Paper ID: 66832
student

IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Interactive Presentations - IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (IP)

Author: Mr. Szymon Krawczuk
Gdansk University of Technology, Poland, szymon.r.krawczuk@gmail.com

Mr. Adam Dabrowski
Gdansk University of Technology, Poland, adadabro@pg.edu.pl

INVESTIGATING LUBRICANTS BEHAVIOUR IN MICROGRAVITY FOR VIBRATION DAMPING PURPOSES.

Abstract

Vibration is one of the harshest environments an object is exposed to during and after launch into space on a launch vehicle. Such vibrations should be damped to avoid destruction of the spacecraft or its elements. Currently, active and material damping is used. A possibility of using lubrication as the damping factor is suggested by some research. MoS2 is a typical solid lubricant used in space applications. Its properties vary heavily with environmental conditions and have been tested on ground. Recent research proves that dynamic characteristics of other lubricants are significantly affected by microgravity regime. This paper sums up current knowledge and proposes a research for the characterisation of mechanical damping properties of MoS2 in microgravity. For that reason a drop tower and zero-g flight experiments are designed with a cantilever beam (a tuned vibration amplifier-filter). The cases of dry and wet (lubricated) vibrations will be tested. The beam will be triggered by an electromagnet and a set of sensors: accelerometers, strain gauges and capacitive displacement sensors will measure its vibrations. Computer analysis of the results will allow us to determine the damping coefficient of the lubricant in microgravity conditions. Knowledge of this parameter will determine if damping properties of the MoS2 lubrication (useful for tribological reasons) could be applied for damping of vibrations in spacecraft. This could possibly decrease the need for active vibration control and lower costs of future space missions.