

## Security Tokens Can Help Fund the High Frontier

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### Abstract

The space revolution has begun. By opening the solar system to creative minds and new players, it will transform life on Earth through a flood of new ideas, concepts, and technologies. This will lead to a new space industrial infrastructure that will support expanding human communities in the universe. To accomplish this, large amounts of funding must be invested over long periods of time. The audacity and commitment needed to make this happen is already on display. The world's richest visionaries build on the technologies and infrastructure of government space programs; a wave of exciting space-tech startups are creating a new space race.

While short-term, near-Earth, sat-tech (satellite-technology) projects are finding needed investments from traditional sources, the companies that will build the frontier-enabling technologies for the next giant leap require new sources of visionary capital. Meanwhile, risk, scale, time horizons, and limitations on who can invest, impede the flow of needed infrastructure development.

Concurrent with this historic shift in off-world development, the digitized, ledger-based concept of security tokens is already providing liquidity to the global investment community. Through this technology's ability to support legal standards, it foreshadows the democratization of venture-based investing. *The authors of this paper believe that to enable the coming space renaissance, investment capital must be liquid, and the right to invest in space must be expanded. "Tokenizing space" has the capability fund the frontier.*

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## A Giant Leap - Space Race to Space Rush

In the nineteen sixties, using slide rules and the weapons of a Cold War, humanity went from a standing start to taking their first steps on the Moon and sending robotic explorers throughout the Solar System – giving humanity the vantage point and tools to understand the Earth, and perhaps even save it.

Over fifty years later, the world is entering the next great space revolution, driven by practical, near-term business models that provide the backbone for economic and industrial development, and the underlying goal of expanding the home of humanity into the high frontier. This revolution is fueled by a positive vision of the future, and ever more by an understanding that space offers a unique platform for the development of new technologies, products, and services, as well as an unlimited supply of resources. The economic potential is huge, by some estimates opening space as an economic zone could lift the world economy from the scale of trillions to the scale of quadrillions. The world’s top financial institutions are taking note, with recent reports from Morgan Stanley, Goldman Sachs, and Bank of America / Merrill Lynch predicting rapid economic growth for this new sector.<sup>1</sup>

With some of the world’s richest people pouring billions into transportation and infrastructure, and governments partnering with commercial enterprises to provide services and supply, it is ‘Day 1’ of the space revolution. The space race of the last generation is turning into a space rush of massive economic magnitude in this generation. The challenge ahead is not one of gravity, technology, or potential, but how to bring together those with capital and investment expertise and those visionary entrepreneurs who will leverage these new opportunities.

### The Cost of Space

Space is expensive. Born of the traditional, government contractor, cost-plus culture best summarized by the concept of the “million-dollar toilet”<sup>2</sup>, space was until recently the exclusive domain of governments, the military, and politicians. This has, unfortunately, resulted in inefficient and expensive methods of exploring and developing the economic, industrial, and physical foundation for an unlimited future.

When the space race began between the United States and the Soviet Union after the launch of the Soviet Union’s Sputnik satellite, the US racked up \$15.9B of space expenditures from 1957 to 1964, while the USSR spent an estimated \$10.2B on space during the same time frame<sup>3</sup> (\$127.5B and \$81.8B adjusted for inflation in 2018, respectively).

Space was seen as a national defense domain by Washington and Moscow, and as a cash cow by those large government contractors receiving contracts with seemingly unlimited budgets. However, once humans walked on the Moon, and without another such clear and directed goal coming from the top, the innovation stagnated. Although government funding kept flowing to a small group of entrenched contractors, with negative incentives to bring down costs, there was no drive to increase efficiency or encourage innovation.

### The Space Establishment

Space ventures are still incredibly expensive, and even today the field is dominated by government funded projects and mega corporations. The primary entry point for private investment and profitable enterprises to date has been the satellite industry, estimated to be a \$240B dollar market in 2016<sup>4</sup>. High cost,

<sup>1</sup> Foust, Jeff (2018). *A Trillion-dollar Space Industry will Require New Markets*. Retrieved from: <https://spacenews.com/a-trillion-dollar-space-industry-will-require-new-markets/>

<sup>2</sup> Smith, Ron. *The Tale of the Million Dollar Toilet*. Retrieved from: <http://vault.hanover.edu/~smithr/Bureaucratic.pdf>

<sup>3</sup> Central Intelligence Agency (1964). *Comparison of U.S. and Estimated Soviet Expenditures for Space Programs*. Retrieved from: [https://www.cia.gov/library/readingroom/docs/DOC\\_0000316255.pdf](https://www.cia.gov/library/readingroom/docs/DOC_0000316255.pdf)

<sup>4</sup> Bryce Space & Technology (2017). *Engine for Growth: Analysis and Recommendations for US Space Industry Competitiveness*. Retrieved from: [https://brycetech.com/download.php?f=downloads/AIA\\_Space\\_Competitiveness\\_2017.pdf](https://brycetech.com/download.php?f=downloads/AIA_Space_Competitiveness_2017.pdf)

infrequent, and highly controlled rides to space meant that each satellite, commercial or scientific, had to be over-engineered against failure, driving up costs, and thus again, limiting innovation. The prohibitive costs and limited access also assured that the sort of radical technology revolutions seen in the development of the internet couldn't happen in space. In a recent Wired article, Jeff Bezos commented on this exact problem and the importance of Blue Origin's work in bringing down the cost of access to space:

As Blue Origin grew, Bezos began to see it as the infrastructure for future space entrepreneurs to build even more exciting things. "There is no way two kids in a dorm room can build a super interesting and important company in space," he says, because it costs way too much to get started. "If I can unleash a thousand Zuckerbergs in the next generation, we will see things you can't even imagine."<sup>5</sup>

## The Space Revolution

One of the spinoffs of the original space race was a generation of true believers. Inspired by amazing breakthroughs in space technology and the promise of low-cost access to space, this generation of believers decided to make humanity's expansion into the Solar System their life's goal. They were driven to action by the seminal book "The High Frontier" by Gerard K. O'Neill, and the inspiration of Carl Sagan and other visionaries, and the hard science fiction of Clarke, Asimov, Roddenberry, and Heinlein. These dreamers set off in three primary directions:

- (1) to change the conversation and legal framework regarding space,
- (2) to utilize the power of free enterprise to start new space companies and projects, and
- (3) to create and gather the wealth needed to make this future a reality.

What the world sees now as a revolution in space, often referred to as 'NewSpace' is the result of this methodical, steady work over the last three decades.

Until recently, most space technologies have been overpriced and inefficiently produced due to the standard government cost-plus contracting model. In most cases these technologies are not designed with flexibility or scalability in mind, and most are not designed for future use-cases such as the utilization of off-planet resources. A new type of innovative thinking, with a focus on growth and responsiveness to future markets, is critical to developing the frontier-enabling technologies that will lead to a viable, economically productive space industrial infrastructure.

### *Definition: NewSpace*

Coined by the leaders of a cultural revolution that began in the US in the late 1980s, primarily exemplified by groups such as the Space Frontier Foundation, the term NewSpace has been co-opted to mean any young space startup or new space technology. In actuality, the term NewSpace was designed to describe the engine of the frontier movement, specifically, those people working to open space to human settlement. According to one of the term's creators and co-author of this paper, Rick Tumlinson:

A NewSpace company is one that is created, designed, or funded by those working to support or enable the opening of space to humanity. A NewSpace company also often has the characteristics of being nimble, innovative, democratic, culturally diverse, and focused on creating breakthrough technologies and innovative business models that will directly lead to the permanent human settlement of space.

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<sup>5</sup>Levy, Steven. (2018) "Jeff Bezos wants us all to Leave Earth – For Good." Wired. Retrieved from: <https://www.wired.com/story/jeff-bezos-blue-origin/>

## *Definition: Frontier-Enabling Technology*

Frontier-enabling technologies are those that:

- (1) accelerate low-cost access to the space frontier for private citizens and companies,
- (2) enable or accelerate the use of space resources, or
- (3) accelerate the rate at which wealth can be generated in space.<sup>6</sup>

For example, frontier-enabling technologies could range from AI robots for asteroid mining to private space habitats, and from 3D printing in space to closed-system vegetable gardening, and all the supporting technologies, manufacturers, intermediaries, and end-users across these supply chains.

## Funding the Revolution - Current Sources of Capital

The leaders of this NewSpace revolution have succeeded in many ways, primarily by creating an entrepreneurial culture in space that has led to a new generation of space startups. These companies are in the process of delivering remarkable new products that will enable humans to live beyond Earth, and - in most cases - enhance life on Earth. This, coupled with the low-cost access to space created by market leading NewSpace companies, has led to a major transitional moment. But, the private investment funds to enable this great transition are unavailable to those who would make it so. As the ecosystem exists today, the majority of space companies require the type of financial backing that only governments, the largest corporations, or billionaire patrons can provide.

### Government Funding

The legacy of the government space race is the foundation on which this new revolution is built and there are major efforts underway by national governments to support commercial space activities. Some of these have been heroic and farsighted, and several have made a significant difference in helping catalyze the NewSpace economy. Some space companies have survived completely from NASA, ESA, and other government grants, providing great 'job shops' that train valuable engineers and produce iterative technology.

Some forward-thinking governments, such as the Luxembourg and the UAE, are developing government-funded space investments vehicles that support commercial initiatives. But government funding always comes with strings that can inhibit or stifle creativity. Such money also comes with the bureaucratic burdens of paperwork, coordination of multiple constituencies, and in some cases geographic constraints as funding entities seek to locate beneficiaries within their own economic zones.

While state funding has been, and likely always will be, important to the birth of space technology and the companies who create it, this source of capital is only a part of the solution. Importantly, by its very nature, government financing is not structured to create the revolutionary breakthroughs needed to develop frontier-enabling technology – especially if that technology might threaten the status quo.

### Large Corporate Investors

Outside of governments, many influential and well-known corporations and organizations have contributed to the growing private space economy over the course of the current decade, through the mechanism of significantly large (and often repeated) investment. In 2010, Google participated in a \$1.2B funding round for O3b, and subsequently co-led a \$1B late-stage round for SpaceX in 2015. More recently, Google led a \$15M round in Orbital Insight during 2016, participated in a \$50M Orbital Insight round the next year, and in 2018, participated in a \$40M early-stage raise for SpinLaunch.

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<sup>6</sup> Tumlinson, Rick (1995). *The Frontier Enabling Test*. Retrieved from: <https://spacefrontier.org/about-us/frontier-enabling-test/>

Fidelity Investments was the other co-leader of the \$1B 2015 SpaceX round; they recently led another \$500M round for SpaceX in 2018. SoftBank led a \$1.2B equity round for OneWeb in 2016 by contributing \$1B of their own capital, and recently participated in a seed round for EarthNow in 2018, for an undisclosed amount. Other participants in the massive 2016 OneWeb round included household names like Coca-Cola and Airbus. Airbus has been involved in over \$60M of fundraises across multiple deals during the past two years. Meanwhile, Boeing has been involved in over \$65M of investment rounds during 2018 alone, while Lockheed Martin has participated in multiple deals since 2015<sup>7</sup>.

## The Billionaire Cavalry

The children of the first space age were driven to go out into the world and make change happen. While some focused on developing early technologies and changing the political and social aspects of space, others went out and made money. In some cases, a lot of money. And thus, as the conditions were set for private players to begin to take the lead in space, a group of tech savvy billionaires arrived to prove the concept of space as an economic and human frontier. Driven by the goal of opening space to human settlement, as well as motivations for profit, they have collectively underwritten a new generation of space companies and projects. For example, since the year 2000, eight billionaires (avg. net worth of \$30.5B) have influenced the NewSpace economy by founding and funding their own space companies or projects, while 15 others (avg. net worth of \$22.2B) have invested in private space companies<sup>7</sup>.

Perhaps the two most well-known of these ventures – SpaceX and Blue Origin – were founded by billionaire entrepreneurs Elon Musk and Jeff Bezos, respectively. Both Bezos and Musk have poured a considerable amount of their personal fortunes into their respective companies (in tandem with other sources of private and public funding) to provide the necessary sustaining capital over the past two decades.

While most of SpaceX’s private financing has been raised via venture capital – with three late-stage rounds (G through I) coming in over the past four years – Musk personally contributed over \$100M to launch the

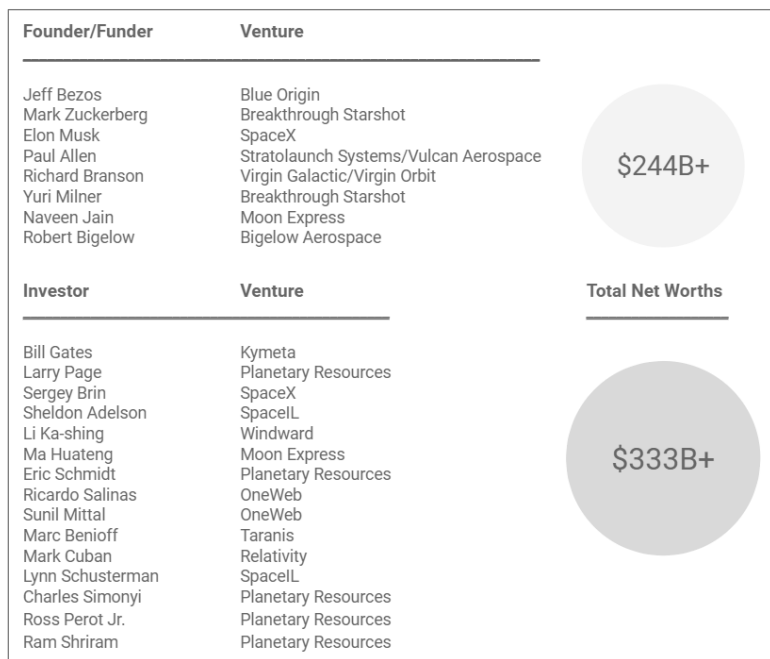


Figure 1: The Billionaire Space Club <sup>7</sup>

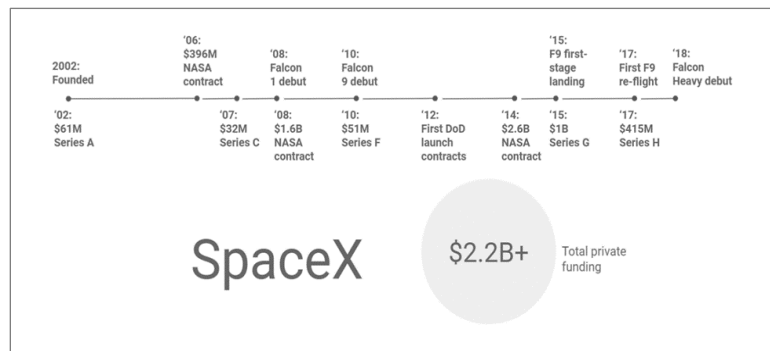


Figure 2: SpaceX Funding and Milestones <sup>7</sup>

<sup>7</sup> Granatstein, Andrew (2018). *SpaceFund Internal References - Various Sources*. Retrieved from: [spacefund.com/references](http://spacefund.com/references)

venture in 2002 and has participated as a financier in later rounds. Meanwhile, the majority of Blue Origin’s financing has come directly from the pockets of Amazon founder Jeff Bezos through the sale of his personal Amazon stock<sup>7</sup>.

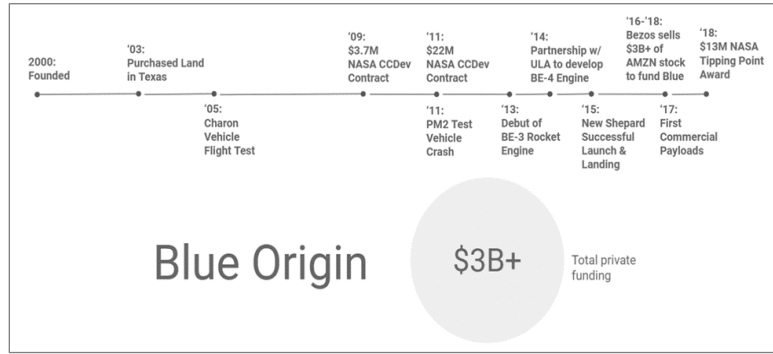


Figure 3: Blue Origin Funding and Milestones <sup>7</sup>

**Venture Capital**

Of the various types of space investors, no segment has been more involved than venture capital (VC). Nearly half of all space investors from 2000-2017 were venture capital firms and of these firms, nearly two thirds were headquartered in the United States<sup>8</sup>. And although worldwide annual space VC investment volume is at an all-time high (roughly \$1.6B during 2017), it still has a long way to go before catching up to other future-focused high-tech sectors like biotech (\$11B), artificial intelligence (\$12B), and fintech (\$12.9B)<sup>7</sup>.

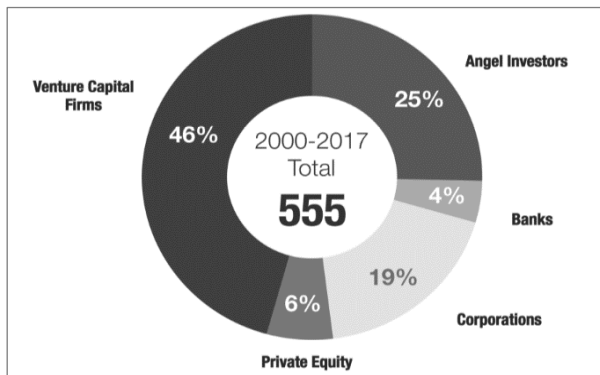


Figure 4: Number of Space Investors by Type, 2000- 2017 <sup>8</sup>

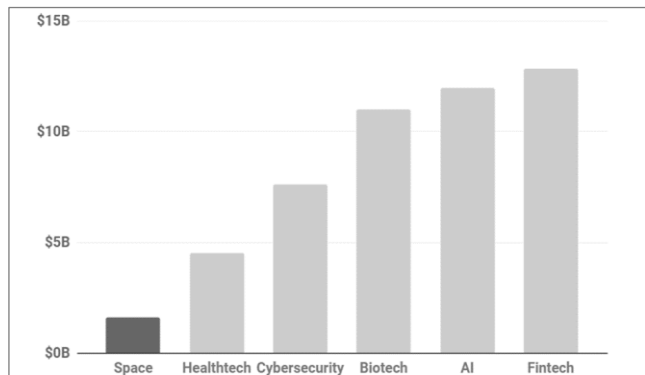


Figure 5: 2017 Venture Capital Investment by Sector <sup>7</sup>

Many of these VC-funded space companies fit a more ‘traditional’ venture capital investment model, focused on providing low-cost, high-value, easily scalable products to a broad and established market – and most importantly, they have an opportunity for a company exit (merger or IPO) within five to seven years. Most of the space companies who have received funding to date fit this model well; they have near-term markets and less intensive funding requirements than are typical of many NewSpace companies. They often have comparatively short timelines and smaller costs due to a focus on developing a minimum viable product – a lesson learned from Silicon Valley software startups.

Examples of this sort of space investment are swarms of relatively cheap and small satellites, data manipulation from existing space-based sources, and a growing number of Earth observations companies taking pictures of parking lots and wheat fields from orbit.

These companies have relatively low costs to get to market, and an established customer base here on Earth. They are also great acquisition targets for the aerospace-industrial complex that innovates through

<sup>8</sup> Bryce Space and Technology (2018). *Start-Up Space 2018: Update on Investment in Commercial Space Ventures*. Retrieved from: [https://brycetech.com/downloads/Bryce\\_Start\\_Up\\_Space\\_2018.pdf](https://brycetech.com/downloads/Bryce_Start_Up_Space_2018.pdf)

purchasing. While these companies are a valuable and productive part of the space economy, they are not typical of the NewSpace movement. *Many space companies, and most frontier-enabling technology companies, will never fit into this low-cost, quick-to-exit, Silicon Valley business model.*

Only between 12% and 17% of space companies have received private funding of any kind since the year 2000. Over 250 space companies have received private (non-government) equity investment since 2000, according to Space Angels<sup>9</sup>. Bryce Space and Technology reports that 187 space companies have received private funding over that same span<sup>8</sup>. NewSpace Hub’s database lists over 1,500 space companies across the world<sup>10</sup>, meaning that more than 80% of NewSpace companies remain unfunded by private capital. There simply are not enough space-passionate billionaires to go around.

### NewSpace Race - The Fight for Capital

It is no surprise that the annual volume of investment and number of unique investors in space companies are at all-time highs – space startup ventures are booming in number and are as ambitious as ever, while the eyes of the world are fixated on this new private space race. Still, these new ventures – particularly the pioneers, those chasing frontier-enabling ideas – are facing a rising hurdle. Capital is in high demand, but supply is running thin. A struggle for resources is brewing amongst the most audacious cohort of NewSpace companies while a gap is growing between the summed financial needs of these companies and the extremely limited pool of attainable investor capital. This problem arose due to several variables, including the fundamental nature of space ventures, limitations on investor demographics and cross-border investment activity, and the general space investment network as it stands today.

Space Investing Challenges		
1.	High Risk Ventures	The nature of space ventures means high operational and market risks, correlating directly to high investment risk.
2.	Investment Lifecycle and Liquidity	Space companies often have long development cycles and their markets may take more time to mature than a typical startup.
3.	Scale of Investment	Operating in space is capital intensive and requires long-term, consistent, investment.
4.	Restrictions on Foreign Investment	The United States restricts who can invest in technologies that are sensitive in nature, and this includes many (if not most) space technologies.
5.	Restrictions on Marketing and Investor Outreach	The United States’ securities laws restrict marketing activities around fundraising.
6.	Limited Information and Investment Expertise	The space industry is relatively understudied and there are few investor resources available to provide industry analysis.

#### Challenge 1: High Risk Ventures

The investment gap between frontier-enabling companies and private financiers can be partially attributed to the unique business models and risk characteristics of space ventures. Doing business in space is inherently risky. One of the legacies of the government-funded and national showcase nature of space activities is that an accident during launch, or in space, receives extreme media and public attention. This causes a risk averse approach on the part of institutional backers and a tendency to shy away from such

<sup>9</sup> Patel, Roshan; Kilian, Justus; Space Angels (2018). *Space Investment Quarterly: Q4 2017*. Retrieved from: <https://www.spaceangels.com/post/space-investment-quarterly-q42017>

<sup>10</sup> NewSpace Hub. *NewSpace Hub Analytics*. Retrieved from: [https://docs.google.com/spreadsheets/d/146iMadW9rEy5dTdv\\_vqIs17B3x04qL3Y0Gkl-j0fZ3M/edit#gid=2068114168](https://docs.google.com/spreadsheets/d/146iMadW9rEy5dTdv_vqIs17B3x04qL3Y0Gkl-j0fZ3M/edit#gid=2068114168)



projects on the part of those who are unable to make it through the resulting paperwork, oversight costs, insurance, and restrictions.

Aside from the risks of failed launches, extreme environments, space debris, loss of human life, and lack of secured insurance, companies are attempting to achieve milestones that have never been accomplished before. Additionally, many frontier-enabling companies are working to solve problems that have not yet occurred, to anticipate markets that have not yet formed, and to leverage or support other technologies that are not yet proven. While the payoff of a fully functioning space industrial ecosystem may be limitless, and even the development of one or more verticals could be incredibly profitable, the interlocking nature of these technologies and systems means that they may not all come together in a predictable or timely fashion, greatly increasing market risk. These operational and market risks correlate directly to high investment risk and can be a significant hindrance to raising capital – especially from traditional or non-space-aware investors.

## Challenge 2: Investment Lifecycle & Liquidity

Venture capitalists, the most active space investors, typically structure their funds with the goal of returning capital to their investors within 10 years, although the median fund takes closer to 14 years to liquidate<sup>11</sup>. Due to this fund life cycle constraint, VCs focus on investing in companies that can exit within five to seven years. Frontier-enabling space companies tend to have lengthy technology and customer development timelines, and many of their proposed markets are either developing or not yet formed. A large portion of these companies may need more than five to seven years to start producing revenue, much less be ready for an exit.

Venture capital investments are also illiquid, which is a separate (and significant) problem entirely. Coupling illiquidity with long timelines means a fund investing in space companies could be locking up its capital for much longer than they or their limited partners are comfortable with. As it becomes clear to market observers that NewSpace companies do not exit on traditional timelines (SpaceX and Blue Origin are both nearly 20-year-old private companies, with no discussion of exit events any time soon), the space economy faces an ever-more present risk of investors turning sour to the sector due to a lack of significant near-term exit volume. Current and previous investors may be holding back on further involvement as they wait to see how their existing investments play out.

## Challenge 3: Scale of Investment

Space ventures are not only high-risk and low-liquidity but as discussed above, are also extremely capital intensive. According to Seraphim Capital's Mark Boggett, the average seed round for a space startup is double that of a general tech startup<sup>12</sup>. While changes in technology, access, and processes are driving costs down considerably, there is nothing that can outwit the tyranny of the rocket equation<sup>13</sup>, and access to space will always be more expensive than access to other industries, locations, and innovation platforms. Most of the NewSpace companies that make the news have yearly budgets in the billions and have a voracious need for new capital. There are very few investors who can significantly contribute to such funding needs, and even fewer that can afford to have that capital tied up for decades.

For those NewSpace companies that measure their budgets in tens of millions (of which there are an increasing number), the biggest barrier in capital raising is more to do with consistency of funding and

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<sup>11</sup> Mulcahy, Diane (2015). *The New Reality of the 14-Year Venture Capital Fund*. Retrieved from: <https://www.institutionalinvestor.com/article/b14z9v7hjbt6y/the-new-reality-of-the-14-year-venture-capital-fund>

<sup>12</sup> Foust, Jeff (2018). *'Golden period' for space startup investment continues*. Retrieved from: <https://spacenews.com/golden-period-for-space-startup-investment-continues/>

<sup>13</sup> Pettit, Don (2012). *The Tyranny of the Rocket Equation*. Retrieved from: [https://www.nasa.gov/mission\\_pages/station/expeditions/expedition30/tryanny.html](https://www.nasa.gov/mission_pages/station/expeditions/expedition30/tryanny.html)

commitment for the long-term nature of their projects. While many companies are successful at raising small Seed and Series A rounds, the later and larger funding rounds needed for successful scaling and growth are exceedingly difficult to close, leaving many of these startups floundering at the most critical stage of their development.

**Challenge 4: Restrictions on Foreign Investment**

Even with risks and barriers in mind, many investors across the globe are eager to finance exciting, frontier-enabling ventures – especially American companies. The US has become the beacon for both the concepts of space exploration and space entrepreneurialism, and according to NewSpace Hub, approximately 45% of all NewSpace companies are in the United States<sup>10</sup>. Additionally, the US has the largest national space budget of any country, and over 80% of satellite industry market share<sup>4</sup>.

Even as NewSpace companies begin to sprout up around the globe, the majority are still located in the US – the country with some of the most restrictive regulations regarding foreign investment in technology companies. Unfortunately, this provides a bottleneck, limiting sources of new investment for US space startups and denying non-US citizens a chance to profit from this industry.

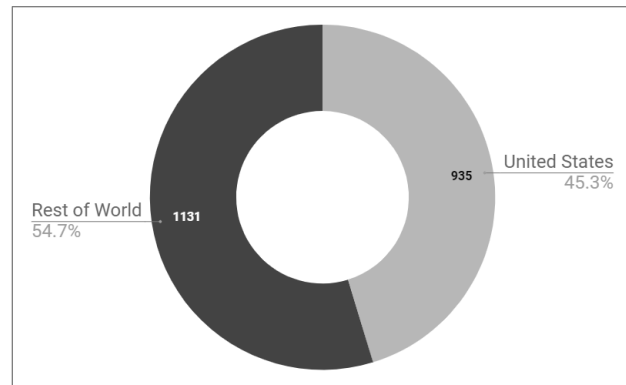


Figure 6: NewSpace Entities in United States vs Rest of World <sup>10</sup>

In August 2018, the Foreign Investment Risk Review Modernization Act (FIRRMA) was signed into law in the US, with the purpose of

“expanding the power of the Committee on Foreign Investment in the US (CFIUS) to scrutinize foreign investments into ‘critical technology’ for national security implications.”

FIRRMA loosely defines what exactly constitutes a ‘critical technology’ company within a list of defined industries, and gives CFIUS jurisdiction over (and the ability to review and reject) any foreign investment that provides the investing party one of the following:

- (1) access to any material nonpublic technical information of the company,
- (2) membership or observer rights on the company’s board or equivalent governing body, or
- (3) any involvement in substantive decision-making of the company, other than through voting of shares<sup>14</sup>.

Foreign investors capitalizing such companies must submit to national-security reviews or face large fines.

The list of affected industries as defined in an October 2018 CFIUS pilot program includes “guided missile and space vehicle manufacturing” and “guided missile and space vehicle propulsion unit and propulsion unit parts manufacturing”<sup>15</sup>. While prior policies affecting US space company investment primarily presented challenges when foreign ownership of a company was at stake, FIRRMA adds a layer of ambiguity for investments even when potential control of the US business is not involved, further disincentivizing foreign investor involvement.

<sup>14</sup> Farrah, Jeff (2018). *Foreign Investment Bill and its Impact on the VC and Startup Ecosystem*. Retrieved from: <https://nvca.org/blog/foreign-investment-bill-impact-vc-startup-ecosystem/>

<sup>15</sup> Cooley (2018). *CFIUS Pilot Program to Require Mandatory Notification of Certain Transactions*. Retrieved from: <https://www.cooley.com/news/insight/2018/2018-10-12-cfius-pilot-program-to-require-mandatory-notification-of-certain-transactions>

In addition to the broad restrictions on foreign investing in technology in the US, some sector-specific laws present additional restrictions. One of the handful of sectors with such laws in place is the defense sector, within which exist many overlaps with the growing NewSpace economy.

"If a government contractor has a facility clearance with the Defense Security Service (DSS) or is registered as an exporter, manufacturer, or broker of defense articles or services under the International Traffic in Arms Regulations (ITAR), then the parties must take steps to comply with those regimes' regulatory requirements before closing a transaction that results in foreign ownership or control of a US business"<sup>16</sup>.

Many companies who do not build armaments are still classified as ITAR restricted today, including most technologies that involve moving things around in space. A healthy portion of space companies work as contractors to defense organizations such as DARPA, US Air Force, or with the US national space agency, NASA – making these companies subject to an additional layer of scrutiny from regulators.

### Challenge 5: Restrictions on Marketing

Another factor influencing the space investor pool is the US restriction on marketing and solicitation of private company investment offerings. As most NewSpace companies are currently based in the United States, these restrictions directly affect these companies' ability to raise capital. The US Securities and Exchange Commission (SEC) imposes significant regulatory and reporting requirements on any 'public' companies. To avoid these onerous and expensive requirements, most companies choose to remain 'private' and fundraise by utilizing an exemption from these requirements. This has the obvious benefit of greatly reducing compliance cost and effort, but also imposes significant restrictions on how companies can fundraise.

Companies seeking exemption from registration during a private offering (as granted under Rule 506(b) of Regulation D of the Securities Act of 1933 – the most commonly used exemption) are not allowed to use general solicitation or advertising of any kind to market their securities<sup>17</sup>. These regulations were put in place after the Great Depression to protect the general public from highly speculative, high risk investments by restricting such opportunities to only 'accredited investors' – those with enough capital to afford taking such risks. The consequence of this is that private companies seeking capital are not allowed to publicly market their investment offerings.

Rather than communicate an opportunity to potential investors via today's preferred communications platforms such as social media, email newsletters, or through the press, companies must instead identify and seek out accredited individuals, investment groups, or funds and then use an individualized outreach approach. This time-consuming process significantly limits the possible investor pool and greatly increases the cost and effort private companies must expend on finding, vetting, and interacting with potential investors.

In 2013, Rule 506(c) granted companies' permission to generally solicit their offerings<sup>2</sup>. However, a few additional requirements were imposed, most importantly that general solicitation is only permissible if a company can verify a potential investor's accreditation status before they invest. In a 506(b) offering, companies can rely on an investors' own attestation of their accreditation status, but under 506(c), companies are required to take additional steps to verify the investor's income and net worth that can be both costly and time consuming. As such, Rule 506 in its current form still presents challenges to space

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<sup>16</sup> Specht, Damien; Capito, Charles; Jenner&Block (2015). *Five Questions Investors and Government Contractors Must Answer Regarding Foreign Investments in The United States*. Retrieved from: <https://jenner.com/system/assets/assets/8992/original/GovContractsAlertOct5.pdf>

<sup>17</sup> U.S. Securities and Exchange Commission (2017). *Rule 506 of Regulation D*. Retrieved from: <https://www.sec.gov/fast-answers/answers-rule506htm.html>

startups who must choose between 506(b) and its restrictions, or 506(c) and its associated complexity and potential costs.

Some platforms, such as AngelList, are attempting to solve this problem by providing an online infrastructure where companies can be introduced to a large pool of accredited ‘angel’ investors. However, the current accreditation and investor validation process used by such companies is highly manual, not scalable, and very US-centric, leaving serious doubts if such a model can provide the type of large-scale investor markets that are needed to fund the next generation of space companies.

**Challenge 6: Limited Industry Information and Investment Expertise**

A further challenge facing the NewSpace investor pool is general information scarcity – the lack of a large network of experienced investors, established investment infrastructure, or reporting and information resources dedicated to the industry. A growing number of investors are interested in NewSpace companies, but most do not have the required science, technology, and market competencies to make sound investment decisions. Without an established network of professionals to rely on for such information, few are brave enough to invest in the highly technical space industry.

This is in stark contrast to other sectors; take artificial intelligence or biotechnology for example, where a quick, targeted internet search will yield hundreds of links to VC funds or angel groups focused specifically on these areas, with significant investing and market expertise to act as intermediaries for interested investors. Additionally, these sectors boast thousands of valuable communities, websites, resources, data analytics, and investment insights, compiled by the large network of individuals with the necessary expertise to provide this information. While space is making strides in this regard, it is not yet there, and as a result, interested investors do not yet have ready access to quality space venture deals, or the means to effectively evaluate them.<sup>18</sup>

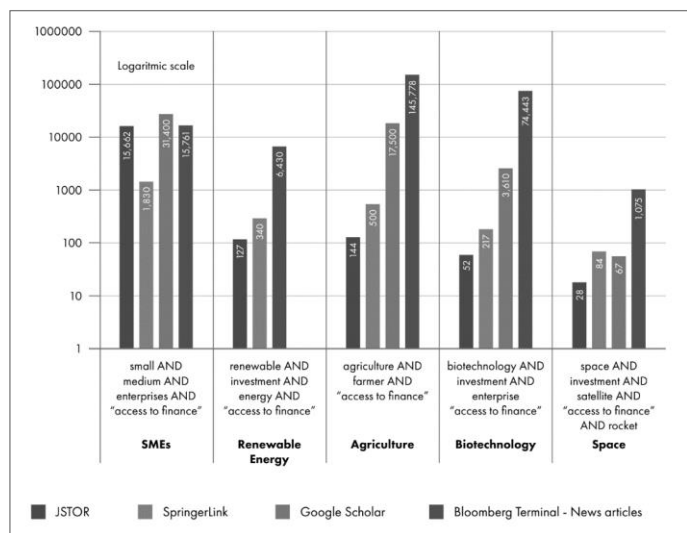


Figure 7: Knowledge Disparity: Space is Comparatively Understudied<sup>18</sup>

Additionally, it must be noted that some of the most high-profile NewSpace company failures - such as XCOR Aerospace (\$25M+ total funding), Kistler Aerospace (\$900M+ total funding), and Teledesic (\$1B+ total funding)<sup>7</sup> – were at least partly due to a lack of astute and knowledgeable oversight. A lack of professional, space-savvy investors leaves these engineering- or personality-driven companies to burn through cash without showing significant progress.

In summation, the NewSpace economy’s growth is being hindered by a lack of access to capital. This lack of available capital is based on the nature of investments in these private companies (capital intensive projects that are both high risk and illiquid), and the limited investor pool to which space startups have access. *New advances in digital financial technologies may help to close this gap.*

<sup>18</sup> Iliev, Yasen; Diaz, Lluc (2018). *Assessment of the Financing Needs of Space SMEs in Europe*. Retrieved from: [https://drive.google.com/file/d/1o9t7MbjYWp\\_o4lIfJTJIOXX7\\_xF1ljB/view?usp=sharing](https://drive.google.com/file/d/1o9t7MbjYWp_o4lIfJTJIOXX7_xF1ljB/view?usp=sharing)

## A Revolution in Finance

During the same period as the space revolution, and in some cases arising from the same roots, there is a revolution underway in the world of legal and financial interactions. This has led to the birth of a rising digital economy that is transforming the way people interact with each other, transfer wealth, and conduct business. The concept of distributed ledgers is best known to the public in the form of blockchain technology and the so-called ‘cryptocurrencies’ like bitcoin and others, that utilize this technology as their backbone. *But far more important than these currencies is the digital, shared, immutable, auditable, public ledger system on which they are based.* This shared ledger is creating new technologies, systems, and processes that are revolutionizing the financial world. Perhaps the most significant of which might be the advent of security tokens – a new digital technology that allows the ‘tokenization’ (or simply, digitization) of ownership claims.

### Security Tokens

Security tokens are digital assets subject to federal securities regulations. Simply put, they are the intersection of digital financial technologies and traditional financial products - new technology improving existing processes. While cryptocurrencies like Bitcoin are considered ‘programmable money,’ security tokens provide ‘programmable ownership’<sup>19</sup>.

A security token is a digital representation of a real-world asset and can function in the same way as stock, representing an ownership interest in a physical item such as real estate, fine art, or anything else that can be owned. Security tokens can also represent shares of a company, LP interest in a fund, or member shares in an LLC. This allows something that is traditionally done on paper (investment agreement) to be put into an ‘electronic wrapper.’ A good comparison is the difference between snail mail and email: someone can write a letter, mail it, and wait a few days, or they can send the same information instantly via email. The content is identical, but the ‘electronic wrapper’ means the content can now be transmitted faster, cheaper, and easier. Security tokens provide this ‘electronic wrapper’ for investor agreements and stock certificates<sup>20</sup>.

These digitized ownership claims have significant benefits over their paper counterparts, including improvements in how these assets are held, traded, and sold, as well as regulatory compliance. Companies can issue tokens to interested investors while adhering to the same rules and regulations as paper-based share transactions. Soon, online exchanges will provide a central location where accredited investors can then buy, sell, and trade these tokens on secondary markets with minimal time, expense, and difficulty.<sup>21</sup>

Security tokens use smart contracts to encode all the information traditionally found in an investment or partnership agreement. A smart contract is a computer protocol intended to digitally facilitate, verify, or enforce the negotiation or performance of a contract. Smart contracts allow the performance of credible transactions without third parties, and these transactions are auditable and irreversible.<sup>22</sup> *With these smart contracts implementing transfer restrictions and offering built-in regulatory compliance, investors can be confident in the ability to sell their tokens at any time, without lawyers, brokers, or other rent-seeking intermediaries.*

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<sup>19</sup> Pompliano, Anthony (2018). *The Official Guide to Tokenized Securities*. Retrieved from: <https://medium.com/@apompliano/the-official-guide-to-tokenized-securities-44e8342bb24f>

<sup>20</sup> Marinova, Polina (2018). *What Is a Security Token? Harbor's CEO Explains*. Retrieved from: <http://fortune.com/2018/05/18/security-token-harbor-ceo/>

<sup>21</sup> Dhillon, Sunny (2018). *Security tokens will be coming soon to an exchange near you*. Retrieved from: <https://techcrunch.com/2018/08/28/security-tokens-will-be-coming-soon-to-an-exchange-near-you/>

<sup>22</sup> Wikipedia. *Smart Contract*. Retrieved from: [https://en.wikipedia.org/wiki/Smart\\_contract](https://en.wikipedia.org/wiki/Smart_contract)

Said differently, security tokens reduce the immense transaction costs associated with highly regulated activities while also improving transparency, thus reducing risk and improving liquidity.

It is important to note, that as regulated securities, in most jurisdictions security tokens will have legal constraints on who can trade which types of assets. Broadly speaking, this includes Know Your Customer (KYC) and Anti-Money Laundering (AML) validation status, restricted transfers depending on the type of investor, lockup periods, limits on size and volume of transactions, etc.<sup>23</sup>

Security tokens are often misconstrued as being the same as utility tokens and ICOs. While both security tokens and utility tokens are digital representations of value, they represent completely different things. Utility tokens are company-issued digital vouchers that can be redeemed for a company's product or service in the future. A utility token is essentially a pre-purchase of future services and behaves in much the same way as a coupon or gift certificate.

In the past several years there has been a huge surge in companies raising money by selling utility tokens in an "Initial Coin Offering" (ICO). In 2017 over \$6B was raised for 371 ICOs, and as of this writing in Q4 2018, over \$20B has been raised for 789 ICOs<sup>24</sup>. For comparison, during 2017, 200 companies IPO'd in the US raising \$51B, and 1,624 companies worldwide raised \$188B through an Initial Public Offering of stock<sup>25</sup>.

However, many companies have marketed ICOs that are not actually utility tokens but represent company ownership according to the Howey Test<sup>26</sup>. Some of these companies used ICOs in a purposeful attempt to bypass securities regulations, and several high-profile frauds have garnered significant attention from regulators in the US and worldwide. As a result, most coin exchanges have now banned trading of these unregulated securities, the U.S. Securities and Exchange Commission (SEC) is issuing notices and warnings to companies that don't comply with regulations, and criminal charges have been filed against companies for defrauding investors<sup>27</sup>. In July 2017 the SEC issued an investor alert warning the public to be wary of unsolicited offers and unbelievable claims in ICOs<sup>28</sup>.

Security tokens have been designed to solve these issues.

Security tokens do not avoid government regulations or disguise fraudulent transactions. Instead, these digital shares provide a fully-regulated and compliant opportunity for companies to legally and transparently raise capital through the sale of company ownership. This digital stock is based on blockchain technology and smart contracts in much the same way as utility tokens, but *security tokens have been designed to work within current US regulatory environments, providing the benefits of both digitization and compliance.*

According to Clay Collins' Flippening podcast, "Tokenize the World: A Tokenized Securities Documentary," the primary benefits of security tokens are:

- Increased liquidity and market depth
- Control for security owners
- Increased liquidity options for through peer-to-peer exchange and decentralized exchanges

<sup>23</sup> Finhaven (2018). *Compliance for Security Token Issuance and Trading*. Retrieved from: <https://static1.squarespace.com/static/5a540a02d0e6288264f86118/t/5af63d861ae6cf80fc058e76/1526087047994/finhaven+technical+white+paper.pdf>

<sup>24</sup> CoinSchedule. *Cryptocurrency ICO Stats 2018*. Retrieved from: <https://www.coinschedule.com/stats.html>

<sup>25</sup> Ernst & Young. *Global IPO trends: Q4 2017*. Retrieved from: [https://www.ey.com/Publication/vwLUAssets/ey-global-ipo-trends-q4-2017/\\$FILE/ey-global-ipo-trends-q4-2017.pdf](https://www.ey.com/Publication/vwLUAssets/ey-global-ipo-trends-q4-2017/$FILE/ey-global-ipo-trends-q4-2017.pdf)

<sup>26</sup> Investopedia. *Definition of 'Howey Test'*. Retrieved from: <https://www.investopedia.com/terms/h/howey-test.asp>

<sup>27</sup> Buhr, Sarah (2017). *The SEC has charged two initial coin offerings with defrauding investors*. Retrieved from: <https://techcrunch.com/2017/09/29/the-sec-has-charged-two-initial-coin-offerings-with-defrauding-investors/>

<sup>28</sup> U.S. Securities and Exchange Commission (2017). *Investor Bulletin: Initial Coin Offerings*. Retrieved from: [https://www.sec.gov/oiea/investor-alerts-and-bulletins/ib\\_coinofferings](https://www.sec.gov/oiea/investor-alerts-and-bulletins/ib_coinofferings)



- Removal of rent-seeking intermediaries and associated reduction in cost and time of trades
- Automatic maintenance of the cap table for private companies
- Cap table analytics for public companies
- Allow for fractional ownership of many different types of assets
- Reduced trade settlement times from days to minutes<sup>29</sup>

### Liquidity Benefits of Security Tokens

Finance experts and economists have long discussed and researched the concept of the “illiquidity discount” – the reduction in the price of assets that have limited tradability. The magnitude of the illiquidity discount varies across investments, with riskier investments bearing larger illiquidity discounts, and across time, with the discounts being greatest when the overall market itself is least liquid. With private companies, the illiquidity discount can be as high as 80% for early stage businesses<sup>30</sup>. This represents a significant amount of value that can be unlocked with the adoption of security tokens. The combination of tokenized, digital assets and markets in which to trade them can significantly reduce frictions to trade and thereby reduce the illiquidity discount substantially<sup>31</sup>.

However, it is important to note that the mere act of tokenizing an asset does not impact liquidity. Improved liquidity comes from increased market depth - more participants and more trades. Tokenization enables these deeper markets because tokens are faster, cheaper, and easier to trade than paper stock. As security token exchanges come online<sup>32</sup>, the market for these tokens will continue to deepen as permitted investors from around the world participate in these regulated digital marketplaces. These exchanges will open an entirely new marketplace for private stock, with the potential for millions of new market participants in the coming years.

Traditionally, for a private company’s stock to have this type of liquidity the company would need to engage in an Initial Public Offering (IPO), which can cost \$10 - \$30M and can take more than two years to complete<sup>33</sup>. Security Token Offerings (STOs) on the other hand, cost a few hundred thousand dollars and can be completed in weeks, not years. Although STOs will not allow companies to reach the same size of market or types of investors as a public offering, tokenized ownership is a significantly less-costly and faster opportunity for companies to reach a much wider pool of investors than is possible without this digitization<sup>34</sup>.

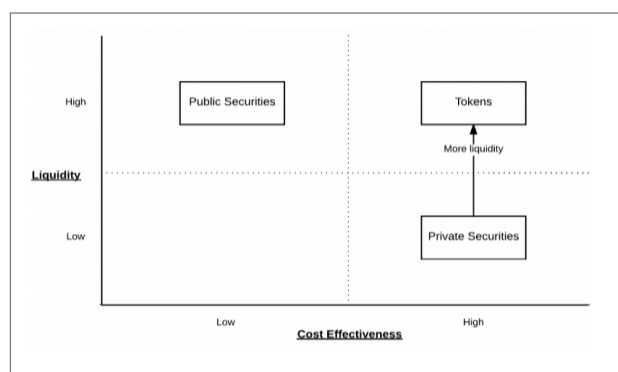


Figure 8: Liquidity vs Cost Effectiveness of Securities and Tokens <sup>32</sup>

<sup>29</sup> Collins, Clay (2018). *Tokenize the World: A Tokenized Securities Documentary*. Retrieved from: <https://blog.nomics.com/flipping/security-token-documentary/>

<sup>30</sup> Damodaran, Aswath (2005). *Marketability and Value: Measuring the Illiquidity Discount*. Retrieved from: <http://people.stern.nyu.edu/adamodar/pdfiles/papers/liquidity.pdf>

<sup>31</sup> McKeon, Stephen (2017). *Traditional Asset Tokenization*. Retrieved from: <https://hackernoon.com/traditional-asset-tokenization-b8a59585a7e0>

<sup>32</sup> Sameeh, Tamer (2018). *An Overview of Security Token Exchanges Expected to Launch in 2019*. Retrieved from: <https://www.cointelligence.com/content/security-token-exchanges-launch-2019/>

<sup>33</sup> PricewaterhouseCoopers (2017). *Considering an IPO to Fuel your Company’s Future?* Retrieved from: <https://www.pwc.com/us/en/deals/publications/assets/cost-of-an-ipo.pdf>

<sup>34</sup> Remeika, Bob; Amano, Arisa; Sacks, David (2018). *The Regulated Token (R-Token) Standard*. Retrieved from: <https://harbor.com/rtokenwhitepaper.pdf>

### Transparency Benefits of Security Tokens

The smart contracts and immutable blockchain ledger at the core of *security token technology* allow the *encoding of logic and law into transactions*. The fact that these digital securities exist on the immutable blockchain ledger means that any ownership and movement of tokens can be tracked, verified, audited, and reported with perfect accuracy and unlimited frequency. This additional transparency will also increase the value of these tokens by providing a hedge against many of the information and transparency risks of investing in private companies.

### How Security Tokens Can Solve the Biggest Barriers to Space Investing

One of the most significant barriers to success for the space industry is access to capital. As discussed prior, capital is restricted due to both the nature of space ventures (being high-risk, low-liquidity, capital-intensive investments), and the limited size of the investor pool (because of marketing restrictions and international control concerns in the US). Security tokens provide a viable solution to some of these concerns and could open a new and extremely large pool of capital to this growing industry.

#### Near-term Liquidity

Security tokens provide the increased liquidity needed to open space investing to the world. Importantly, security tokens can be issued much earlier in a company’s lifecycle than an IPO, which is especially useful for space companies who may need more time to reach a typical exit event. Security tokens should, ideally, be issued during a company’s growth stage, providing an opportunity for a wider group of investors to participate in the high-growth phase of these companies, and providing a reasonably-timed exit for early Seed and Series A round investors.

This may be especially valuable to companies endeavoring to participate in audacious goals like asteroid mining, Moon projects, or human spaceflight initiatives – projects that can capture the imagination of a wide pool of investors, even if they may take more than a decade to complete. Without the challenge of illiquidity, many more investors will be willing to financially support in these frontier-enabling companies, knowing they do not have to keep their investment tied up for the entire duration of the project.

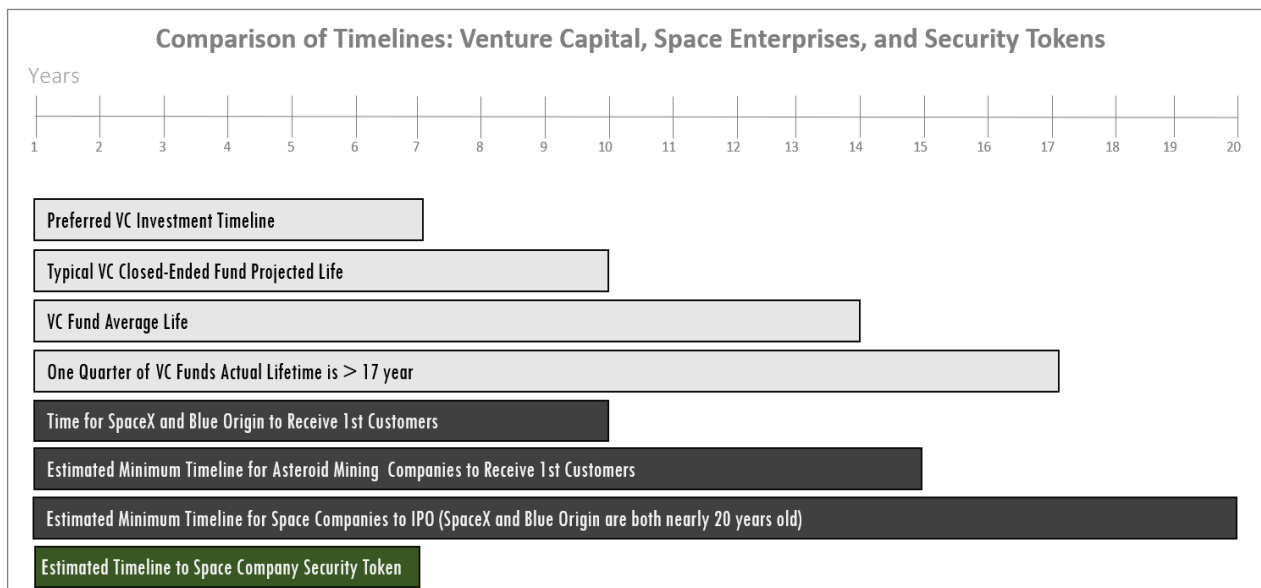


Figure 9: Comparison of Timelines: Venture Capital, Space Enterprises, and Security Tokens



### Increased Investor Pool

The smart contract technology that forms the basis for security tokens will also provide an additional function that solves a previously mentioned problem unique to the space industry – restrictions on foreign ownership. Companies can use these smart contracts to prevent tokens from being traded in certain restricted jurisdictions, or to restrict certain types of foreign transfers or control.

Global online exchanges for security tokens will create a network of thousands, and eventually millions, of interested investors<sup>21</sup>. For the first time, space companies will be able to reach the large number of accredited individuals, small investment firms, and other geographically diverse investors who would be too expensive and time consuming to reach out to on an individualized basis.

Space Investing Challenges		Security Token Solutions
2.	Investment Lifecycle and Liquidity	Near-term liquidity through reduced friction to trade and ‘built-in’ regulatory compliance.
4.	Restrictions on Foreign Investment	Increased transparency and prevention of unauthorized trades.
5.	Restrictions on Marketing	Planned global exchanges with digitized KYC/AML may provide a large pool of accredited investors in a single location.

### Limitations of the Security Token Model for Space Investing

Security tokens provide an exciting potential solution to the space industry’s need for capital, but there are additional challenges that are unique to security tokens that must be addressed. While security tokens provide space companies the most comprehensive solution currently available to deal with international investing, a rapidly shifting policy landscape in the United States provides ongoing risk and uncertainty with regards to international investments in US companies with ‘restricted’ technology. Additionally, countries outside the US are also changing international investment policies as trade wars play out on a global stage. While security tokens can encode today’s laws and restrictions and are updateable over time to account for securities regulations changes, they cannot provide investors with a hedge against the uncertainty of changing and volatile international investment regimes such as FIRRMA and CFIUS.

Although security tokens will certainly provide a larger, deeper market for private securities, in most cases this market will still be limited to ‘accredited’ or ‘permitted’ investors due to the restriction of SEC ‘exemptions’, such as Reg D. In the United States, accredited investors include anyone who has an income of greater than \$200,000 (or \$300,000 with a spouse) or has a net worth over \$1 million<sup>35</sup>. According to estimates from Seeking Alpha, in 2016 approximately 9.86% of American households were accredited<sup>36</sup> meaning less than 10% of Americans could participate in a security token offering for a private company that is restricted to only accepting accredited investors. International investors will need to be permitted based on the regulations in their home country. There are no cross-border international investor accreditation standards, although many (if not most) developed countries have definitions that are roughly equivalent to (or at least serve the same purpose as) the United States’ “accredited” status<sup>37</sup>.

<sup>35</sup> SEC Office of Investor Education and Advocacy. *Investor Bulletin: Accredited Investors*. Retrieved from: [https://www.sec.gov/files/ib\\_accreditedinvestors.pdf](https://www.sec.gov/files/ib_accreditedinvestors.pdf)

<sup>36</sup> Seeking Alpha (2017). *How Many Accredited Investors Are There in America?* Retrieved from: <https://seekingalpha.com/article/4121810-many-accredited-investors-america>

<sup>37</sup> Wikipedia (2018). *Accredited Investor*. Retrieved from: [https://en.wikipedia.org/wiki/Accredited\\_investor](https://en.wikipedia.org/wiki/Accredited_investor)

Limitations of Security Tokens for Space Investing		
7.	Potential for Fraud	The low-cost and ease-of-use of security tokens may allow bad actors to participate and fraudulent activities to occur.
8.	Company Stage	Early stage startups have extremely high failure rates and if startups attempt to fundraise with this method at very early stages, there may be correspondingly significant risk of loss when investing in security tokens.
9.	Secondary Market Depth	While many online exchanges are expected to launch in the coming months, it is unknown how many investors will participate in these exchanges and how quickly these communities will grow.

### Challenge 7: Potential for Fraud

As mentioned above, security tokens are both easy and inexpensive to create, which is excellent for companies. However, this could potentially pose problems for investors. With such low barriers to entry for tokenization, anyone with the necessary know-how and financial resources can create and offer a security token for sale. This has also been a problem in the ICO market, with thousands of new ICOs and minimal direction for investors to determine which companies are legitimate investment opportunities. Although security tokens provide safety to investors through regulation-compliance, the security token model does not ensure sound investments. Without the high cost, slow, regulation- and intermediary-heavy IPO process to weed out fraudulent investments, investors in security tokens will need to be wary of potential scams and frauds in the marketplace.

### Challenge 8: Company Stage

Because there are no restrictions on the type, age, or earnings bracket for companies that can create and sell security tokens, it is highly likely that very early-stage, pre-revenue companies will attempt to offer security tokens to raise the equivalent of a Seed or Series A round of financing. This could be disastrous for the security token market as the risk of failure in such companies is extremely high, regardless of industry. According to CB Insights, “70% of upstart tech companies fail — usually around 20 months after first raising financing... For consumer hardware startups, the stats are especially brutal, with 97% of seed or crowd funded companies eventually dying or becoming ‘zombies’”<sup>38</sup>.

Ideally, security tokens should be utilized for companies with proven products in proven markets, who need investment to scale rapidly to meet market demand. Within the private equity markets, these growth-stage companies provide the best possibility of return with the lowest risk. Additionally, by the time a company reaches this growth stage, the business is mature enough to have years of financial, market, and operating data, providing investors with the information they need to make sound investment decisions. Yet in a decentralized market there is no method to restrict STOs to these types of companies, potentially exposing investors to the much higher risk of failure associated with early-stage companies.

### Challenge 9: Secondary Market Depth

The tradability of security tokens depends on the transparent and compliant operation of exchange platforms where these tokens can be traded in secondary markets. In the United States and internationally, several organizations have already launched online exchange platforms and several more are scheduled to

<sup>38</sup> CB Insights (2018). *269 Startup Failure Post Mortems*. Retrieved from: <https://www.cbinsights.com/research/startup-failure-post-mortem/>

launch within a few months. Some of the top industry players include Open Finance Network, Blocktrade.com, Binance (in a partnership with the country of Malta), tZero, Bancor, and BnkToTheFuture. Furthermore, in 2019 new security token exchanges are expected from the Gibraltar Stock Exchange, Coinbase, Templum, SharesPost, the Australian Securities Exchange, the SIX Swiss Exchange, and the London Stock Exchange<sup>32</sup>.

Nevertheless, these exchanges are not yet populated with investors, as security tokens are still relatively new and unknown by the wider investment community. While there is reason to believe that many blockchain-savvy investors will quickly join these exchanges, it is yet to be seen how the rest of the financial market ecosystem will react to these new exchanges, or how long it will take to achieve a large and frictionless-enough market to provide the liquidity promised by security tokens.

## The SpaceFund Solution

SpaceFund has brought together these revolutions in NewSpace and digital financial technology by building a renaissance team of leaders in the space, finance, and blockchain communities. This team is bridging the gap between visionary, frontier-enabling space companies, and the large pool of accredited investors who will benefit from the liquidity and transparency of security tokens. SpaceFund's model for space investing utilizes the best practices from venture capital and tokenization to provide significant benefits to investors and the frontier-enabling companies who need their support.

The model is based on a traditional venture capital limited partnership, utilizing a highly specialized General Partner (GP) to create value for Limited Partner (LP) investors by building and growing revolutionary space companies. However, SpaceFund is also tokenizing interest in the fund, providing investors with the groundbreaking combination of near-term liquidity and informed investing in a diversified space portfolio.

As the SpaceFund team builds a portfolio of the most important companies of this generation, they will help these revolutionary companies tokenize their offerings as well – providing a leverage point for the tokenization of space. This model will allow SpaceFund to produce liquidity events for early stage investments well within the 10-year life of the fund, providing confidence that the fund will liquidate on time, even while it invests in frontier-enabling technologies. By aggregating investor capital into a single pool, SpaceFund can provide funding security for capital intensive projects, allowing companies to focus on building the future instead of expending valuable time and resources on continuous, difficult fundraising.

The team has deep ties to and partnerships with the leading tokenization platforms, exchanges, and service providers, giving SpaceFund a robust internal ecosystem for the tokenization of portfolio companies. This also puts SpaceFund in the unique position to help drive interest in space security tokens through thought leadership, a deep partnership network, and the listing of SpaceFund tokens across multiple international platforms. This will increase market depth for space security tokens well before portfolio companies need it. Additionally, when SpaceFund helps a portfolio company tokenize, investors can have confidence that these more mature, growth-stage companies are successful, well-run, legitimate investment opportunities and that the tokens being offered will be secure and highly tradable.

The SpaceFund model also helps mitigate the high risk of investing in restricted technologies across borders. While security tokens can help implement transfer restrictions and enforce regulations, tokens cannot help companies and investors navigate the intricacies of foreign investment restrictions that are specific to the space industry. SpaceFund is uniquely situated to help solve this problem as:

*“investments by a foreign person in a US business indirectly through an investment fund are excluded”*

from CFIUS oversight (and the corresponding FIRRMA regulations) if the investment fund is managed by a US general partner<sup>39</sup>. This exemption highlights the traditional venture capital structure as an increasingly important means to secure foreign investment for space companies post-FIRRMA. SpaceFund has the capability to utilize this exception to significantly increase the space investor pool to include international participants. Additionally, the SpaceFund team has the experience, expertise, and personal relationships necessary to navigate the nebulous world of CFIUS reviews and ITAR restrictions, providing investors with the confidence that both they and the portfolio companies will always be in compliance with these regulations.

SpaceFund firmly believes that tokenization will continue to open investment opportunities to new types of investors. While this first step in tokenization, the STO of SpaceFund One, is only open to qualified investors, the implementation of digital securities will eventually allow others to participate as well. And as the token economy continues to grow and mature, this team will continue to develop and implement safe and regulatory compliant investment offerings that increase the numbers and types of investors who can participate in, and profit from, the opening of the frontier.

SpaceFund has brought together the unique combination of expertise needed to open space to new markets of investors and create the financial leverage point to open the high frontier to free enterprise. This combination of a deep understanding of these two disparate fields, tokenization and the space industry, allows SpaceFund to solve the decades-old problem of funding the frontier.

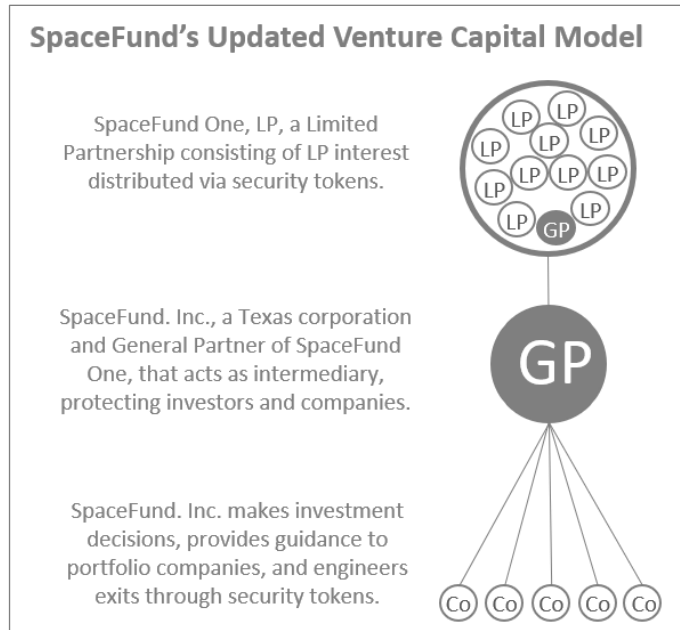


Figure 10: SpaceFund's Updated Venture Capital Model

<sup>39</sup> Holbrook, Richard; Holleyman, Robert; Crowell & Moring LLP (2018). *The 2018 CFIUS Amendments: Ten Questions Venture Capital Fund Managers and Investors Need to Answer*. Retrieved from: <https://www.lexology.com/library/detail.aspx?g=3e97cb40-60f7-4438-b10e-feb9a8f87dfa>

Space Investing Challenges		SpaceFund Solutions
1.	High Risk Ventures	SpaceFund’s model helps mitigate investor risk in two important ways: (1) Providing investors with diversification across up to 30 companies with a single investment and (2) Providing investors with confidence that the selected investments are of the highest quality due to SpaceFund’s specialized expertise and extensive deal flow network.
2.	Investment Lifecycle and Liquidity	SpaceFund provides near-term liquidity to investors through tokenized LP interest, and portfolio company liquidity through tokenization of their offerings within 5-7 years. This model successfully de-couples space company life cycles from traditional investment life cycles of VCs, providing significant benefit to both investors and companies.
3.	Scale of Investment	By aggregating investor capital into a single pool, SpaceFund can support capital intensive business models and provide project funding certainty. This funding certainty, combined with a realistic, near-term exit opportunity through tokenization will allow companies to diligently work towards the most productive and profitable business models for the frontier, without having to contort their plans or reimagine their technology to fit within restricted or short-term budgets.
4.	Restrictions on Foreign Investment	SpaceFund’s traditional US venture capital structure and Texas-based General Partner allows it to take advantage of the VC-specific carve-out to protect international investors and portfolio companies from CFIUS and FIRREA regulations and interference.
5.	Restrictions on Marketing and Investor Outreach	With deep ties to the blockchain community, SpaceFund can offer additional marketing through its networks and partnerships with exchanges. SpaceFund will also be working to develop a deep network of space-interested investors, providing portfolio companies with a ready market for their token offerings.
6.	Limited Information and Investment Expertise	The SpaceFund team helped create this industry and have unparalleled insider access. They have the technical and market knowledge, and access to the most promising and high-value projects.
Security Token Challenges		SpaceFund Solutions
7.	Potential for Fraud	Through in-depth diligence, incubation, and reputation SpaceFund will create a portfolio of trusted space investment opportunities.
8.	Company Stage	SpaceFund can shepherd startups through their most high-risk phases, tokenizing companies only once they reach growth stage, providing investors with confidence that the portfolio companies SpaceFund tokenizes are mature and stable.
9.	Secondary Market Depth	SpaceFund will help develop secondary markets through marketing, PR, and education about the space industry, informing investors about exciting new opportunities to participate in the NewSpace, and pulling investors onto the platforms of SpaceFund’s exchange partners.

## The Space Revolution May be Tokenized

As has been shown in this paper, there is a new space revolution underway. It is audacious and visionary, with nothing less than a transformation of human society as its goal. Its leaders and creators range from the richest people on the planet to some of the smartest minds and entrepreneurs in the world. This space revolution also promises to deliver incredible new technologies, intellectual property, and wealth to those who get involved – especially in its' early stages.

All of the challenges detailed in this paper have caused a severe shortage in funding for what might be tomorrow's breakthrough space technologies and IP. This has left the field to be dominated by a few extremely wealthy investors who have the vision, the funds, and the ability to dedicate those funds over long time periods to reach success.

These are the challenges that SpaceFund solves, and the opportunities that SpaceFund unlocks. By combining the insight and knowledge of founding insiders from the NewSpace industry with the insight and knowledge of those who helped create the concept of tokenized assets, SpaceFund opens space to new investors and brings new capital to the brilliant and disruptive space startup community.

Thus, SpaceFund brings together two of the most important revolutions of the modern era, combining NewSpace with digital financial technologies. SpaceFund is curating a global community of those who believe the future can be better than the present and are willing to provide their dedication and resources to make it happen. Together, this community will begin to realize the dreams of those who first took those great steps into the sky. The promise of space can at last be realized and the airlock to the frontier can be opened to the people of Earth.

You can join the community at: [SpaceFund.com](https://SpaceFund.com)

## Acknowledgements

The authors would like to show gratitude to David A. Johnston, Roland Hicks, Andrew Yashchuk, Pradyuman Vig, Michael Laine, and Aaron Pagel for their invaluable feedback and contributions.