Paper ID: 77833
student

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Interactive Presentations - IAF MATERIALS AND STRUCTURES SYMPOSIUM (IP)

Author: Mr. Jaime José Romero León
LEEM-UPM, Spain

Mr. Ángel Martín
LEEM-UPM, Spain
Mr. Álvaro Carrasco
LEEM-UPM, Spain
Mr. Pedro Tallon
LEEM-UPM, Spain

PRELIMINARY DESIGN AND EXPERIMENTAL VALIDATION OF AN IMPACT ATTENUATION SYSTEM FOR A SOUNDING ROCKET DATA RECOVERY MODULE

Abstract

In the event of an in-flight mishap, the availability of flight (avionics and payload) data is of the utmost importance to aid in the subsequent investigation. An in-house DRM (Data Recovery Module), initially envisioned for vehicles which attain altitudes of up to 3000 m AGL, will ensure the successful retrieval of said data in all stages of flight. In this study, several preliminary design configurations of a passive, single event IAS (Impact Attenuation System) for the DRM are analysed and tested. Different materials and topologies are evaluated within the scope of recent studies, crashworthiness criteria and DRM integration. Manufacturability as well as efficient (in the context of impact energy absorption), lightweight structures and small production costs are other driving factors for the selection of the prototypes. Initial testing and optimisation of these preliminary configurations will utilise numerical simulation software in order to replicate the observed impact energy and strain rate. The validation of the IAS configurations will be completed via a ground-based test campaign. These configurations will be integrated in an instrumented boilerplate model of the DRM and subjected to impact testing at the predicted impact velocity (DRM recovery system failure). An optimised IAS is designed for its intended use in the DRM as a means to absorb and reduce the transient loads experienced by the data storage device during impact. Its practicality and cost-effectiveness with respect to other existing technologies and impact attenuation techniques is proven.