IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
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ON THE ROAD TO EUROPEAN REUSABLE LAUNCHERS

Abstract

ArianeGroup, supported by ESA, the European Union Horizon Europe programme, CNES and FR2030 funding, is advancing the development of European reusable launchers first stages through a series of demonstrators. The goal of this effort is to achieve a significant cost reduction for future launchers compared to Ariane 6 as well as a breakthrough in terms of launch rate flexibility. The central programme, Themis, funded by ESA, is focused on maturing the technologies required to build a reusable launch vehicle first stage in a fully representative environment.

Themis follows an Agile development, beginning with a series of ground demonstrations and progressing towards increasingly complex in-flight demonstrations through a test-and-learn approach allowing for failures/corrections. The first step was the successful "T0" demonstration in Vernon, France, where full-scale fluidic and electrical ground operations were conducted, including the filling and draining of Liquid Oxygen (LOX) and Liquid Methane (LCH4) and active pressure management. This was a prerequisite to the "T1G" series of hot firing test of the new Prometheus® engine. Prometheus® is the high-thrust, throttleable methalox engine, developed by ArianeGroup under an ESA programme.

Themis is now completing the preparation of the T1H vehicle, the first European prototype of a LOx/LCH4 reusable first stage equipped with one Prometheus® engine. The flight campaign will be organized through the SALTO project in the frame of the European Union's Horizon Europe programme. SALTO will attempt the first-ever reusable flight campaign in Europe. The campaign will start with a low-altitude "hop test" from the Swedish Space Corporation facilities in Kiruna.

In parallel, the next Themis increment, T1E vehicle is being prepared with the goal to incorporate an upgraded version of the Prometheus® engine and to perform higher-altitude hop tests.

Themis & SALTO will reinforce European autonomy of supply for critical technologies and equipment and contribute to expand the reach of the European autonomous access to space.

The ultimate demonstration step will involve recovery and reuse of a three Prometheus® equipped first stage of the Maia mini-launcher in French Guiana. After a CNES call for tender for the implementation

of such a demonstration on a commercial mini-launcher, the offer from ArianeGroup and MaiaSpace was selected in 2024.

This paper will describe the articulation of these different demonstrations, marking a significant step toward mastering in Europe launcher recovery and reuse, allowing for a breakthrough in terms of accessible launch rate and effective cost of access to space.