IAF SPACE PROPULSION SYMPOSIUM (C4)
Propulsion System (1) (1)

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FIRING TESTS OF LE-9 DEVELOPMENT ENGINE FOR H3 LAUNCH VEHICLE

Abstract

Development of Japanese new booster engine LE-9 started in 2014 as one of key components of H3 Launch Vehicle which will be Japanese next flagship launch vehicle. The first test flight of H3 Launch Vehicle is scheduled for 2020. The concepts of H3 are as follow. 1.Launch capability and competitive price 2.Shorten the period from contract to Launch 3.Providing a comfortable environment for satellites For achievement these concepts, we adopted an expander bleed cycle for LE-9. For example, the engine cycle has fewer components than other cycles like the staged combustion cycles. This design concept increases reliability and lowers costs. We designed LE-9 for manufacturing and assemly. This design consept contributes decreasing product lead-time. LE-9 is the first booster engine which is adopted an expander bleed cycle in the world. We obtained sufficient data and results that are as follows by 1st and 2nd firing test campaigns. 1.Pre-cooling specification 2.The engine performance and characteristics in a wide operation range 3.Transient characteristics for establish start ,stop and throttling sequences in a wide operation range 4.The engine sensitivity to propellant interface condition 5.Operation under closed loop control of thrust level and mixture ratio with electro-mechanically actuated valves. The Firing Test of the 5th Engineering Model with some components, the injector and pipes, manufactured with AM(Additive Manufacturing) for cost reduction and Battleship Firing Test (BFT) which is first propulsion system test series for H3 and is two engine cluster configuration are underway. The second BFT series, three engine cluster configuration, will be conducted from 2nd quarter in CY2019. We will obtain the data of the engine performance and characteristics, transient characteristics under variation of flight propellant interface condition in the first stage propellant system of H3. The firing test of the Qualification Model will be conducted in 2019 to 2020subsequently. This paper will report the development status and these firing testing results of LE-9 engine.