

Topic: N132-105

Physical Sciences Inc.

Advanced Composite Propellant Replacement for High Performance Plateau Burning Double Base

The Composite Propellant (CP) technology will improve the reliability, safety, performance and costs of cartridge-actuated devices (CAD) / propellant actuated devices (PAD) used in Navy ejection seats by replacing the currently used Double Base (DB) propellants, which experience degradation and depletion of the stabilizers used in the formulation over time, resulting in limited service lives. The CP formulation provides a “drop-in” replacement for the DB compositions. Physical Sciences Inc. (PSI) has demonstrated that the CP removes high-pressure “slope breaks” from concern and maintains plateau burning rate profiles from 2000 to 5000 psi. This technology demonstration would also be directly applicable to high performance solid rocket motors for all sized missile systems. PSI has successfully developed and provided innovative technology solutions by maturing emerging science to application for commercial and government use.

Technology Category Alignment:

Air Platforms

Engineered Resilient Systems (ERS)

Propulsion and Extreme Environments

Weapons Technologies

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SYSCOM: NAVAIR

Contract: N68335-15-C-0130

Department of the Navy SBIR/STTR Transition Program

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Advanced Composite Propellant Replacement for High Performance Plateau Burning Double Base Physical Sciences, Inc.

WHO

SYSKOM: NAVAIR

Sponsoring Program: PMA-201

Transition Target: NACES Ejection seat's catapult cartridge (WB15) in T-45 and F-18

TPOC:
(301)744-1520

Other transition opportunities:

Potential propellant replacement to allow for longer service life by eliminating the use of stabilizers in formulations, achieving performance improvements, or to address obsolescence of current propellants in Parachute Deployment Rocket Motors, Seatback Rockets, Canopy Remover Cartridges, Canopy Jettison Rocket Motors Rocket, Catapults, Trajectory Divergence Rocket Motors, Yaw Thrusters, & Vernier Rocket Motors



<http://www.navair.navy.mil/img/uploads/ab704daa2a2e471>

WHAT

Operational Need and Improvement:

Currently double base propellants used in Navy aircraft ejection seat system experience degradation and depletion of the stabilizers in the formulation over time, resulting in limited service life. The advanced Composite Propellant (CP) replacement will improve the reliability, safety, performance and costs of cartridge-actuated devices (CAD) / propellant actuated devices (PAD) used in ejection seats.

Specifications Required:

The goal is a composite propellant without any nitrate esters in the formulation, that produces a pronounced plateau and mesa in the burning rate curve, and has minimal temperature sensitivity (minimal variation in performance with changes in temperature).

Technology Developed:

An innovative composite propellant (CP) formulation that provides a "drop-in" replacement for double base (DB) compositions used in cartridge- and propellant actuated devices (CAD/PADs). The CP will remove high-pressure "slope breaks" from concern and maintain plateau burning rate profiles from 2000 to 5000 psi with minimum temperature sensitivity.

Warfighter Value:

Improve the reliability, safety, performance and costs of cartridge-actuated devices (CAD) / propellant actuated devices (PAD) by replacing the currently used double-based propellant formulation with an advanced composite propellant. The use of a composite propellant with near identical ballistic performance to double base propellant will:

- (1) Life cost reductions due to increased service life of CAD/PAD products;
- (2) Reduce costs by significantly diminishing need to monitor the propellant's health;
- (3) Greater insensitivity to aging (more consistent performance) when exposed to high operational and storage temperatures.

WHEN

Contract Number: N68335-15-C-0130 **Ending on:** September 30, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Complete Refinement in CP formulations	Low	Improved burn profile	4	March 2018
Transition DB to CP	Low	Extended burn rate plateau	4	June 2018

HOW

Projected Business Model:

PSI has provided technology solutions and innovative products to our government and commercial customers for over 40 years. Our employee-owners continue to grow the company across a range of markets applying emerging science to important problems including the development and transition of advanced prototypes to commercial and government use.

Company Objectives:

PSI intends to expand relationships with both the Navy, Air Force, and MDA by offering advanced composite propellant options.

Potential Commercial Applications:

PSI is currently working with the Navy for CAD/PAD applications but welcomes discussions regarding transition of the composite propellant formulation to other applications such as solid rocket motors for advanced missile propulsion systems, the automotive airbag or emergency hatch release, and UTC Aerospace Systems' Advanced Concept Ejection Seats ACES 5.

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