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INVESTIGATION OF PAYLOADS FOR SMALL SATELLITES WITH A COMMERCIAL OVERVIEW

Abstract

Small satellites have proven to be a real game-changer, enabling substantially cheaper and frequent access to space, by implementing simple COTS (Commercial Off-The-Shelf) technology, with significant reductions in development and execution lead-time, and manpower (Sandau, 2010). They make possible a diverse variety of missions and serve as excellent educational platforms for universities, technology demonstrators in emerging space markets, and have introduced new players to the space arena. Small satellite missions enable faster revisits, wider coverage, and shorter development timelines for constellation applications. The prospect of launching small satellites to address a plethora of pressing problems must go hand-in-hand with further miniaturization of key technologies. In this paper, we address the standing challenges being faced in the small-satellite industry, highlighting the primary technological drivers that will open up a wide suite of applications.

One of the essential aspects to be understood, for further advancement of small satellites, is their commercial role. For small satellites ($\leq 50\text{kg}$) to be viewed as a viable, versatile technology-platform for commercial players, monetizable applications must be demonstrated on them. We review the current applications that small satellites have been used in, and reflect upon the extensions to the commercial world. Our findings serve to highlight the advantages of small satellites with respect to conventional, large-satellite counterparts, with a focus on avenues for revenue-generation.

Our study shows that the miniaturization of payload technology seems to have not kept pace with the developments in the other subsystems within small satellites. The work we present here includes an investigation of novel payloads, which can serve commercial applications using the small-satellite platform. These include, cases of payload miniaturization, Just-In-Time (JIT) solutions, distributed systems, and complementing large-satellite missions. We analyze a number of future applications in both well-established, and emerging space markets, highlighting the primary advantages of the small-satellite platform, and the challenges that lie ahead to implement these systems. With this, we provide deeper insight on the future role of the small-satellite platform within the commercial space market.