REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED *(From - To)*
12 May 2017	Briefing Charts	12 April 2017 - 12 May 2017

4. TITLE AND SUBTITLE
Shape Memory Alloy Isolation Valves: Public Quad Chart

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
William Hargus

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER
Q1G8

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Air Force Research Laboratory (AFMC)
AFRL/RQRC
10 E. Saturn Blvd.
Edwards AFB, CA 93524-7680

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Air Force Research Laboratory (AFMC)
AFRL/RQR
5 Pollux Drive
Edwards AFB, CA 93524-7048

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
AFRL-RQ-ED-VG-2017-075

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for Public Release; Distribution Unlimited. PA Clearance Number: 17231 Clearance Date: 03 May 2017

13. SUPPLEMENTARY NOTES
For presentation at AFRL Sustainment Office; May 12, 2017

14. ABSTRACT
Viewgraph/Briefing Charts

15. SUBJECT TERMS
N/A

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			William Hargus
Unclassified	Unclassified	Unclassified	SAR	2	19b. TELEPHONE NUMBER *(Include area code)* N/A

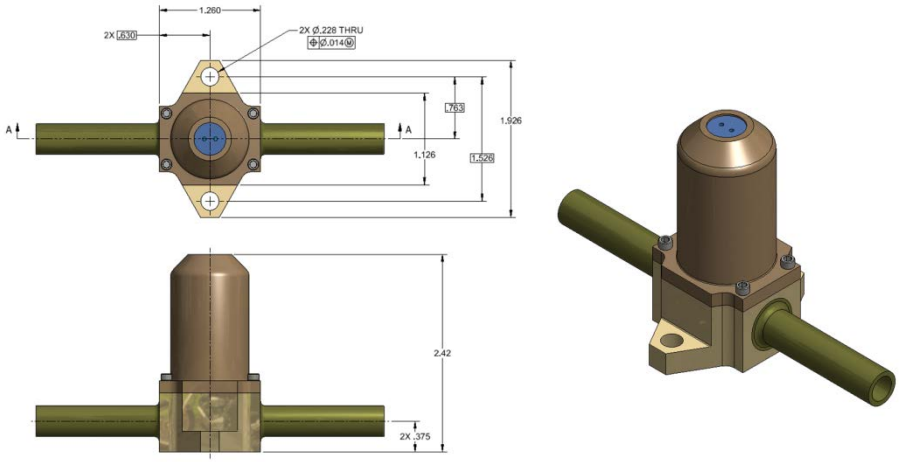
Shape Memory Alloy Isolation Valves

POC: W. Hargus, Ph.D., AFRL/RQRC

MOTIVATION

- Existing propellant isolation systems such as pyrotechnic valves require special handling and have lifetimes (<10 yrs) shorter than typical operational spacecraft (15+ yrs)
- Shaped memory alloy isolation valves provide an intrinsically safe isolation system that increases lifetime >5x over SOTA and contain no explosives
- Long lived propellant isolation systems are required to passivate spacecraft propulsion at end of life (>15 yrs) to prevent orbital debris and comply with treaty obligations
- Reduced logistics requirements and intrinsically safe systems will produce industry wide savings

APPLYING AFRL TO SUSTAINMENT



Design of shape memory alloy isolation valve compatible with existing pyrotechnic valve electrical and mechanical interfaces

TECHNICAL APPROACH

- Evaluate available isolation systems (pyrotechnic and latch valves) and determine optimal geometries and power levels
- Define system packaging and validate performance and safety margins within operational constraints
- Build, test, and qualify 3 variants; 5000 psi NC, 5000 psi NO, and propellant isolation 500 psi NC valves
- Flight qualify valves via extensive ground testing
- Partner with AF flight programs to demonstrate delivered units

PAYOFF/TRANSITION

Shape memory alloy isolation valves will increase safety, storability and readiness for spacecraft with propulsion

- Eliminates life limitations of SOTA pyrotechnic valves
- Intrinsically safe pressurant and propellant isolation
- Enables high confidence propulsion passivation at EOL
- Decreases costs logistics costs in testing and verification
- Eliminates explosive hazards during launch ops

Pervasive payoffs to satellites that use propulsion!