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THE OPEN SOURCE SATELLITE: SPINNING IN "BEST-OF-BREED" SPACE AND TERRESTRIAL INNOVATIONS TO SPIN-OUT AFFORDABLE NEW MISSION IDEAS

Abstract

The spin-out of technologies from *space* into *terrestrial* applications during the past 50 years has made a direct impact to the lives of people on Earth. A key challenge for coming decades is improving the affordability and accessibility of space systems, to truly democratise space and enable further progress.

We have identified several current and emerging terrestrial technologies which can spin-into satellite platform production and operation, to enhance the price-performance point and stimulate more missions in LEO, MEO, GEO and interplanetary space.

We have initiated the development of an innovative, *fully Open Source*, flexible microsatellite platform, embracing an open source approach, creating an efficient fail-safe microsatellite platform that is performant, capable, modular and robust. The platform can be tailored for different missions, upgraded and configured after launch and operate with multiple ground networks. Developed using COTS parts, processes and tools, the design will be released for free to the small satellite community.

The goal for the LEO variant of the Open Source Satellite Platform is high performance at a cubesat price: Launch mass 25kg to 250kg; <70% payload mass fraction; Payload volume 600x600x450mm; Payload power 10W to 1kW; 3-axis stabilised; adaptable pointing knowledge, control and agility; orbit 400km to 850km; 5-7 year lifetime; <14 month schedule; and prices of USD1m for a 50kg variant, GBP1m for a 100kg variant, even for single or low quantities of satellites.

We are taking a holistic approach to capturing and satisfying the diverse technical and programmatic needs of different stakeholders, addressing the requirements for: a modular, versatile, scalable, robust architecture; mission configurability; standard payload and equipment interfaces; dedicated and rideshare launcher capability; ground segment interoperability, a cost-effective ground-based model for development and training and low total mission cost.

This paper will review the status and progress of the programme, the technical outputs of the Model-Based Systems Engineering approach that we are applying to satellite development, including: Mission ontology, Requirements capture and analysis, Functional analysis, Performance analysis, System design, Trade studies, System architecture specification, System Verification Validation.

The paper will describe next steps and timeline for Mission#1 and risks to be mitigated.

The paper will conclude by discussing the longer-term roadmap and how, by improving the level of integration and robustness within the platform, the Open Source Satellite Programme approach will allow subsequent platform variants to meet the needs of missions in harsh Earth orbits and interplanetary missions.