



BUSINESS ANGELS
GUIDE TO INVESTMENT IN THE
SPACETECH SECTOR

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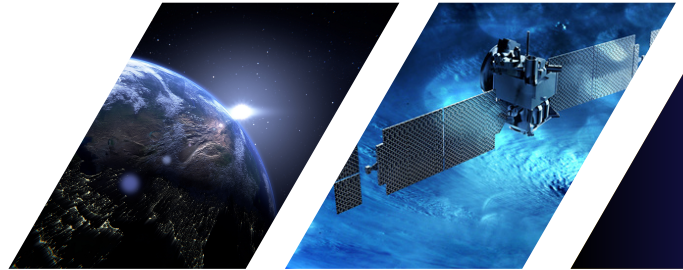
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Introduction



The space sector has been the exclusive domain of space agencies until recent years, when an increasing number of private entities started investing in this sphere, looking to tap into the anticipated multiple X returns for investing in a sector deemed to reach 1 Trillion USD by 2040 and to provide countless actionable insights for the Climate Change and the Environmental Crisis, amongst other sectors. This increasing injection of private capital into space projects and the affordable access to space data for private companies have reduced the barrier to entry; cheaper and more effective solutions are now being developed on a regular basis. Moreover, public agencies have been financially supporting the adoption of space technologies for applications not directly related to space such as transportation, finance, agrifood, maritime, health and tourism. Currently the space sector represents an opportunity for economic growth and investment to which every investor interested in innovation should pay attention.

The European space sector benefits from being diverse, robust, and enjoying rapid growth in recent years. European nations have a long history of cooperation in space research, technology development, and satellite deployment and the European space sector encompasses a wide range of activities, including satellite manufacturing, launch services, Earth Observation (EO) applications, broadcasting satellite services, global navigation solutions, and space exploration ventures.

In this handbook, we will explore the key players, trends, risks, and opportunities to provide Business Angels, who are not yet operating in the sector, with the basic information to assess and explore investment opportunities in the space sector.

WHAT IS SPACETECH?

SpaceTech refers to the technologies and business models developed by companies operating in space.



Today we can refer to two partially different concepts regarding metrics and values, although they are both part of the SpaceTech family and are integral parts of the transformation of Space as an investment opportunity.



Traditional Space (or 'old space' as some people refer to it) encompasses all activities aimed at building rockets, satellites, ground control and transmission infrastructures. Many times, but not always, traditional or old space was begun as a government program to be part of a certain industrial policy or government program, whether this was for connectivity, television broadcasting, intelligence, military or earth observation purposes. The satellites, launchers, etc were contracted for by government and large aerospace and defence companies received those contracts. One notable exception to this is the world's largest satellite system, SES, which was incorporated in 1985 as a totally private company, responded to market demands for "Freedom of Choice" and was a precursor of "New Space", many times in part defined as "commercial and market-oriented, privately financed Space".



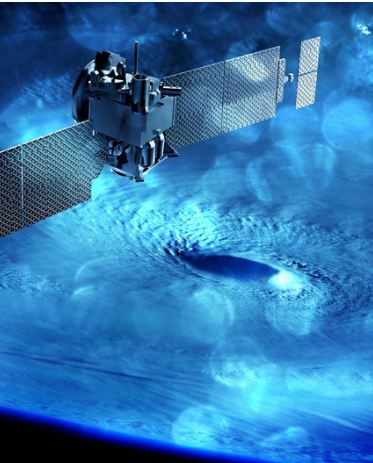
A little more than ten years ago a number of things happened which were to dramatically alter the use, operations, and financing of space. The first change was the miniaturization, digitalization, and accompanying decrease in costs of components. All of a sudden, it was possible to take excellent, high-resolution pictures of the earth's surface with a smartphone embedded in a shoe-size "CubeSat". This is exactly what Planet Labs did in 2010 to take pictures of the earth and sell them to agriculture companies, tax offices, weather bureaus, NGOs etc to help them do their daily business. The second thing that happened is that launch costs dropped tenfold within the period of a decade. And the third thing that happened was the concurrent rise of IOT - the "Internet of Things" and AI - "Artificial Intelligence" or more aptly described as "ML -Machine Learning".

"New Space" as opposed to "Traditional or Old Space" was on its way to transform the way we see the world, the way we use the world, the way we operate and communicate in the world.

The development of processes and materials was capable of creating cross-fertilization between Space and traditional industrial sectors, including:

- innovative production systems;
- artificial intelligence applied to objects in orbit and data;
- commercial applications that integrate and make use of satellite data or spatial assets to provide terrestrial economic operators with new kinds of data and enriched information.

In any case, the SpaceTech category, which refers to both the Space and New Space trends, includes all goods or services designed to go into orbit or for the use on Earth of data or materials designed for or produced in Space.



UPSTREAM SEGMENT

In the space sector, "upstream" refers to the activities, processes, and technologies associated with the design, development, manufacturing, and launch of space assets, such as satellites, spacecraft, and launch vehicles. Upstream activities include research and development, engineering, production and testing of space-related hardware and software. It also involves the infrastructure needed to support space missions, such as launch facilities, ground stations, and tracking and control systems. In summary, the upstream space sector is focused on creating and deploying the assets and infrastructure required for space exploration and utilization.



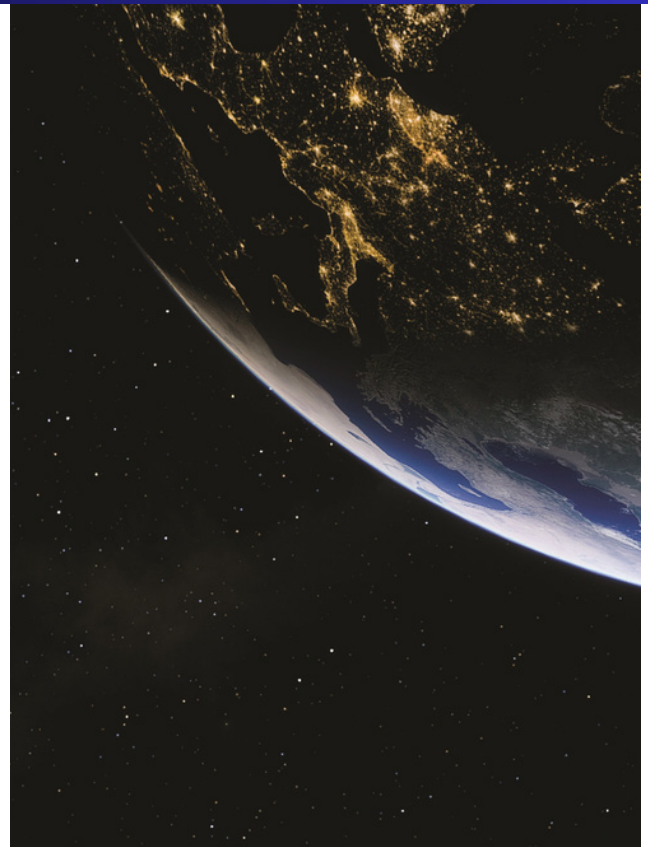
DOWNSTREAM SEGMENT

In the space sector, "downstream" typically refers to the applications, services, and activities that depend on or make use of data, information, and technology provided by space assets, such as satellites and space-based systems. Downstream activities include the processing, analysis, and distribution of satellite data for various purposes such as Earth Observation (EO), communication, navigation, and weather monitoring. The downstream sector is important for the development of value-added products and services that utilize space-derived data to benefit various industries, such as agriculture, transportation, telecommunications, and disaster management. This segment encompasses technologies derived from space but which have found use in Earth-based applications in addition to technologies used in space with the main goal of serving Earth-based applications. In summary, the downstream space sector deals with applications and services that use the data and information provided by space assets.

Although it is still important for an investor to be familiar with the terminology commonly used in the SpaceTech sector, the distinction between downstream and upstream has become less relevant over time, as both segments also include companies where space/space-derived technology is not their core focus, as they provide services through space capabilities to non-space companies/industries.

WHY INVEST IN THE SPACE SECTOR?

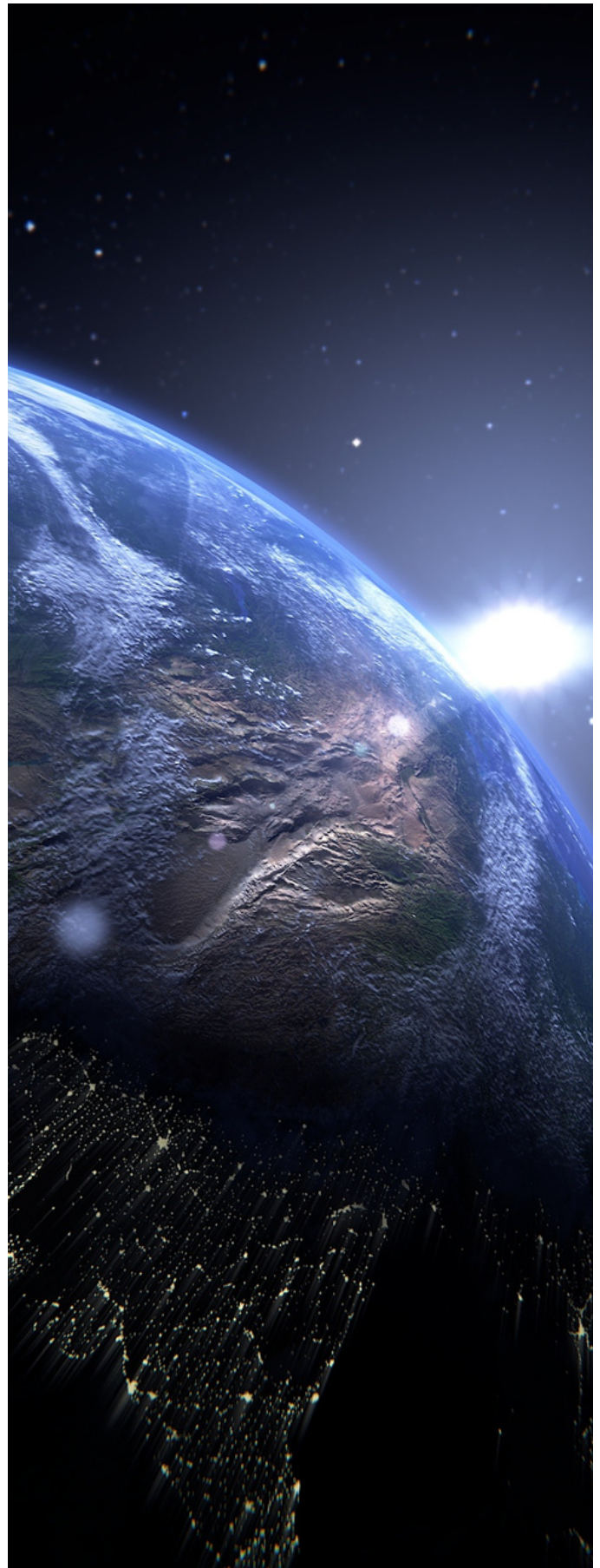
There are several reasons for investing in SpaceTech, including the following:



- First of all, it is one of the fastest-growing sectors, estimated at around \$390 billion worldwide in 2023 and, according to many analysts' estimates, it will reach one trillion dollars in 2040[1][2].
- It is a sector partially decoupled from economic growth and therefore always active. Thanks to its strategic relevance it enjoys unconditional political support regardless of the specific government in power at the time.
- It is 'Deep Tech', meaning it is the result of years of research, studies and analysis in science, technology and market business fields, and often accompanied by the development of a substantial IPR. This makes it a very protective sector for investors, if well-analysed, compared to "bubble" risk investments and those areas based on a trend or a fad of the moment. Of course, investment in the sector also entails risk, but the intelligent investor will know how to choose between technology-driven companies and companies that develop their project based on an innovative business model, albeit with Commercial Off-the-Shelf (COTS) components.
- Being a relatively small sector, there is a robust and competent community where technological validation can be obtained to derisk one's portfolio. In recent years, SpaceTech initiatives, although often started with the support of public funding programs, have been supported by both private investors and other private entities (e.g., banks, investment funds), with the interesting involvement of large space companies in skill acquisition programs acting as customer contracts.
- Despite some space operations not being disclosed for military reasons, it is a transparent sector. Data on the number of launches, scientific advancements, political-strategic decisions, protagonists and development trends can be easily retrieved.

WHY INVEST IN THE SPACE SECTOR?

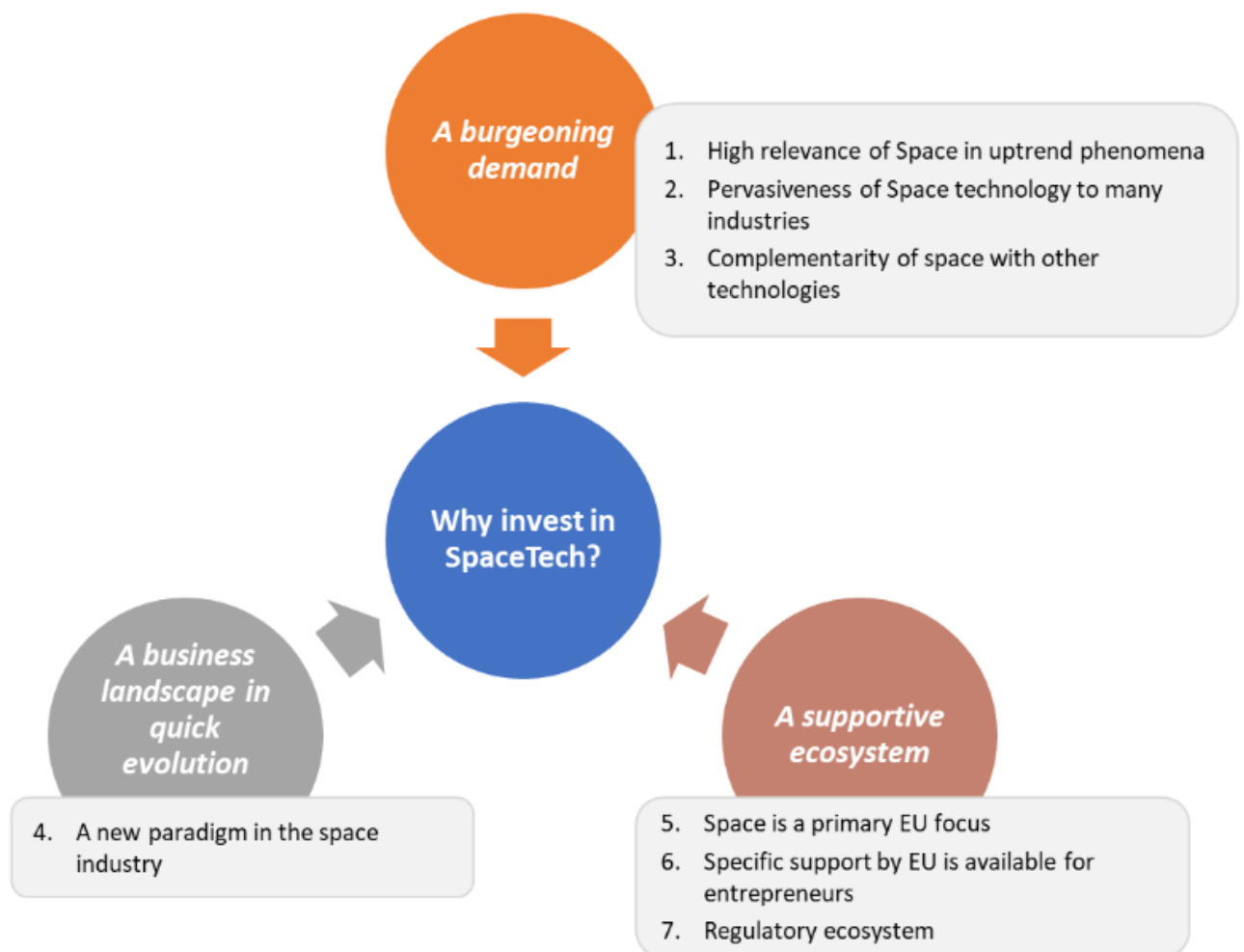
- It is increasingly considered as having “survival” value in terms of enabling the protection of the Earth’s inhabitants and environment and consequently achieving any and all of the 17 UN Sustainable Development Goals (SDGs). For instance, space is considered as indispensable to the achievement of several policy priorities of the European Union, such as the Green Deal and the Digital Transition.
- Space activities have impact far beyond commercial revenues, with spill-overs in many segments of the economy such as agriculture, transport and the environment. For instance, approximately 10% of the EU's GDP – more than €1 100 billion – is enabled by satellite navigation signals[3].



WHY INVEST IN THE SPACE SECTOR?

Now is definitely the best moment for European Business Angel investors to invest in SpaceTech: the growing demand for space-based services in the field of satellite navigation, Earth Observation (EO) and SATCOM is still far from being met by the current industry offering. Such untapped potential is further strengthened by a supportive industrial ecosystem, in light, for example, of the level of the government support - from EU, national and even regional institutions – that has never been so strong as the present. In considering the reasons why a European Business Angel should now invest in SpaceTech, the following 7 main factors are of significance:

Figure 1 - 7 factors to invest in SpaceTech.





01

HIGH RELEVANCE OF SPACE IN UPTREND PHENOMENA

Several macro trends are strongly affecting the way we do business; space data and services are relevant to many of them. Among others, an increasing focus on **sustainability practices** and an **accelerated digital transformation** leveraging AI, IoT, big data and VR/ AR constitute two perfect examples of the still untapped potential of Space data and services.

As regards sustainability, space data and especially satellite Earth Observation (EO), provide a wide range of different types of information. The amount of data available, together with the advancements in algorithms and data processing, allow for the widespread usage of this information at scale and beyond the specialized scientific community. As a result, Earth Observation is becoming a relevant enabler for the harmonization of international reporting on natural resources and ecosystems. Furthermore, satellite EO data are a vital component in ensuring the fulfilment of EU framework policies such as the **Green Deal** and **Farm to Fork** in addition UN initiatives such as the **Sustainable Development Goals**.



02

PERVASIVENESS OF SPACE TECHNOLOGY IN MANY INDUSTRIES

More than ever, modern society depends on innovative solutions to deal with the big data paradigm, to respond to natural disasters, mitigate the spread of deadly diseases and strengthen a global supply chain that underpins our daily lives in the face of global challenges.

Space activities have impact far beyond commercial revenues, with spill-overs in many segments of the economy such as agriculture, transport and the environment. For instance, approximately 10% of the EU's GDP – more than €1 100 billion – is enabled by satellite navigation signals[4].

With 17 market segments featured in the EUSPA Earth Observation (EO) & Global Navigation Satellite System (GNSS) Market Report[5], space technology has a significant impact on various industries.

For instance, precision **agriculture** is made possible by using space-based data to monitor crops, soil moisture, and weather patterns. This increases agricultural yields and lowers the environmental effect of farming.

Health apps using Earth Observation (EO) data about air quality and air monitoring are becoming popular in the marketplace. For instance, by providing information about wave conditions and water quality, EO enables sustainable and safer **tourism**. The **Energy** infrastructure, including power grids, wind and solar farms, and oil and gas pipelines, is monitored and managed using space technology.

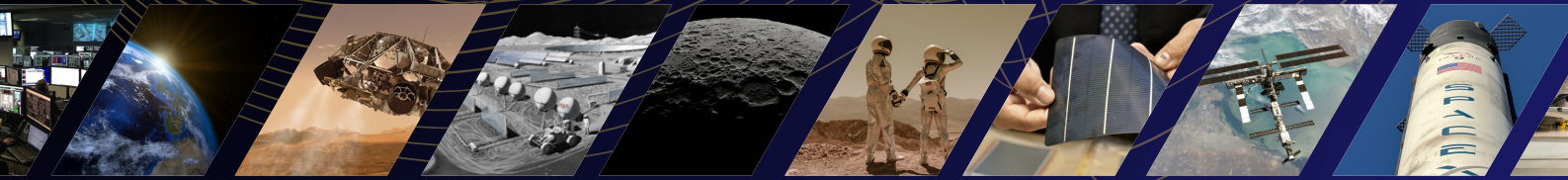
The **insurance and finance** industry will realize substantial growth in the utilization of Earth Observation data over the next decade and become the largest contributor to global EO revenues in 2031 (with €995 m and an 18.2% market share), boosted by the growing use and demand for parametric insurance products in the context of disaster resilience frameworks. Last, but not least, satellite technology plays a crucial role in national **security and defence**, providing communication, surveillance, and intelligence capabilities.

Space data can also be used in other industries, such as aviation and drones, emergency management and humanitarian aid, raw materials, fisheries and aquaculture, forestry, maritime, transport, urban development and cultural heritage.

03

COMPLEMENTARITY OF SPACE WITH OTHER TECHNOLOGIES

Space technology is closely linked with other technologies. For instance, cell phones and TV rely on satellite communication in **telecommunications**. The Space industry also contributed to the growth in the development of cutting-edge **computing technologies** like **artificial intelligence and machine learning**, as large volumes of data, which must be examined and processed in real-time, are produced during space exploration. **Telemedicine**, today widely used for communication between patients and doctors, first began as a form of healthcare delivery in the late 1960s to meet the needs of NASA astronauts who required medical assistance from physicians on Earth[6]. Additionally, discoveries resulting from research aboard the International Space Station into the **human body** and ailments such as osteoporosis and muscular atrophy can be used to advance human health on Earth.



04

A PARADIGM SHIFT IN SPACE INDUSTRY

For years, the space industry was exclusively the sector of public stakeholders and big private players: launching satellites into space used to be the exclusive domain of government agencies operating with the support of large aerospace contractors. This is not happening anymore. In the last decade, start-up space companies have shown that they can compete with and in some cases even upstage their larger counterparts. All at once, the space industry is witnessing a paradigm shift due to:

- **Technological transformation**, for example, due to the increased availability of space data, both in terms of generation and distribution, and to the enhanced accessibility of space. Nano and small satellites in Low Earth Orbit can be successfully launched and operated by small, new companies and the related services also leverage integration with other technologies such as HPC, IoT, AI.
- **Regulatory changes**, with the use of space “democratized” thanks to the establishment of new regulatory frameworks that make spaceflight and satellite launches easier.
- **Innovative forms of public/ private cooperation**, e.g. in 2020 SpaceX became the first private company to send NASA astronauts to the ISS.

This has led to the creation of a new term “New Space Economy”, which underpins a new industrial landscape where the classic model of centralized, government-directed human space activity has made way for a new model, in which public initiatives in space increasingly share the stage with private stakeholders. This represents a true paradigm shift since, in contrast to governments that mainly focus on benefits for citizens, the private sector is more eager to identify a viable commercial model for their initiatives while focusing on a clear and quick Return on Investment.

05

SPACE IS A PRIMARY EU FOCUS

The European Union invests significant amounts of money in space-related activities through various programs and initiatives. The European Union's space initiatives have indeed benefitted over the past twenty years from a multi-billion investment by the EU, which has enabled the development of the flagship Galileo and Copernicus satellite constellations. More recently, the commitment of the EU regarding the deployment and exploitation of space has been strengthened even further from a future-oriented perspective. Regulation (EU) 2021/696 establishing the EU Space Programme foresees a record high budget of €14.8 billion for space.



06

SPECIFIC SUPPORT BY EU IS AVAILABLE FOR ENTREPRENEURS

The early phases of scaling up for start-ups are supported by a variety of EU programs and initiatives, most notably the Union Investment Plan, its European Fund for Strategic Investments (EFSI), or the Union Framework Programme for Research and Innovation. These have encouraged several investments in the space industry.



07

REGULATORY ECOSYSTEM

The EU's regulatory framework for space activities is designed to ensure the safety, security, and sustainability of space activities. Particularly, intellectual property (IP) protection rules for space companies in the EU are governed by several legal instruments, including national laws, EU regulations, and international treaties. These enable companies to secure their investments, promote innovation, and drive growth and competitiveness in the sector[7]. Additionally, the Unitary Patent system will enter into operation in June 2023 and will benefit European businesses with broader and more effective patent protection at lower costs. The new system will enable uniform patent protection across all participating member states (17 to date) by filling in one, single patent application with the European Patent Office and will provide a centralised platform for Europe-wide patent litigation before the Unified Patent Court[8].

MAIN PLAYERS

Key trends shaping the European space sector include the increasing commercialization of space, the growth of small satellite and CubeSat technologies, and the development of reusable launch systems. Furthermore, international cooperation and competition play a significant role in shaping the European space sector, as European countries collaborate on joint missions and compete with other global players, such as the United States, China, and Russia.

The main players in the space sector can be broadly categorized into three groups: spacefaring nations, international organizations, and private companies. The following is an overview of some of the most influential entities within each group:

- **Spacefaring nations**, including the USA, which through the National Aeronautics and Space Administration (NASA) is the leading government agency responsible for the United States' civilian space program and space research. The U.S. also has a strong military space program, led by the United States Space Force. Russia has an advanced space capability through Roscosmos, the Russian State Corporation for Space Activities, which is responsible for Russia's space program, including satellite launches, manned space missions, and international collaboration projects. China, a space newcomer, operates in space through the China National Space Administration (CNSA) and oversees China's space program, which has been rapidly advancing in recent years and has achieved significant milestones, such as lunar and Mars missions.
- **Europe** plays a relevant role in space. Overall, the European space sector is diverse, innovative, and well-positioned for future growth. The region's strong commitment to research, development, and collaboration makes it one of the major players in the global space industry. In this landscape different types of actors play a role, including the European Space Agency (ESA), an intergovernmental organization with 22 member countries that collaborate on space projects, such as satellite launches, telecom, navigation and Earth Observation (EO) applications, and space exploration. ESA serves as the primary space organization for Europe and plays a leading role in shaping the region's space policies and strategies, with a strong involvement in supporting space start-ups and scale-ups. In addition, the European Union plays a crucial role in funding and managing space programs, such as Galileo (global navigation satellite system), Copernicus (Earth Observation program) and IRIS2 (Infrastructure for Resilience, Interconnectivity and Security by Satellite). These programs provide essential services to European citizens, industries, and governments. The EU operates directly through EUSPA, which is the operational European Union Agency for the Space Programme. It adopts a user-oriented approach to promote sustainable growth and to improve the security and safety of the European Union.

WHY INVEST IN THE SPACE SECTOR?

MAIN PLAYERS

- **National space agencies:** Many European countries have their own national space agencies, such as CNES (France), DLR (Germany), UKSA (United Kingdom), and ASI (Italy). These agencies undertake national space missions, participate in international collaborations, and contribute to the overall growth of the European space sector.

Other relevant actors for the space ecosystems are:

- **International organizations,** such as the United Nations Office for Outer Space Affairs (UNOOSA) which promotes international cooperation in the peaceful uses of outer space and maintains the legal framework for space activities, including the Outer Space Treaty and related agreements.
- **Private companies,** including:
 - SpaceX, founded by Elon Musk, has revolutionized the space industry with reusable rocket technology and ambitious plans for Mars colonization. The company also operates the Starlink satellite constellation, providing global internet coverage.
 - Blue Origin, founded by Jeff Bezos, is focused on developing reusable rocket technology for suborbital and orbital flights, aiming to enable human access to space and future space settlement.
 - In the downstream sector, Planet Labs, a private Earth imaging company that operates a large constellation of small satellites, provides high-resolution imagery and data for various applications.
 - OneWeb is a global communications company that aims to provide worldwide internet coverage through a constellation of low Earth orbit (LEO) satellites.
 - Several European companies are active in the space sector, including Airbus, Thales Alenia Space, OHB System, and ArianeGroup. They manufacture satellites, develop launch vehicles, and provide a range of space-based services.

Others key players and organizations in the European space sector include research institutions and universities. Europe is home to numerous research institutions and universities that conduct space-related research and develop cutting-edge technologies. These institutions play a vital role in fostering innovation and training the next generation of space professionals.

GEOPOLITICAL ENVIRONMENT

The geopolitical environment of space refers to the interplay of political, economic, military, and strategic factors that shape the policies and actions of countries and organizations in their pursuit of space-related activities. After the Cold War, the United States dominated space in satellite communications, navigation, and launch services, but over the past two decades, an emergent China and a resilient Russia developed advanced technologies and became leaders in space launch and space-based services. As the importance of space for various aspects of national security, economic development, and scientific advancement has grown, the geopolitical landscape of space has become increasingly complex and competitive. The geopolitical environment of space is characterized by a complex interplay of cooperation and competition among nations and organizations, driven by strategic, economic, and scientific interests. The most important challenges in the space sector are related to international security and cyber security, technology independence, sustainability, and the implementation of space technologies to find business solutions in the national labour market. Several key aspects of the geopolitical environment of space include:

1. THE CHALLENGE BETWEEN SPACEFARING NATIONS

Countries with advanced space capabilities, such as the United States, Russia, China, and members of the European Space Agency play leading roles in the geopolitical environment of space. These nations often compete for influence and prestige, while also cooperating in various international space projects.

2. THE EMERGING SPACE POWERS

Countries like India, Japan, and Brazil are expanding their space capabilities and asserting their presence in the geopolitical landscape. These emerging space powers contribute to the increasing complexity of the international space environment.

3. THE COMMERCIALIZATION OPPORTUNITY

The rise of private space companies, such as SpaceX, Blue Origin and OneWeb, has led to increased competition and innovation in the space sector. This shift has also raised questions about the roles and responsibilities of private actors in space and their impact on the geopolitical environment.



4. INTERNATIONAL COOPERATION AND COMPETITION

While there are many examples of international cooperation in space, such as the International Space Station, countries also compete for strategic advantages, access to resources, and control over critical space infrastructure. This dynamic can lead to tensions and rivalries in the space domain.

5. THREATS AND SPACE SECURITY

The increasing dependence on space-based assets for military, communication, and navigation purposes has raised concerns about the vulnerability of these systems to attack or disruption. As a result, nations are developing strategies and capabilities to protect their space assets and, in some cases, to potentially deny adversaries the use of space-based systems during conflicts.

6. SPACE GOVERNANCE AND REGULATIONS

The existing international legal framework for space activities, such as the Outer Space Treaty, is facing new challenges due to technological advancements and the increasing number of actors in space. Debates about space governance and the development of norms for responsible behaviour in space are becoming increasingly important in the geopolitical environment.

7. SPACE EXPLORATION AND RESOURCE UTILIZATION

Ambitious plans for lunar and Mars exploration, in addition to the potential exploitation of resources like water and rare minerals on celestial bodies, are driving competition and cooperation among nations and raising questions about the legal and ethical aspects of such activities.

INVESTMENT CYCLE

The investment cycle in the space sector depends on the different stages in which various types of investments are made into space-related activities and ventures. Being predominantly engineering-based, the space sector utilizes the Technology Readiness Level (TRL) scale, which can be easily referenced. The cycle can be divided into several phases, each representing a different level of maturity and risk for investors.

1. RESEARCH AND DEVELOPMENT (R&D)

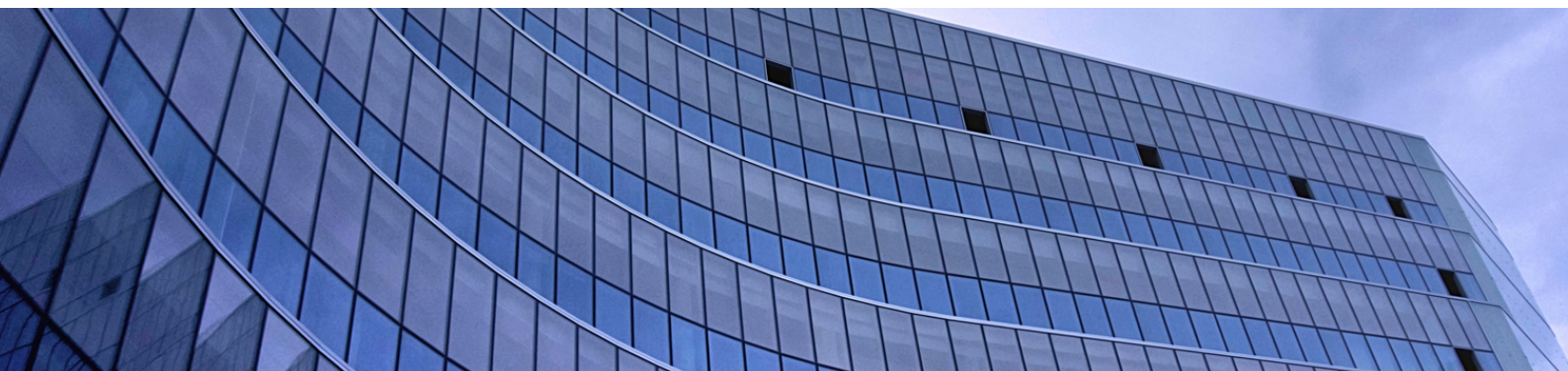
At this stage investments, considered high-risk due to the uncertainty of outcomes and the potential for failure, are primarily focused on the research, development, and testing of new technologies, concepts, and systems. These investments are in the European space landscape typically made by research institutions and funded by space agencies; sometimes private companies support innovation, mainly because of the high level of contributions provided by public entities. Nevertheless, some initiatives are in progress to improve access to capital markets for activities in development stages at TRL 2-3.

2. TECHNOLOGY DEMONSTRATION AND VALIDATION

This phase involves proving the feasibility and performance of new technologies through demonstrations, prototypes, or small-scale deployments. Investments at this stage may come from government agencies, venture capital firms, or private investors looking for opportunities in emerging technologies with high growth potential. In recent years, specialized funds in the space sector have entered the market, among which we can mention Seraphim Capital (UK)[9]. A recent initiative by Dealroom, the European Space Agency, and the E. Amaldi Foundation has launched a SpaceTech platform as a consultation and investigation tool for active space start-ups in Europe[10].

3. EARLY-STAGE VENTURES

As technologies mature and start to show promise, early-stage ventures may attract investments from venture capital firms, angel investors, or government-backed funds. These investments are still considered high-risk but offer the potential for significant returns if the venture succeeds. Also in this segment, corresponding to TRL 4-6, specialized funds and specific support initiatives by ESA, EUSPA, and other government agencies are active. These support derisking in investments and encourage syndicated investments among investors or in association with the same entrepreneurs.



4. EXPANSION AND GROWTH

As space ventures mature and demonstrate their ability to generate revenue, they may attract further investments to support their growth and expansion into new markets or applications. At this stage, investments may come from larger venture capital firms, private equity firms, or even public markets through initial public offerings (IPOs) or other forms of public financing. The European Space sector has not yet demonstrated fully feasibility in this respect, with a few exceptions (e.g., Astrocast, Spyre). Traditionally technological integration in the space sector between large industries and start-ups has been vertical, with technological developments being acquired directly by large space companies following the early-stage phase. Recent commercial agreements (e.g. ICEYE and Swiss Re) suggest that horizontal integration will, instead, be the trend of the decade.

5. MERGERS AND ACQUISITIONS (M&A)

As space companies grow and become successful, they may become targets for acquisition by larger companies or may merge with other companies to form more significant entities. M&A activity in the space sector can be an exit strategy for investors, allowing them to realize returns on their investments.

6. MATURE AND ESTABLISHED COMPANIES

At this stage, space companies have proven business models, stable revenue streams, and may become attractive investments for more risk-averse investors, such as institutional investors, pension funds, or retail investors. These companies may also invest in or acquire smaller companies to maintain their competitive edge or expand their capabilities. If listed on regulated markets, mature space companies are often indexed within ETFs or sector-specific funds.

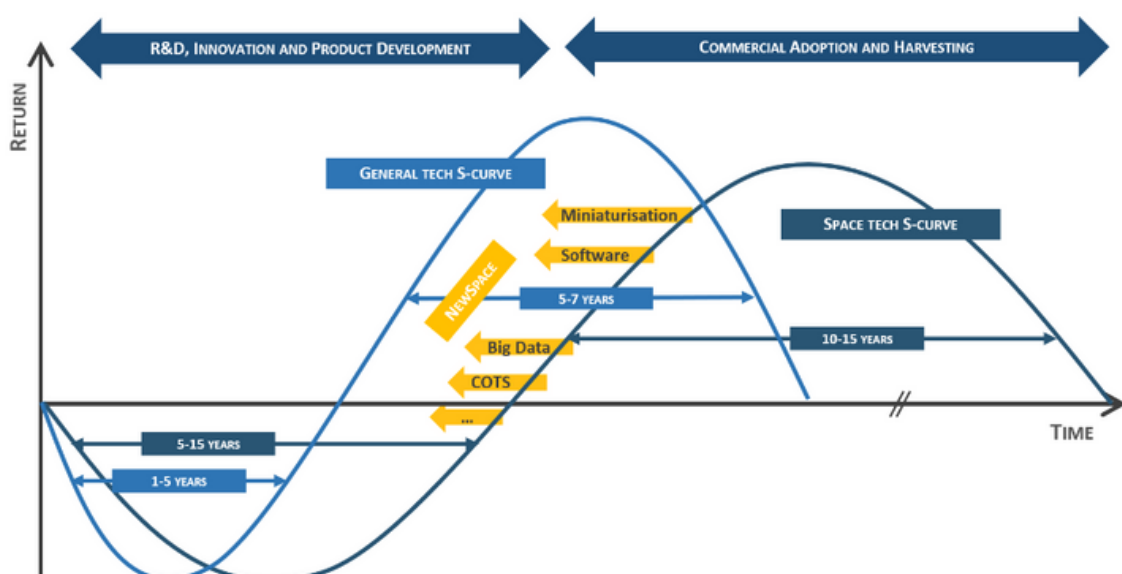
WHY INVEST IN THE SPACE SECTOR?

INVESTMENT CYCLE

As with any other sector, the investment cycle in the space sector can be characterized by varying degrees of risk and return, with investments in earlier stages typically associated with higher risks and potential rewards, while investments in later stages are generally more stable but may offer lower returns. The cycle is driven by the continuous development and commercialization of new technologies, the growing importance of space for various industries and applications, and the increasing number of players in the space sector. However, it is important to be able to distinguish between upstream and downstream investments, as this is generally connected to the time required to verify the return on investment.

The space upstream sector can have a long investment cycle, for the type of technology and degree of innovation concerned. As an example, space technology has historically been different from ICT technology in both the early phases and the time of positive return. In comparison to other ICT technologies, space technologies often demand larger upfront expenditure over longer time periods. In contrast to the 5–15 years needed in the space sector, the ICT industry's product development period lasts just one to five years. This discrepancy highlights the need for further investments and the significant capital requirements in the space upstream sector. The consulting firm SpaceTec Partners forecasts that the lifetime of the return on investment of technical development in space will continue to be compressed as space systems and components are upgraded and further improved due to ongoing progress in manufacturing technology and as an increasing number of private players enter the market. Obviously, a significant reduction of the lifetime investment cycle for downstream space initiatives also results.

Figure 2 - How NewSpace changes the S-Curve of space ventures.



Source: SpaceTec Partners.

TYPE OF INVESTORS AND FINANCIAL INSTRUMENTS AVAILABLE ON THE MARKET

There are various types of investors in the space sector, each with different levels of risk tolerance, investment focus, and time horizons, as well as different kinds of instruments to support investments in the sector.

1. GOVERNMENT AGENCIES

Many national governments invest in space-related research, development and infrastructure through their space agencies, such as NASA in the United States, Roscosmos in Russia, and the European Space Agency (ESA) and EUSPA in Europe. Government investment typically supports projects with strategic, scientific, or economic significance. In Europe both EUSPA and ESA have specific programmes supporting de-risking investment activities, generally provided through zero equity instruments for investors investing in start-ups[11][12][13]. To provide a concrete example in 2021, the new CASSINI programme was launched, an initiative introduced by the European Commission and managed by the European Investment Fund to support entrepreneurship and growth among space related businesses in the EU. The initiative is equipped with €1bn in funding[14].

2. RESEARCH INSTITUTIONS AND UNIVERSITIES

These entities often invest in space-related research projects and technologies, usually with a focus on scientific discovery, technological innovation, or workforce development. No specific tools are generally provided to investors despite the fact that specific universities, through their technology transfer offices, support co-investments for business angels.

3. VENTURE CAPITAL FIRMS

Venture capital firms invest in early-stage, high-growth companies in the space sector, aiming to achieve significant returns on their investments. These firms typically invest in start-ups with innovative technologies or business models and may provide mentorship, resources, and industry connections to help the companies succeed. Venture capital (VC) firms play a critical role in the space sector by providing early-stage investments to start-ups developing new technologies and services. Some of the major venture capital funds that have invested in the space sector include Bessemer Venture Partners, Space Angels, Promus Ventures, Seraphim Capital, NewSpace Capital, Primo Space, CosmiCapital, and Orbital Ventures[15]. These venture capital firms have played an important role in supporting the growth and development of the space sector by providing funding, resources, and expertise to innovative start-ups. Their investments have helped shape the industry by enabling new technologies and services, fostering competition, and driving down costs.

WHY INVEST IN THE SPACE SECTOR?

TYPE OF INVESTORS AND FINANCIAL INSTRUMENTS AVAILABLE ON THE MARKET



4. ANGEL INVESTORS

Angel investors are high-net-worth individuals who provide capital to early-stage ventures, often in exchange for equity or convertible debt. They usually invest their own money and may also offer guidance, mentorship, and networking opportunities to the companies they support. Specific groups of Business Angels are focusing on space, realizing syndicates to provide better investments[16].

5. PRIVATE EQUITY FIRMS

Private equity firms invest in more mature companies in the space sector, often through leveraged buyouts or growth equity investments. These firms generally seek to improve the performance of the companies in which they invest and exit through mergers and acquisitions, public offerings, or other liquidity events. However, they have not yet played a significant role in the space sector, mainly because space companies grow more organically than inorganically, which is the primary way through which private equity firms manage the growth of their target companies.

6. INSTITUTIONAL INVESTORS

Institutional investors, such as pension funds, insurance companies, and endowments, may invest in the space sector through public equities, bonds, or other financial instruments.

7. CORPORATE INVESTORS

Established companies in the space sector or related industries may invest in or acquire smaller companies to expand their capabilities, access new technologies, or gain a competitive advantage. These investments are often strategic in nature and may involve partnerships, joint ventures, or research collaborations. There is still a lack of investments made by corporate investors, directly or through CVC funds, searching for financial gains and thus indirectly supporting the growth of space start-ups. This is the main point of distinction between the European sector and the US ecosystem, where these structures are active and there are large space companies promoted by visionary investors.

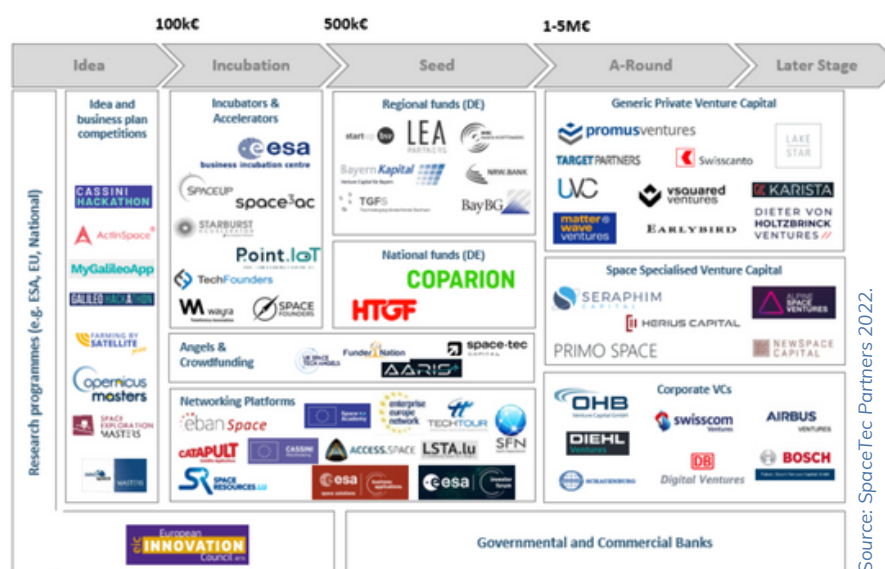
WHY INVEST IN THE SPACE SECTOR?

TYPE OF INVESTORS AND FINANCIAL INSTRUMENTS AVAILABLE ON THE MARKET

8. RETAIL INVESTORS

Individual investors can invest in the space sector through public equities, exchange-traded funds (ETFs), or other financial instruments that provide exposure to space-related companies and industries. Retail investors may have diverse investment goals and risk tolerances, depending on their personal financial situation and objectives. Exchange-traded funds (ETFs) provide investors with a way to gain exposure to the space sector without investing in individual stocks. ETFs typically track an index or a group of companies within a specific industry, allowing investors to diversify their holdings and mitigate risk. In the space sector, there are several ETFs that focus on companies involved in various aspects of space-related activities, such as satellite manufacturing, launch services, and space tourism. One notable example of a space-focused ETF is the ARK Space Exploration & Innovation ETF (ARKX) which is an actively managed Exchange Traded Fund (ticker: ETF) that seeks long-term growth of capital by investing under normal circumstances primarily (at least 80% of its assets) in domestic and foreign equity securities of companies that are engaged in the Fund's investment theme of Space Exploration and innovation. Another notable example of a space-focused ETF is Procure Space ETF (ticker: UFO). This ETF tracks the S-Network Space Index, which includes companies that derive a significant portion of their revenues from space-related activities. The UFO ETF provides investors with exposure to a diverse range of companies involved in satellite communications, space infrastructure, rocket and satellite manufacturing, and other space-related businesses. Another example is the SPDR S&P Kensho Final Frontiers ETF (ticker: ROKT). This ETF tracks the S&P Kensho Final Frontiers Index, which includes companies involved in both space and deep-sea exploration activities. The ROKT ETF offers investors exposure to a range of companies that are at the forefront of exploring and utilizing space and deep-sea resources. Finally, ESA, the European Commission and Promus Ventures joined efforts for a Space Index launched, developed, and maintained by Euronext. This is the first Euronext European space-related index to measure the stock market performance of European companies in the space sector[17].

Figure 3 - Overview on space ventures and their growth stage.



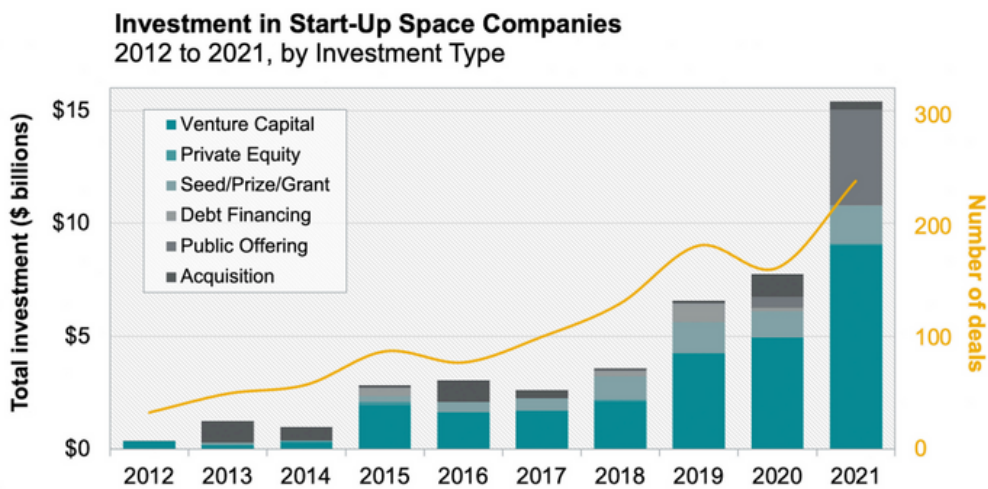
These different types of investors play essential roles in providing the capital, resources, and support needed for the growth and development of the space sector. Their investment decisions are influenced by factors such as technological advancements, market trends, regulatory frameworks, and geopolitical dynamics.

WHY INVEST IN THE SPACE SECTOR?

TYPE OF INVESTORS AND FINANCIAL INSTRUMENTS AVAILABLE ON THE MARKET

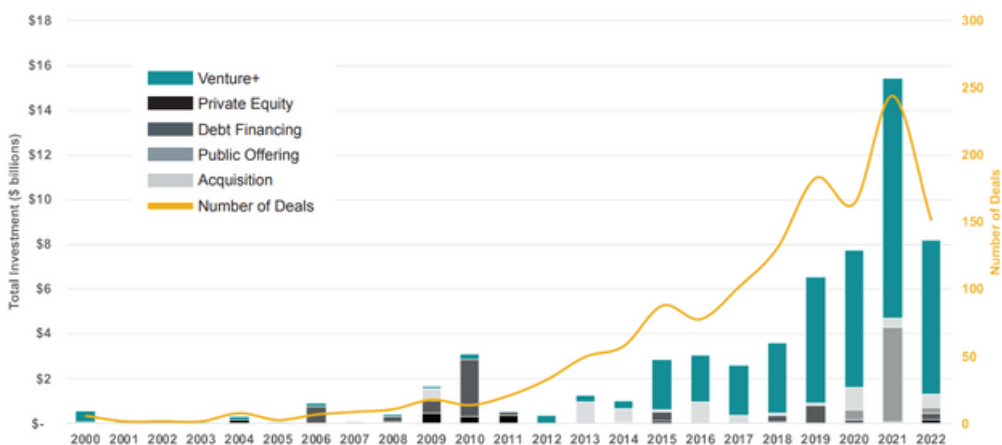
Looking at the type of investors in the start-up space companies, it is noticeable that from 2012 to 2021 the venture capital investor is the most involved, with around 180 deals. Next, debt is the second most popular access to financing for start-ups. Seed, private equity firms, and banks have played a comparatively smaller, less consistent, role in start-up space investment (Figure 4- 4.1)[18].

Figure 4 - \$15.4 billion invested in 2021 across 241 deals.



Source: Bryce StartUp space report 2022.

Figure 4.1 - Over \$8 billion invested in 2022 across 154 deals.



Source: Bryce StartUp space report 2023.

REWARDS PROFILE/ PERFORMANCES



It is difficult to provide specific expected returns on investments in the space sector, as returns can vary widely depending on the type of investment, the company, the market conditions, and the time horizon. Investing in the space sector can be risky, as it involves significant technological and regulatory challenges, and some companies may not succeed in achieving their goals.

However, the space sector has been experiencing substantial growth in recent years, driven by advancements in technology, the increasing commercialization of space, and a surge in public and private investments. This growth has led to promising returns for some investors, particularly in areas such as satellite communications, Earth observation, and launch services.

Some factors to consider when assessing the potential returns on investments in the space sector include:

1. MARKET SIZE AND GROWTH

The global space market has been growing rapidly and is expected to continue expanding in the coming years. This growth may present investment opportunities in various subsectors, such as satellite manufacturing, launch services, and space-based services. A thorough analysis of TAM, SOM, and SAM proves to be one of the main factors in determining the quality of the investment, given that the relatively small size of the space market allows for easy identification of growth trends and the real opportunities in the reference market.



2. TECHNOLOGY DEVELOPMENT

Rapid advancements in technology, such as reusable launch systems and small satellites, have the potential to lower costs and increase the accessibility of space, creating new opportunities for investment and potentially higher returns.

3. REGULATORY ENVIRONMENT

The space sector is subject to complex and evolving regulations, which can affect the viability and profitability of certain projects. Investors should carefully consider the regulatory environment when assessing the potential returns on space investments.

4. COMPETITIVE LANDSCAPE

The space sector has become increasingly competitive, with new players and start-ups entering the market alongside established companies. This competition can drive innovation and potentially lead to higher returns for successful companies. At the same time, the high competitiveness increases the pervasiveness of the space sector with regard to other industrial verticals, allowing for the substitution effect of space-origin technologies compared to less efficient terrestrial technologies.

5. RISK TOLERANCE AND INVESTMENT HORIZON

Investing in the space sector can obviously be risky, and some projects may take several years to generate returns. Investors should carefully consider their risk tolerance and investment horizon, especially depending on whether it is an upstream or downstream initiative, when assessing the potential returns in the space sector.

VOLUMES/NUMBERS

Start-up space ventures achieved rounds of €527M in 2022, outperforming 2021. This includes upstream and downstream sectors, but there were no mega rounds. When mega-rounds are included, €7.1 billion has been invested in European Upstream Space Tech since 2010. Downstream start-ups working with ESA raised €709M in 2022.

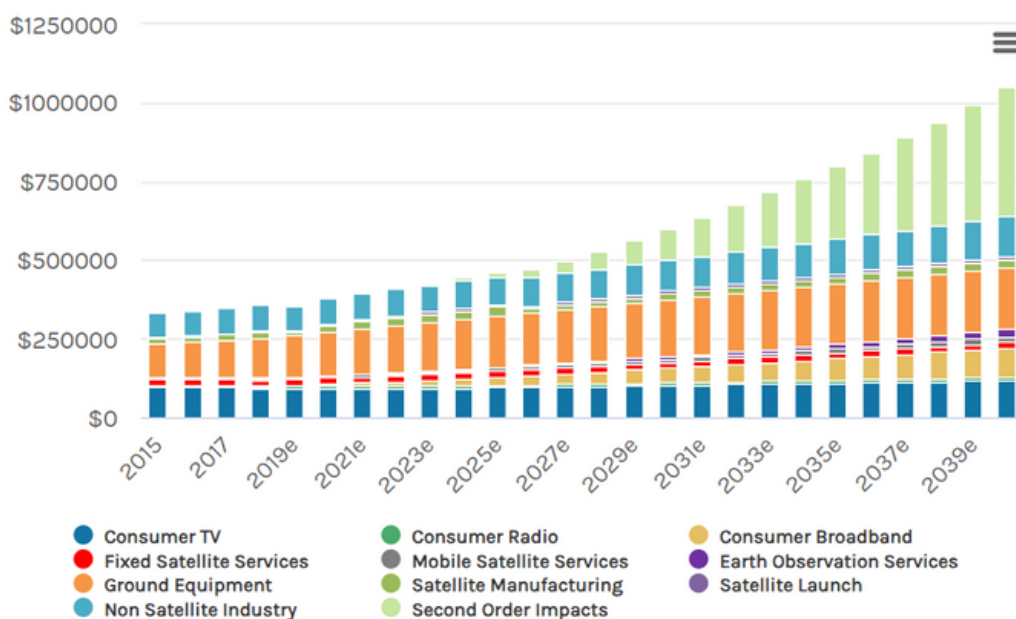
However, the exact market volume or size for the European space sector can be difficult to assess due to the rapidly evolving nature of the industry and the multitude of subsectors involved.

In 2019, the European space sector had an estimated market size of €9 billion, according to a report by the European Investment Bank (EIB). This estimate includes activities such as satellite manufacturing, launch services, and satellite-based services.

The European space sector benefits from strong public funding, with the European Union (EU) and the European Space Agency (ESA) allocating significant resources to space programs and initiatives. For instance, the EU's Multiannual Financial Framework (MFF) for 2021-2027 earmarked €13.2 billion for the EU Space Programme, which includes Galileo (global navigation satellite system), Copernicus (Earth observation program), and other space-related initiatives. During the ESA Council Ministerial Meeting held on 22nd-23rd November 2022 in Paris, the ESA budget of € 16.9 billion was allocated for the period 2023-2025.

The estimated value of the economic potential of the space sector for business is 1 trillion by 2040 [19][20].

Figure 5 - The Global Space Economy (\$t).



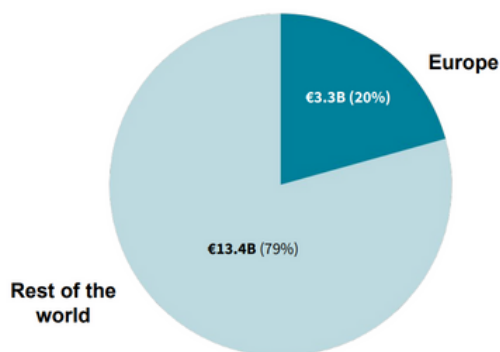
Source: Haver Analytics, Morgan Stanley Research forecasts.

WHY INVEST IN THE SPACE SECTOR?

VOLUMES/NUMBERS

In order to give a measure of the numbers behind this sector, it must be underlined that Start-up space ventures attracted around \$15 billion in total financing for the Upstream segment during 2021. \$3.3B of those relate to Europe (Figure 6) [21].

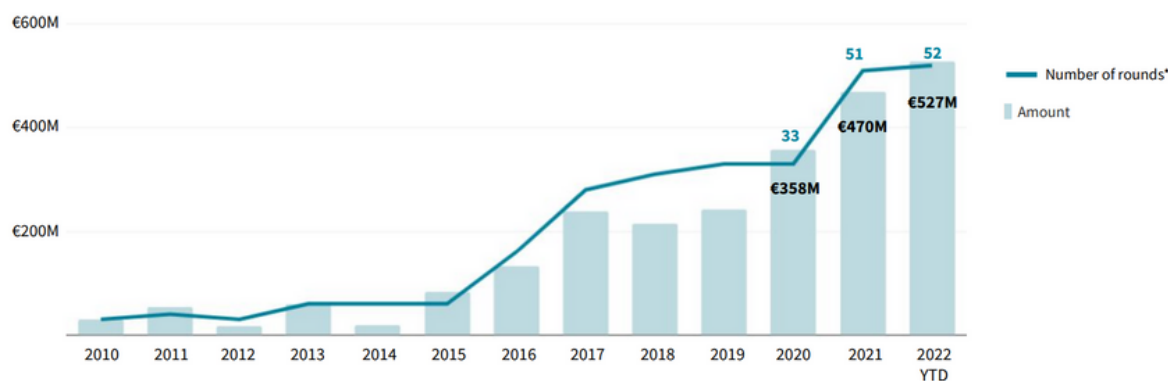
Figure 6 - VC funding in Upstream Space Tech by startup HQ location (2020-2022), including megarounds (€100M+).



Source: European Space Tech, Dealroom.

For example, ESA BIC, supported companies with the backing of local partners which are now worth €6.5B for the downstream segment[22]. This sector has increased fifty-fold in value from 0.5 billion in 2010 to 25.4 billion in 2022, so there is an increasing positive trend in this sector which is extremely promising (Figure 7)[23].

Figure 7 - VC funding in Upstream Space Tech startups & scaleups, excluding megarounds (€100M+).



Source: European Space Tech, Dealroom.

Even after the Covid-19 crisis in 2020-2021, the sector still registered a positive trend, proving to be an excellent industry that withstands even the most severe economic crises. A slight downturn during 2022 does not seem to have affected the overall growth trends.

The most attractive space start-ups sectors are communication and connectivity satellites, semiconductors for space, earth observation satellites, launch vehicles and materials for space in addition to smart cities, finance, agriculture and food.

TRENDS

The space sector is rapidly evolving, driven by technological advancements, commercial opportunities, and growing global interest. Some of the major trends in the space sector include:

1. COMMERCIALIZATION AND PRIVATIZATION

The role of private companies in the space sector has grown significantly, with firms like SpaceX, Blue Origin, and OneWeb developing new technologies and providing services such as satellite launches, satellite-based internet, and space tourism. This trend has led to reduced costs, increased innovation, and greater access to space.

2. REUSABLE LAUNCH SYSTEMS

Reusable rockets, such as SpaceX's Falcon 9 and Falcon Heavy, have revolutionized the space industry by significantly reducing launch costs and enabling more frequent space missions. This trend is likely to continue as more companies develop reusable technologies to drive down costs further and improve access to space.

3. SMALL SATELLITES AND CUBESATS

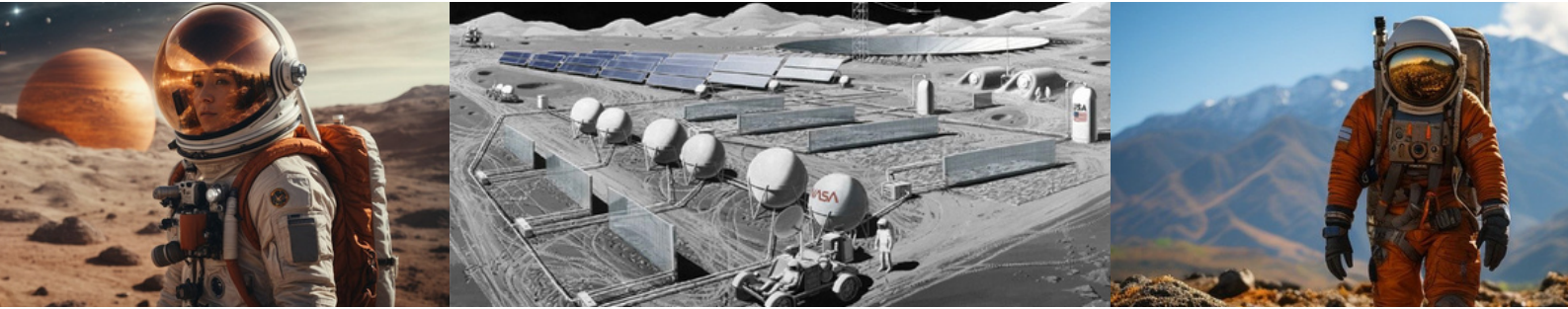
The miniaturization of satellite technology has led to a surge in small satellites and CubeSats, enabling more affordable and accessible options for space missions, Earth Observation, and telecommunications. Small satellite constellations are being deployed for various purposes, such as global internet coverage and real-time monitoring of Earth's resources.

4. SPACE-BASED INTERNET SERVICES

Satellite constellations, such as SpaceX's Starlink, OneWeb, and Amazon's Project Kuiper, are being developed to provide global high-speed internet access, particularly to remote and underserved areas. This trend has the potential to transform the telecommunications industry and bridge the digital divide.

5. IN-ORBIT SERVICING AND MANUFACTURING

The development of technologies for in-orbit servicing, such as satellite refuelling, repair and maintenance can extend the lifespan of satellites and reduce space debris. Additionally, in-orbit manufacturing could enable the production of materials and structures in the unique environment of space, opening up new potential for space exploration and commercialization.



6. SPACE TOURISM

Companies like Blue Origin, SpaceX, and Virgin Galactic are working towards providing suborbital and orbital space tourism experiences to the public. As technology advances and costs decrease, space tourism is expected to become more accessible, opening up new opportunities for the space sector and the general public.

7. SPACE EXPLORATION AND COLONIZATION

Ambitious plans for space exploration, such as NASA's Artemis program, SpaceX's Mars colonization plans, and China's lunar exploration program, are driving renewed interest in manned missions to the Moon, Mars, and beyond. This trend may lead to the development of new technologies, resources and opportunities in the space sector.

8. INTERNATIONAL COOPERATION AND COMPETITION

The space sector is witnessing increased international cooperation in areas like space exploration, research, and infrastructure development. However, competition among countries for dominance in space is also intensifying, raising concerns about potential conflicts and the militarization of space.

These trends are shaping the future of the space sector and offer new opportunities and challenges for governments, companies, and individuals involved in space-related activities. As technology continues to advance and the space sector becomes more accessible, it is likely that these trends will evolve and lead to new developments in the years to come.

WHO ARE THE KEY SUPPORTERS FOR SPACE STARTUPS?

There are several major space associations and organisations in Europe that play crucial roles in the development and growth of the European space sector and can be helpful in exploring space investments.

Some of the most **prominent players** include:

- **European Space Agency:** ESA serves as one of the primary space organizations for Europe and plays a leading role in shaping the region's space policies and strategies. The ESA has several Business Incubation Centres, the largest network of incubators supporting space related start-ups in Europe, and many established Business Applications Ambassadors to exploit and promote the ESA's commercial programs. [24][25].
- **European Union Agency for the Space Programme:** EUSPA has several initiatives and tools, ranging from a VC database to a catalogue of resources for space investments[26].



RESPONSIBLE INVESTING IN SPACE

As documented in this guide, the Space industry will have a transformative impact on both society and the economy in the coming years, addressing such key areas as climate change, environmental sustainability, connectivity and security. In this context, SpaceTech can make a decisive contribution to the achievement of the Sustainable Development Goals (SDGs) of the United Nations.

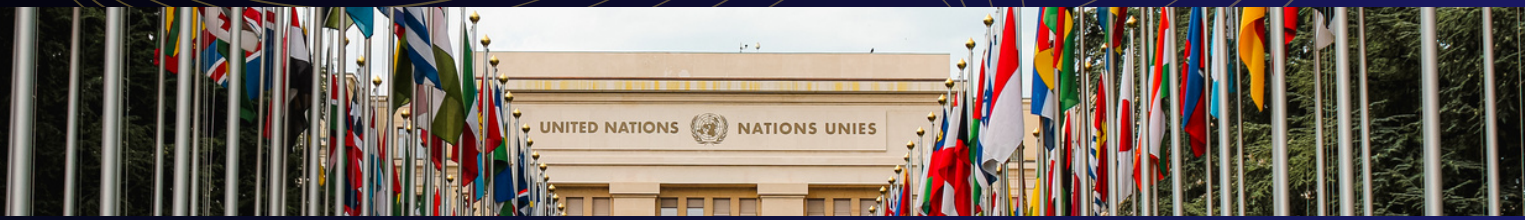
However, as in all industries, Space also has the potential for harmful effects on such aspects as sustainability, equality and the wellbeing of life on earth. The unbridled monopolization of Space resources by large-scale operators can also threaten equitable access to the benefits of Space for all nations and peoples. These factors should be taken into consideration in any responsible investment process.

EBAN Space member Seraphim Space Manager LLP (Seraphim Space) has developed a 'Responsible Investment Policy'[27] guide for investment in Space. In the following, we quote from the guide as an exemplary model for responsible investment in this sector:

“We recognize that Space, like all industries, carries potential for negative as well as positive ESG impacts and we ensure consistent considerations of material Environmental, Social and Governance (ESG) factors are embedded across the investment cycle from investment screening to due diligence, ownership and exit. Seraphim Space is a signatory of the United Nations Principles for Responsible Investment (PRI) and is therefore committed to:

- ***Incorporate ESG issues into investment analysis and decision-making processes.***
- ***Be active owners and incorporate ESG issues into ownership policies and practices.***
- ***Seek appropriate disclosure on ESG issues by the entities into which investments are Made.***
- ***Promote acceptance and implementation of the PRI's principles (the Principles) within the investment industry.***
- ***Work together to enhance effectiveness in implementing the Principles.***
- ***Report on activities and progress towards implementing the Principles.***

Seraphim Space believes the implementation of these Principles will result in better outcomes for its investors and closer alignment between their investment objectives and value for society more broadly”.



We strongly recommend consulting the UN Principles for Responsible Investment (PRI) and ESG impact and risk categories, which are well documented in the Seraphim Space 'Responsible Space Investment Policy' guide, as an essential part of the Space investment process. In step with other leading international space communities[28], EBAN has also published its own MANIFESTO for a Clean, Safe, Equitable and Peaceful Space for All, expressing its engagement and commitment to preserving and protecting the Space environment for future generations:

MANIFESTO FOR A CLEAN, SAFE, EQUITABLE AND PEACEFUL SPACE FOR ALL

- Space is the largest resource in the universe.
- It needs to be protected and made accessible for all.
- As the digital transformation gains further momentum, more and more countries and citizens around the globe are becoming dependent on space as a resource for their economies, for their societies, for the health and well-being of all life on the planet and for peace in the Universe.
- The United Nations Sustainable Development Goals (UN SDGs) and the United Nations Declaration of Human Rights must now be extended to space. Without this, the same devastation that has occurred on earth and our oceans will also be encountered in space, thus depriving us of this most valuable resource. Mindless, unintended and intended harm is already endangering the access and ability to operate in space. This includes pollution coming from fossil fuels, debris, and inefficient use or colonisation of frequencies or orbital positions. This is leading to an inequitable use of this invaluable resource.
- We must take action now to preserve and protect space in order to keep it clean, safe, equitable and peaceful for all.
- In order to do this, we call on all existing and future operators to apply the UN SDGs and the U.N. Declaration of Human Rights. We as investors will not be able to ensure the financial viability of the ventures we are financing without applying these very principles and guidelines.
- In addition, we refer to the excellent work being done by UNOOSA / EUSPA on the report covering how space technologies such as GNSS and space data contributes to SDGs; as well as work being done by The Secure World Foundation and several publications on Ethical and Socially Responsible Investing.
- All countries and citizens around the globe need access to space for eternity.
- Let's make it happen.
- Humanity deserves a clean, safe, equitable and peaceful space for all.

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Business Angels Guide to investment in the SpaceTech Sector

Source: European Union, Copernicus Sentinel-2 imagery.



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REFERENCES

1. Source: SpaceTech Across Europe An Overview of Investment Activity between 2017-2021, EBAN, at [link](#).
2. Source: McKenzie, How will the space economy change the world, Nov 2022.
3. Source: EU space policy: Boosting EU competitiveness and accelerating the twin ecological and digital transition, European Parliament.
4. Source: EU space policy: Boosting EU competitiveness and accelerating the twin ecological and digital transition, European Parliament.
5. Source: EUSPA, EO and GNSS Market Report, 2022, at [link](#).
6. Source: NASA, Nasa and telemedicine, at [link](#).
7. Source: European Commission, IP and Space Activities, at [link](#).
8. Source: EPO - The Unitary Patent is to become a reality, at [link](#).
9. Source: Seraphim, Spacetechnology The big business of space on Earth, January 2023, at [link](#).
10. Source: Dealroom Spacetechnology platform, at [link](#).
11. Source: EUSPA Cassini matchmaking program, at [link](#).
12. Source: ESA Space Solutions programs, at [link](#).
13. Source: ESA Commercialisation gateway, at [link](#).
14. The forthcoming largest funding programme in the EU is InvestEU, which with the InvestEU Fund is using loans guaranteed by the EU, combines 13 financial instruments for a total envelope of €372bn.
15. Source: EUSPA Venture capitalis database, at [link](#).
16. Source: EBAN Space, at [link](#).
17. Source: Euronext Helios Space index, at [link](#).
18. Source: Bryce Startup Space 2022, at [link](#).
19. Source: Morgan Stanley, Space: Investing in the Final Frontier, at [link](#).
20. Source: Mc Kinsey, How will the space economy change the world, Nov 2022, at [link](#).
21. Source: Dealroom.co, European Space Tech lifting off Report 2022, at [link](#).
22. Source: Dealroom.co, European Space Tech lifting off Report 2022, at [link](#).
23. Source: Bryce Startup Space 2022, at [link](#).
24. Source: ESA Business Incubation Centers, at [link](#).
25. Source: ESA Business Applications Ambassadors, at [link](#).
26. Source: EUSPA Opportunities website, at [link](#).
27. Source: Seraphim, Responsible Investment Policy, at [link](#).
28. Similar calls to collaborative action have also been issued by the following organizations: WEF, Space Industry Debris Mitigation Recommendations, June 2023, at [link](#); ESA, Statement for a Responsible Space Sector, at [link](#); ESA, Zero Debris Charter, at [link](#); SWF, Space Industry Statement in Support of International Commitments to Not Conduct ASAT tests, at [link](#).



BUSINESS ANGELS GUIDE TO INVESTMENT IN THE **SPACETECH SECTOR**

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