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Changing paradigm in satellite design, development and assembly with 3D printing

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3D printing has evolved with time into a matured process for being able to manufacture functional parts and structures gaining widespread attention in aerospace industry. It has started changing the satellite design philosophy. Designs can now be customized to ease assembly, optimize the space and reduce the overall weight. A design model of a plastic CubeSat structure fabricated employing Fused Deposition Modelling (FDM) process is presented. The CubeSat was designed to make assembly easier, possibly by hand, with minimum fasteners. This design ensured that there were no overhanging parts thereby eliminating use of any support material during printing, and it required no surface finishing. Closing or solar panels can be attached to this CubeSat frame without any screws. Essentially this design was easy-to-assemble using only 8 thumb screws in total. Prototypes of the designed CubeSat were printed in ABS to validate the tolerances. The entire sub-systems and payload layout was printed and put together to understand the usage of the available volume. This type of prototyping makes satellite design, development and assembly less complex and easy to visualise. Such designs can potentially be used to 3D print the structure in different environmental or print conditions such as off-world manufacturing.

Biography

Sunil C Joshi obtained his PhD from Monash University (Australia) and has been a Faculty in School of Mechanical & Aerospace Engineering since 2000. His expertise lies in the domain of Aerospace Materials and Structures, especially advanced composites and novel material systems. He was a member of XSAT, Singapore's first in-house designed and developed micro-satellites, team, where he served as the team leader for thermal controls sub-system. Besides currently being an Assistant Chair for Graduate Studies, he also chairs School's Aerospace Engineering (AE) accreditation committee that prepares towards accreditation of the BEng (AE) programme.

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