



# Fast Acting Flow Control Valve

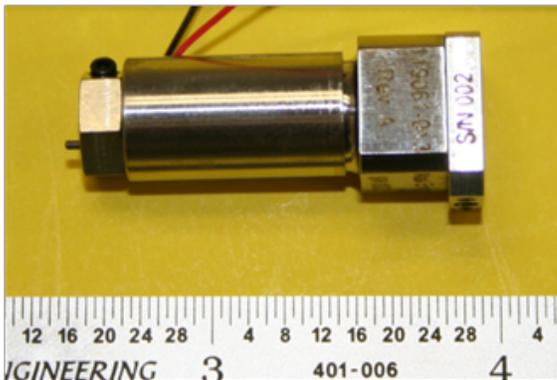
WASK Engineering, Inc.

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## OBJECTIVES

The primary objective of the phase 1 work is to demonstrate the feasibility applying the proposed peizo crystal actuated, long life, fast acting control valve design to control propellant flow for pulse mode electrical thrusters. This was accomplished through the design, fabrication, and test of a valve. To validate the objectives required testing the valve in pulse mode operation at various relevant frequencies and verifying the valve met the leakage requirement.

The effort concluded with a conceptual design of a fast acting valve intended for testing with a full scale Pulsed Inductive Thruster.



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## ACCOMPLISHMENTS

### NOTABLE DELIVERABLES PROVIDED

The deliverables provided to NASA on the effort included 1) IT Security Management Plan, 2) an Interim Report, 3) Fast Acting Control Valve Detailed Design Review, 3) Final Report detailing the valve design and the results of the valve testing, 4) Final Summary Chart, 5) a Program Summary, and 6) a New Technology Report

### KEY MILESTONES MET

The objectives were accomplished by testing the Fast Acting Control valve.

The testing verified the valve had leakage rates of less than  $1 \times 10^{-3}$  sccs of He.

Valve was operated at frequencies from 10 to 40 Hz with pulse widths from 10 to 20 msec.

Testing also verified valve opening and closing response rates are better than 1 msec.

The valve demonstrated ability to throttle over its entire flow range.

## FUTURE PLANNED DEVELOPMENTS

### PLANNED POST-PHASE II PARTNERS

WASK Engineering plans to begin discussions with companies currently manufacturing electric thrusters during a Phase 2 effort, should it be awarded. As there are still significant technical issues associated with cycle life that must be addressed with the valve. The valve's small size and low power useage may make it a candidate for other applications.

### PLANNED/POSSIBLE MISSION INFUSION

Potential future missions where the valve could be beneficial include 1) microsat required pressure regulation or 2) operation of a pulsing thruster in a space mission.

### PLANNED/POSSIBLE COMMERCIALIZATION

WASK Engineering is currently examining applications for the valve other than electric thrusters where small size, throttleability, and fast response can be beneficial. These include gas turbine fuel controls, small satellite propellant system control valves and regulators, and cold gas thrusters. Demonstration of the valve operating in a vacuum environment would be significant benefit.

CONTRACT (CENTER)	NNX14CM33P (MSFC)	SOLICITATION-PHASE	SBIR 2014-I
SUBTOPIC	H2.01 High Power Electric Propulsion	TA	2.4.2 Propellant Storage & Transfer

