EARTH OBSERVATION SYMPOSIUM (B1)
Future Earth Observation Systems (2)

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HIGH RESOLUTION EO MISSIONS WITH VERY LOW-FLYING SPACECRAFT

Abstract

An in-house study has been initialised to investigate the potential benefits of operating an Earth Observation spacecraft in a very LEO (in the ranges of 200-400 km), with the aim to minimize overall costs by using less complex instruments that benefit from the closer distance to Earth.

The purpose of the study is to analyse and demonstrate technical and programmatically feasibility at mission and system level, with focus on the platform. After thorough background research, a set of driving Applications, User-, Mission- and System requirements will be defined. Then, a suitable S/C will be designed, to identify critical technologies, risks, costs and benefits.

On Mission level, different very-low altitudes will be evaluated with regard to coverage and revisit time, and compared to traditional LEO. Also shorter Sun/eclipse durations, the effect of Ionosphere on the spacecraft, shorter G/S contact times, a more challenging thermal environment and the incoming atmospheric composition will be assessed.

On Payload level, two instrument concepts are investigated; first, completely OTS payloads from existing LEO missions are "brought down" to very LEO - thus providing higher resolution. Second, we investigate the use of low-cost instruments providing the same resolution as more complex siblings in traditional LEO.

On Platform level, a low-cost design that is suitable for the payload and the very LEO environment is to be performed. Consequently, lifetime, reliability, cost and simplicity/robustness will be traded against design solutions for drag compensation, configuration vs. cross section area, orbit control technologies vs. propellant demand, attitude concept vs. use of mirrors for higher Field Of Regard, power demand vs. solar panel size and accommodation.

The paper will present the main results from the study. The conclusions will also include an estimate for the delta overall mission cost between a traditional LEO spacecraft and a new low-flying spacecraft – with both satellites providing the same high resolution data products.