NASA SBIR/STTR Technologies

High Performance Monopropellants for Future Planetary Ascent Vehicles

Physical Sciences Inc. – Andover, MA 01810

PI: Dr. Allan Dokhan

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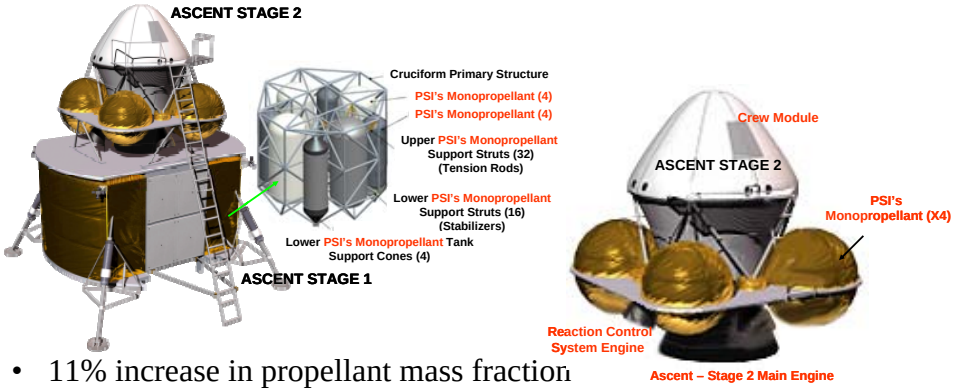
Identification and Significance of Innovation

- High performance, green, non-cryogenic, and non-carcinogenic, liquid monopropellant
- Superior specific impulse performance exceeding 240 sec solicitation requirements by 56%
- A 38% higher propellant density, a 55% higher specific impulse, and a 113% increase in density specific impulse over hydrazine
- Comparable density-specific impulse performance to NTO/MMH

Estimated TRL (1 – 9) at beginning and end of Phase I contract:
TRL at the beginning ~ 1 , TRL at the end ~ 2



- 11% increase in propellant mass fraction
- 32% improvement in vehicle mass ratio
- 16% improvement in MAV's ΔV to reach ECCV
- A simpler, more compact system than bi-propellant systems

Technical Objectives and Work Plan

- Evaluate the physical and chemical properties of proposed monopropellants to ensure maximum I_{sp} and ρI_{sp}
- Demonstrate ignition and sustained combustion of proposed monopropellants at atmospheric Martian pressures as low as ~0.09psi
- Identify a Mars Ascent Vehicle design (using the Design Reference Architecture 5.0 as baseline) that uses the proposed monopropellant, and demonstrate by analysis enhanced vehicle performance and potential for implementation for space mission

NASA and Non-NASA Applications

Multiple application within the NASA Exploration System and Planetary Science directorate:

- Advanced Capabilities Program
- Exploration Technology Development Program
- Mars Exploration program

Non NASA applications include:

- NetCentric Airborne Defense Element Proto-program
- Falcon force HTV-2 program
- Divert attitude control and upper-stage propulsion system for MDA missile programs

Firm Contacts: Dr. Allan Dokhan, Tel: 978-738-8133
email: dokhan@psicorp.com

NON-PROPRIETARY DATA