Identification and Significance of Innovation

Dynamic seals are used throughout the turbopump in high-performance, pump-fed, liquid rocket engines for a variety of purposes. The most common applications are in the lift-off seal (LOS), inter-propellant seal (IPS), and balance piston seals. The system solution for conventional seals represents a compromise between the turbopump mechanical design, primarily flowpath, and secondary flowpath design that results in increased leakage, increased seal wear, and reduced balance piston load capacity that reduces performance, throttle-ability, thrust-to-weight, reliability, and operability.

Expected TRL Range at the end of Contract (1-9): 4 (Phase 1) 5-6 (Phase 2)

Technical Objectives and Work Plan

The specific objectives and work plan for Phase I were:

- Determine requirements and impact for LOS.
- Determine requirements and impact for IPS.
- Determine requirements and impact for thrust balance piston.
- Generate conceptual design of magnetic actuation system.
- Conduct evaluation testing of magnetic actuation system.

NASA and Non-NASA Applications

Magnetically actuated seals are sought for lift-off seals, inter-propellant seals, and thrust balance seals in liquid rocket engine turbopumps. The technology developed can also be applied for rocket engine throttling valves and ground support equipment (GSE) umbilical couplings.

The resulting technology is directly applicable to dynamic seals in FTT’s family of small UAV turbofan engines as well as for active clearance control systems in industrial gas turbine engines. These product lines have the potential demand for more than 10,000 units annually.

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