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STACKED SMALL-SATELLITE LAUNCH CONCEPT FOR COST EFFICIENT, FLEXIBLE AND
HIGHLY RELIABLE MULTIPLE SATELLITE LAUNCHES

Abstract

Today, satellites are typically launched with their own individual separation systems. In case of multiple satellite launches, different adapter, dispenser or deployer structures are additionally used. The alternative solution would be to stack the satellites on top of each other, similarly to shipping containers in maritime logistics. The stacking concept has already been used successfully in the past (e.g. the first generation Orbcomm satellites launches and some dual geostationary satellite launches). Currently, Starlink satellites make very efficient use of the stacking concept for launching satellites in extremely high numbers on a single launch vehicle.

Recently, ESA issued an ITT for a study with the aim of developing a new guideline for multiple launch of small satellites with heavy-lift launch vehicles. The company team of OHB Czechspace, LuxSpace and OHB Orbital Access is working on the study.

This paper generally discusses the advantages and disadvantages of multiple satellite launch concepts for different mission types and spacecraft sizes. Based on the state-of-the-art analysis and forecasting of future market needs, a cost-effective, simple and highly reliable satellite stacking concept is presented, ensuring maximum utilization of the launcher fairing volume.

Particularly for the NewSpace applications with the new small launch vehicles, the maximum utilization of the fairing volume and the lift-off mass capacity will be the economic success criterion. The stacking concept presented and discussed will be one of the possible solutions to this challenge.

Within the study, a design guideline for small satellites is being developed and evaluated. Satellites developed based on this guideline will enable efficient stacking in various launchers fairings due to standardized interfaces, leading to more affordable access of small satellites to space.

The stacking concept and the guideline will be applicable to the needs of both small constellations and mega-constellations using dedicated launches and ride-share launch services. The guideline will provide

a framework for the structural design, development, collective integration, and on-orbit deployment. It aims to serve as a guiding tool for professionals, researchers, and organizations involved in the small satellite development and launch services. The project also includes discussions with stakeholders such as launch service providers and satellites/constellation owners and developers. This serves to ensure a wider guideline applicability and successful integration into the broader landscape of small satellite and launcher technology.