

Development of Self-Reliant Satellite-Level Propulsion System by Using Hydrogen Peroxide Propellant

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Abstract : To satisfy the mission requirement of the FORMOSAT-7 project, NSPO has initialized a self-reliant development on satellite propulsion technology. A trade-off study on different types of on-board propulsion system has been done. A green propellant, high-concentration hydrogen peroxide (H₂O₂ hereafter), is chosen in this research because it is ITAR-free, nontoxic and easy to produce. As the components designed for either cold gas or hydrazine propulsion system are not suitable for H₂O₂ propulsion system, the primary objective of the research is to develop the components compatible with H₂O₂. By cooperating with domestic research institutes and manufacturing vendors, several prototype components, including a diaphragm-type tank, pressure transducer, ball latching valve, and one-Newton thruster with catalyst bed, were manufactured, and the functional tests were performed successfully according to the mission requirements. The requisite environmental tests, including hot firing test, thermal vacuum test, vibration test and compatibility test, are prepared and will be completed in the near future. To demonstrate the subsystem function, an Air-Bearing Thrust Stand (ABTS) and a real-time Data Acquisition & Control System (DACS) were implemented to assess the performance of the proposed H₂O₂ propulsion system. By measuring the distance that the thrust stand has traveled in a given time, the thrust force can be derived from the kinematics equation. To validate the feasibility of the approach, it is scheduled to assess the performance of a cold gas (N₂) propulsion system prior to the H₂O₂ propulsion system.

Keywords : FORMOSAT-7, green propellant, Hydrogen peroxide, thruster

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