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SPACE SYSTEMS SYMPOSIUM (D1)
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A NEW APPROACH TO PICOSATELLITE DESIGN

Abstract

Space, a frontier largely unknown to man, demands him to muster all his ingenuity to build satellites of exceptional functionality and robustness such that it can withstand the harshest of environments. Satellites offer man an insight into space that no other man-made invention can do. Hence, the design of satellites involves developing and incorporating innovative, cutting edge technologies and design practices. Rapid evolution of engineering and manufacturing practices has spearheaded the miniaturization of several space components necessary for the assembly of satellites whose mass does not exceed 100 grams. Such a satellite (Femtosatellite) accords satellite designers a platform whose ingenuity is exceeded only by its straightforward design. Distinguished for compacting rudimentary satellite components onto diminutive constructs such as printed circuit board (PCB), these Femtosatellites represent the future of satellite systems. Emboldened and encouraged by this innovative design, a progressive approach of unprecedented practicality led towards the conceptualization of the integration of a Femtosatellite into a CubeSat. CubeSats are cubed shaped satellites which weigh less than 1 kg. Satellites of such a make are classified as picosatellite. CubeSat, in recent times, has established itself as the preferred satellite platform among educational and research institutions for its versatility and inexpensive overheads in the conducting of proof of concepts/tests on various new space qualified components. In considering Femtosatellite based components, conventional CubeSat subsystems can be condensed onto the paradigmatic Femtosatellite construct - a PCB. Consequently, valuable mass and space will be extricated to facilitate the introduction of possible newer more sizable components for subsystems and/or payloads. A new, innovative form of attitude control envisaged for this type of picosatellite is the Charge Exchange Thruster (CXT) or Nano Thruster. As a new form of ion thruster, it operates from the application of a several kilovolt potential difference which results in the formation of plasma and acceleration of ions inside the thruster. Developed by the Fusion group in the School of Physics at the University of Sydney, thrusters as small as a pencil have been designed, tested and verified to produce estimated thrust of 100 microNewtons.