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THE NEW RACE FOR SPACE

By Ryan Lewis and Todd Stavish

President John F. Kennedy, speaking several months after John Glenn’s historic flight aboard Friendship 7, famously proclaimed that, “No nation which expects to be the leader of other nations can expect to stay behind in this race for space.” The origins of the modern space industry are rooted in one of the most renowned global competitions: the race for space between the United States and the former Soviet Union. Fifty years later, a new space race is underway that is being driven not by nations, but by venture-backed startups.

Throughout the 1960s and 1970s, space research and development was driven by government agencies seeking to expand their national security capabilities and prestige. In today’s space race, this generation of venture-backed startups is challenging long-held industry conventions by leveraging the same techniques that drove innovation in the software market and applying them to space systems. As a result, space capabilities and services are rapidly becoming accessible for commercial and government consumers alike.

The changes currently unfolding in the market are truly unprecedented. While the space industry had its share of new commercial entrants in previous decades, never before has the industry experienced aggressive startup activity across every market segment. From providing reliable and affordable access to space to developing new analytics for remote sensory data, startups are looking to disrupt current practices by leveraging affordable platforms that allow them to innovate quickly and inexpensively. This approach allows companies to rapidly evolve their products and services at previously unimaginable price points.

The cost structure of these startups also allows them to pursue new types of business models. Unlike a majority of their predecessors, most new space startups are not

looking to government agencies to serve as their sole or even primary customers. Instead, commercial industries serve as their main sources of revenue generation. While many of these consumers may be unfamiliar with space-based capabilities, the insights provided from space remote sensory data fit directly into existing big data, communications, or tracking and monitoring challenges. This comprehensive market change and rising commercial interest has not been lost on investors. For the first time, venture capital firms are playing an increasingly significant role in funding space startups. As more money enters the industry, more entrepreneurs are likely to join this new race.

It is important to consider why this innovation in the market is happening now. Startups are taking advantage of fundamental changes occurring across a variety of market sectors, including launch vehicles, hardware and software, satellites, and analytics.

Decreased Cost to Access Space

The ability to reach outer space safely has always been one of the biggest challenges in the space industry. As recent events have shown, rocket launches are still risky enterprises. Despite the inherent challenges of rocket science, recent advances in expanding affordable



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access to space have made it possible for entrepreneurs and startups to put pathfinders and prototypes into orbit at a fraction of the cost. Demand for secondary rides has developed so rapidly that startups specializing in launch brokerage services have emerged to simplify the process for new companies. The U.S. government also helped ease access to space by supporting efforts like NASA's rideshare program, which provides secondary rides to university science projects.

Although the secondary launch market helped catalyze growth among aspiring small satellite startups, it cannot address the ever-increasing demand for launch services. From launch dates to desired orbits and altitudes, startups are demanding increasingly complex services to meet their needs on an already overtaxed system. A series of startups have emerged to meet this demand for timely, reliable, and affordable access to space. These innovations will be important not only for aspiring companies dedicated to small satellite launch, but also the current heavy lift providers who are looking to diversify their product lines.

Commodity Hardware and Software

The second major change to the space industry is the adoption of commodity hardware coupled with the use of agile development methods. The advantage of using commodity hardware is most widely recognized in "Moore's Law" — the observation that, over the history of computing hardware, the number of transistors in a dense integrated circuit doubles approximately every two years. This doubling effect creates massive computing power over generations. The power of generational doubling is not isolated to computing, however. For example, space startups are utilizing the rapid pace of innovation currently experienced in solar power cells, battery systems, software-defined radios, and smartphone sensors.

The exponential improvement of commodity hardware is further amplified by the use of agile development

methods, in which requirements and solutions evolve through collaboration between self-organizing, cross-functional teams. This promotes adaptive planning, evolutionary development, early delivery, continuous improvement, and rapid and flexible response to change. The end result is that a single satellite design can evolve through ten generations in one or two years — taking advantage of hardware that did not exist at the inception of the design cycle.

Standardized Satellite Buses

Expanding on the original CubeSat standard developed at California Polytechnic State University and Stanford University, manufacturers have drastically simplified the process for researchers and companies alike to procure, test, and fly their own inexpensive satellites for a wide variety of missions and/or research projects. This flexibility has catalyzed numerous startup companies to develop tailored satellite services leveraging an inexpensive satellite bus. As the standard matures and companies support different elements of the supply chain, it will become easier for individuals and companies interested in CubeSats to experiment with their own satellites.

Common Analytic Engines and Services

Historically, the analysis of remote sensory data from space assets required a series of highly trained professionals to prepare, analyze, and disseminate the data to the appropriate stakeholders. While there will always be a need for highly trained professionals, the emergence of proprietary and open source analytics engines have enabled companies to sell affordable analytic products, not just raw data.

The shift from raw data to insights will have a substantial impact on the market. Companies, both incumbents and startups, now have new product lines to sell customers. Furthermore, it has given rise to a new group of startups focusing exclusively on remote sensory analytics. Thus, a major barrier to entry for

most commercial companies interested in space-based remote sensing data has been removed. Companies, no longer encumbered by analytic challenges associated with raw data exploitation, focus directly on business needs by purchasing tailored analytic products.

In conclusion, the transformation occurring in the commercial space industry is undeniable, but change is not easy. In each market segment, consumers, both public and private alike, are slowly being forced to reconsider how they currently plan, buy, and use commercial space services and products. Similar to the software market, customers, including the Intelligence Community, will be increasingly challenged to decide between a series of companies, not simply one or two sole-source suppliers.

Recognizing this shift in the space market, IQT is undertaking a strategic mission initiative focused on exploring the commercial space revolution. Going beyond IQT's core investment model, this initiative seeks to provide the IC with a mechanism to rapidly understand, architect, and demonstrate the art of the possible using new capabilities from the emerging commercial space industry.

As space services become the realm of startups, not just governments, the IC and its partners must consider the implications of global commercial sales. While these market forces present both changes and challenges, it is truly an unprecedented time in the market. The new space race is on. **Q**

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