating, aided with three thrusters to bring down the velocity to near zero value for a safer touchdown.
- Visco-elastic damping materials serves as shock absorbers to prevent impact load transfer to the payload inside.

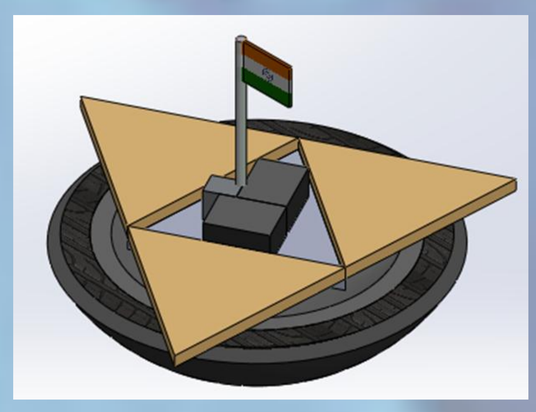
- This paper aims primarily of…
- An atmospheric entry probe undocked from the mother spacecraft orbiting the planet
- The probe enters the Martian atmosphere decelerating itself to a near zero touchdown velocity on the surface of the planet.
- A spherical configuration is proposed for the probe having an overall weight of 15 kg with the payload inside.

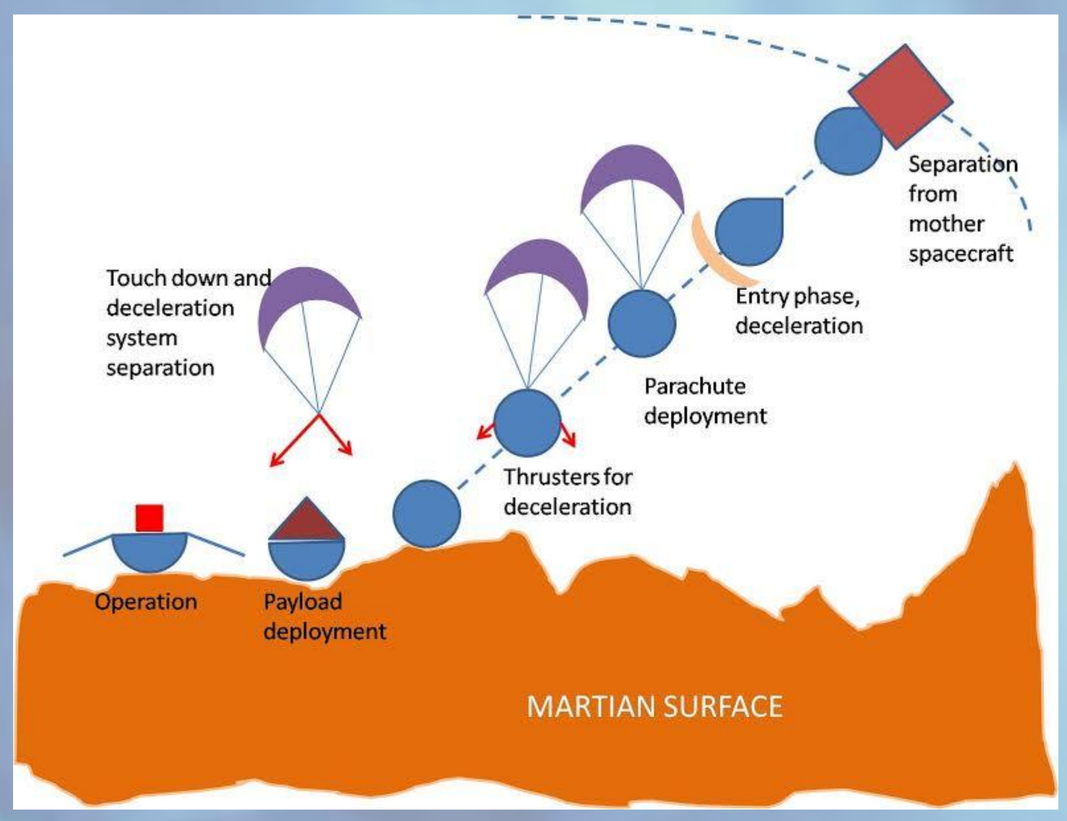


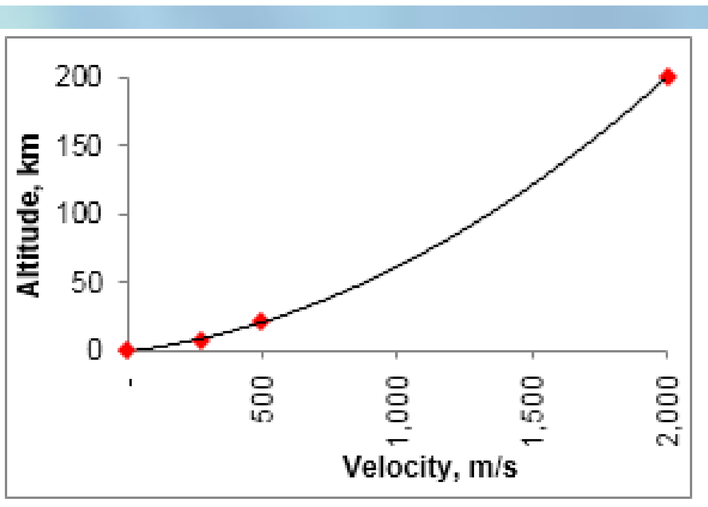




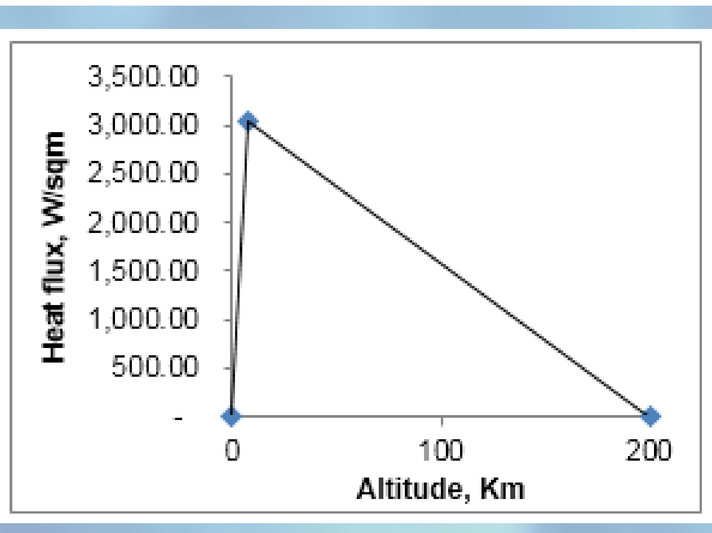








- Outer aeroshell in the shape of a stretched sphere (tear drop shape)
- Multiple layer of Thermal Protection System (TPS)
- Visco-elastic shock absorbing layer
- Decelerator system consisting of parachute and thrusters



- Maximum deceleration: 11.5 m/s (3.28 ‘g’)
- Altitude of maximum deceleration: 20.40 km from surface
- Velocity at maximum deceleration: 491.93 m/s
- Maximum dynamic pressure: 880 Pa
- Drag force at maximum deceleration: 180 N
- Altitude of maximum heating: 8.20 km from surface
- Maximum heating rate: 3033 Watt/sqm (lesser than the space capsule recovery experiment heating rate as achieved by ISRO in earth atmosphere)

- Concept is analogous to advent of mini-satellites when larger spacecrafts of agencies reign the space arena.
- Small scale space enthusiasts can enter planetary exploration via such small payload delivery systems

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