

REPORT DOCUMENTATION PAGE

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Shape Memory Alloy Isolation Valves

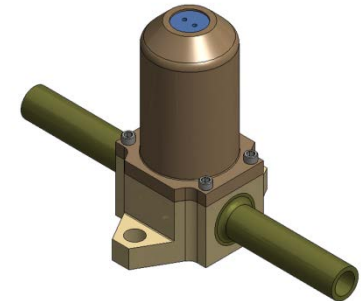
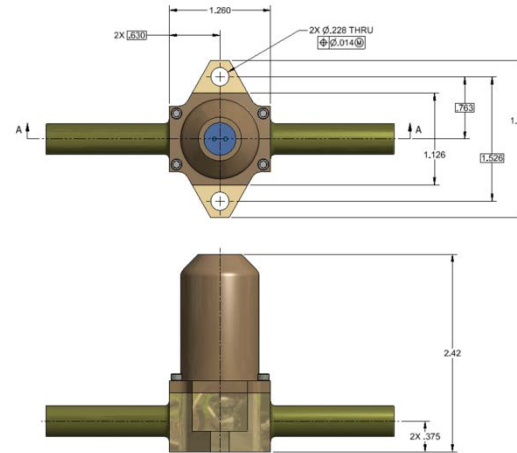
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MOTIVATION

- 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!