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DEVELOPMENT OF 500N CLASS BIPROPELLANT CERAMIC THRUSTER FOR SLIM(SMART LANDER FOR INVESTIGATING MOON)

Abstract

MHI has been developing thrusters for satellites and spacecraft since around 1965 and has over 500 products so far. In this paper, we will introduce the thrusters developed by MHI in recent years, focusing on the technical features of the main thrusters for SLIM(Smart Lander for Investigating Moon), which have been developed after overcoming many technical issues. The SLIM currently under development by the Japan Aerospace Exploration Agency (JAXA), is a lunar landing demonstration probe that demonstrates a technology for achieving a high precision soft landing on the surface of the moon and planets, as well as a lunar planetary exploration. It aims to contribute to the realization of high frequency lunar and planetary exploration in the future by the development of a lightweight probe system. The SLIM propulsion system is required to generate sufficient thrust to support the spacecraft's weight during power descent, in addition to the large V requirements in the sequence from rocket separation to lunar landing (insertion of moon transition orbit, launch of lunar orbit, power descent landing, etc.). MHI has developed a 500 N class ceramic thruster which satisfies the above requirements of SLIM. It has the following features: At first, the stable performance is required over a wide range of thrust because of the blowdown operation. The second is the pulse operation when landing on the moon. Though pulse operation is usually used in small thrust thrusters, the realization with a 500 N class orbit change engine faced various issues such as the detonation and the combustion instability. These problems are currently achieved through the qualification test. We will show the specific technical issues and efforts. In addition to the above explanation, we will introduce the features of our unique ceramic chamber and recent project examples of MHI thruster. (For example, Hayabusa2)