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

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MISSION AND FLIGHT MECHANICS OF IXV FROM DESIGN TO POSTFLIGHT.

Abstract

The Intermediate eXperimental Vehicle (IXV) is a re-entry demonstrator successfully flown by 11th February 2015 whose objective is to tackle the basic European needs for re-entry from LEO, consolidating the knowledge necessary for the development of any future European re-entry system while allowing risk limitation.

IXV has represented an opportunity to increase the TRL level not only of technologies but also of design methodologies and tools. disciplines like the Mission design and the flight mechanics have follow the vehicle since the conceptual design up to the operations.

The Mission Analysis and Flight Mechanics activity provide inputs for the specification of different subsystems as well as performance verification metrics. During the production phase after the CDR, up-to-date performances to cope with the subsystems and the system evolution have been conducted in order to confirm the margins and the compliance of the specification.

After the System Qualification and Acceptance Review, the estimation of the performances evolved from this requirement verification to flight prediction, whose objective is to provide a more accurate estimation of the expected performances during the day of flight made weeks in advance or a few hours before launch. For instance, the availability of a measured mass, centre of gravity and Inertia reduces the uncertainty levels and hence improves the accuracy of the flying qualities performance estimation. The final launcher performance is another relevant contributor to the flight prediction. In terms of environment, the consideration of models with reduced dispersions for the day of launch has also a relevant impact into the performance estimation.

This paper deals with the evolution of the Mission Analysis and Flight Mechanics performances and predictions from the design activities up to the postflight where methods and tools have been calibrated to build the most accurate design and verification tools.

Results of the postflight activities will be presented as well as the main lessons learned coming from the comparison with the design and verification predictions.