Colloid Microthruster Propellant Feed System

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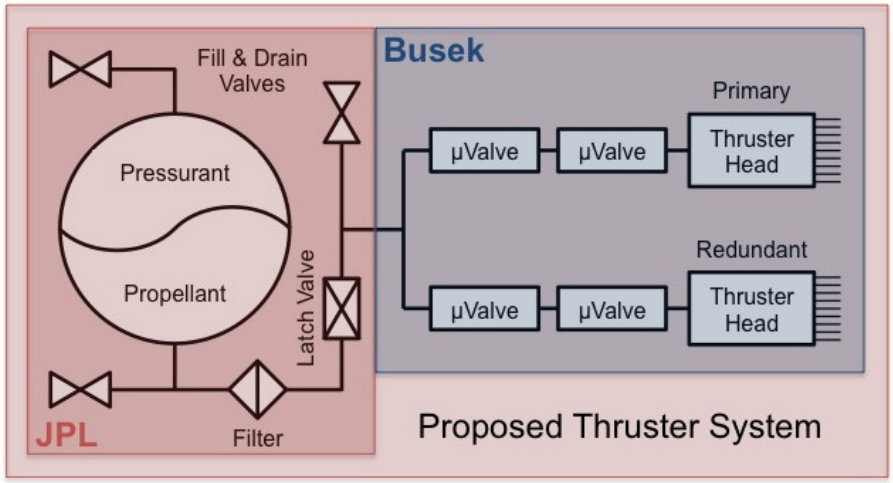
Objectives and Key Challenges:

- Replace the heavy (up to 15 kg) spring-loaded bellows design from ST7 with a light-weight pressurized diaphragm tank (≤1 kg)
  - O1: Design tank and feed system with full redundancy
  - O2: Design, fabricate, and test stainless steel diaphragm tank
- Use the new Busek Microvalve (Phase II SBIR and Phase IIe) to reduce complexity while providing redundancy
  - O3: Design, fabricate, and test new Busek Microvalves
  - O4: Integrate and test feed system components to TRL 5

Significance of Work:

- A new, flight-like, fully redundant, higher capacity colloid thruster feed system at TRL 5 can support any gravity wave observatory concept
- A clear path to TRL 6 once the mission and system are defined



Approach:

- Teaming arrangement between flight tank vendor Keystone, Busek for the Microvalve, and JPL to manage, perform I&T
- Use standard liquid-fed propulsion flight design guidelines and practices – the new technology is in the assembled pieces working together, not the propulsion engineering approach
- Four tasks related to each objective, plus a management task, each with a JPL expert lead
- Hold peer reviews at each meaningful milestone: requirements definition, design, and test

Key Collaborators:

- Busek Co., Inc. on Microvalve and systems engineering
- Keystone Engineering on flight-like tank manufacture and test
- JPL electric / chemical propulsion and flight propulsion groups

Current Funded Period of Performance:

- Jan 2013 – Jan 2015

Recent Accomplishments:

- Tank fabrication and TRL 5 tests are complete
- Microvalve fabrication and environmental tests are complete
- Redundant Microvalve subassembly including accumulator and volume compensator has been fabricated and tested for TRL 5
- Tank and supportive feed system components are all at JPL, ready for integration; data system complete

Next Milestones:

- Receive Busek Microvalve subassembly and test full feed system assembly to TRL 5

Application:

- Drag-free gravity wave observatories
- Remove reaction wheels - precision pointing of exo-planet observatory and next generation space telescopes
- Small spacecraft main propulsion

TRLin = 3-4 ***TRLcurrent = 4*** ***TRLtarget = 5***