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

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OVERVIEW OF LE-9 ENGINE DEVELOPMENT FOR H3 LAUNCH VEHICLE

Abstract

Development of Japanese new booster engine LE-9 has started since 2014 as one of key components of H3 Launch Vehicle which will be Japanese new flagship launch vehicle and of which the first test flight is scheduled for 2020. LE-9 engine is based on Japanese technological heritages; the design and evaluation method of high pressure and high temperature component of LE-7A, the current booster engine of H2A and H2B Launch vehicle and the simple and reliable engine cycle of LE-5B, the current upper stage engine. Some of key features of LE-9 engine were demonstrated through LE-X engine program (2008 2014). An expander bleed cycle is adopted for its engine cycle to meet three key concepts of H3 Launch vehicle; reliability, affordability, and performance. This engine cycle has fewer components than other cycles like a gas generator cycle or a staged combustion cycle. In addition to simplifying engine cycle, all valves are electro-mechanically actuated (EMA) and no pneumatic lines are equipped. This design concept is directly linked with higher reliability and lower cost. As for the reliability, high reliability development methodology is also being developed to improve LE-9 engine reliability not only by deterministic approach but also probabilistic approach. As for the affordability, several new manufacturing processes are also being developed to lower engine cost. In addition to higher reliability and lower cost, LE-9 engine can achieve competitive performance with inherent features of the expander bleed cycle. LE-9 engine will be developed through an Engineering Model test phase (2018) and Qualification Test phase (2020). Prior to the whole engine firing test, several component development activities are currently ongoing. In the paper, key features of LE-9 engine system, latest status of development activities, and future plan will be summarized and discussed.