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Opportunities for satellite in the era of commercial spaceflight

The NewSpace race is on, with commercial spaceflight projects deeply embedded at the core of the movement. While major players like SpaceX, Blue Origin and Virgin Galactic are making global headlines with their advances, the developments are being felt across the entire aerospace industry. What are the opportunities and implications for satellite? Sam Baird explains.

After decades of governmental monopoly, the spaceflight sector has exploded onto the commercial stage. The Space Age, pegged at starting in 1957 with the launch of Sputnik 1, has become the NewSpace age, and everyone wants a piece of the action. Massive government organisations, slow to move and encumbered by strict regulations, tight budgets and an old-school mentality, have been surpassed by more agile private spaceflight companies with new ideas and (seemingly) cash to burn.

The NewSpace arena seems to be split into two camps; a small number of companies founded by billionaires with dreams of the stars i.e. Jeff Bezos with Blue Origin, Elon Musk with SpaceX, Richard Branson with Virgin Galactic; and more traditional companies founded by forward-thinking innovators such as Rocket Lab, Vector Launch, PTScientists, etc., whose goal is to meet new market demands with profit-generating solutions.

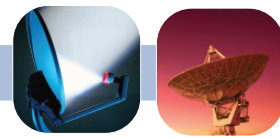
The billionaire-fronted companies seem primarily focused on incredibly ambitious projects with the end goal the priority, rather than the incredible technology developed on the way.

Elon Musk's aim is settlement on Mars, for example, and SpaceX continues to develop its re-usable rocket technology towards that final goal; the revenues produced from satellite launches along the way seem largely coincidental to the external observer. Other more traditionally-minded companies, however, have revenue-generating and profitability more closely on their minds, aiming to develop innovative new small satellite launch vehicles that generate profit from a very real present-day need, as is the case for Vector Launch.

NewSpace opportunities

The NewSpace era of commercial spaceflight really began to take hold in the 2000s. Space Adventures, Inc. made history in 2001 when it launched Dennis Tito, the world's first space tourist, to the International Space Station (ISS) for an eight-day trip.

The company organised a total of eight trips to the ISS over eight years, ending in 2009. Space Adventures can be considered one of the earliest pioneers in the NewSpace



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era, paving a path that many others are now attempting to follow.

Around the same time, in 2000, Amazon founder Jeff Bezos quietly launched Blue Origin, which, unlike SpaceX, stayed below the radar until its first attempted re-usable rocket launch in 2015. Meanwhile, in 2001, Elon Musk announced several ambitious Mars plans including the Mars Oasis project, which were never realised due to the launch costs. Appropriately, one of his current aims is to make access to space more affordable; today, SpaceX's Falcon 9 re-usable rockets cost some US\$50-60 million each, considerably less than competitors in the US\$100 million range. Virgin Galactic, too, can trace its history back to the early 2000s. In 2004, pilot and astronaut Mike Melvill flew SpaceShipOne to space in a test trip, and after two more test trips and the award of the US\$10 million X-Prize, Virgin Galactic and Scaled

Composites incorporated that technology into SpaceShipTwo, a passenger vessel intended to take private citizens into suborbital space for the trip of a lifetime with a very reasonable US\$250,000 price tag.

Technology has come a long way since the early 2000s. While both SpaceX and Blue Origin have succeeded in landing and re-using rockets for satellite launches, Blue Origin has also successfully flown and safely landed its crew capsule, whereas in May 2019, SpaceX's attempted launch of its Crew Dragon capsule saw it explode during a test fire. Boeing, too, is working on a crew capsule; its Crew Space Transportation (CST)-100 Starliner spacecraft is being developed in collaboration with NASA's Commercial Crew Program and we may see test launches later this year. Meanwhile, in December 2018, Virgin Galactic flew its first private astronauts on board SpaceShipTwo to suborbital space. According to recent announcements, Virgin Galactic is moving its development and testing activities from Mojave, California to its commercial headquarters, Spaceport America in Mexico, as part of the final countdown to a regular commercial spaceflight service. Most recently, in June 2019, NASA announced that it plans to allow 30-night stays on board the ISS for the very reasonable cost of US\$35,000 a night, starting in 2020.

And these are just the big-name companies. A little further away from making the headlines on a regular basis are the lesser-known NewSpace organisations, progressing towards their goals in leaps and bounds.

Barriers to space

Commercial space tourism has been 'just around the corner' for a couple of decades now. According to SpaceX et al, 2018 was the year when the first space tourists of a new generation would see their dreams of visiting the stars realised. Alas, this was not to be; SpaceX and Blue Origin are still a long way off to launching humans into space, and Virgin Galactic was the only organisation to meet the 2018 target.

Critics have been overly (in my opinion) harsh in their judgement of these slipping space tourism timelines. Each

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commercial spaceflight company has been embarking on a massive array of tests – as you'd hope, if you're one of the lucky few with realistic goals of heading to space any time soon – of every possible aspect of their rockets and crew capsules. Sure, there have been a number of catastrophic failures, including SpaceX's May 2019 explosion of its Crew Dragon capsule, and parachute deployment for crew capsule re-entry seems to be a particular challenge for most of the companies involved. However, testing on this magnitude, and for projects of this ambitious a scale, are going to invite some pretty significant failures on the way to making sure everything is fine tuned and safe for the first paying customers.

Financially speaking, it takes a lot of cash to embark on some of the ambitious spaceflight programmes running right now. Jeff Bezos reportedly sells US\$1 billion of Amazon stock each year to fund Blue Origin's campaign – a remarkable amount, but then, he is richer than all the other spaceflight billionaires combined (apparently), and Blue Origin is operated as a non-profit. SpaceX, on the other hand, is bringing in significant revenues from a steady stream of satellite launches, as well as resupply missions for the ISS. In addition, while the US Government no longer operates a human spaceflight programme, both SpaceX and Boeing have been contracted to transport astronauts to and from the ISS in the near future.

Investment into commercial spaceflight is massive, and can only really be supported by massive companies, government backing, investment fund interest, or private billionaires, since return on investment is, if we're honest, a long way off. However, when that day does finally arrive, NewSpace companies have a whole host of income-generating opportunities, including space tourism with both orbital and suborbital jaunts, transporting supplies to space stations, satellite launches, support of off-world settlements, etc.

Impacts on the satellite sector

The satellite sector stands to benefit greatly from this new era of commercial space tourism.

For one, the whole host of new launch options, including lower cost reusable vehicles which can be launched to any orbit desired, will make future satellite launches more versatile than ever before. Launch frequency is a small but growing issue among satellite operators as increasingly large numbers of satellites are due for launch; as the 20,000+ planned small satellite launches for the next few years grow nearer, competition for launch bookings is set to rocket. In addition, launch to less common NGSO are also ramping up in availability, opening up doors for interesting new projects.

Today, and in the near future, we can expect satellite operators to have more choice in launch provider than ever before, too. As more and more companies get in on the action, with satellite launch capabilities either their main goal or just a stepping stone along the way, launch sector competition is set to increase, helping ease prices for operators, on top of availability. Never before has there been such strong demand for satellite launch capabilities, and accordingly, there is a rapidly growing number of dedicated small satellite launch organisations coming into their own. Going beyond traditional rocket launches, in-air launch systems on high altitude platforms (HAPs) like space planes and balloons, are also gaining ground.

Then there are the 'off-world' opportunities. Satellites are, of course, in common use around the world, whether the general public has any idea of the true scale or not. However, as private organisations and government bodies edge closer to off-world settlements or other-world industrial hubs, interplanetary communication becomes a very real challenge. The most obvious solution to enable reliable communications between the Earth and Mars, for example, is a satellite network. This opens the door to a whole host of new satellite opportunities for the most innovative of satellite manufacturers and operators.

You can bet your bottom dollar, too, that once mankind has established off-world activity, we won't be looking at just one deep space satellite network, but a collection of networks offering a variety of services, both complementary and in competition with one another. ■



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