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ASTEROIDFINDER: IMPLEMENTING A SMALL SATELLITE MISSION TO DETECT IEOS

Abstract

The need for an improved cataloguing of the solar system's Inner Earth Object (IEO) population is one which has achieved significant attention in recent years, both within the scientific community and in the general public media. However, with opportunities for ground-based surveys limited, it seems likely that much of this need will be served in the immediate future by space-based systems. With no such system yet operational, the German Aerospace Centre (DLR) has sought to fill this gap with the AsteroidFinder mission.

The AsteroidFinder mission began in 2007 as part of the founding of the new DLR Institute of Space Systems in Bremen, Germany. With a launch scheduled for late 2014 and the typically limited budget of a small satellite project, much innovation is required in order to achieve the challenging mission goal of characterizing the IEO population without the benefits of the advanced solutions typically afforded to larger projects: for instance, conflicting demands for a high spacecraft agility alongside a high pointing stability (necessary to allow the spacecraft to cover a large area of the sky in clear, undistorted images) are exacerbated by the lack of a propulsion system, leading to a highly optimised control and scanning strategy. Equally, advanced detector technologies and processing methodologies are required to compensate an absence of cryogenic cooling.

In order to overcome such challenges many novel project implementation concepts are employed, such as a tailoring of the ECSS standards, utilisation of COTS components and the use of an atypical requirement tree structuring (depicting a clear distinction between science and support services). Furthermore, system engineering practices such as concurrent engineering and elements of lean engineering are utilised to attain the greatest performance from the system within the tight constraints. Notably, AsteroidFinder represents the first reported application of concurrent engineering to Phase B space system design [1].

To achieve significant science within the tight bounds of a small satellite mission requires considerable innovation, both in the technologies applied and in the practices supporting them. AsteroidFinder aims to be a demonstration of just how far this approach can be pushed by being the first mission to characterize the much publicised IEO population.

References [1] Findlay, R., Spietz, P., Pedersen, J.F., and Gerené, S. (2010) Concurrent engineering through the stages: AsteroidFinder (Phase B), Proc. 4th International Workshop on System Concurrent Engineering for Space Applications (Lausanne), Oct 13-15