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AN OVERVIEW OF THE APPLICATION OF 3D PRINTED SPACECRAFT STRUCTURES WITHIN  
THE REDSHIFT PROJECT

**Abstract**

The investigation of additive manufacturing technology started in the 1980's and over the previous four decades has developed dramatically. The advantages of this technology, such as increased geometrical design freedom, faster production times, the possibility of increased functional integration, the reduction of material waste and reduced costs have driven the development of this technology in many market sectors. However, the benefits of additive manufacturing is only starting to be realised within the spacecraft industry. Within the last five years there has been a growing momentum of research and development into the application of additive manufacturing for spacecraft and in many cases, this has been constrained to the optimisation and production of small secondary structural components. The European Union funded

research project entitled ‘ReDSHIFT’ (Revolutionary Design of Spacecraft through Holistic Integration of Future Technologies) began in 2016 and focused on passive means of reducing the impact of space debris by prevention, mitigation and protection. The main innovative aspect of the project came as a result of a synergy between theoretical and experimental aspects, such as long term astrodynamics simulations, de-orbiting devices, hypervelocity impact testing, design for demise and the application of 3D printing for future satellite design. This paper will present an overview of the work performed on the application of 3D printing to future satellite design as part of the ReDSHIFT project, which finished in March 2019, along with the key results. This work was led by the University of Southampton in the UK with the coordination and support of the project partners and involved the design, simulation and test of many functional components as well as a complete 3D printed small satellite 8U cubesat structure. The work performed within ReDSHIFT has enabled the potential of this technology for multiple applications to be quantifiably identified.