

MARKET INSIGHT

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One Giant Leap for Humankind?



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ONE GIANT LEAP FOR HUMANKIND?

JAMES ROWBURY | INVESTMENT RESEARCH LEAD

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RISK WARNING

Investments and income arising from them can fall as well as rise in value. Past performance and forecasts are not reliable indicators of future results and performance. There is an extra risk of losing money when shares are bought in some smaller companies. Redmayne Bentley has taken steps to ensure the accuracy of the information provided.

On a warm afternoon in a small Texas town 500 miles west of Dallas, the residents of Van Horn were going about their daily business. For one man, this was a momentous day. Jeff Bezos, founder of Amazon, was the second businessman that month to take flight into space. Only a fortnight earlier, the British entrepreneur Richard Branson made his own historic strides into the final frontier.

Both flights carried a lucky few upon them, ranging from flight crew to siblings and auction winners, making the journey an exclusive experience for those involved. After a year in which the world was largely unable to travel abroad for their holiday, it seems two of our planet's billionaires were not content with a staycation, and instead jetted off into the stars. Such space tourism may be limited to those with deep pockets, but the ability for privately funded individuals to take this leap has profound ramifications for us mere mortals left on earth.

Space travel is nothing new. Now a multi-generational aspiration, the desire to leave earth stems back to mid-20th century Cold War tensions, where the world's largest superpowers battled it out to become not just rulers of the planet, but beyond as well (See: **Spacenomics**). Since then, satellites have provided the backbone of global communications and, with the advent of a rapidly growing automated world, space technology seems to hold the key to unlock the economic growth of the next century.

But with economic growth comes an environmental cost. Burning rocket fuel and filling our outer atmosphere with metal boxes seems

to be at odds with the strides we are making to reduce pollutants here on earth. Mr Bezos's Blue Origin space company promises to "build a road to space so our children can build the future". Very exciting, but what does that mean?

I'll leave the detail to my colleagues in the following pages, but simply put, to address the world's biggest challenges, we must first use the vantage of space to gain a view of our actions and their consequences (See: **Fruitless Fame or Fuelling Change?**). In a world so depleted of resource, how will we keep finding places to farm, mine, or fish? Not least, technological milestones developed for space have offered new innovations for humankind.

With the industry in its relative infancy, we find ourselves in a narrow investment universe. With mostly private and early-stage companies, space tourism remains in the science fiction section of the stock markets for now. Instead, it is the ancillary technologies that will continue to take the lion's share of this untapped market (See: **Seraphim Space Investment Trust**). Data analytics, communications and navigation companies are poised to benefit from a more connected and automated world. Drones will need an air traffic controller, autonomous cars will need a driver, and rockets will need to become cheaper to sustain the expected demand in satellite launches.

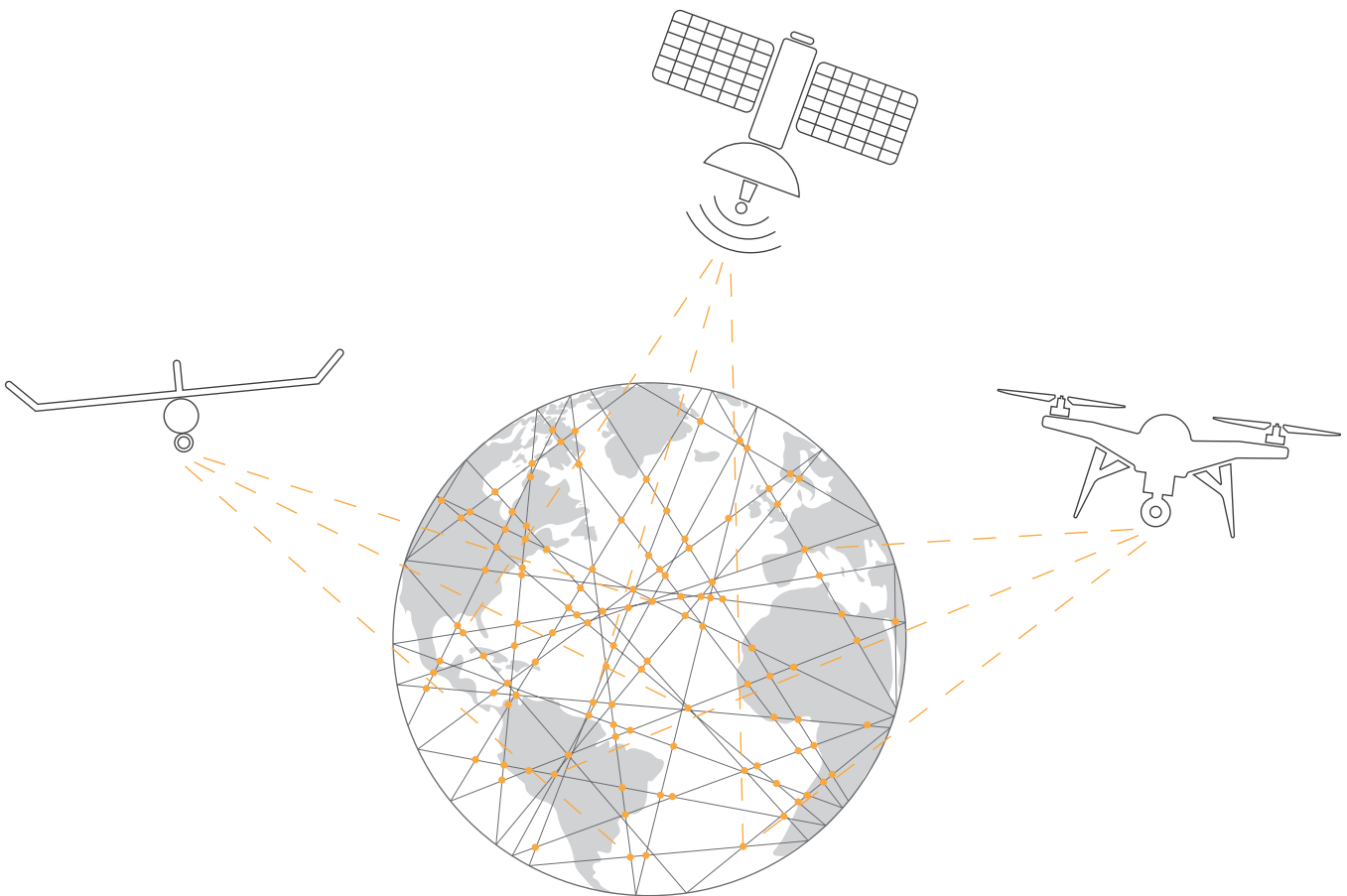
There are some revolutionary technologies out there, but the appetite of governments to fund agencies such as NASA and the ESA is waning under political pressure. Funding must come from investors to push these boundaries. We might not be joining the billionaires in the stars just yet, but we can take part.

STOCK FOCUS



SERAPHIM SPACE INVESTMENT TRUST

WHY EVEN BRANSON HAS BACKED THE BURGEONING INVESTMENT VEHICLE



The words richest person, Jeff Bezos, recently said ‘When I have a good quarterly conference call with Wall Street, people will stop me and say, “Congratulations on your quarter,” and I say, “Thank you,” but what I’m really thinking is that quarter was baked three years ago. Right now, I’m working on a quarter that’s going to reveal itself in 2023 sometime, and that’s what you need to be doing.’ The reality is, the likes of Bezos, Musk and Branson have a proven ability in spotting multi-decade

growth opportunities, and all three are now focusing in on one specific trend: Space. While Bezos’ and Musk’s space companies remain private and Branson’s Virgin Galactic offers only narrow exposure to the sector limited to commercial space flight, the recently public Seraphim Space Investment Trust offers well diversified exposure. Interestingly, its recent initial public offering (IPO) attracted financial backing from Branson himself.

The space technology fund was launched in 2016 and has invested in over 50 space start-ups, achieving a return of 30% per annum to date. The trust has a wide funding range with potential investment from US\$1-25m and has access to an extremely active global deal flow with up to 50 new opportunities analysed every month. Investment directly into Seraphim Space throughout the first half of 2021 equates to 85% of funds raised throughout the entirety of 2020, and the sector on aggregate rocketed by £4.7bn.



Amidst the excitement and noise surrounding the space industry, many are still in the dark about the underlying companies and opportunities driving the sector. Contrary to the image of fuel guzzling rockets flying billionaires into orbit at the expense of mass carbon emissions, opportunities in space offer solutions to global issues such as food scarcity, traffic congestion, climate change and natural disaster preparation. Furthermore, with 50% of the world currently unable to connect to the internet, satellite constellations will enable billions of people to improve their education, health and standards of living. James Bruegger, Chief Investment Officer of Seraphim Space, said in the Q4 2022 report: “Space tech is at the nexus of mega-trends that will define societal change over forthcoming decades and is now playing a unique role in addressing the world’s most pressing problems. Radical advances in the space sector mean a data and connectivity tsunami is transforming the world as we know it, driving the next major paradigm shift in the global economy.”

Drilling down into Seraphim’s portfolio is what really offers a concrete perspective on the wide-ranging potential of the sector.

In the artificial intelligence space, ChAI, a London-based start-up, uses alternative space data to give commodity price expectations, mitigating the negative cash flow impacts of price risk for buyers and sellers of commodities. Alternative data is sourced from satellites in orbit which use advanced imagery to look at change detection and volumetrics of mines and smelters, as well as tracking movements of commodities by freight around the world. Machine learning is then used to determine a weight for each ‘input family’ of information, which predicts a price with associated confidence intervals across various time horizons. ChAI suggests that such price predictions enable users to capture an average increase in margin of 25% of commodity spending.

Another company in the portfolio, Nightingale Security, builds and deploys autonomous drone systems that protect critical infrastructure for Fortune 500 companies. Such drone systems operate consistent patrols in all weathers to respond to alarms, transmit live video streams and report on any maintenance needs recognised by the system. Through an extensive network of propriety infrastructure, drones and base stations

communicate and collaborate with each other to ensure that drones remain charged, covering each other to maintain flight if one drone runs low on power.

In the realm of climate change is a holding in Satellite Vu, an earth observation company using a satellite constellation with advanced infrared sensors providing high resolution thermal imagery to monitor the temperature of buildings across the globe. This offers information regarding the activities taking place within buildings, energy efficiencies and carbon footprints. Temperature information transmits in near real time and can identify where energy wastage is occurring, as well as whether businesses declaring net zero are as efficient as they claim.

“Investors need to balance the appeal of accessing a new frontier with pragmatism. It is critical not to get too caught up in the story and ‘unlimited’ potential as this will likely take decades to be realised.”

Looking forwards, Seraphim Space Investment Trust offers attractive targeted annualised returns of 20%. An impressive portfolio of holdings with a proactive approach for investing in young, but exciting companies offers a promising case for investment. Despite this, it is important to remember that risk can go both ways in new markets. Independent Wealth Consultant Adrian Lowcock recently commented to Portfolio Adviser: “Investors need to balance the appeal of accessing a new frontier with pragmatism. It is critical not to get too caught up in the story and ‘unlimited’ potential as this will likely take decades to be realised.”

“This has the potential to be a hugely exciting area for many years to come but we can be certain that there will be many bumps on the journey towards the launch pad, let alone the stratosphere,” he added. ■

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INSIGHT

SPACENOMICS



The groundwork for a fully-fledged space industry was laid many years ago across several decades in the mid/late 20th century when the US and the Soviet Union, the two cold war adversaries, fought for superior spaceflight ability of both manned and unmanned spacecraft. A desire to beat one another led to several significant milestones including the first artificial satellite launch of Sputnik 1 in 1957 and the first manned moon landing of Neil Armstrong and Buzz Aldrin onboard Apollo 11 in 1969. This eventually culminated in a cooperation between the two nations which still exists to this day and helps to further the innovation in space exploration.

When space was at the peak of its popularity, the potential for it to conquer further milestones and to become a viable business area were seen as a genuine possibility. However, it wasn't until the early 2000's that companies started emerging

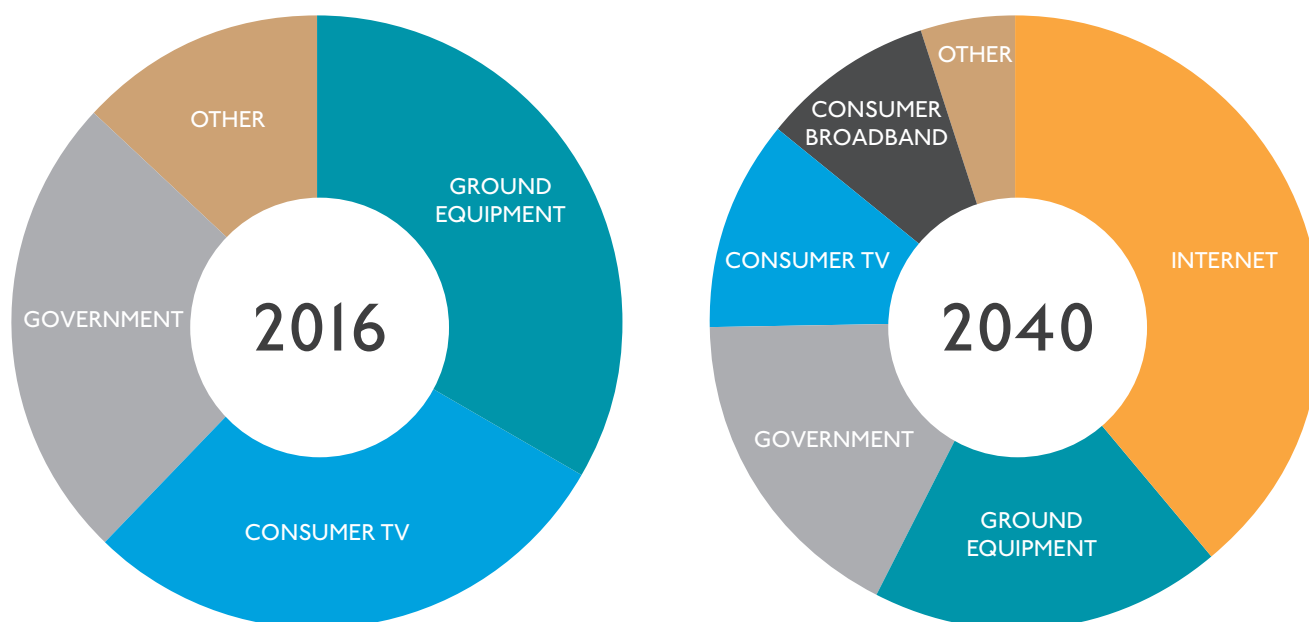
with proof of concept such as Elon Musk's SpaceX successfully launching rockets and satellites, effectively creating a space industry.

As companies started to realise that space offered a viable business area, many of fledgling private companies started to grow rapidly, producing innovative products and solutions to aid the space industry's growth. While we are certainly still in this phase of growth and many years away from maturity, the industry is at an all-time high and growing year over year, currently from US\$350bn to over US\$1tn by 2040. This growth is expected to come from a variety of sources including satellite launches and services to an array of consumer products such as broadband, tv and radio.

Even so called 'space tourism' will be a significant beneficiary of the outer space boom with UBS forecasting a US\$20bn



Space revenue stream 2016 vs 2040



Source: Satellite Industry Association, Morgan Stanley Research, Thomson Reuters. *2040 estimates

market within a decade. While this currently consists of billionaires such as Jeff Bezos and Elon Musk shooting off into outer space, many are pointing to the long-haul travel market, currently serviced almost exclusively by airlines, as the next to be disrupted by space travel with flights of more than 10 hours likely to be most impacted by the changes. While this is currently not possible and in fact extremely expensive, it is not unreasonable to believe that with the current pace of innovation that someday this would be a feasible opportunity.

Companies such as Blue Origin and Virgin Galactic have proved this is a possibility and that people, albeit limited to very rich individuals, are willing to pay for the opportunity with the latter receiving applications, and a US\$250,000 fee, from almost 8,000 people, forcing them to stop taking requests given the high level of interest.

This proof of concept and high level of interest in recent years has prompted a wider array of investment products dedicated to the theme, or at least to ideas that utilise the theme as part of its strategy. In terms of a more indirect exposure, the UK's largest, and one of its best performing, investment trusts, Scottish Mortgage (LON: SMT), has a long-standing holding in Elon Musk's SpaceX alongside Relativity, a 3D printing company which manufactures rockets and their components with the help of autonomous factories and artificial intelligence (AI). This shows the broadening appeal for space assets across fund managers seeking innovative and exciting growth opportunities, with those possessing a much greater risk appetite also satisfied given the flurry of new direct stock investments such as Virgin Galactic and more established names such as Lockheed Martin. However, even the UK market has its own option with a brand-new investment trust called Seraphim, dedicated to investments in private space companies which covers satellites, but also business software and security as it relates to space.

In fact, SpaceX's Starlink venture, an internet services provider which aims to bring the internet to parts of the world that don't already have access, has already begun to garner subscribers with its current 200,000 predicted to balloon in size to cover 14.4 million households in 2025. This will help to not only provide an alternative to traditional telecoms infrastructure, most of which the emerging world does not have adequate access to, but also provide the business with a regular stream of income which will help with both business continuity and also reinvestment into improvements of their servicing.

Given the growth in the industry and its current and future application, it is not unfeasible to believe that we could see a new sector of the economy created altogether. With the US Government creating a Space Force under President Trump and the continued increase in funding, business and investor interest, it puts forward the case for space to become part of our everyday lives. Whether it comes to providing under-served communities with fast internet or improving the quality of services across television or even travel, the possibilities are endless. And it's just getting started.

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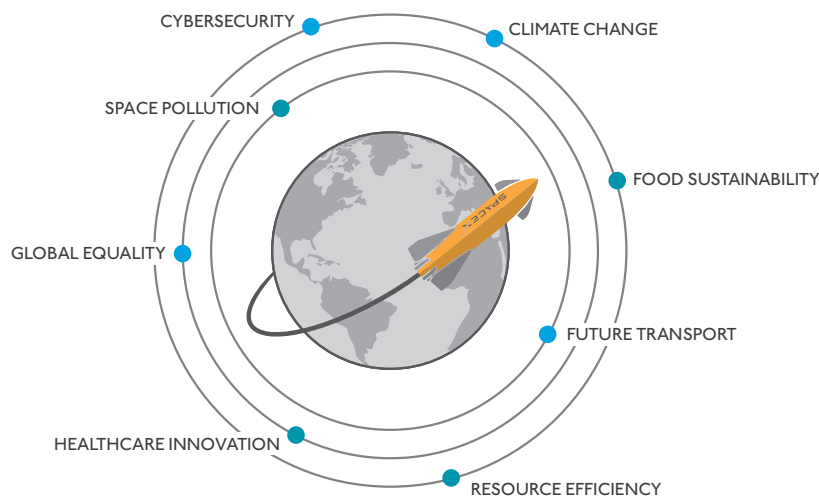
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*Invested in our Moderate MPS portfolio at inception in May 2019 and correct to 30.06.21

TOPIC OF THE MONTH



FRUITLESS FAME OR FUELLING CHANGE?



The term ‘space economy’ is widely seen as synonymous with billionaire vanity projects that waste resources and, though some hail the rockets soaring into the sky, others raise an eyebrow at the plume of smoke they leave behind. Away from the headline-grabbing rockets, is there more to the space economy? Is it all just a vacuum of resources, or does it do more than we might realise?

CLIMATE CHANGE

An important sector of the space economy involves monitoring of all stripes, which is invaluable in the fight against climate change. A range of satellites occupy the Earth’s orbit collecting key data on the environmental impact of company activities using satellite imagery. This activity has provided data on greenhouse gases (GHG) and emissions since 2002 with specialised satellites, of which more and more are being launched. Governments and companies are planning to launch satellites that can pinpoint the source of pollutants and GHG emissions, a key function in holding actors accountable to their sustainability commitments.

Realising the potential in this segment, a plethora of start-ups have jumped into the fray; for instance, Bluefield, a San Francisco based start-up, plans on monitoring the whole planet for GHG emissions at a granular level and selling the data. Another, ChAi, is using climate data to predict

commodity prices and improve hedging strategies, claiming to improve commodity spend margins by 25% and, importantly, improving preparedness against increasingly volatile weather events.

FOOD SUSTAINABILITY

Though far from sight or mind at the dinner table, the space economy is also supporting food sustainability. The global economic impact of illegal fishing is estimated to exceed US\$20bn annually as declining fish populations reduce yields. Overfishing represents a systemic challenge to ocean biodiversity and health. To fight illegal fishing, ImageSat International ISI developed Kingfisher, a multi-sensor maritime intelligence system combining information sources to help expose the movements of fishing boats in protected zones.

GLOBAL EQUALITY

The space economy is also at work providing global connectivity and equality of access to the internet. Satellite broadband is a flexible alternative to cable internet, able to reach rural areas otherwise lacking in internet infrastructure. The sector’s major players are SpaceX with Starlink, and OneWeb. Normal communications satellites work by transmitting radio waves to antennae down on earth. Those antennae then provide connected devices with the signal

to communicate. Satellite internet instead uses lasers which are faster and have a stronger signal resulting in speeds of 300Mbps, similar to speeds provided through fibre broadband.

FUTURE TRANSPORT

The space drive could also be key to the next revolution in transport. Many proponents of autonomous driving believe it will require global connectivity to operate, with satellites being endorsed by the EUSPA (The EU Space Agency), and invested in by carmaker Geely, as a core component of connected car systems. Satellite's ability to reach areas without terrestrial connections could be instrumental in the roll-out of software updates to regions simultaneously – a mismatch of software updates could have deadly consequences if the new operating systems fail to communicate with the old. This capability to transmit volumes of data to areas regardless of terrestrial connection would also make the space economy an important provider of road condition and traffic information, vital for any traffic management systems.

SPACE POLLUTION

In typical human fashion, where great activity can be found, so too can commensurately great pollution. Space debris is a growing problem: currently there are 3,000 inactive satellites and up to 900,000 pieces of space junk ranging from one to ten centimetres floating in orbit. Admittedly, this sounds a small figure relative to the size of the planet, but the threat rises as orbit becomes crowded – Starlink alone plans to have 42,000 satellites. The issue is compounded by the fact that objects as small as 1mm can cause major accidents to spacecraft and astronauts; for example, a single fleck of paint cracked the window of the ISS, hardly surprising when space junk travels at up to 17,500 mph.

Therefore, clearing this debris is a recognised imperative. A Japanese company, ALE, has developed a debris-capturing solution that involves wrapping a membrane around a satellite at the end of its operation, with atmospheric drag forcing it to leave orbit. Meanwhile, the RemoveDEBRIS consortium has trialled a range of capture technologies such as a remote-operated spacecraft to remove debris.

HEALTHCARE INNOVATION

The space economy can be divided into two parts: Space-to-earth (STE), where goods and services in space are sold for consumption on earth, and Space-to-Space (STS), where they are sold for consumption in space. The phrase 'beam me up, scotty' has long held cultural significance in the minds of sci-fi buffs, but with SpaceX's reusable rockets bringing the cost of space flight down to just 3% of a NASA shuttle flight, perhaps 'launch me up, Elon' would be more appropriate. This has quickly proliferated a viable space economy, which earned US\$366 billion in revenues in 2019, STE accounting for 95% of the total.

An exciting component of this economy is the R&D potential, including global health and resource efficiency innovations. As the only micro-gravity lab, the ISS has been at the core of important discoveries such as 3D printing, osteoporosis research and cancer treatments which would accelerate growth

on Earth too. Axiom, a start-up, has won contracts to provide ISS modules and aims to construct commercial space stations. As the ISS is due to close by 2028 at the latest, new commercial research stations will likely be needed to pick up its work.

RESOURCE EFFICIENCY

Though having fallen significantly, the costs of transporting between Earth and space are still prohibitive, and this is where the resource efficiency potential for the STS economy begins to crystallise. In a bid to return 3D printing to its birthplace, Made in Space is launching a manufacturing facility into orbit, having won a contract to print large metal beams for spacecraft. Meanwhile Maxar-Technologies is developing a robotic construction tool to be manufactured in space for use on low-orbit spacecraft. Performing these functions in space is cheaper and more resource efficient than doing so on Earth and transporting the finished goods up.

Space mining would involve harvesting asteroids and planets for minerals. Such companies failed in the 2010s mainly because of the considerable transport costs involved in shipping commodities from STE. If the minerals never need to return to earth that key hurdle begins to evaporate. As the space economy grows, demand for space construction may grow too – construction requires manufacturing and manufacturing minerals, while the spacecraft and stations involved would need servicing. As with the earth economy, new sectors could spawn other sectors or sub-sectors, and growth can be self-reinforcing.

CYBERSECURITY

When reviewing the potential opportunities in any space, it's easy for us as investors to race ahead of the crucial topic of regulation. In space, jurisdiction is unclear and rules mostly unestablished. This makes regulation an unusually complex conundrum and, though some may welcome the absent regulation as an ideal environment for free-wheeling innovation, a lack of common rules, standards and regulations can hinder a market just as much as help it. Moreover, risks arise in the STE sector, where the development of potentially hyper-critical infrastructure such as autonomous driving platforms pose questions of cyber-security. The world has already seen the havoc that can be wrought by targeted cyber-attacks, and many recent high-profile attacks have brought to light the inadequacy of current cyber defences.

NET POSITIVE BENEFIT?

Determining value is a subjective process, and the space economy has a choice selection for all. Human health and wellbeing? Cutting edge research, innovation, and connectivity? Environmental impact and sustainability? Critical monitoring infrastructure and data processing? Concerns about inefficient, dirty rockets are well-founded, yet critics would be hard pressed to find any technology that was efficient and perfect in its early stages, and this one has already come a long way with much further left to go. In the meantime, the free market is already at work, with firms looking to circumvent this inefficient transit wherever possible. No lunch is free, and the price of this one is a price worth paying. ■



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