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CALLISTO: A COOPERATION FOR AN IN FLIGHT DEMONSTRATION OF REUSABILITY

Abstract

Both, Europe and Japan are developing their new competitive launcher, respectively Ariane 6 and H3, with the primary goal to drastically decrease the launch service cost, increasing their competiveness when the access to space competition becomes more severe. These new launch system, planned to enter into operation by 2020, are based on expendable concepts. Nevertheless, the question of reusability, now successfully demonstrated in USA, is open. - Does this technology represent a must for Europe and Japan for a more affordable next generation launcher? - What are the key technics and technologies necessary to be mastered?

In order to get part of the answers and assess the technical difficulties and potential benefits of reusability, CNES, DLR and JAXA have decided to joint their competences and their efforts in the development of a scaled VTVL in-flight demonstrator dubbed CALLISTO (Cooperative Action Leading to Launcher Innovation in Stage Toss - back Operations), allowing to recover and reuse the vehicle under conditions representative for an operational launcher first stage. Technologies such as approach and landing device, aerodynamic control surfaces, propellant management during highly dynamic manoeuvres, guidance, navigation and control, re-ignitable engine with throttling capability will be tested in a relevant environment at system and flight conditions level. A first approach of MRO will be also tested between successive flights.

CALLISTO vehicle is about 13 m high and 1.1 m diameter, propelled by a LOX/LH2 engine. It will be operated from the French Guiana Space centre and sized for about 10 flights following different mission profiles, opening the flight domain from low altitude test up to a full demonstration profile. CALLISTO will be launched from the refurbished Diamant site and will land on both Diamant site and a "barge" on the open sea, depending of the mission profile.

This paper will provide an overview of the project at a Preliminary Definition status (vehicle, ground segment, CONOPS, missions).