SMALL SATELLITE MISSIONS SYMPOSIUM (B4)
Design and Technology for Small Satellites (6A)

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SKIMSATS – ULTRA LOW ALTITUDE SPACECRAFT DESIGN CONCEPTS AND APPLICATIONS

Abstract

Operating satellites at ultra low altitudes can bridge the gap between sub-orbital experiments and full operational space missions and can be shown to provide the "best of both worlds" through the use of new technologies and breaking of traditional supply chains and methods. The operation at ultra low altitude provides benefits in terms of link budget for earth observation (and thus reduction in mass, power and volume for the optics or RF component), and yet provides an environment which is capable of observing deep space without the hindrance of Atmospheric effects which affect ground based equipment. This paper covers the study work performed by SEA in an exciting new development known as "Skimsats". They are a novel type of spacecraft optimised to operate with low perigees (with low drag), taking advantage of new aerostructures and constructions methods. The study shows the benefits in mass producing satellites which offer several months or longer of high quality science in regions which are attractive to many branches of science including;

>Life sciences and long duration microgravity,
>Geospace science and auroral effects,
>Astrophysical observations
>Earth Observation and atmospheric chemistry
>Underflight of operational missions for correlation purposes
>Demonstration of new space technologies.

The paper also identifies the technological challenges posed by operating in this region including the challenges in finding suitable materials, potential AOCS solutions to cope with the hypersonic turbulent impacts, orbit lifetime and propulsion needs, launch vehicle opportunities, miniaturisation of key technologies enabled by MEMS approaches. Also covered are the benefits of using aerostructures including tactical orbit changes and disposal. It also identifies payload types which would benefit, as well as indicative mission parameters for Earth Observation missions which have a parallel with the following;

>High resolution imaging class (1m resolution)
>ESA-"Accurate" class (atmospheric composition in the UTLS region)
>Earth Radiation budget class (global coverage)