SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
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DEMISE OBSERVATION CAPSULE: PROGRESS UPDATE

Abstract

This paper is an overview of the many capabilities of the Demise Observation Capsule (DOC) as well as providing on the status of the mission. The DOC aims to provide an in-situ observation platform of the re-entry processes in order to gain a better understanding of rocket upper-stage trajectory, footprint, and disintegration upon break-up in the Earth's atmosphere. S[]T leads a consortium of 7 international partners toward the first qualification flight for DOC, currently on schedule for 2018. The mission, developed and qualified for the European Space Agency (ESA), seeks to help ensure public safety while increasing regulatory compliance and to reducing the impact footprint of launcher stage parts returning to the earth surface. By practically assessing re-entry models, and better understanding the physical processes of re-entry, we can 'design for demise', ensuring that what we send up in future is safe if it must eventually come back down.

The DOC itself is an entirely autonomous, small capsule attached to the upper-stage of either a Vega, Ariane or other launcher, piggy-backing launch with other missions. As the mission payload/s are released, DOC initially remains with the upper-stage separating after the reentry process begins. DOC will record images of the upper-stage, measures the evolution of break-up, and track key disintegration events upon descent. The DOC is constructed such that it will be able to withstand the hostile conditions of both re-entry and the rocket stage's disintegration surrounding it. After performing its pre-programmed set of observations DOC will stabilise into a final descent, and use the time after the communications blackout to process and send data back to the ESA team via satellite relay to a ground station. This data will enable the engineering of upper stages that more completely disintegrates during re-entry, and lead to improvements in the accuracy of predicted break-up altitudes, debris trajectories and ground impact footprint. These analyses are therefore critical not only to mission success, but more importantly for improving public safety aspects of such re-entry scenarios. As the launch date of DOC approaches, the disparate systems being developed by our global partners are starting to come together. A high-level mission update is provided in order to allow the public to follow the development of this insightful project.