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Author: Mr. Pawel Nowakowski
Łukasiewicz Research Network – Institute of Aviation (ILOT), Poland, pawel.nowakowski@ilot.edu.pl

Ms. Ewa Majewska
Łukasiewicz Research Network – Institute of Aviation (ILOT), Poland, ewa.majewska@ilot.edu.pl
Mr. Mateusz Krasuski
Łukasiewicz Research Network – Institute of Aviation (ILOT), Poland,
mateusz.krasuski@ilot.lukasiewicz.gov.pl
Mr. Tadeusz Górnicki
Łukasiewicz Research Network – Institute of Aviation (ILOT), Poland,
tadeusz.gornicki@ilot.lukasiewicz.gov.pl
Mr. Arthur Pazik
Łukasiewicz Research Network – Institute of Aviation (ILOT), Poland, arthur.pazik@gmail.com
Dr. Adam Okninski
Łukasiewicz Research Network – Institute of Aviation (ILOT), Poland, adam.okninski@ilot.edu.pl

ENGINEERING MODEL OF THE SOLID ROCKET MOTOR FOR DIRECT DEORBITATION

Abstract

Since 2016 Łukasiewicz Research Network – Institute of Aviation (Ł-ILOT) is working on concept of Solid Rocket Motor for direct deorbitation manoeuvres. This type of propulsion is considered as one of the promising potential solutions for controlled Post Mission Disposal. Within several activities for European Space Agency (ESA), the main aspects of this technology was addressed such as a dedicated solid propellant. Together with institutional and industrial polish partners, Ł-ILOT is continuing this development for ESA. This paper presents current advancements in development of the Engineering Model of the Solid Rocket Motor itself. Technical challenges together with the solutions applied and initial tests results are described. Directly de-orbiting large objects from Low Earth Orbit at end-of-live call for high delta-V and long storage in space. Additionally aspects of scalability and possible use as an autonomous system were analysed. A demanding requirements set was defined for this propulsion system, including: storability, environmental, no solid particles generation and high performance at low accelerations. This required motor configuration with low thrust levels and long burn times, resulting in high impact on thermal aspects. This paper describes an approach to thermal insulation solution dedicated to this application together with its verification. Other aspects of the Solid Rocket Motor design and testing, such as ignition system and materials selection, are also described. Development of a full scale Engineering Model required further preparation of the special processes used for manufacturing, which are also described in this paper.