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DESIGN REFERENCE AND ADVANTAGES OF A VERY LOW EARTH ORBIT SAR EARTH OBSERVATION MISSION.

Abstract

Lowering the operational altitude can provide significant advantages to space missions that make use of Synthetic Aperture Radar (SAR) for Earth Observation. Orbiting closer to the target substantially reduces the amount of power required to operate the SAR.

The aerodynamic forces will increase when lowering the altitude, and they will become one of the design drivers. Mainly the increase in drag may drastically reduce the lifetime of the spacecraft at very low altitudes, forcing to add drag-compensating systems. Some of the natural characteristics of SAR payloads can be used to alleviate this problem (specially when compared to optical payloads). Specifically the elongated shapes of the antenna can be used to achieve an elongated spacecraft with a small cross-sectional area, lowering the total drag force. SAR payloads have also the ability to steer their beams electronically, reducing the attitude maneuvers required and hence reducing even further the mean drag experienced by the spacecraft.

Here the concept of a Very Low Earth Orbit SAR mission is explored over a range of different altitudes, the design drivers at different altitudes are identified and finally a design reference is provided. The advantages of such a concept with respect to the traditional higher altitude counterparts are then analyzed and discussed.