Paper ID: 68179
oral

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems Verification and In-Flight Experimentation (6)

Author: Mr. Charles Bertorello
ArianeGroup SAS, France

Mr. Olivier GOGDET
ArianeGroup, France
Mr. Jérôme Breteau
European Space Agency (ESA), France
Mr. Yann Tincelin
ESA - European Space Agency, France
Mrs. elisa cliquet moreno
Centre National d'Etudes Spatiales (CNES), France
Mr. Emmanuel Coletti
ArianeGroup SAS, France
Ms. Sorya Bensalem
ArianeGroup SAS, France

THEMIS DEMONSTRATION PROGRAMME

Abstract

In December 2019, the European Space Agency (ESA) Council at Ministerial level decided to commence the Themis demonstration programme, with a decision to place the "Themis Initial Phase" contract to ArianeGroup SAS as Demonstration Authority. This development followed the rise of reusability studies throughout the European Aerospace ecosystem. It has been notably previously prepared and accelerated by the ArianeWorks platform involving a small group of CNES and ArianeGroup representatives actively collaborating throughout 2019 and 2020. The aim of the Themis demonstration is to mature in a fully representative environment the technologies required to develop a low cost and reusable launch vehicle first stage. Such technical evolution prepared through Themis is deemed necessary in order to achieve a 50Themis is an incremental development conducted in Agile mode, involving a set of ground demonstrations followed by in-flight demonstrations of increasing complexity and representativeness. In July 2021, the first flagship demonstration was successfully conducted in Vernon, France, with the real-life fluidic and electrical ground operation of a battleship stage. This so-called "T0" demonstration involved several filling and draining sequences of both Liquid Oxygen (LOX) and Liquid Methane (LCH4) at full scale, completed by active pressure management in view of the next-to-come Prometheus Hot Firing Test (HFT). In April 2022, and with CNES support, the completely new low cost and reusable Prometheus high thrust engine developed by ESA will be hot fired for the very first time using the same facility in Vernon hence achieving the so-called "T1G" test, before starting a more substantial test campaign at DLR facility in Lampoldshausen in the second half of the year. In parallel, ArianeGroup, with the support of ESA will simultaneously prepare the next Themis increment (so-called "T1H"), involving a first hop test to be conducted in 2023 in Kiruna, within the Swedish Space Corporation facilities. Finally, Themis will be upgraded to its final design standard (so-called "T3"), with the goal of performing high energy flights from Kourou CSG, France with a re-entry and recovery performed both at sea and on a designated landing zone in CSG. The aim of this paper is to provide an overview of the Themis demonstration roadmap, to draw lessons learnt from the early steps that have been performed, and to share the way Agile can be successfully implemented on a hardware-based test-rich European demonstration programme.