Unconventional Microaccelerometers for Nanosatellite-Specific Attitude Control Systems

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Since the cost of manufacturing and launching a nanosatellite is low, nanosatellites have become increasingly popular in the astronautics industry, thus increasing the demand for the development of specific components. One of the most important components aboard a nanosatellite is the attitude control system that deals with the control of the nanosatellite attitude. This research project aims to develop a low cost, small and precise unconventional microaccelerometer for nanosatellite-specific attitude control systems in which the active element is either a piezoelectric material or a polymeric material where the electrostrictive effect is present. When acceleration appears along the sensitivity axis of the developed microaccelerometer, the inertial mass will be induced acceleration and will apply pressure onto the active element. Based on the direct piezoelectric or electrostrictive effect, the active element, consisting of a piezoceramic plate or a dielectric elastomeric polymer will polarize and an electric voltage signal proportional to the acceleration will go through the electrodes. The developed unconventional micro-accelerometers are using magnetic inertial masses to improve the micromechanical contact between the proof mass and the active element, resulting in better performances in the structure. Three other structures without magnetic proof masses have been proposed and approached for which experimental models were designed and developed. The experimental models have been tested with specific methods. At this moment the research project is unfolding and the developed micro-accelerometers are in a calibration procedure on a specific stall using a Modal Shop vibration exciter and a Mixed Domain Tektronix Oscilloscope.

Awards Won:
Fourth Award of $500