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THE DIFFICULTIES OF SMALL SPACE STARTUPS IN ACCESSING MANUFACTURING RESOURCES

Abstract

Precession machining has been widely used in a variety of industries, including aerospace, precision instruments, and automotive. Complex manufacturing process issues frequently hinder production due to their high tolerance requirements, exotic materials and the knowledge-intensive characteristics of precession aerospace machining. Furthermore, access to such processing methods is limited, impacting their access to lean new space startups. Due to new applications in defense systems, high-speed communications, and climate tracking, demand for space equipment is increasing. In addition to business process innovation, private commercial sector technology improvements are upgrading obsolete and expensive space operations by reusing rockets and constructing more efficient spacecraft, cutting pre-launch costs.

A projection by morgan stanley suggests that the global space sector would earn $1.1 trillion in sales by 2040, up from 350 billion in 2022. Edge computing, quantum computing, ai, and digital twins have improved commercial efficiency and insight. Also, they will reduce expenses while collecting and analyzing crucial data faster and at a larger scale to make more accurate decisions. Space technology companies face similar technological and inventive challenges as terrestrial engineering firms. This presents an opportunity for technology application in production processes. Aside from the ever-increasing instrumentation for advanced detection and measurement systems, there are competing and often contradictory requirements for serial satellite production and customization.

Many missions have failed due to launch vehicle or spacecraft production faults. Even after extensive testing and quality control, undetected flaws in missions cost billions of dollars. Hecht and fiorentino classified failure reasons into seven categories: design, environment, parts, quality, operation, and other known and unknown. Unlike other industries, space hardware assemblies have a complex structure, a large number of parts, and very rigorous criteria. The advent of digital twin technology allows for real-time interaction between the manufacturing process and quality feedback control. Furthermore, these technologies can reduce the cost of operations lowering the barrier of entry for new space startups. As digitalization evolved, advanced computer technologies like big data, ai, cloud computing, digital twins, and edge computing were employed in different fields. There lies an opportunity to apply commercially proven technologies such as digital twins and ai to the manufacturing and assembly of space hardware. This will significantly increase quality, reduce production cycles, and allow new space startups to compete and innovate.