Paper ID: 48965
oral
student

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Smart Materials and Adaptive Structures (9)

Author: Mr. Muhammad Shadab Khan
IMT Mines Albi, France

Prof. Denis Delagnes
Institut Clément Ader – Université Fédérale Toulouse Midi-Pyrénées, France
Prof. Philippe Lours
IMT Mines Albi, France
Prof. Etienne Copin
IMT Mines Albi, France
Dr. Rauno Gordon
Tallinn University of Technology, Estonia
Mr. Martin Simon
Tallinn University of Technology, Estonia
Prof. Thierry Sentenac
Institut Clément Ader – Université Fédérale Toulouse Midi-Pyrénées, France

NEW MATERIALS AND MANUFACTURING PROCESSES FOR NANO-SATELLITE COMPONENTS

Abstract

CubeSat/Nano-Satellite Missions provide an innovative and cost effective method to explore space. Minimizing the cost of a mission is a foremost requirement while considering other factors related to manufacturing the components for the various subsystems for the CubeSat.In order to make sure that the Satellite functions properly it is very vital that all the components used are certified and comply with the requirements for various environments during various phases from design, manufacturing, transportation to launch site, integration in the launch vehicle as well as for the final destination in the space environment. Fasteners/Bolts used to connect the subsystem boards with the Mechanical structure are very critical and vital. It has been observed in some CubeSat Missions for example in the case with ESTCUBE-1 Mission from Estonia that due to the Fasteners/Bolts used in the CubeSat, it was responsible for inducing constant dipole magnetic dipole moment and therefore a torque with respect to Earth's magnetic field. The bolts/fasteners used in ESTCUBE-1 were manufactured with AIS 316 Steel.AIS 316 Steel which is paramagnetic in nature but possibly due to the manufacturing process applied to manufacture the fasteners, they show ferromagnetic property. The availability of Ti6Al4V alloy based fasteners provides a solution to prevent possible ferromagnetism but considering the cost for Ti6Al4V alloys which is about 20-40 times more expensive than similar AIS 316 based fasteners, it is a good approach to explore new materials and manufacturing processes in order to minimize the cost of the mission while maintaining the operational requirements. In this regard a specialize CES Edupack Software (©Granta Design) has been used to do a material selection to find the most suitable material(s) which can be used to manufacture the fasteners while considering all the operational requirements for various environments through which the fasteners in the CubeSat has to undergo in various phases of design, development and launch. Depending upon the final material (s) selected the selection for the most suitable manufacturing process is taken into consideration in the end.The paper presents the results obtained during this selection process to select the most suitable new material (s) and the manufacturing process to produce the fasteners for Nano-Satellites. These results can be a prospective solution to the issue of ferromagnetism in the materials for Nano-Satellites components.