

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

Author: Dr. Sylvain Guédron

Centre National d'Etudes Spatiales (CNES), France, sylvain.guedron@cnes.fr

Mr. Pascal Tatioossian

Centre National d'Etudes Spatiales (CNES), France, pascal.tatioossian@cnes.f

Mr. Christophe Chavagnac

Centre National d'Etudes Spatiales (CNES), France, Christophe.chavagnac@cnes.fr

Mr. Jean Desmariaux

Centre National d'Etudes Spatiales (CNES), France, jean.desmariaux@cnes.fr

Mr. David Monchaux

Centre National d'Etudes Spatiales (CNES), France, david.monchaux@cnes.fr

Mrs. Carole Deremaux

Centre National d'Etudes Spatiales (CNES), France, carole.deremaux@esa.int

Mr. Norbert Lidon

CNES, France, Norbert.Lidon@cnes.fr

Ms. Nathalie Cesco

Centre National d'Etudes Spatiales (CNES), France, nathalie.cesco@cnes.fr

Ms. Elisa Cliquet-Moreno

Centre National d'Etudes Spatiales (CNES), France, elisa.cliquet@cnes.fr

Mr. Olivier Frenoy

Centre National d'Etudes Spatiales (CNES), France, olivier.frenoy@cnes.fr

Dr. Shinji Ishimoto

Japan Aerospace Exploration Agency (JAXA), Japan, ishimoto.shinji@jaxa.jp

Mr. Etienne Dumont

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, etienne.dumont@dlr.de

CALLISTO DEMONSTRATOR: FOCUS ON SYSTEM ASPECTS

Abstract

Japan and Europe are currently developing their new competitive launchers that are planned to enter into operation very soon, and they are based on expendable concepts. In the same time, reusable concepts are successfully operated in USA. For the future launch system, reusability could be the solution. Then, one of the main question we have to address is “do we master the technics and technologies necessary to recover and to reuse part of launchers?”.

This is why, in order to 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.

CALLISTO vehicle is about 13 m high and 1.1 m diameter, propelled by a JAXA LOX/LH2 engine able to reignite in flight and with throttling capability. 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 DIAMANT site and will land on the same site.

This paper will provide an overview of the project and its missions after the System Preliminary Definition Review. In particular, the paper will focus on the activities performed under CNES responsibility with the support of JAXA and DLR, providing description of the in-house activities as well as the ones conducted with French and European partners. This paper will address: 1) Architecture design activities focusing on: Trajectories satisfying demonstration objectives as well as operational constraints, the definition of the flight domain due to multiple mission profile, flying qualities during descent phase, including aero-shape design, flight control and management of different actuators, 2) CONOPS focusing on safety critical operations before lift-off and after landing, and associated means 3) Maintenance, Repair and Operations guidelines 4) Different products and module definition and in particular the management of COTS 5) Ground segment definition