VIBRATION LOADS IN THE PROCESS OF DESIGNING SCIENTIFIC SPACECRAFT PAYLOADS

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Scientific missions constitute fundamental cornerstones of space agencies such as ESA and NASA. Modern astronomy could not be understood without the data provided by these missions. Scientists need to design very carefully onboard instruments. Payloads have to survive the crucial launch moment and later perform well in the really harsh space environment. It is very important that the instrument conceptual idea can be engineered to sustain all those loads.

IDR/UPM (Instituto “Ignacio Da Riva”, Universidad Politécnica de Madrid) is a Research Institute whose R&D activities are focused on space science and technology. In particular IDR/UPM is specialized in the thermal control and structural design and analysis of spacecraft and scientific instruments. Currently IDR/UPM participates in instruments of the ESA Solar Orbiter mission and of the ESA/NASA ExoMars mission.

Based on this experience a research work has been performed at IDR/UPM on the role of the different types of dynamic loads (sine, random, shock, acoustic) in the design process of scientific missions’ instruments. These loads, always important, become even more critical when the mission thermal requirements are also very restraining. In this case the structural design parameters, like the materials selection, the geometrical lay-out, the sizing of the different elements and the presence of dedicated thermal control structural elements (relatively large radiators, for instance), need to take into account also the thermal requirements. At the same time scientific payloads usually have stringent pointing requirements that have to be maintained when the large temperature variations between illumination and eclipse periods cause thermoelastic distortions in the instrument structure.

In this paper the main findings of this work are presented.

REFERENCES