Investing in space: Stairway to heaven?

The numbers are impressive. 2021 was a record year for investment in the satellite and space segment. According to a report issued by Space Capital, venture capital firms invested more than US$17 billion into 328 companies and the private investment market poured close to $15 billion into the segment in Q4, with a total of $46.3 billion invested across all space technology stacks. The question is: who will win and who will lose?

Crispin Littlehales, Global Contributing Editor, Satellite Evolution Group

In 1962, AT&T along with Bell Telephone Laboratories, launched Telstar 1 to transmit television signals across the Atlantic Ocean. Seven years later, Neil Armstrong set foot on the moon. Fast forward 52 years and we have a global space economy valued at more than US$447 billion, according to the Space Foundation, a non-profit advocacy group. Financial services giant, Morgan Stanley, recently reported that the industry could generate more than US$1 trillion in ten to twenty years. With such a high-flying trajectory, it is no wonder the satellite and space sector has become a hot spot for investment (See Figure 1).

"Space used to be viewed by investors as too esoteric, too intangible, too risky, but all that has changed," notes Dara Panahy, a partner at Milbank LLP (a law firm) who advises satellite and space companies on finance, corporate, commercial, and regulatory matters. "The sector is no longer driven solely by civil and government requirements and contracts that limit participation to a privileged group of companies. The barriers to entry have been lowered. We have experienced a long period of economic expansion and growth whereby capital has become available for pre-revenue commercial and start-up space business companies," he explains. "It is currently possible for two smart people with a business plan to have a chance of getting a new product or service into the marketplace."

"The changes in the space sector that I think are really exciting to investors have to do with miniaturized low-cost satellites made from the same components that go into your mobile phone; rockets that are reusable; and the new digital infrastructure in the sky that's providing this constant stream of data and connectivity," comments James Bruegger, Chief Investment Officer for global space technology investment firm, Seraphim Space. "There has been such a profound change in the dynamics of the sector, and this has led to a spawning of thousands of entrepreneurs from around the world who are looking to innovate in an entirely new way."

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Then, too, in July 2021, we witnessed a couple of the most successful entrepreneurs of our time, Sir Richard Branson, and Jeff Bezos, fly into space. Although Elon Musk remained on the ground, his contributions to the satellite and space segment are unparalleled. "One cannot overlook the importance of three of the most high-profile entrepreneurs pouring very significant amounts of their own money into realizing their space ambitions," declares Bruegger. "They added a halo to the industry that accelerated the investment phenomenon," adds Panahy.

Indeed, 2021 was the first time that the public markets started to broadly recognize the investment potential of the industry. Some 13 companies in the segment went public using a mechanism called a special purpose acquisition company (SPAC) that is created solely to raise capital from an initial public offering (IPO) to acquire or merge with an existing company. While there are pros and cons to this approach, it can be an effective means for raising funds and increasing visibility. Dozens of other startups received major backing from venture capitalists, giving them not only a longer runway but also expert guidance to achieve profitability (see Table 1)

Cheryl Chan, Group Chief Strategy and Sustainability Officer for ST Engineering Is responsible for finding

Cheryl Chan, Group Chief Strategy and Sustainability Officer, ST Engineering ●●●

James Bruegger, Chief Investment Officer, Seraphim Space ●●●

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companies that augment the Group's businesses. "Our aim is to build successful, collaborative relationships with our startups, where we take a minority stake and collaborate with them, combining technologies and expertise to co-create breakthrough solutions," she says. "Our startups have the opportunity to integrate into our global business ecosystems, networks and distribution channels, as well as to tap into our expertise and resources."

EYES TO THE SKY... AND TO THE GROUND

"The industry will continue to grow as long as there is a human race," states Christopher Stott, Founder and Executive Chair of ManSat LLC. "Space is providing a most necessary service to all the world and that is data in the form of communications, remote sensing and more."

There are more than 4,500 active satellites orbiting our planet. The demand for connectivity and capacity is rising at a dramatic rate across the board. Chan states, "The satellite industry is on the cusp of the biggest evolution in its history given new mega-constellations with terabit levels of capacity and the software-defined satellite payloads that can be dynamically reconfigured to specific use cases.

At the same time, we're witnessing massive transformation in telecommunications with the introduction of 5G. This creates new possibilities and opportunities." Chan believes that the ground segment sits at the intersection of space assets and 5G and is critical to the orchestration and allocation of space resources so that satellite, terrestrial and wireless solutions can improve the speed, sale, cost, and flexibility of satcom service delivery.

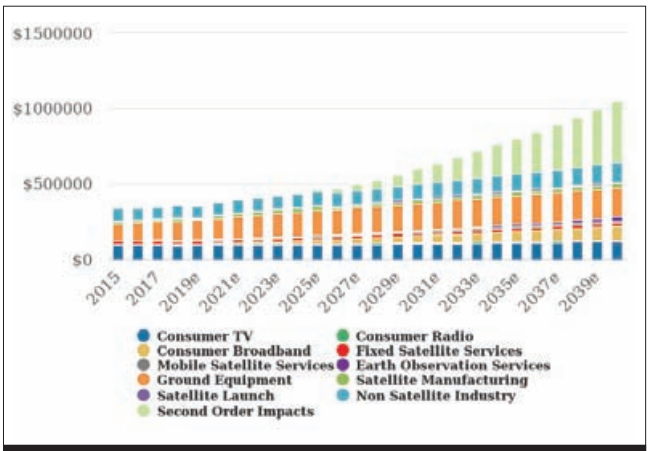


Figure 1. The Global Space Economy ($t). Image courtesy of Haver Analytics, Morgan Stanley Research forecasts ●●●

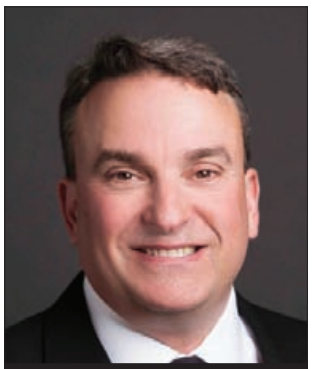
Dr. Leslie Klein, who founded C-COM Satellite Systems, Inc. 25 years ago, asserts that the world is now waking up to the business opportunity of delivering bandwidth. "There are well over three billion people who are not connected," he observes. "This presents enormous potential and is a huge untapped market for satellite and ground equipment manufacturers." Bruegger takes ubiquitous connectivity one step further. "For all those people to get online, to learn, to communicate, and to transact has massive potential to help eradicate poverty," he contends.

Another area that is blasting off is Earth observation and analytics. "Anything that can enable users to acquire wealth is key," says Panahy. "Let's say you are an investment bank, and you want to understand the investment potential of a certain mine in South Africa. Data that could allow you to see how much ore is being extracted from the mine, how many trucks are transporting the ore, or how much ore is being offloaded as a transit hub would be invaluable."

Satellites providing high-fidelity imagery in close to real-time are also instrumental in improving life on Earth and that is a game changer according to Panahy. "We can do a lot from space—manage risk, improve agriculture, monitor climate change, and track weather more accurately," he points out. "That means that we can provide notice about when a hurricane is coming much earlier and that will most certainly save lives."

The potential is certainly there, but so, too, are the risks. With so many companies entering the game, some will inevitably fail. Many of the so-called space SPACS have already seen their share prices drop (See Table 2).

"It takes a long time to develop products and it takes a lot of money," says Klein, who knows from experience. C-COM has more than 8,500 antennas deployed in 106 countries on all continents. The company's latest product, a phased array antenna, took five years to develop. "Many companies will need to borrow money and they will spend



Christopher Stott, Founder and Executive Chair of ManSat LLC ●●●

Dara Panahy, a partner at Milbank LLP ●●●

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hundreds of millions of dollars on products that may not ultimately succeed."

SURVIVAL OF THE FITTEST

Throughout its sixty-year history, the industry has seen some spectacular failures. Some, like the Challenger disaster in 1986, or the disintegration of the Columbia space shuttle, delivered an emotional as well as financial blow. Others, like the US$5 billion Iridium/Motorola constellation, caused one of the largest bankruptcies in US history.

Even the day-to-day business of getting satellites into orbit can be problematic. On February 9, 2022, just a few days after launching 49 of its newest Starlink satellites, SpaceX reported that as many as 40 of them were prevented from entering orbit by a geomagnetic storm and would soon burn up in Earth's atmosphere. Similar catastrophes loom in our future as the next solar maximum is expected in 2025.

Investment in the satellite space segment requires due diligence and a whole lot of patience. "The trick is to make sure that the technology is not a pipe dream, not vaporware," says Klein. "There are a lot of promises being made in the satellite arena that will never materialize," he warns. "Who will make it and who will be the living dead?"

Bruegger affirms, "I think anyone who is looking to invest in any space-based business that's intending to put things into orbit needs to be cognizant of how those businesses evolve. You've got to develop your technology, test it in orbit and then you need to deploy a constellation to actually deliver some form of service or product or revenue."

Christopher Alfenito, Director of Marketing and Sales for Modular Devices, observes, "Raising money is one thing, it's another to make it work and pay the investors back with interest." In the forty-plus years that he's been in the business, he's seen it all. "Without a solid business model and a plan, it's hype. There needs to be a path forward for eventual success, even if it is a steep and difficult climb to the top."

Because the industry is both highly competitive and constantly evolving, Chan believes it is essential to forge synergistic partnerships. "ST Engineering iDirect has a keen knowledge of end-consumer challenges, as well as strong market access – something many start-ups do not have.

INVESTMENTS, TRANSACTIONS, AND CONSOLIDATION IN SATELLITE/SPACE SEGMENT IN 2021

Space SPACs

At least thirteen space companies announce or close merger transactions with special purpose acquisition companies to become publicly traded, producing a collective valuation of approximately US$26 billion: Arqit, AST SpaceMobile, Astra, BlackSky, Momentus, Planet, Redwire, Rocket Lab, Satellogic, Spire, Terran Orbital, Tomorrow, and Virgin Orbit.

VC Investments

A record year for venture capital investments in space start-ups, including: ABL Space Systems; Accion Systems; Albedo Space; Astranis, Astroscale, Axelspace, Axiom, Firefly, Fleet Space Technologies, GHGSat, HawkEye 360, Hiber, Hydrosat, HySpecIQ, ICEYE, Inversion Space, Isar Aerospace, Isotropic Systems, Ispace, Kepler Communication, LeoLabs, Loft Orbital, Mangata, Mynaric, Omnispace, Orbital Sidekick, Relativity Space, Sierra Space, Stoke Space Technologies, Totum Labs, Unseenlabs, and Ursa Major.

Industry Consolidations

Consolidation in the space business thrives: Astra purchases Apollo Fusion; BAE Systems acquires In-Space Missions; Marlink buys ITC Global; OneWeb purchases Trustcomm; Planet acquires VanderSat; Redwire adds Deployable Space; Raytheon purchases SEAKR; Rocket Lab acquires Advanced Solutions, Planetary Systems, and SolAero; SpaceX buys Swarm; Spire adds exactEarth; Viasat acquires Inmarsat; and Voyager Space purchases The Launch Company.

Table 1. Courtesy Milbank's Space Business Review, December 2021

Joining up with us enables a young company to gain access to revenue and customers much more quickly."

Can all these new companies stay the course, particularly as interest rates rise? Panahy suggests, "If capital tightens or money dries up, there will be a flight to quality, meaning investors will get behind companies with the most promising return-on-investment. When you have too many companies competing, you have the natural order of creative destruction. Companies will either get acquired or they will run out of cash and close up shop."

WHAT LIES AHEAD?

Despite the cautionary tales, this is such a robust and innovative time for the industry that it's difficult to imagine any other trajectory than upwards and onwards. "We are seeing an amazing level of disruptive innovation that is sparking dramatic growth," says Panahy. "SpaceX is a high-profile example. They take risks and embrace a return on experience," he explains. "Instead of perfecting something for years in a lab, they field test what they've got, which

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may not be perfect and might well fail. Then they take all that feedback to improve, correct, and innovate."

Today we are witnessing dramatic advances in the creation of small satellite constellations and the improved data communications capabilities and imagery they provide. "We see that as more of a near term area of opportunity" alleges Bruegger. "Space businesses that are particularly focused on solutions to help us mitigate and combat climate change are of particular interest in the near term. Five years out, the space economy will open. We'll be able to service satellites in space, deal with space debris, and embark on lunar missions as a precursor to having some form of a more permanent presence on the moon," he adds.

"The big prize is in space mining," says Alfenito. "Humans consume resources, and the Earth is resource-constrained." Not only are there precious metals, elements, and gases, there is a huge amount of money to be made. According to the Asterank database, the asteroid, Anteros, could yield a profit of more than US$1 trillion.

Panahy maintains, "The science to do this is not that far beyond our grasp. We've already softly lowered a rover on Mars from a hovering platform. We'll still need stations, laboratories, habitats, and more for such sophisticated space commerce—multi-planetary stepping stones, but we'll get there."

One has only to listen to Elon Musk tout his plans for colonizing Mars and making humans a multiplanetary species to realize that he means to do as he says— "make science fiction not fiction forever." Even if his plans are not fully realized, his efforts will continue to extend the limits of what is possible.

"It's been fifty years since Apollo and we have over half a century of development and growth in this industry," asserts Stott. "We are now beyond critical mass. Of course, we are going back to the moon. Of course, we will have more and more people flying in space. This is the future."

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SPACE SPACS MARKET PERFORMANCE

Company	Symbol	52-week high/low (US$)	2/11/22 Price (US$)
Arquit	NASDAQ:ARQQ	41.52/8.00	14.08
AST SpaceMobile	NASDAQ:ASTS	22.00/4.84	5.73
Astra	NASDAQ:ASTR	22.47/3.25	3.32
BlackSky	NYSE:BKSY	17.47/2.46	2.69
Momentus	NASDAQ:MNTS	27.36/2.88	3.66
Planet Labs	NYSE:PL	12.15/4.95	5.92
Redwire	NYSE:RDW	16.98/4.66	5.89
Rocket Lab	NASDAQ:RKLB	21.34/7.55	9.63
Satellogic	NASDAQ:SATL	12.23/5.00	5.04
Spire Global	NYSE:SPIR	19.50/2.01	3.25
Virgin Orbit	NASDAQ:VORB	11.28/5.88	7.04

Table 2. Space SPACS market performance


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