

# NASA SBIR/STTR Technologies

H2.02-9347 - 100-lbf Non-Toxic Storable Liquid Propulsion



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## Identification and Significance of Innovation

NASA's Road Maps for both Launch and In Space Propulsion call for the development of non-toxic, monopropellant reaction control systems to replace the current toxic hydrazine based systems. The Orion Multi-Purpose Crew Vehicle capsule with twelve 160 pound force (lbf) hydrazine monopropellant thrusters and the Orion Service Module with eight 100lbf NTO/MMH auxiliary propulsion thrusters are obvious insertion candidates. Additionally, the Commercial Crew and Cargo spacecraft have also demonstrated the need for 100lbf class attitude control thrusters with quantities comparable to Orion. Hydrazine replacements, including non-toxic HAN- and ADN-monopropellants, combust at higher temperatures making them incompatible with current Inconel 625 thrusters used in 100lbf engines. With an emphasis on hydrazine replacement increased performance, ease of manufacturing and cost reduction, a "green" 100lbf flight-weight thruster is proposed.

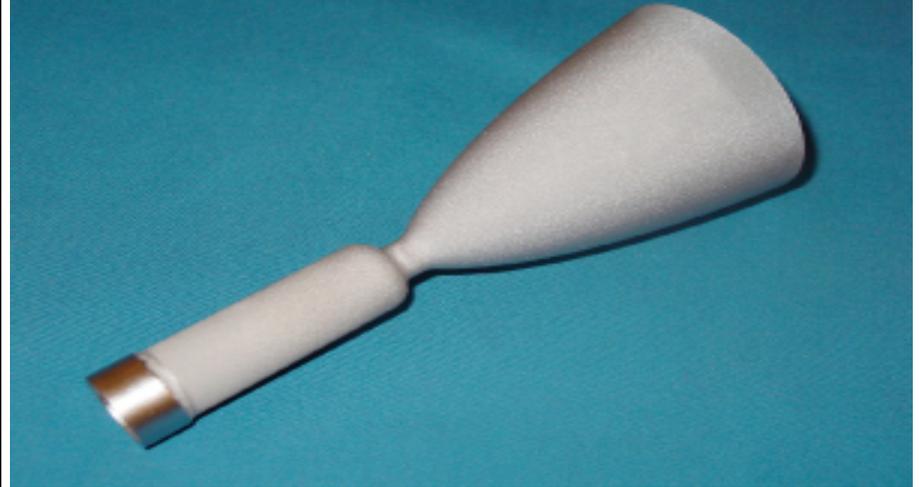
Estimated TRL at beginning and end of contract: ( Begin: 3 End: 4 )

## Technical Objectives and Work Plan

The overall project objective is to demonstrate the design, manufacture and preliminary testing of a long-life, high-temperature 100lbf thrust chamber for advanced non-toxic monopropellant reaction control systems.

- Design truncated oxidation resistance high temperature combustion chamber with instrumentation ports for 100lbf non-toxic monopropellant thruster for sea level testing
- Fabricate instrumented combustion chamber
- Fabricate and evaluate high-temperature monolithic catalyst based on metal foam
- Design and fabricate oxidation resistant injector
- Hot fire test truncated 100lbf chamber and injector

## Plasma Processes Produced Thruster



## NASA Applications

NASA applications include reaction control thrusters for the Orion MPCV capsule and service module; 100lbf thrusters in support of Commercial Crew and Cargo spacecraft; Reaction Control Systems for Space Launch System

## Non-NASA Applications

Non-NASA applications include Commercial Access to Space programs including the lift/space craft programs for SpaceX Falcon/Dragon and Orbital Antares/Cygnus; Satellite insertion and positioning; tactical missile divert and attitude control; auxiliary power generators; and jet engine restarters.

## Firm Contacts

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**NON-PROPRIETARY DATA**