

49th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE
ACTIVITIES (D5)

Prediction, Measurement and Effects of space environment on space missions (3)

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DEVELOPMENT IN THE NATIONAL POLYTECHNIC INSTITUTE OF MEXICO OF A THERMAL
VACUUM CHAMBER FOR ENVIRONMENTAL TESTING OF AEROSPACE COMPONENTS.

Abstract

With the foundation of the Mexican Space Agency it was generated a new impulse for the space projects in Mexico; starting several projects related with the development of micro, nano and pico satellites, bringing together universities, research centers and startups. As part of the evolution of these projects, should be performed environmental testing to confirm whether a satellite can function properly in orbit; however, it is not possible to perform in Mexico because there are no specialized facilities.

In order to fill this gap in the Mexican space capabilities, the National Polytechnic Institute of Mexico created an Aerospace Integration and Testing Laboratory focused in the performance of mechanical

environmental test (vibration, shock and thermal vacuum) for small satellites.

The project to develop a thermal vacuum chamber was presented to the Mexican Space Agency and it was supported through the Sector Fund for Research, Technological Development and Innovation in Space Activities. The project focuses on the development (not purchase) of a thermal vacuum chamber using commercially available compounds, grouped in an architecture developed and controlled by algorithms programmed by the team. An important aspect is that the main workforce is formed by last semester students of the careers of Aeronautical Engineering, Automatic Control and Mechatronics.

The entire project is developed under a system engineering approach, a methodology that is not yet widely used in Mexico and is divided into three segments:

-Test Chamber: responsible for the design of the pressure vessel following the guidelines of the standard ASME BPVC section VIII division 2 and optimizing the design to the available manufacturing process.

-Pressure Control: focused on the design of the array to decrease the internal pressure of the Test Chamber until a barometric pressure of 1×10^{-5} Torr, and his control system.

-Thermal Control: responsible for developing a system capable of varying the internal temperature of the test chamber in a controlled manner within the range of 173 to 423 Kelvin at a variation rate of 3 K/min.