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TABLE OF CONTENT

1 New Space trends in 2020

1.1 About New Space

The global landscape of space activities is currently undergoing profound changes. Whereas the vast majority of space activities is still led by governments, with private industries acting as suppliers for public programmes and relying massively on public funding, a disruptive and commercially driven ecosystem has emerged over the last decade marked by ambitious private endeavours featuring innovative schemes and business models. In this new ecosystem, public actors are eager to explore new ways to conduct space programmes and to foster the development of the space sector. In turn, private actors also seek to play a more prominent role, leveraging public funding and private investment to develop new space services and address new markets.

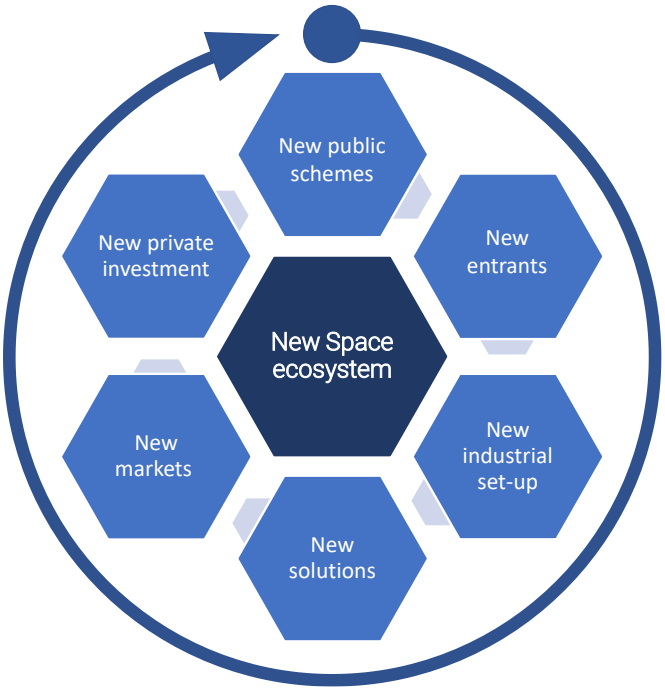


Figure 1: The New Space ecosystem

The underlying dynamic of this new ecosystem, usually referred to as New Space, features a wide range of interrelated trends leading the space sector towards a more business and service-oriented step:

- New public schemes for space programmes, procurement and support to innovation involving new arrangements with the private sector and the development of new public instruments.
- New entrants including emerging spacefaring nations and new business ventures from space companies and start-ups as well as from non-space companies seeking to enter the space sector.
- New solutions including new products and services but also disruptive value propositions such as integrated solutions, lower prices, reduced lead times, lower complexity, and better flexibility.
- New markets under exploration or development in both the upstream and downstream segments of the space value chain (e.g., in-orbit servicing, satellite broadband, satellite imaging, micro-launchers…)
- New industrial set-ups and implementation of new industrial methods and processes for the development and production of space systems as part of innovative business models.
- New private investment from various sources and involving multiple financial instruments (e.g., venture capital, private equity, loans, prizes, crowdfunding…)

1.2 New public support instruments in Europe

1.2.1 EU New Space investment mechanisms

With New Space increasingly high in its space agenda, the EU is now openly and actively seeking to support entrepreneurship and investment in the European space sector and introduced new instruments for this purpose. Several new major European initiatives to boost investments, mobilise additional funds and support entrepreneurship and private investment were introduced in 2020. In particular, the European Commission stepped up its collaboration with the European Investment Bank (EIB) and the European Investment Fund (EIF) to foster investment and entrepreneurship in the space sector.

Throughout the year, specific initiatives and funds have accelerated their support and investment in the European New Space ecosystem:

InnovFin space equity pilot[1]

- The European Commission announced €300 million in investments for the space sector following the joint investment by the European Commission and the EIF in Orbital Ventures and the Primo Space venture capital fund. The announcement is part of the initiatives put in place by the Commission and the EIF in the framework of the €100 million InnovFin space equity pilot, which is part of the InnovFin equity initiative launched by the EU and the EIB Group under Horizon 2020. It constitutes the first ever space equity pilot officially backed by the EU and is expected to reach full deployment in Q1 2021.
- Through this initiative, the EIF and the European Commission generate continued support to space companies across the continent through the financing of European funds focused on the financing of space technologies. The EIF's participation in this initiative is backed by the European Fund for Strategic Investment (EFSI).
- Following the European Commission and the EIF's investment, Primo Space co- led a €5 million Series A financing round for Italian start-up Leaf Space and led a €1.5 million investment deal with AIKO Autonomous Space Mission.[2]

European Innovation Council Equity Fund

- The European Commission has also awarded €238 million in investments in highly innovative start-ups and SMEs through the European Innovation Council (EIC) Equity Fund.[3] The EIC Fund is an innovative instrument part of the EIC accelerator, through which the Commission aims to make direct equity as well as quasi-equity investments. Through these investments, ranging between €500,000 and €15 million, the Commission expects to gain a "10% to 25% ownership stake in each company".[4] The European Commission officially launched the EIC in 2021 as a successor to the pilot initiative, with a budget of €10 billion (current prices) for 2021-2027.[5]
- The Dutch start-up Hiber benefited from this mechanism as it closed a €26 million round in 2021 in a new funding round led by the European Innovation Council. The EIC participated by means of a co-investment with the Dutch government as a part of the first round of equity investments carried out at the start of the year to finance 42 highly innovative European start-ups with a total of €178 million.[6] This represented the first time the European Commission made direct equity or quasi equity investments.

[1] European Commission, InnovFin space equity pilot (https://ec.europa.eu/commission/presscorner/detail/en/ip_21_89)
[2] Primo Ventures, Primo Space invests in Aiko Space and adds Raffaele Mauro as General Partner
[3] European Commission, Commission awards more than €278 million to 75 start-ups and SMEs set to shape the future
[4] European Commission, European Innovation Council Fund: first equity investments of €178 million in breakthrough innovations
[5] European Commission, Commission launches European Innovation Council to help turn scientific ideas into breakthrough innovations, (March 2021)
[6] European Commission, European Innovation Council Fund: first equity investments of €178 million in breakthrough innovations

CASSINI

At the 13th European Space Conference, European Commissioner Thierry Breton announced the creation of the Competitive Space Start-ups for Innovation initiative (CASSINI), which is projected to result in the establishment of a €1 billion European Space Fund building on the success of the InnovFin space equity pilot. The fund will be put in place by the European Commission and the EIB Group and will "cover actions on the whole innovation cycle, from business idea to industrialisation".[7] The initiative is in line with the EU Strategy for SMEs and aims to stimulate private investment in space companies from VC funds as well as increase the number of start-ups in the sector and improve their market penetration throughout the entire entrepreneurial cycle.[8]

EU funding mechanisms as well as the type of investment/ size are summarized below:

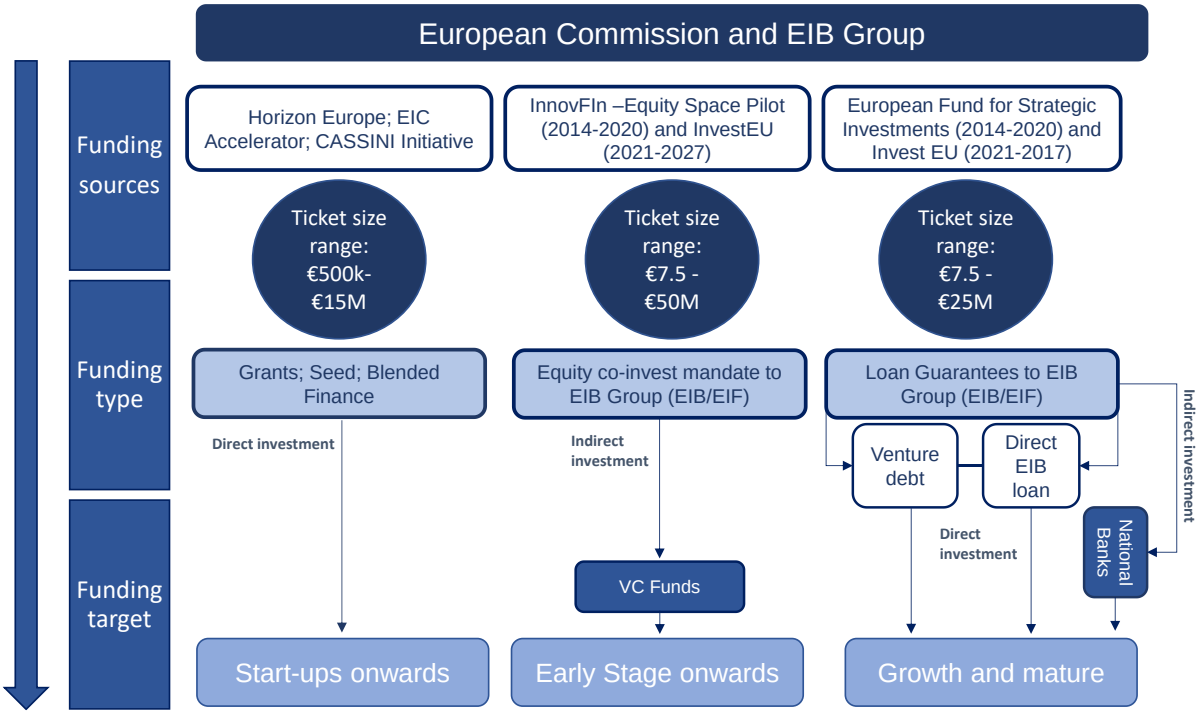


Figure 2: EU space investment mechanisms

[7] European Commission, Speech by Commissioner Thierry Breton at the 13th European Space Conference (available : https://ec.europa.eu/commission/commissioners/2019-2024/breton/announcements/speech-commissioner-thierry-breton-13th-european-space-conference_en)
[8] Startup Europe Club, What is Cassini (available at: https://startupeuropeclub.eu/cassini/)

1.2.2 The new EU MFF and European programmatic developments

In 2020, the European Union (EU) concluded the negotiations of its new Multiannual Financial Framework (MFF) for the 2021-2027 period. The EU has reinforced its support to the space sector with the adoption of an ambitious EU Space Programme, with a budget of €14.9 billion (in current prices).9 The new budget represents a considerable increase compared to the €11.1 billion provided to the space sector as part of the 2014-2020 MFF and underlines a growing emphasis given to space. Within the new framework some key programmes are of particular interest to New Space trends in Europe:

Horizon Europe

- Within the scope of the new MFF, the EU adopted a budget of €95.5 billion for its Horizon Europe programme, which will be succeeding the Horizon 2020 programme implemented under the previous MFF as the new EU's Framework Programme for Research and Innovation (R&I). Horizon Europe is formally in effect as of January 2021.
- The programme will support space-related projects under Pillar 2 "Global Challenges and European industrial competitiveness" within its Cluster 4 denominated "Digital, Industry and Space". The European Commission is allocating a total of €13.4 billion to Cluster 4 for the duration of the next MFF. The European Commission is expected to establish an indicative budget for space activities of approx. €173.6 million and €128.1 million for 2021 and 2022 respectively.[10]
- The funding made available through Horizon Europe is set to be "at least proportionally commensurate with that under Horizon 2020" and aims to "foster a globally competitive and innovative European space sector" in coherence with the Union Space Programme.[11] The support provided is therefore thematically linked to the development of Copernicus and Galileo programmes, SSA/STM and GOVSATCOM activities, as well as to other strategic innovation areas such as reusable launchers, European technology non-dependence and space science.[12]

InvestEU programme

- The European Commission has driven efforts to simplify funding mechanisms in the EU and created the InvestEU Fund with the aim of "bringing all EU investment instruments under one roof".[13] The Fund will thus offer a single budgetary guarantee scheme involving 14 European financial instruments, including the European Fund for Strategic Investment (EFSI) that backed investments made in the scope of the unprecedented InnovFin Space Equity Pilot in the previous MFF.
- To mobilise both public and private funds, the EU provided the InvestEU programme with a total EU budget guarantee of €26.2 billion for the purpose of attracting over €372 billion in additional investment over the 2021-2027. With regards to start-ups and SME's, the European Commission aims to use the InvestEU Fund to address "sub-optimal investment situations and reduce the investment gap in targeted sectors".[14] Space is part of the areas eligible for financing and investment operations, in particular for activities that are in line with the Space Strategy for Europe that have the objective of

[9] Space policy and activities beyond 2020: the new EU space programme at a glance" (June 2018). The initial proposal of €14.2 billion and the 2020 approval of €13.2 billion in constant prices correspond respectively to €16 and €14.9 billion in current prices
[10] European Commission, Draft Horizon Europe Work Programme 2021-2022 – Digital, Industry and Space
[11] European Council, Position of the Council at first reading with a view to the adoption of a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing Horizon Europe – the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination, and repealing Regulations (EU) No 1290/2013 and (EU) No 1291/2013
[12] European Commission, Draft Horizon Europe Work Programme 2021-2022 – Digital, Industry and Space
[13] European Union, InvestEU, (available: https://europa.eu/investeu/about-investeu_en)
[14] European Parliament and European Council, REGULATION (EU) 2021/523 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 March 2021 establishing the InvestEU Programme and amending Regulation (EU) 2015/1017

"underpinning space entrepreneurship".[15] The funding of space activities, together with those of defence and cybersecurity, can also be considered as strategic investments in the programme.

European Defence Fund

- By virtue of the increased emphasis given by the European Commission to enhancing synergies amongst sectors in the EU, space companies will be eligible for funding under the new European Defence Fund. The Commission confirmed that it "envisages up to 8% of its budget to support disruptive technologies", which are defined as having a "high risk and high potential impact".[16] This will be particularly relevant for companies in the space sector working with dual-use technologies.
- For this purpose, the European Commission also foresees the creation of an innovation incubator "to support new technologies and shape dual-use innovation".[17] The incubator is expected to be launched in the first half of 2022 and work in close collaboration with the European Innovation Council and the European Defence Agency.

1.2.3 ESA support to the European New Space ecosystem

The European Space Agency has long played a major role and been a driving force in the growth of the European start-up ecosystem by supporting entrepreneurship and investment through various support mechanisms ranging from incubation centres to different funding instruments.

ESA support Mechanisms

There are currently a variety of support programmes and initiatives offered by ESA for start-ups and SMEs at different stages of their development:

- The ESA ARTES 4.0 programme, which offers varying degrees of support and funding opportunities to all businesses focused on satcom technologies.[18] The ARTES 4.0 programme contains various generic programme lines (GPLs) that enable the agency to enhance the activities of start-ups and SMEs present along different development levels and developing technologies or services across the Technology Readiness Level (TRL) spectrum. Among these GPLs we can find:
  - The ESA Business Applications and Space Services (BASS), which contains:
    - The ESA Business Incubation Centres (BICs), through which the agency offers incubation solutions as well as funding for start-ups and SMEs seeking to turn ideas into commercial solutions.[19] ESA Business Incubation Centres (BICs) have long supported start-ups in the space sector and remain one of the primary sources of support for entrepreneurs and early-stage companies. As of 2020, the programme now counts 21 centres and over 60 locations across Europe. There are currently over 300 start-ups in incubation.[20] The latest BIC was inaugurated in Greece in 2021. In total, start-ups and companies that have received support from BICs have generated over €96 million in turnover since 2018.[21]

[15] Ibid.
[16] European Commission, Action Plan on synergies between civil, defence and space industries (available at: https://ec.europa.eu/info/sites/info/files/action_plan_on_synergies_en_1.pdf)
[17] Ibid.
[18] European Space Agency, Telecom 4.0 Artes programme (available at: https://artes.esa.int/our-activities)
[19] ESA Space Solutions, Business incubation, (available at: https://spacesolutions.esa.int/business-incubation/about)
[20] Europeans Space Agency, BUSINESS INCUBATION CENTRES: FACTS & FIGURES (available at: https://spacesolutions.esa.int/business-incubation)
[21] Ibid.

- The Kick-Start activities through which the agency offers co-funding to any company for selected innovative and space-related activities.[22] Kick-Start activities are one of the three elements composing ESA Business Applications (BA) together with open competitions and direct negotiations. The BA programme funds various space related projects through zero-equity funding between 60k and €2 million and has invested over €190 million in more than 500 businesses.[23]
- Feasibility Studies, through which the agency proposes funding covering up to 50% of the total eligible costs for activities aiming to offer a preparatory framework to define potential applications and services in ESA's Business Application programme.[24]
- Demonstration Projects, through which the agency can support the funding of activities aiming to implement pre-operational demonstration services. Activities undertaken under this element receive between 50% and 100% in ESA funding depending on the nature of the type of activity funded and the nature of the institution undertaking the activity.[25]

- The ARTES Core Competitiveness (CC) programme, through which the agency provides both financial and non-financial support to companies developing solutions across the technology development process. The CC programme is a combination of the previous ARTES Advanced Technology element, which provides up to 100% in funding for projects, and ARTES Competitiveness and Growth (C&G) element, which provides up to 80% in funding for SMEs.[26]
- The ARTES Partnership Projects (PP), which support end-to-end services form the start-up level to in-orbit validation and federates members of the industry around large-scale projects with the aim of fostering the competitiveness of the European satcom industry and allowing a greater risk sharing among operators and ESA.[27]
- The Future Preparation (FP) element, which represents the strategic component of the ARTEs programme and focuses on identifying new opportunities and future needs for the European space industry. In terms of funding, the element provides opportunities in order to finance studies by members of the industry and other institutions.[28]

- The InCubed programme, which is a Public Private Partnership co-funding programme supervised by the ESA Φ-lab that aims to support companies developing innovative and commercially viable solutions that harness Earth Observation data.[29]
- The ESA Technology Research programme (TRP)/Technology Development Element (TDE), which is a cornerstone of the agency's innovation efforts and grants an average of €50 million in industrial contracts to universities and businesses every year across all technical disciplines.[30]
- The General Support and Technology Programme (GSTP), which is divided into three main elements (GSTP "Develop", GSTP "Make" and GSTP "Fly") and covers all technical disciplines and applications except for those covered by ARTES. The programme receives and average of €90 million in commitments every year.[31]

[22] European Space Agency, Funding Scheme - Kickstart Activities, https://business.esa.int/contextual-funding-scheme-kickstart-activities
[23] European Investment Bank, The future of the European space sector (available at: https://www.eib.org/attachments/thematic/future_of_european_space_sector_en.pdf)
[24] European Space Agency, Feasibility studies (available at: https://business.esa.int/funding/direct-negotiation-call-for-proposals/feasibility-studies)
[25] European Space Agency, Funding schemes (available at: https://business.esa.int/funding-schemes)
[26] European Space Agency, Artes 4.0 Core Competitiveness : An overview (available at: https://artes.esa.int/sites/default/files/ARTES%20CC%204.0%20overview%20-%20public%20-%20Nov%202020%20RP.pdf)
[27] European Space Agency, ARTES Partnership Projects (available at: https://artes.esa.int/artes-33/overview)
[28] European Space Agency, Future preparation (available at: https://artes.esa.int/future-preparation)
[29] European Space Agency, InCubed is an ESA programme managed by ϕ-lab (available: https://incubed.phi.esa.int/)
[30] European Space Agency, ESA Technology Programmes: Focus on GSTP in Support to "Innovative Substitution (available at : https://indico.esa.int/event/264/contributions/4518/attachments/3490/4613/TDE__GSTP_Support_innovative_Substitution.pdf)
[31] Ibid.

Through these mechanisms, ESA offers a wide range of solutions covering the entire spectrum of Technology Readiness Levels (TRLs) for companies at different business development stages. While non-financial solutions are a fundamental part of ESA's support to start-ups, ESA funding plays an essential role not only in the development of technologies but also acts as a "signalling effect" for potential investors.[32]

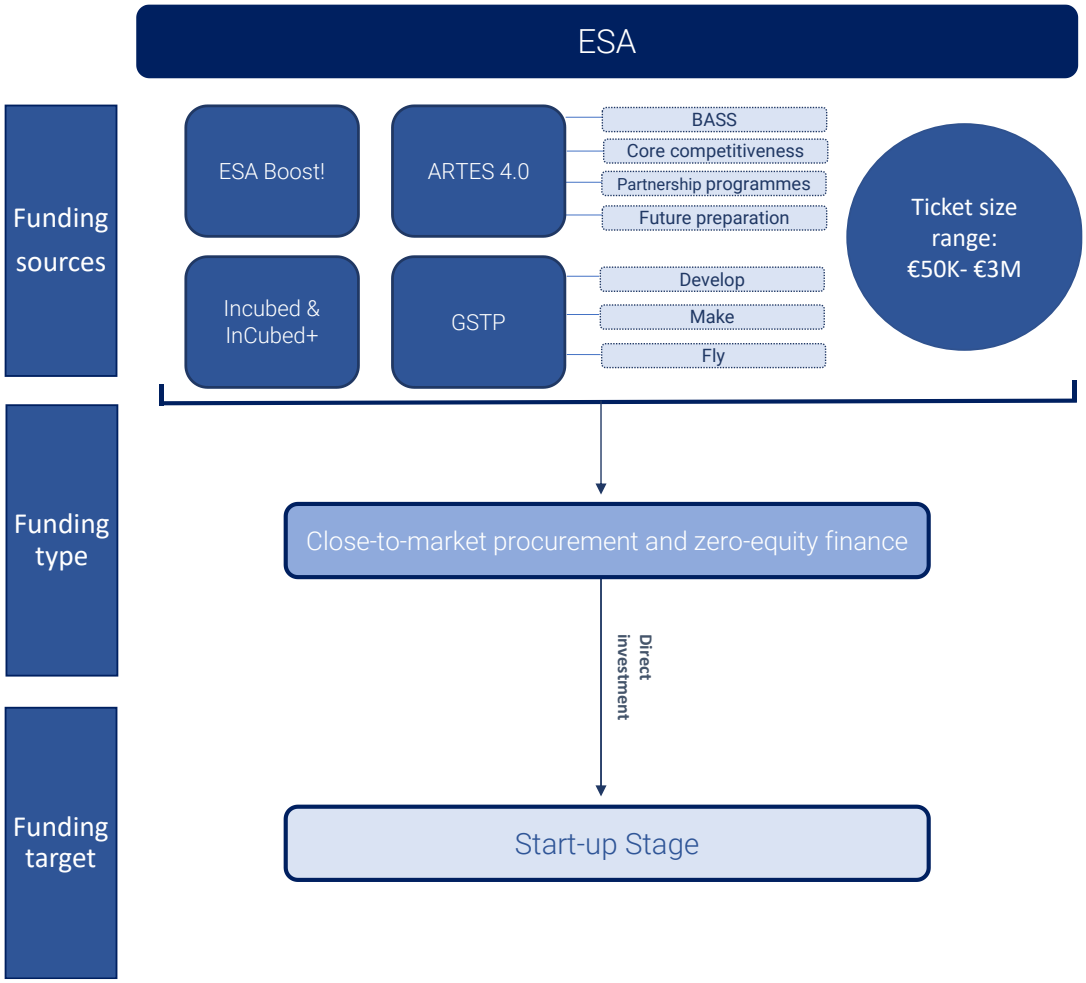


Figure 3: ESA space start-up funding mechanisms

[32] European Investment Bank, The future of the European space sector (available at: https://www.eib.org/attachments/thematic/future_of_european_space_sector_en.pdf)

ESA access to space

ESA Boost!

ESA awarded the first contracts under its Boost! Commercial Space Transportation Services and Support Programme in 2020. The programme was adopted during the Space19+ ESA Ministerial Council with the objective of supporting "commercially successful, privately funded initiatives for new space transport services".[33] The programme has a €54.5 million budget running from 2020 to 2022, with seven countries having committed to it on a voluntary basis.

- The first development contracts in the framework of ESA Boost! Were awarded to German micro launcher companies Isar Aerospace, Rocket Factory Augsburg and HyImpulse Technologies. Through the contracts, ESA awarded €500.000 to each company as well as a tailored support in the technical and business pre-commercial phases. The three companies competed in the DLR's Microlauncher competition, with Isar Aerospace winning the first round.[34] The start-up is expected to receive a letter of recommendation to advance in the Boost! Programme and will also potentially be eligible for ESA launch contracts.[35] Germany is the largest contributor to the programme with a commitment of approx. €27.2 million.
- ESA has also awarded two additional contracts in the framework of the Boost! Programme to UK small launcher companies Orbex and Skyrora. In the framework of the contracts, Orbex received €7.5 million in co-funding in order to support the development of its Prime launcher while Skyrora was awarded €3 million for the development of its Skyrora XL three stage launch vehicle. The UK is the second largest contributor to ESA Boost! with approx. 26% of the programme total budget.[36]
- In addition to the Boost! Contracts, ESA also continued to support innovative companies in the field of access to space through its Future Launcher Preparatory Programme (FLPP). Dawn Aerospace is the latest company having received a development contract through the FLPP, with ESA awarding €385.000 to the start-up to enhance the development of their 3D printed combustion chambers.[37]

ESA Procurement

Credit: ClearSpace

In 2020, ESA also took major steps to explore new approaches to procurement with the aim of increasing the involvement of private actors and new companies. Following the SPACE19+ Ministerial Council, the Agency made the decision to engage more actively in space debris removal activities and adopted a service-oriented approach designed to demonstrate the commercial viability of In-Orbit Services. A significant step was taken in December 2019 to this end, as the agency awarded a €86 million space debris removal services contract to the Swiss start-up ClearSpace in the framework of its Active Debris Removal/In-Orbit Servicing (ADRIOS) mission. The start-up will lead an industrial team with the objective to deorbit a 100kg Vega Secondary Payload (Vespa) upper stage in LEO in 2025. Additional information about ClearSpace is available in section 5 of this report "European start-up stories".

[33] European Space Agency, ESA boost to new commercial space transportation services (available at: https://www.esa.int/Enabling_Support/Space_Transportation/ESA_boost_to_new_commercial_space_transportation_service)
[34] Deutsches Zentrum für Luft und Raumfahrt, Herzlichen Glückwunsch an Isar Aerospace (available at: https://www.dlr.de/content/de/bilder/2021/02/mikrolauncher-urkunde-bmwi.html)
[35] Peter B. De Selding, German small-launcher plot thickens: After OHB signing with RFA, Airbus contracts with Isar Aerospace (available at: https://www.spaceintelreport.com/german-small-launcher-plot-thickens-after-ohb-signing-with-rfa-airbus-contracts-with-isar-aerospace/)
[36] Peter B. De Selding, ESA, with UK funds, awards $12.4M to launch startups Orbex & Skyrora; Scotland sees $6.3B 10-year market for UK (available at: https://www.spaceintelreport.com/esa-with-uk-funds-awards-12-4m-to-launch-startups-orbex-scotland-sees-6-3b-10-year-market-for-uk/)
[37] Dawn Aerospace, Future Launcher Preparatory Programme (available at: https://www.dawnaerospace.com/blog/esa-dawn-flpp)

1.2.4 National programmes supporting space start-ups

In addition to the new initiatives undertaken by the EU and ESA, the year has also been marked by new national efforts in support of investment and entrepreneurship.

Germany

Credit: Isar Aerospace

- Germany has been particularly active in 2020, with the DLR notably sponsoring a competition for micro launchers aiming to support the development of new launch solutions in Europe.[38] Isar Aerospace won the second phase of the competition and is expected to receive an €11 million award from the agency as well as a letter of recommendation for ESA to advance in the agency's Commercial Space Transportation Services and Support Programme. The letter of recommendation is a necessary step to potentially be considered eligible to carry out future ESA launches alongside the Ariane 6 and Vega C launchers.[39] The DLR selected Isar Aerospace as the winner of the first round according to a series of weighted success criteria that included "launches and launch contracts", "finances" and "technology".[40] Within these categories, particular attention was attributed to the total value of launch contracts and to the volume of raised capital and existing financial assets. Prior to winning the competition, Isar Aerospace signed a 20-year contract with Andøya Space for the exclusive use of a launchpad at the Andøya Spaceport and was awarded a launch contract for and Earth observation satellite by Airbus Defence and Space. A second winner is expected to be selected in 2022 after having its application reviewed and will similarly be awarded a €11million award. Isar Aerospace, Rocket Factory Augsburg and HyImpulse were the first companies that qualified for the competition in 2020, with all of them receiving a Commercial Space Transportation Services contract from ESA.
- The DLR hosted its annual INNOspace Master with the support of the Federal Ministry of Education and Research (BMBF).[41] The competition focuses on the transfer and development of innovative technologies to and from the space sector, with a particular focus on sustainable infrastructures. DLR partners with various stakeholders such as Airbus, OHB and ESA in order to create challenges and offer prizes. The last edition of the competition counted 316 participants who submitted 117 ideas, out of which 15 were selected as winners.
- The German government participated indirectly in start-up funding rounds through support to venture capital funds. High-Tech Gründerfonds for instance led the seed funding round closed by German start-up DcubeD in 2021.[42] High-Tech Gründerfonds is one Germany's most active venture capital firms, and its establishment is the result of a public-private partnership benefiting from the support of the Federal Ministry of Economics and Technology.

[38] Deutsches Zentrum für Luft und Raumfahrt, DLR-Mikrolauncher-Wettbewerb (available at: https://www.dlr.de/content/de/artikel/news/2020/03/20200714_dlr-mikrolauncher-wettbewerb-drei-teams-sind-eine-Runde-weiter.html)
[39] Peter B. De Selding, German small-launcher plot thickens: After OHB signing with RFA, Airbus contracts with Isar Aerospace (available at: https://www.spaceintelreport.com/german-small-launcher-plot-thickens-after-ohb-signing-with-rfa-airbus-contracts-with-isar-aerospace/)
[40] , Teilnahmebedingungen für den DLR Mikrolauncher-Wettbewerb (available
[41] Deutsches Zentrum für Luft und Raumfahrt, DLR INNOspace Masters (available at: https://www.dlr-innospace.de/innospace/innospace-masters/)
[42] Deployable Cubed GmbH, Boost for "New Space made in Germany" through investment by HTGF and ILV in Munich-based Start-up DCUBED (available at : https://dcubed.space/2021/01/07/boost-for-new-space-made-in-germany-through-investment-by-htgf-and-ilv-in-munich-based-start-up-dcubed/)

France

- France continued to sustain its efforts to foster the emergence of space start-ups in 2020. This was notably carried out through its participation in several significant investment rounds in French space companies. France participated in the funding €100 million investment in Kinéis through CNES, CLS Groupe and Bpifrance.[43] The round was the largest European investment for a space start-up in 2020 and once again demonstrates shows the country's willingness to foster the development of a national New Space ecosystem. In addition to Kinéis, France also backed the funding of Preligens (formerly Exocube) through a €20 million investment led by the French public investment bank Bpifrance.[44]
- France will launch the CosmiCapital Venture Capital fund in 2021. The fund is the result of a partnership between CNES and ESA and will be managed by Karista with the specific objective of investing in space spart-ups and SMEs.[45] CNES also launched the SpaceFounders accelerator in collaboration with the Bundeswehr University in Munich to help the best European space start-ups "become world leaders in the decade ahead", with the support of ESA and the DLR.[46]

United Kingdom

- The United-Kingdom also remained one of the most active players in the development of a national New Space ecosystem by participating in a number of high-profile deals in 2020. Notably, the UK Space Agency led the €33 million investment in the satellite terminal manufacturing start-up Isotropic Systems, and backed Lumi Space with a grant in the framework of a collaboration with the Ministry of Defence[47] to support the company's efforts as it develops its debris-tracking technology.
- The UK government played a prominent role in the emergence of OneWeb from Chapter 11 bankruptcy as it provided 50% of the initial $1billion investment necessary to co-acquire the company with Bharti Global. The company has since received an additional $950 million in funding from Softbank and Eutelsat and resumed operations. Following launches in 2020, the company currently has 182 of its projected 648-large first-generation satellite constellation in orbit.

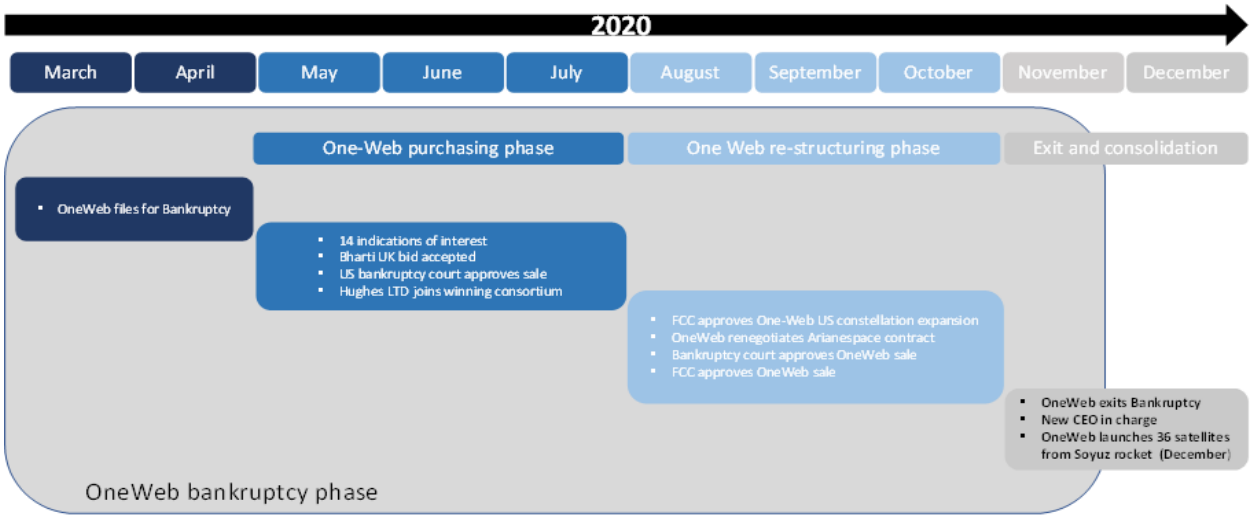


Figure 4: OneWeb Bankruptcy Timeline

[43] Kinéis, Kinéis raises 100 million euros and finances its constellation of nanosatellites dedicated to the Internet of Things (IoT)
[44] Preligens (available at: https://www.preligens.com/post/announcement-series-a-name-change)
[45] CosmiCapital, Karista publishes an article on the NewSpace in Private Equity Magazine (available at: https://cosmicapital.com/karista-publishes-an-article-on-the-newspace-in-private-equity-magazine/)
[46] CNES, Spacefounders cnes launches accelerator programme for european space tech start-ups (available at: https://presse.cnes.fr/sites/default/files/drupal/202104/default/cp053-2021_-_space_founders_va.pdf)
[47] United Kingdom Government, Government backs UK companies tackling dangerous space junk (available at: https://www.gov.uk/government/news/government-backs-uk-companies-tackling-dangerous-space-junk)

- Following the UK's decision to contribute approx. €15 million to ESA's Boost! Commercial Space Transportation Services and Support Program, both Orbex and Skyrora received development contracts from the agency, with the former obtaining €7.5 million and the latter receiving €3 million.[48]
- The government also participated in the funding of companies such as Modularity Grid, Arqit and Space Forge through its innovation agency, Innovate UK. The Scottish small launcher start-up Orbex has in addition received a €1.6 million grant from the Scottish government's development agency Highland and Islands Enterprise (HIE).[49]

Italy

- Italy remained active in 2020 following the creation of the Primo Space venture capital fund, which launched in July with a first closing worth approx. €58 million. The fund is supported by the Italian Space Agency and is backed by the new EU InnovFin Space Equity Pilot (ISEP). Primo space has already contributed to the Italian space venture ecosystem by leading the €5 million Series A funding round in Leaf Space[50] and the €2 million funding round in Aiko Space.[51]

Spain

- Spain continued its participation in the development of the first Spanish renewable launch vehicle through a €405.000 investment made by the Centre for the Development of Industrial Technology (CDTI) in the private company PLD Space, as the start-up continues the production of its Miura micro launcher.

[48] European Space Agency, ESA boost for UK space transportation initiatives (available at : https://www.esa.int/Enabling_Support/Space_Transportation/ESA_boost_for_UK_space_transportation_initiatives)
[49] Ross-Shire Journal, (available at : https://www.ross-shirejournal.co.uk/news/hie-commits-1-5m-to-space-firm-s-highland-satellite-launch-vehicle-development-programme-205005/)
[50] Primo Space, Primo Space & Whysol Investments lead a €5m Series A round in Leaf Space (available at : https://primomigliosgr.it/en/post/primo-space-and-whysol-lead-eur5m-series-a-round-in-leaf-space)
[51] Primo Space, Primo Space invests in Aiko Space and adds Raffaele Mauro as General Partner (available at: https://primomigliosgr.it/en/post/primo-space-invests-in-aiko-space-and-adds-raffaele-mauro-as-general-partner)

2 INVESTMENT IN EUROPEAN SPACE START-UPS

2.1 Top investment deals in 2020

In 2020, a significant share of the investment volume was concentrated in the top 5 deals (€324 million), which accounted for 65% of the total volume of investment. This is a strong increase compared to 2019 where the top 5 deals represented €71 million or 37% of the total. However, this is in line with the trend of previous years (the top 5 deals represented 65% in 2017 and 62% in 2018).

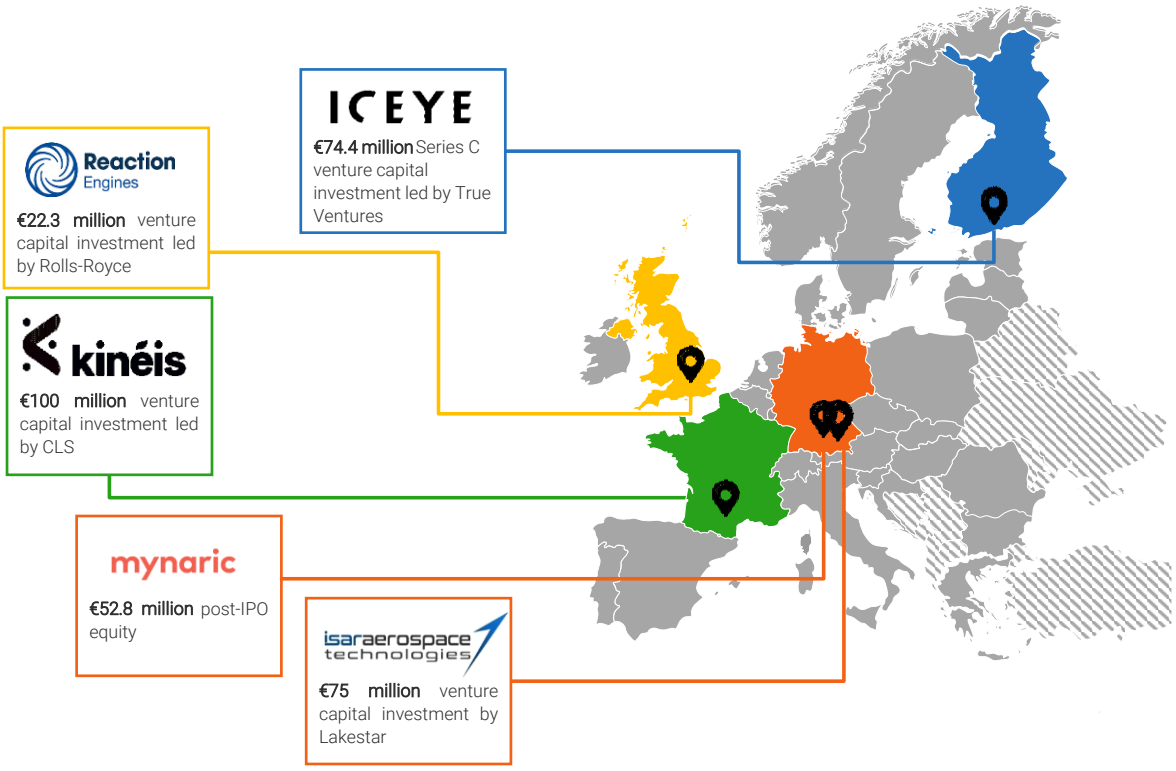


Figure 5:Top five European investment deals in 2020

- Kinéis (€100 million): The French IoT company raised €100 million in venture capital investment from a mix of private and public investors led by Collecte Localisation Satellites (CLS). In addition to the CLS, CNES and BPI France also participated in the investment with Ifremer, Thales, Hemeria, Celad and BNP. Kinéis aims to develop and launch a constellation of nanosatellites capable of providing universal satellite IoT connectivity. The company aims to launch 25 nanosatellites in 2022 to enhance the services offered by its 8 satellites currently operational. As a spin-off project launched by CLS in 2018, Kinéis complements the services provided by the Argos constellation.

- Isar Aerospace (€75 million): The Munich based launcher company which focuses on developing an environmentally friendly low-cost launch vehicle has secured a €75 million Series B financing led by Lakestar, bringing its total funding raised to over €100 million. In addition to Lakestar, investors such as Earlybird, Vsquared Ventures and Airbus ventures also participated. The company was founded in 2018 as a spin-off from TU Munich, and the new round of funding was the largest ever for a European micro launcher company. The start-up aims to use the additional investment to proceed with the development of its Spectrum micro launcher, which is expected to have its maiden flight in 2022.

- Iceye (€74.4 million): Finnish microsatellite-systems start-up Iceye raised €74.4 million in a Series C venture capital investment round led by True Ventures, bringing the total funds raised by the company to over €130 million since their founding in 2014. In addition to True Ventures, other notable investors were present such as OTB Ventures, Draper Esprit, Seraphim Space, Promus Ventures and Space Angels. The EIB also participated as an advisor for the Luxembourg Future Fund (LFF), and as an investor through its InnovFin For Equity (IFE) mechanism. The additional funding is set to ensure that the company reaches a total deployment of at least 12 SAR satellites in 2021 to complement its 10 currently operational satellites. Iceye's current constellation makes the company the operator of the largest SAR satellite constellation in the world today.

- Mynaric (€52.8 million): Germany based laser communication start-up raised €52.8 million in a post-IPO equity investment. The investment brings the total capital raised by the company to over €110 million. The start-up was founded in 2009 and successfully completed its IPO in 2017 at the Frankfurt Stock Exchange. It has the objective of enabling the industrialisation of laser communication products and the company looks to secure its market position and meet the increasing demand from both commercial and government actors through the mass-deployment of its technology. In particular, the company is looking to expand its business in North America after inaugurating a new production facility in California and recently receiving U.S. government contracts for the delivery of its flagship CONOR terminals.

- Reaction Engines (€22.3 million): The Oxfordshire based aerospace manufacturer Reaction Engines has formed a strategic partnership with Rolls-Royce, which invested €22.3 million in the start-up. The funds will serve to support the development of Reaction Engine's thermal management technology for high-speed propulsion, which is a key component both for the company's SABRE engine and for Rolls Royce's growing interest in the field of supersonic flight. The company's "air-breathing rocket engine" is capable of working both in traditional airspace as well as in outer space and could be used by Roll Royce as it explores new hypersonic and supersonic flight solutions. Reaction Engines has previously been backed by companies such as BAE Systems and Boeing as well as by the UK government.

2.2 Overview and key indicators

Over the period 2014-2020, 295 investment deals concerning European space start-ups were recorded for a total amount of €1.249 million. In 2020, ESPI recorded a total of 57 deals totalling a new record high of €502 million.

This is a conservative estimate and the value of 8 recorded transactions was not disclosed. This value does not include either investment in space ventures after they have successfully reached maturity (see definition of start-up Annex A). In 2020 the OneWeb investments were not included as it does not fit within the perimeter of start-ups set up for this study (prior to filing for Chapter 11 OneWeb upheld an employee count superior to 500 employees and conducted most of its business operations on U.S. soil).

While the previous three years (2017-2019) had been marked by a plateauing of investments in European space start-ups at around €200 million per year, 2020 broke with this trend upholding a total of €502 million invested in European space start-ups. The considerable increase of the investment volume contrasts with the flat number of deals which since 2017, underlining that investment rounds of European space start-ups are increasingly large.

As such in Europe, while the average size of deals has increased, the number of deals has stagnated.

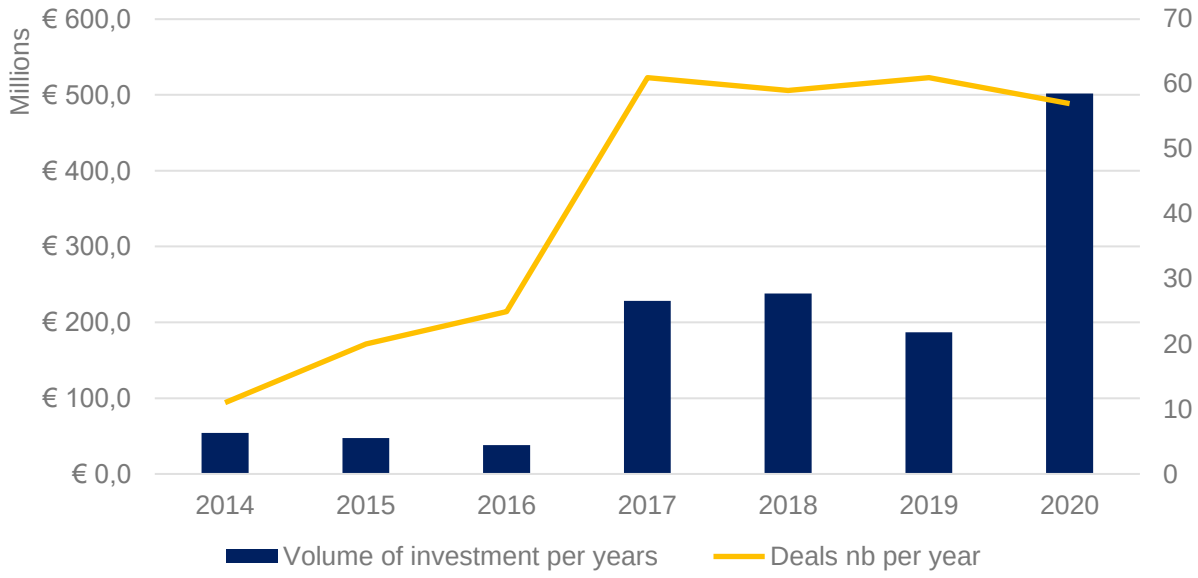


Figure 6: Investment value and number of deals per year 2014-2020

Furthermore, in 2020 the top five deals represented 65% of the total volume of investment meaning that the remaining 52 deals represent only 35% of the investment for 2020. This is in line with previous years (2018, 2019) where the top five deals represented 60% and 38% respectively.

Venture Capital accounts for a vast majority of the investment in European space start-ups (71% between 2014-2020). In 2020 again, Venture Capital accounted for a total of 30 deals which represented €375 million or 75% of total investments. This is a 13% increase compared to 2019 where it was only of 62%. It should be mentioned, however, that many of the venture rounds are combined rounds which include public support (investment or grant). ESPI database shows that, out the 30 rounds of venture capital, 52% of them involved a mix of public and private funds. As such, VC investment increasingly is becoming a tool utilized by both private investment companies and public investment banks.

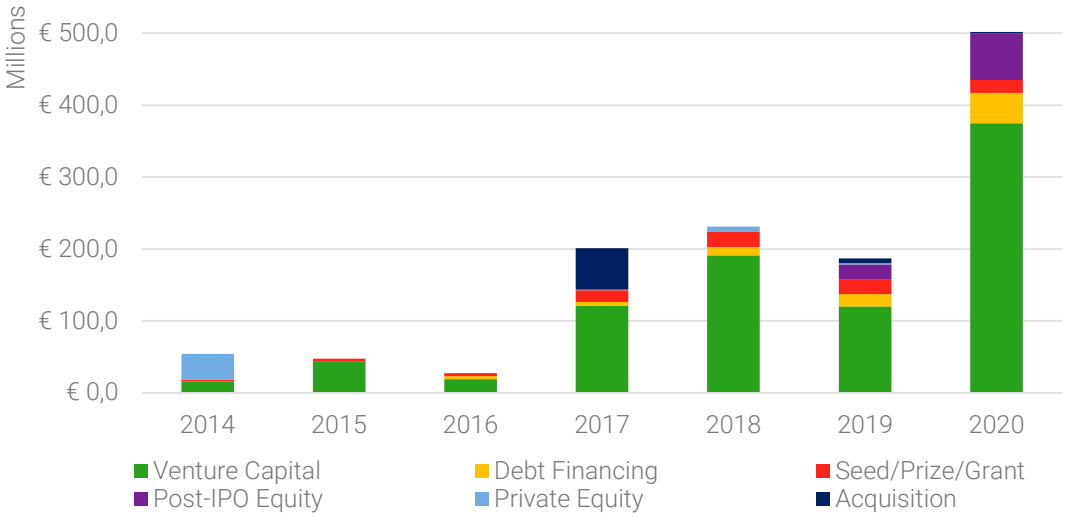


Figure 7: Investment type 2014-2020

The second type of investment in terms of volume in 2020 was equity. This financing represented 2 investments one of them which was the €52 million invested into German laser-com Mynaric and the second the €12 million invested into Kleos Space.

The third form of investment in 2020 was debt financing/venture debt. Out of the six debt-financing deals two were made by the European Investment Bank and included deals of €20 million for Spire Global and of €15 million for D-Orbit.

Although it is the second category in terms of number of deals (18 deals), Seed/Prize/Grant only represented €18 million or 3.6% of the total volume. Some of the most notable deals in the Seed/Prize/Grant category in 2020 were 9T Labs worth €4 million and LiveEO worth €3 million.

Finally, only one acquisition happened in 2020 – AAC Clyde Space acquired Hyperion Technologies for €2 million.

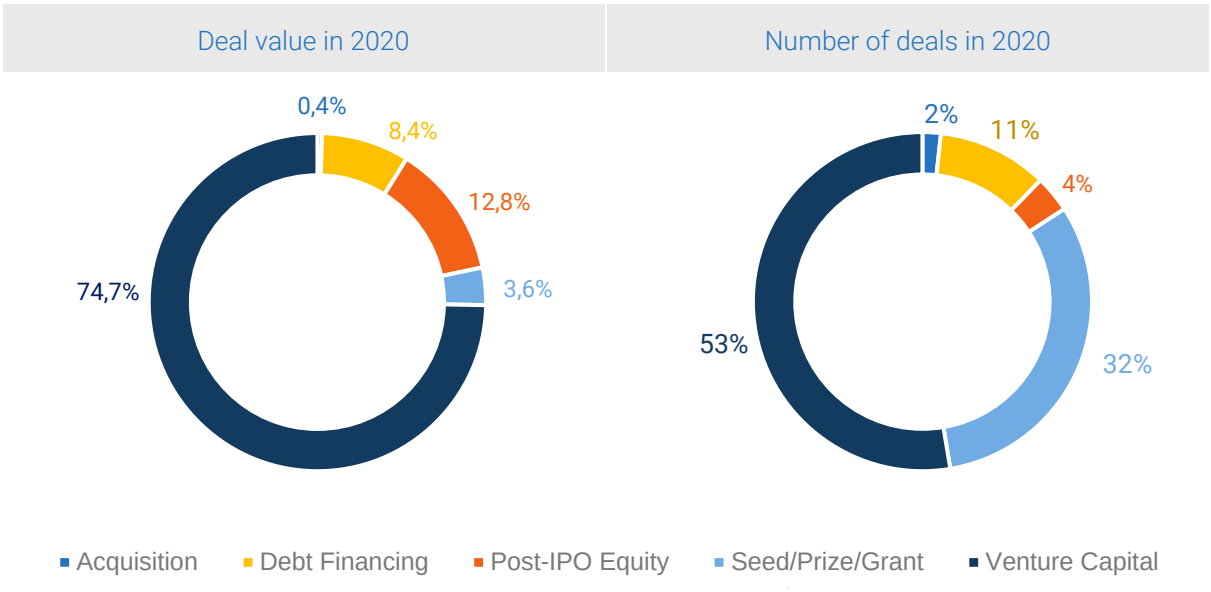


Figure 8: Distribution of investment by category in 2020

2.3 Growing support in investment from public institutions

European and national public Institutions continued to develop financial instruments to foster entrepreneurship and accelerate investment into space start-ups. Through these instruments and funds, public institutions play an increasingly prominent role in the development of the European New Space ecosystem and in particular in the acceleration of investment trends in Europe.

In 2020, 8% of the total investment originated purely from institutional investors such as public investment banks or regional development funds. This accounted for €40 million directly invested into European space start-ups. This is comparable to 2019 where purely public investments represented 11% of the total.

The real change in 2020 occurred on the front of mixed investments (public/private). An investment is considered mixed when the investment round counts with at least one public institution and one private company. The investment profile in 2020 changed consequently with an increasing volume of mixed investment through ambitious investment partnerships between public institutions and private companies. In 2019, 19% of the volume fell in the category of mixed investment. In 2020, this share reached 52% of the total volume. This means that out of the €501 million invested into the European space start-ups ecosystem in 2020, €260 million came from consortiums with at least one public backer.

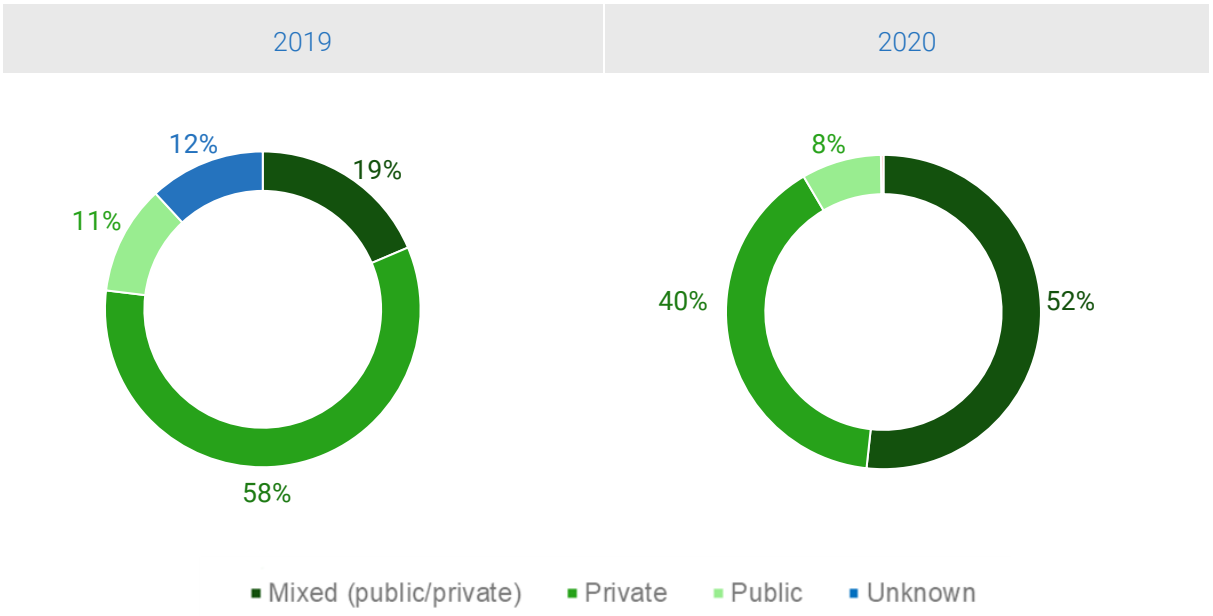


Figure 9: Public support to New Space investments

This trend, which will have to be confirmed in the next years, is a consequence of the public approach to New Space adopted by most European and national public institutions and which relies on strong partnerships between public and private actors to foster investment. As reported by the European Investment Bank, 40% of private space companies consider public capital as a precondition for private investments. With public funding serving as a market source of approval, the usage of public instruments to unlock private capital should increase in the years to come.[52]

[52] European Investment Bank, The future of the European space sector (available at : https://www.eib.org/attachments/thematic/future_of_european_space_sector_summary_en.pdf)

2.4 Distribution of recipients

The figure below shows the geographical distribution of the total value of investment operations in space start-ups according to the location of their headquarters. The figure does not include recorded deals with an undisclosed amount.

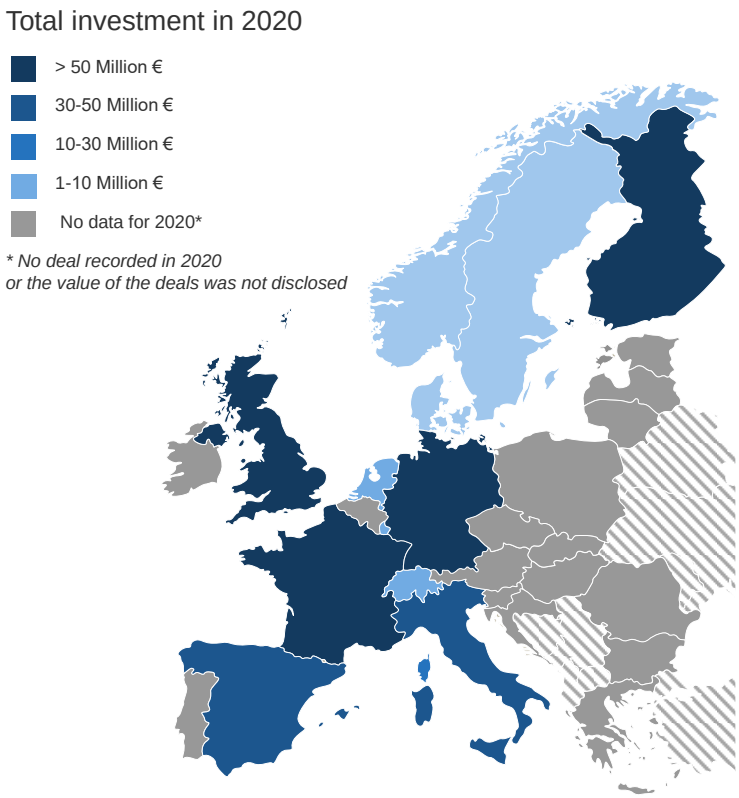


Figure 10: Geographical distribution of investment recipients in Europe in 2020

Although investment remains widespread across European countries, the majority of investment deals and volume in 2020 took place in countries that have historically invested heavily in the space sector (73% of total volume of investment for France, Germany, UK, Italy, Spain).

- France: France lead in terms of deals in 2020 with a total invested into French start-ups of €148 million over 7 investment deals. Some of these investments include the record high €100 million invested into French IoT Kineis (representing 67% of total French investment), €20 million into the secure analytics company Preligens and finally, €11 million into micro-propulsion company Exotrail.
- Germany: With €135 million invested over a total of 8 deals, German start-ups have performed at a record level in 2020 and are second only to France in terms of volume of investment. German success stories in 2020 include micro-launcher start-up Isar Aerospace which raised a total of €75 million and laser communication manufacturer Mynaric which raised €53 million in a post IPO- Equity round.
- United-Kingdom: The UK continues to stand out in terms of investment received (i.e. half of the top 5 deals in 2018 and 2019 were located in the UK). With over 15 deals and a total invested of over €80 million, this highlights a continued success in UK policy to foster entrepreneurship and attract investment. Some of the major deals that occurred in 2020 were the € 22 million venture capital investment into manufacturing company Reaction Engines and the €20 million round into micro-launcher start-up Orbex.
- Finland: Finland upheld a highly successful year in terms of volume of investment, however, 98% of the investment volume originated from the €74.5 million VC into Iceye.

2.5 Origin of lead investors

The figure below shows the distribution investment according to the geographical location of the lead investor. In the case of investment deals involving more than one investor, only the origin of the lead investor is represented.[53]

The geographical distribution of investors offers insights into the relative importance of European and foreign investors in the overall investment in European space start-ups. The investment of European investors in non-European start-ups is not represented here.

The identity and origin of lead investors is not always disclosed. The share of undisclosed lead investors ranged between 25% in 2014-2019 and 10% in 2020.

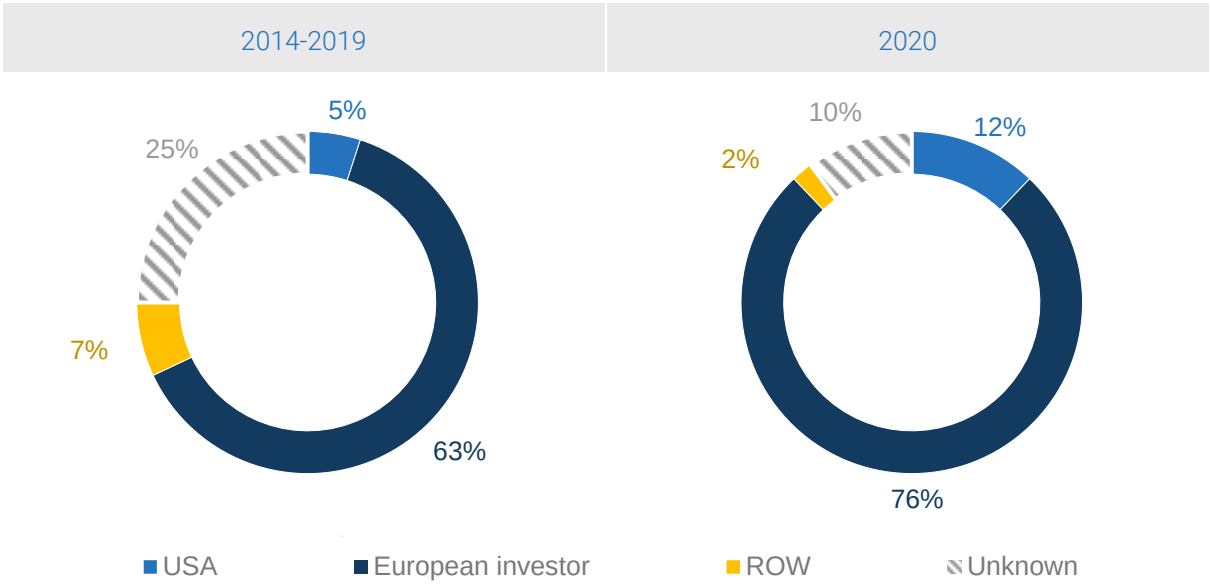


Figure 11: Geographical distribution of lead investors up to 2020

In line with previous years, a majority of the investment in European space start-ups in 2020 originated from within Europe. Over the period 2014-2019, 63% of all investments were led by European investors representing almost two thirds of the total. In 2020 this share reached 76% of all lead investors.

European space investments in 2020 also confirmed that there is a strong national underlying dynamic and that investors tend to primarily fund start-ups located within their own country. On the period 2014-2018, 38% of the investments concerned investors funding start-ups in the same country. This share grew to 43% in 2019 and to 63% in 2020, underlining growing domestic ties.

The share of foreign companies investing in Europe is comparatively small. In 2014-2019, 12% of the total number of investments was led by investors from outside of Europe. Investors from the USA and from the rest of the world (ROW) accounted for the majority of these 12%. In 2020 this share increased to 14% with a strong increase from U.S. investors (increase from 5% to 12%).

[53] ESPI investment database records the list of all disclosed investors for each investment deal but does not record the respective investment shares of each investor

2.6 Investment across the Space value chain

The figure below shows the distribution of the total value of investment according to the core business of the start-up (bars) and the number of deals concerned (dots).[54]

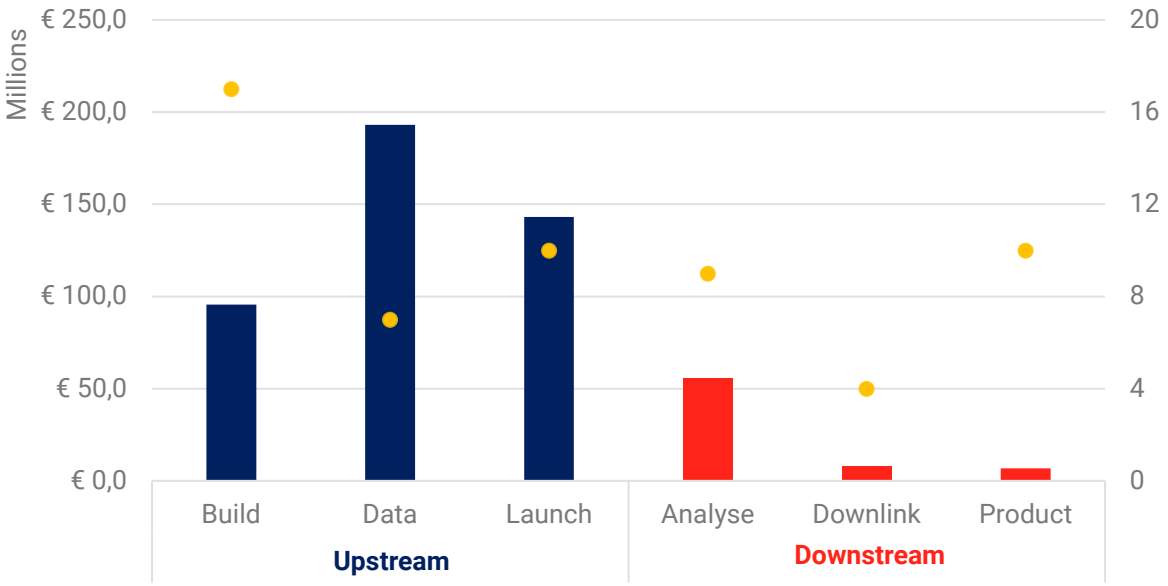


Figure 12: Volume and number of deals across the European space value chain in 2020

In 2020, the upstream sector accounted for 86% of the total investment (50% in 2019). With €431 million invested over 34 deals, the average value per deal for the upstream segment in 2020 was €12.5 million.

- Whereas in 2019 the Build segment accounted for the majority of all investments (31%), in 2020 it was the upstream Data segment (i.e. operation of space systems to lease or sell satellite capacity data) which upheld the largest share of investments with 39% of the total share. This is due to two primary investments: Kineis (€100m) and Iceye (€74m).
- The Launch segment (i.e. development and manufacturing of launch systems and/or provision of launch services) represented 29% of the total volume of investment in 2020 with significant deals in companies such as Isar Aerospace (€75m) and Orbex (€20M).
- The Build segment (i.e. development and manufacturing of space systems) involved many deals. With 17 deals in 2020, including Mynaric (€53m), NAWATechnologies (€13m) and Exotrail (€11m), the Build segment represented almost 19% of the deal total volume in 2020.

The downstream sector accounted for 14% of the total investment in 2020, down from the 48% upheld in 2019. With €70 million invested over 23 deals, the average value per deal was €3 million.

- The largest downstream segment in 2020 was the Analyse segment (i.e. value-adding solutions for space data exploitation) representing 11% of the volume with key deals such as Preligens (€ 20m).
- The Downlink segment (i.e. development and manufacturing of the ground support infrastructure and services required to exploit a space system) and the Product segment (i.e. provision of space-enabled products to end-users) represented together 3% of the total investment in 2020, a serious decrease from 2019 where the total of both segments represented 33% of the aggregated invested volume.

[54] Note: the value of investment in downstream start-ups is probably underestimated due to the inherent difficulty to track investments in the downstream sector which involves companies whose business is often only partially related to space. With a growing cross-fertilization between space and terrestrial technologies, the distinction between investments within and outside the space sector is poised to become increasingly blurred.

2.7 European investment in a global context

The value of investment in European space start-ups can seem rather small in comparison to the multi-billion figures reported globally, in particular in the United States. Several aspects should be considered to understand how this estimation fits in the global context.

Different boundaries of assessment: Estimations provided in this report focus on a narrower definition of "space start-ups" which excludes companies having reached business maturity and companies with limited links to the space sector.

Prominence of the Big 4: The value of investment is highly concentrated in a few high-profile companies. In 2019, close to 70% of the worldwide investment was concentrated in four companies: SpaceX, Blue Origin, OneWeb and Virgin Galactic, which received $3.9 billion over the year. Although focused on new projects, these companies do not fall in the definition of "start-ups" of this report given the size of their business (e.g. SpaceX has nearly 10,000 employees). The funding model may also not be representative of a third-party investor interest (e.g. investment received by Blue Origin comes from founder Jeff Bezos).

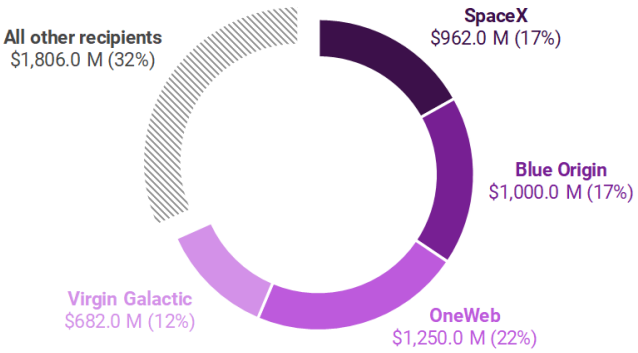


Figure 13: Global space investments in 2019 (Source: Bryce, ESPI representation)

Size of the space sector: European space budget and sector are at least 4 to 5 times smaller than in the United States. When comparing the size of investment with public budgets, ratios suggest that Europe performs well to stimulate investment in the space sector with an investment value corresponding to 4,2% of the European public space budget in 2020 (1,9% in 2019). This ratio was 8,3% in the United States in 2019 but only 1,6% when excluding SpaceX, Blue Origin, OneWeb and Virgin Galactic.

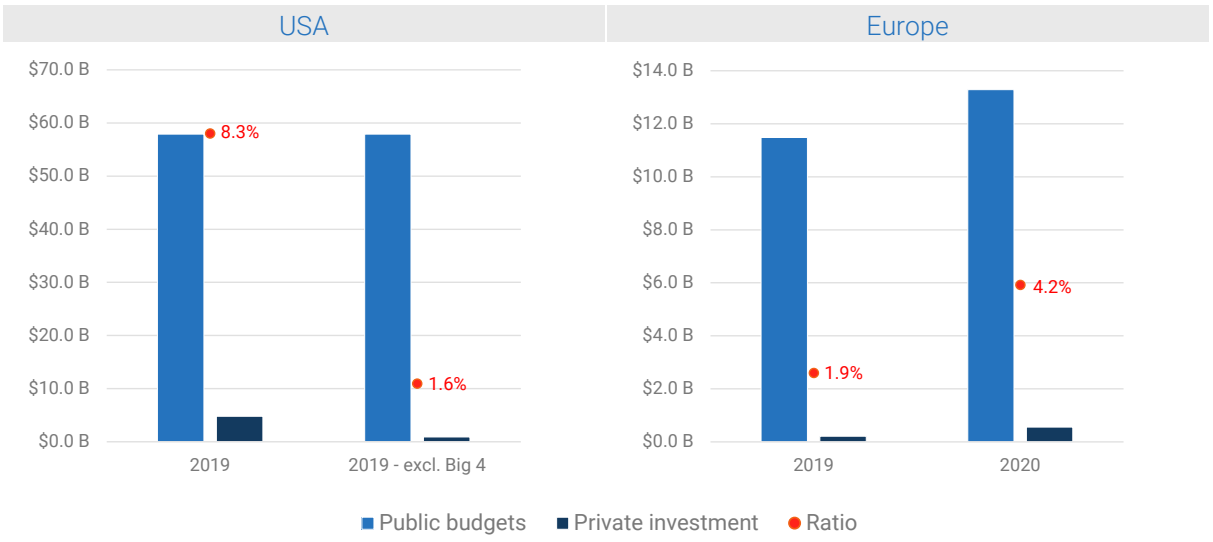


Figure 14: Comparison of investment with public space budgets in the Unites States and in Europe

3 European Space Entrepreneurship Survey

This chapter provides an overview of the results of the ESPI Space Entrepreneurship and COVID-19 Survey. The survey was issued to 300+ European space start-ups and ESPI received more than 120 responses, out of which 77 individual, qualified responses were selected for statistical analysis.

This year, ESPI entrepreneurship survey consisted of 30+ questions addressing 3 main themes:

- *Space start-up ecosystem*: geographical distribution, business and markets, workforce, foundation.
- *Impact of COVID-19*: evaluation of negative effects and potential positive externalities, use of public business continuity measures, expectations and needs for business recovery.
- *Business situation and prospects*: self-assessment in 2020, priorities and prospects for 2021, perception of public support

3.1 European space start-ups ecosystem

3.1.1 Geographical distribution

With responses from start-ups located in 19 European countries, the survey underlines again this year that entrepreneurship trends in the space sector are widespread throughout Europe.

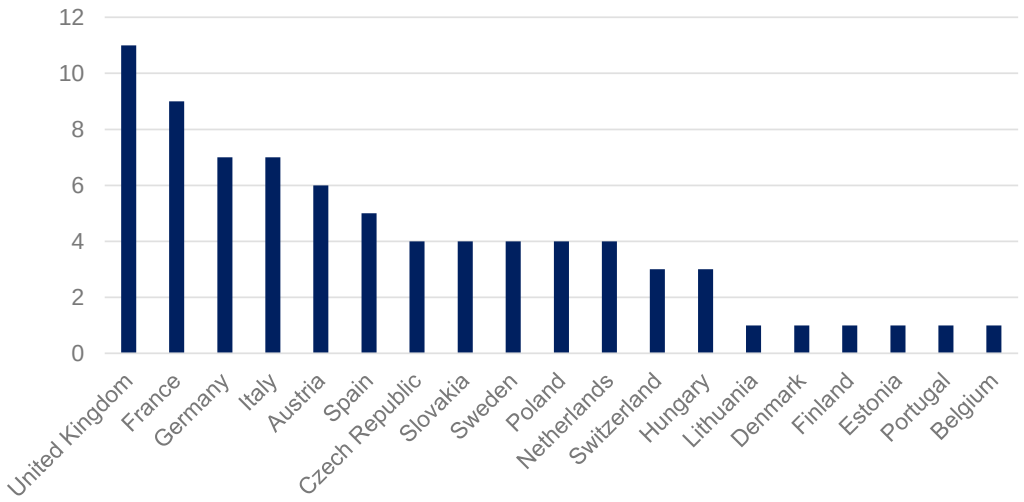


Figure 15: Geographical distribution of respondents to the ESPI survey 2020

France and Germany are more largely represented this year with more than 20% of respondents, which echoes the outstanding investment dynamic observed in 2020 in these two countries. Until now, France and Germany, which have the largest space budgets in Europe, did not particularly stand out with regards to entrepreneurship and investment statistics. This trend, which will have to be confirmed next year, is the probable result of the multiple initiatives launched by French and German governments and space agencies to foster the emergence/acceleration of entrepreneurship and investment trends in their national space sectors.

Start-ups located in the United Kingdom still represent the largest share of respondents. Other countries with a significant number of respondents include countries with large space budgets such as Italy, Spain and the Netherlands (national space budget > 100M€) as well as countries with more modest resources but ambitious objectives for the space sector such as Austria, Czech Republic, Slovakia, Sweden, Poland and Switzerland.

3.1.2 Business development and workforce

Out of the surveyed start-ups, over 59% are less than 5 years old, with around 35% of companies having been founded during the last 3 years. 30% were founded between 2010 and 2015 and 11% before 2010. Most of these older companies are at a later stage of business development with 43% of them at Growth, Expansion or Maturity stage.

Overall, 58% of start-ups are still in their initial phase of development, including seed and early stage. At this stage, the start-up activity is usually focused on concept and product development and commercial operations have not yet started or are just starting. At such an early stage, business viability is not yet established, and risk of failure remains high. 34% of start-ups are in their growth stage and 8% are in their expansion stage. At these stages, business is more firmly established with a product portfolio and steady revenue streams. These more mature start-ups have usually met one commercial success and are seeking growth or expansion (diversification, internationalisation) of their business. Risk of failure at these later stages remains significant.

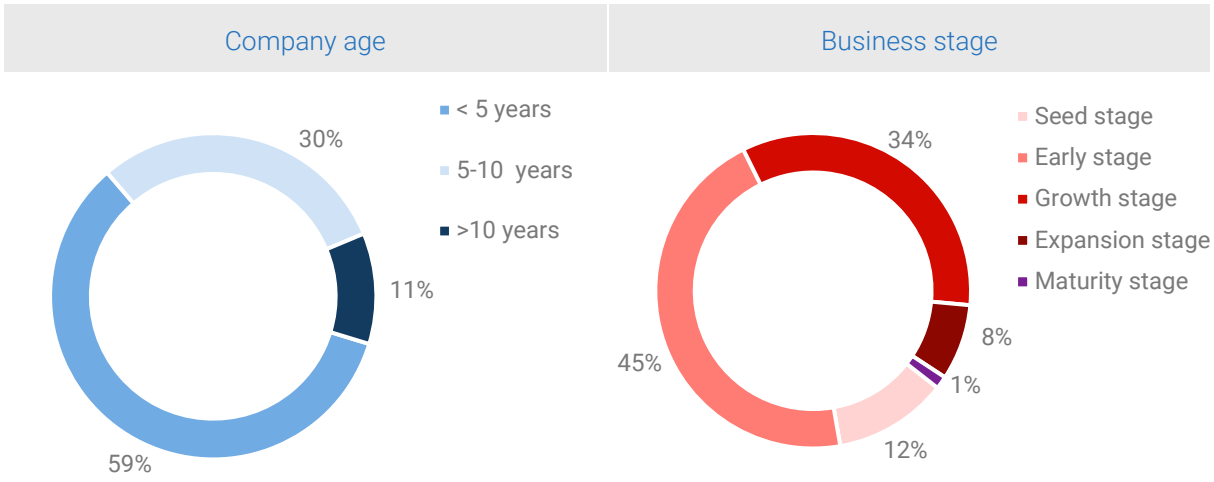


Figure 16: Age and business stage

Most European space start-ups are micro-enterprises with a workforce below 10 employees: 48% of them have between 1 and 5 employees and 21% have between 6 and 10 employees. On the other side of the spectrum, only 5% of start-ups have already reached the status of medium enterprises with a staff headcount above 50 employees.

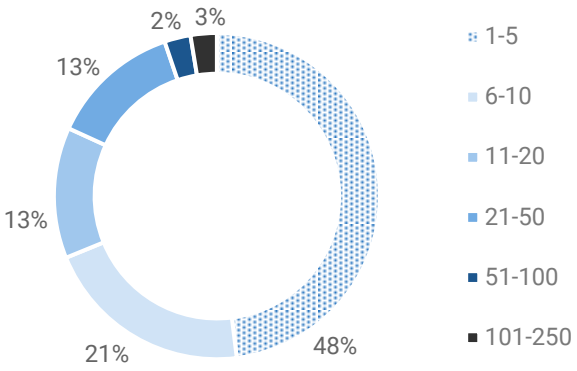


Figure 17: Number of employees (excluding founders)

3.1.3 Products and innovation

Respondents to the survey are well distributed across the space value chain with 29% of companies in the upstream, 48% in the downstream and 23% positioned in both upstream and downstream. This last category, which corresponds to companies involved in both space system development and space system operation, concerns mainly start-ups that were founded in the last five years (66%).

62% of start-ups consider that their business is fully related to space meaning that the company exclusively addresses space markets or that the products/services the company offers are fully dependent on space capabilities (e.g., satellite images, satellite bandwidth, PNT signals). 34% consider that their business portfolio is significantly but not fully connected to the space sector and 4% consider that space represents only a part of their business.

A vast majority of upstream start-ups (86%) are fully space businesses while it is the case of only half of downstream start-ups that rely significantly, but not only, on space capabilities for their business activities.

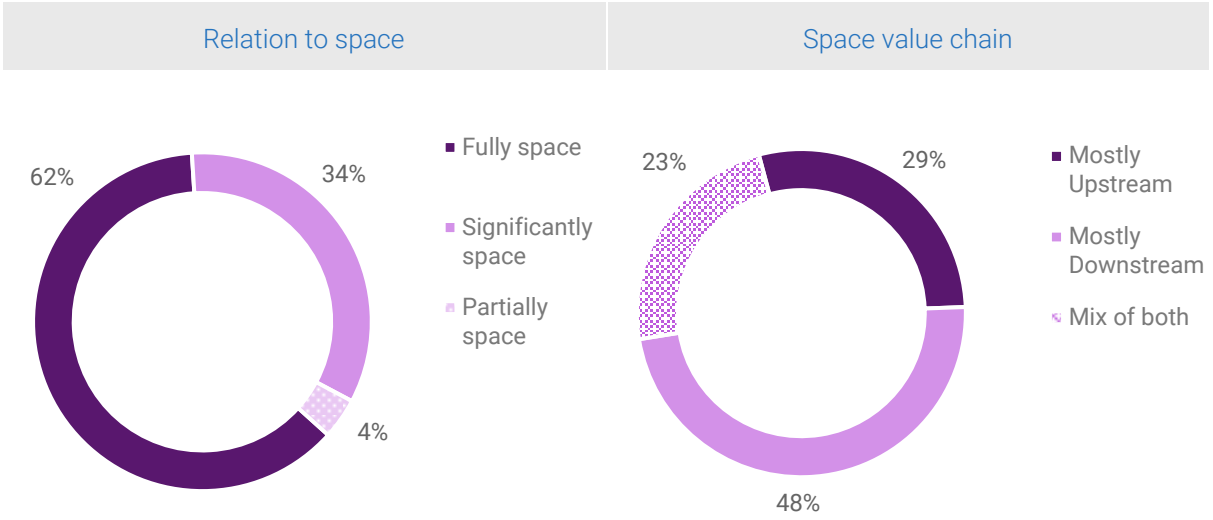


Figure 18: Position in space value chain and share of space-related business

3.1.4 Revenues and target markets

Most European space start-ups already generate a revenue (82%) with 63% declaring a revenue below €1 million and 19% of them declaring revenues above €1 million. On the other hand, 52% of the companies declare no revenues or a revenue inferior to €150.000. These companies are mainly composed of young start-ups that have been founded in the last five years and that are at an early stage of development with 61% of them at seed stage. Out of the companies having generated a revenue between €150 thousand and €1 million, 55% are in their growth stage of development.

On the other side of the spectrum, companies declaring a revenue higher than €1 million are usually in their expansion or maturity stage. In this category, 46% of the companies were in their growth stage while 27% are in their expansion stage.

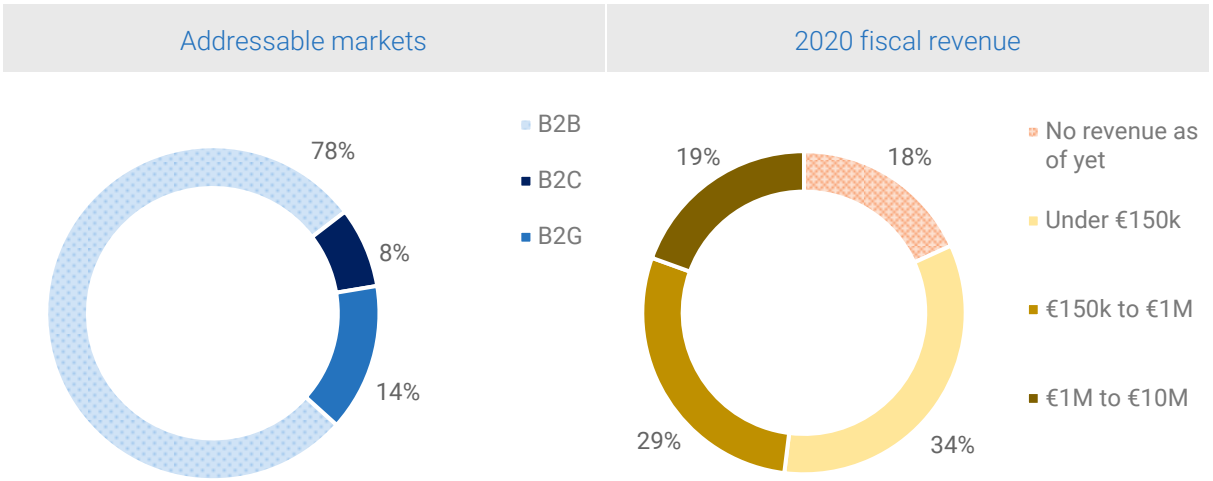


Figure 19: Addressable markets and revenues

In terms of business models, the European space start-up ecosystem is overwhelmingly dominated by companies offering their products to other businesses (B2B) with 78% of all respondents concentrated in this category. In contrast, only 14% of the respondents offer their products to governments on public markets (B2G) and 8% to consumer markets (B2C).

3.2 Impact of COVID-19 on European space start-ups

3.2.1 COVID-19 and investment: pause during first lockdown

Like most economic sectors in Europe, the space sector has also been profoundly impacted by the COVID-19 crisis and directly suffered the consequences of lockdown measures adopted by governments. Throughout the space value chain, the activity of space agencies, system manufacturers, launch service providers, satellite operators as well as downstream companies was disrupted by sites shutdowns, supply chain disruptions as well as work interruption as well as payment delays and orders cancellation.[55]

With regards to investment, the uncertain financial environment following the COVID-19 outbreak was expected to be unfavourable for investments in the space sector. Yet, with €263 million extra funding compared to the previous record of 2018, European space start-ups continued to attract capital.

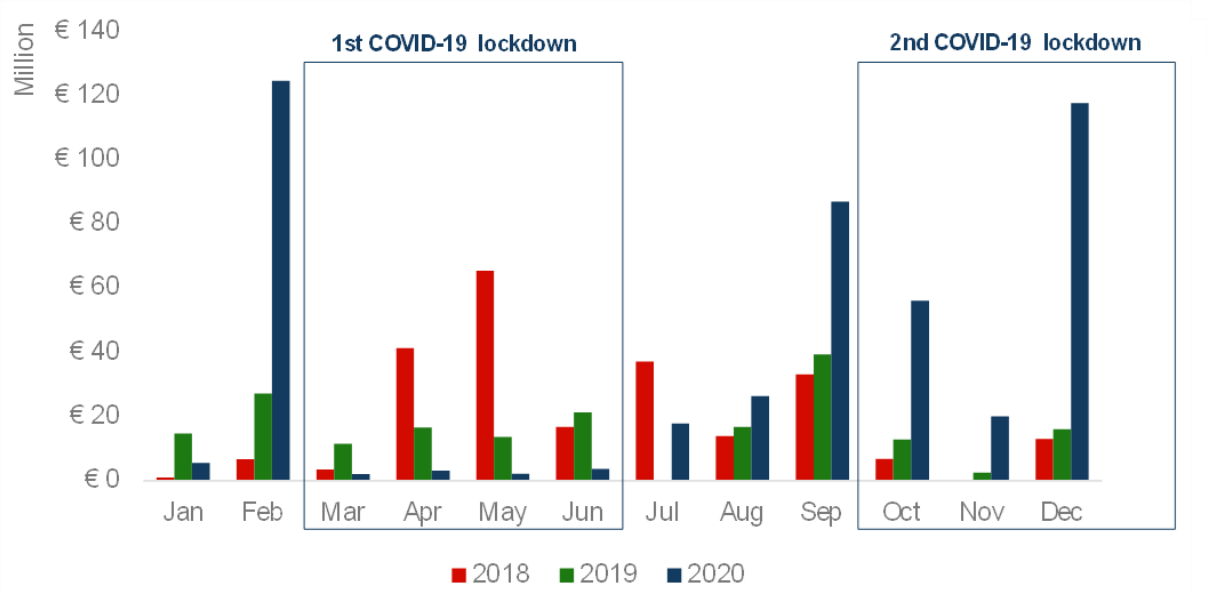


Figure 20: Monthly volume of investment comparison (COVID-19 lockdowns highlighted)

Notwithstanding the large-scale investments recorded in 2020, the year was still marked by the impacts of COVID-19 during the first global lockdown from March to June: the number of deals decreased two-fold compared to 2019 and 2018. With only 15 deals recorded and €11 million raised from March to June 2020, the investment pace decreased considerably during this period.

Interestingly, while investments were frozen throughout the first lockdown, the same situation did not occur during the second lockdown, which started around October in Europe. Quite the contrary actually as European space start-ups raised a total of €193 million (40% of total annual value) in October, November and December 2020.

The impact of the COVID-19 crisis on space investment actually mirrors the situation faced on other European financial markets over the year. Ultimately the economic impact of the COVID-19 crisis has been greatly mitigated on the short term by governmental measures including quantitative easing and economic stimulus. As a consequence, and although investments paused between March and June 2020, the impact of the COVID-19 crisis on investment in the European space sector was not noticeable at the end of the year.

[55] ESPI Special Report, COVID-19 and the European space sector, June 2020

3.2.2 Negative effects of the COVID-19 crisis on European space start-ups

European space start-ups have had a mixed perception of the impacts of COVID-19 in 2020:

- 47% of start-ups assessed that COVID-19 had a limited impact, with 16% of them considering that the impacts proved to be insignificant.
- On the other hand, 53% of respondents assessed a significant impact on their businesses, with 19% of them highlighting a high impact.
- Although no start-up mentioned that COVID-19 had a catastrophic impact, the approach suffers from a "survivor bias" as start-ups that went bankrupt did not reply to the survey.

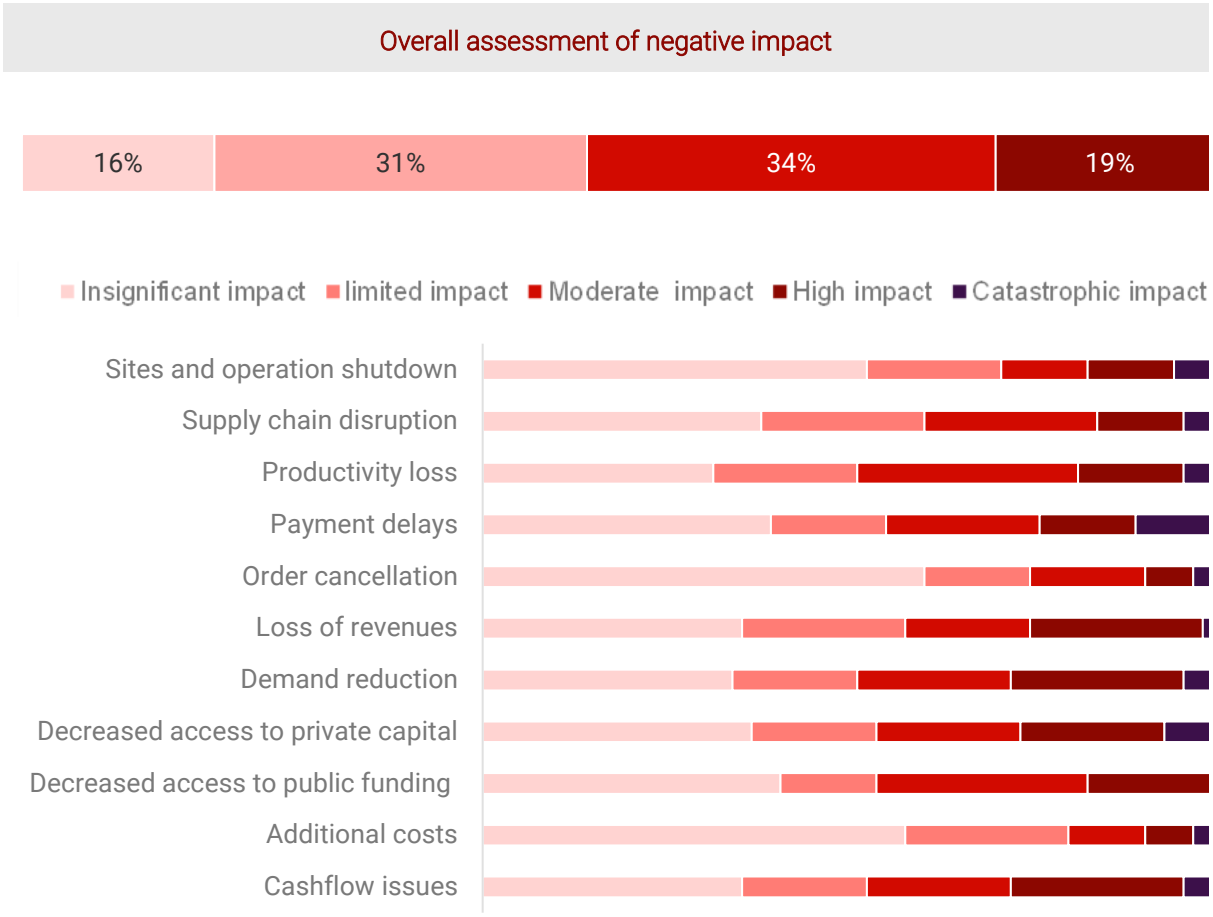


Figure 21: Negative impact of COVID-19 on European space start-ups

The business and activities of European space start-ups have been affected in multiple ways by the crisis. Impacts on the demand side (e.g., payment delays, loss of revenues, demand reduction) have been more significant than on the operation side (e.g. sites and operation shutdown, supply chain disruption, productivity loss), leading to cashflow issues. The impact in terms of order cancellations and additional costs (e.g., to comply with health safety measures) has been reportedly limited.

Interestingly, even though no start-up considered that the crisis had a catastrophic impact overall, they estimate, however, that the crisis had a catastrophic impact on some aspects of their business. This concerned mainly payment delays (12%). Although investment statistics show that 2020 has been an outstanding year for access to capital, 30% of start-ups consider that the crisis had a high or even catastrophic impact on their capacity to raise private funds. In addition, 18% of start-ups estimated that the COVID-19 had a high impact on their capacity to raise public capital

3.2.3 Positive externalities of the COVID-19 crisis on European space start-ups

When asked about the potential positive impact of the global pandemic on their businesses, surveyed space start-ups have generally responded that the positive impacts were also quite varied:

- 50% of respondents consider that the positive externalities linked to COVID-19 were limited or even insignificant.
- 33% of respondents estimate there were moderately positive externalities.
- 17% of respondents pointed out very high or even exceptional positive externalities due to COVID-19. Interestingly, a majority of these companies were in the downstream sector. Seed and early stage start-ups also benefited the most from positive externalities: more than half of seed and early stage companies consider COVID-19 had a positive impact on their business.

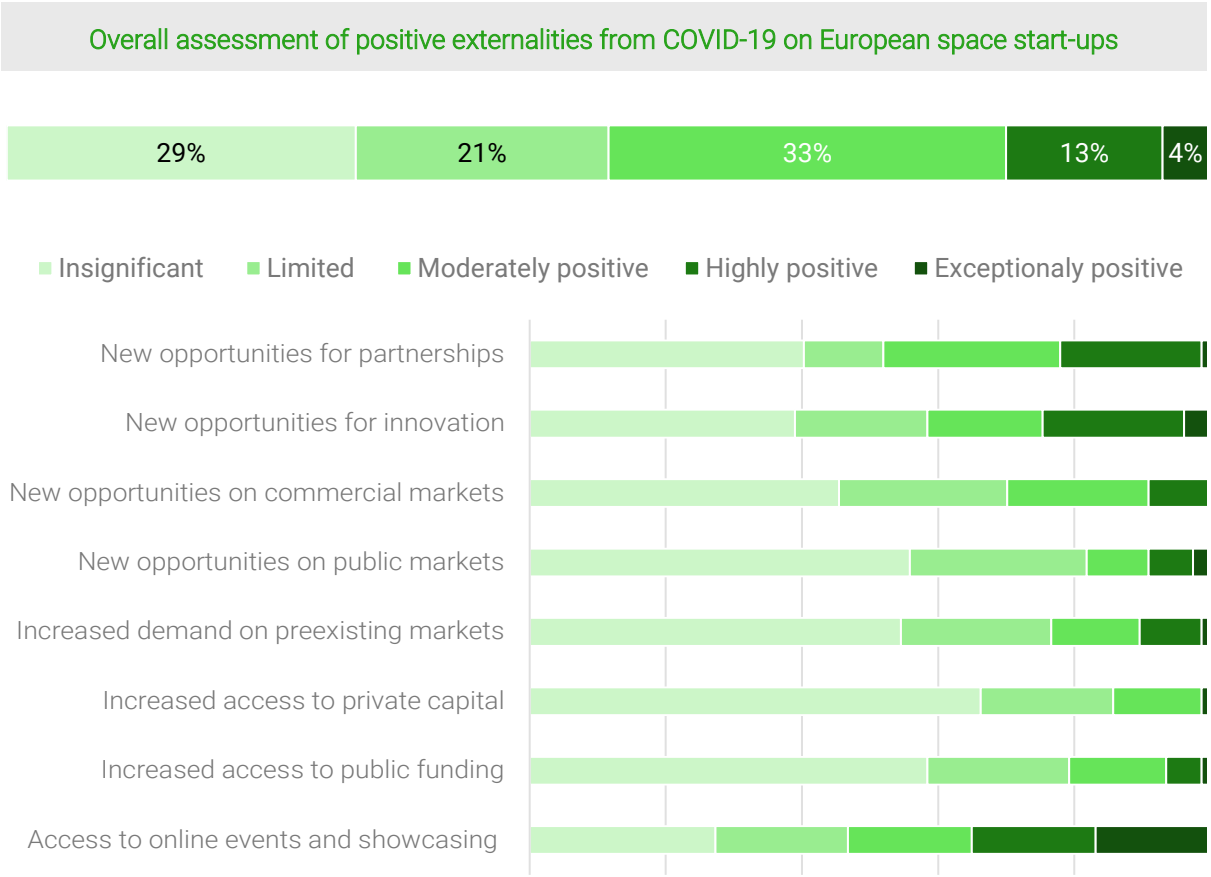


Figure 22: Positive externalities of COVID-19 for European space start-ups

When asked about the aspects of their businesses which most benefitted from COVID-19, surveyed respondents have mainly indicated three main positive externalities:

- The increased capacity to access online events and to showcase products, with over half of the surveyed companies (53%) finding that it had a significant positive impact on their businesses (moderate to exceptional).
- The new opportunities for partnerships also received a high number of responses with regards to the positive impact of the pandemic, with 48% of surveyed responses.
- Finally, new opportunities for innovation, with 42% of respondents stating that the pandemic played a positive role in this regard.

Although space-based solutions have been reportedly used for the management of the COVID-19 crisis, only a small share of start-ups consider that the crisis led to new market opportunities.

3.2.4 COVID-19 and business-continuity measures

Throughout 2020, a variety of measures were implemented by European governments and public institutions to mitigate the economic repercussions of the COVID-19 crisis on businesses.

During the crisis, 19% of surveyed start-ups were considered essential businesses.

Figure 23: Companies considered an essential business

More than 50% of surveyed start-ups benefited from at least four business continuity measures amongst the following:

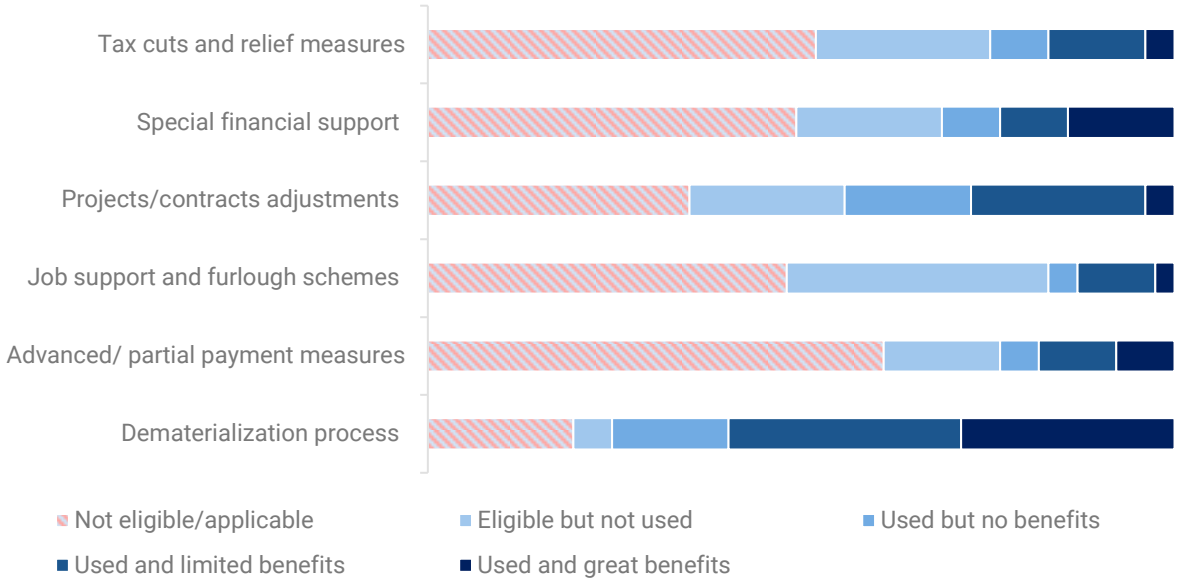


Figure 24: Benefited and impact of business continuity measures

The form of support that was the most largely used by start-ups and which reportedly had the most noticeable impact is the dematerialization process. 81% of start-ups resorted to dematerialized processes (e.g., electronic signature, online meetings) and 60% of them found that it was beneficial. For example, respondents highlighted that the dematerialization process allowed to drastically reduce travel expenditure, even though it made the contact with potential investors more difficult, especially for seed/early-stage companies.

Adjustments to projects/contracts proved also to be beneficial for 30% of European space start-ups (42% of those eligible for this measure).

Special financial support (e.g., guaranteed loans, salaries/contract payments) proved to have very strong benefits for eligible space start-ups, with 28% of eligible companies considering it had great benefits.

On the other side of the spectrum, a much smaller share of start-ups was eligible to receive advanced/partial payments (38%). A larger number was eligible for job support and furlough schemes but those were considered beneficial by a small share of start-ups.

3.3 Start-ups business situation, priorities and prospects

3.3.1 Perception of business outcome in 2020

When asked to assess their current business situation, European space start-ups have responded with a more balanced perspective than the pandemic would have led to expect.

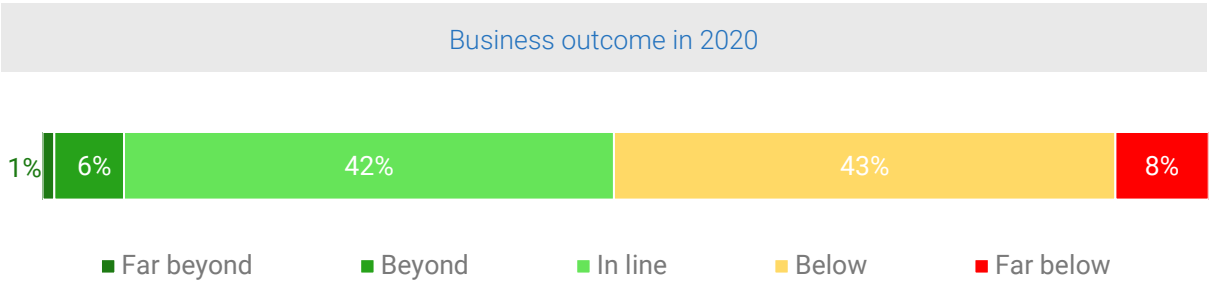


Figure 25: Rate of business expectation in 2020

When asked to rate their current business situation:

- 49% of start-ups answered that they had either met or exceeded their objectives for 2020 with a vast majority (41%) considering their business situation to be in line with their expectations. Only 7% consider that their situation was beyond expectations and 1% far beyond expectations.
- 51% of respondents answered that they had not met their expectations in 2020. In this group, 43% consider their business situation below expectations and 8% consider it far below expectations.

This represents a significant deterioration of the overall situation compared to last year. In 2019, 87% of start-ups considered their business situation good or satisfactory and only 13% considered it bad. While less start-ups consider their business situation to be considerably worse compared to the previous year (13% in 2019, 8% in 2020), there is a much more significant proportion of respondents that believed that their business situation was below expectations.

The survey shows that out of the 49% companies considering their business situation satisfactory, a considerable amount (63%) were start-ups in their early or seed stages. On the other hand, out of the 51% of companies that considered they had not met their business expectations in 2020, half were companies in their growth, expansion, or mature stages. This suggests that start-ups with more established commercial activities probably suffered more significantly from the crisis than early-stage start-ups that have less of a presence on commercial markets.

3.3.2 Business expectations for 2021

When asked to assess their business prospects for 2021, European space start-ups uphold a rather positive outlook suggesting great confidence in their capacity to further develop their business.

Figure 26 :Business situation expectation for 2021

With regards to European space start-ups prospects for 2021, the survey highlights a rather optimistic outlook for 2021:

- **69% of start-ups answered that they expect their business situation to improve or even improve greatly (58% improve, 11% improve greatly) in 2021**. This shows a high confidence of European space start-ups in their capacity to recover from the crisis and/or to further develop their business. In line with this, most companies which did not meet their business objectives in 2020 expect an improvement of their situation in 2021.
- **25% of companies expect their business situation to remain stable**. While this may appear positive, in 2020 51% of start-ups estimated their business situation to be below or far below their expectations and as such, the stability of the business expectations should be read and assessed with caution.
- **Only 6% of space start-ups foresee a deterioration compared to 2020**. This is more than in 2019 where only 2% of respondents envisioned a risk of deterioration for their business situation.

2020 survey results highlight a definitive transition towards less optimistic considerations of future business situations.

Interestingly, just as for the outcome of the business situation in 2020 where the earlier stage start-ups in a large majority highlighted that their business was satisfactory, out of the 69% start-ups that have a positive outlook on the future of their business, 63% are in their early or seed stage. This suggests that early-stage businesses perceive 2021 with a more positive outlook than more mature companies.

3.3.3 Start-up priorities

When looking at the priorities of European space start-ups, results of the 2020 survey are very much in line with precedent editions (2018, 2019) where product development, sales growth and customer acquisition were consistently picked as the top 3 priorities. As such, most companies still prioritise goals related to the establishment of steady revenues and the development of a marketable solution as compared to those related to expansion or scaling of production.

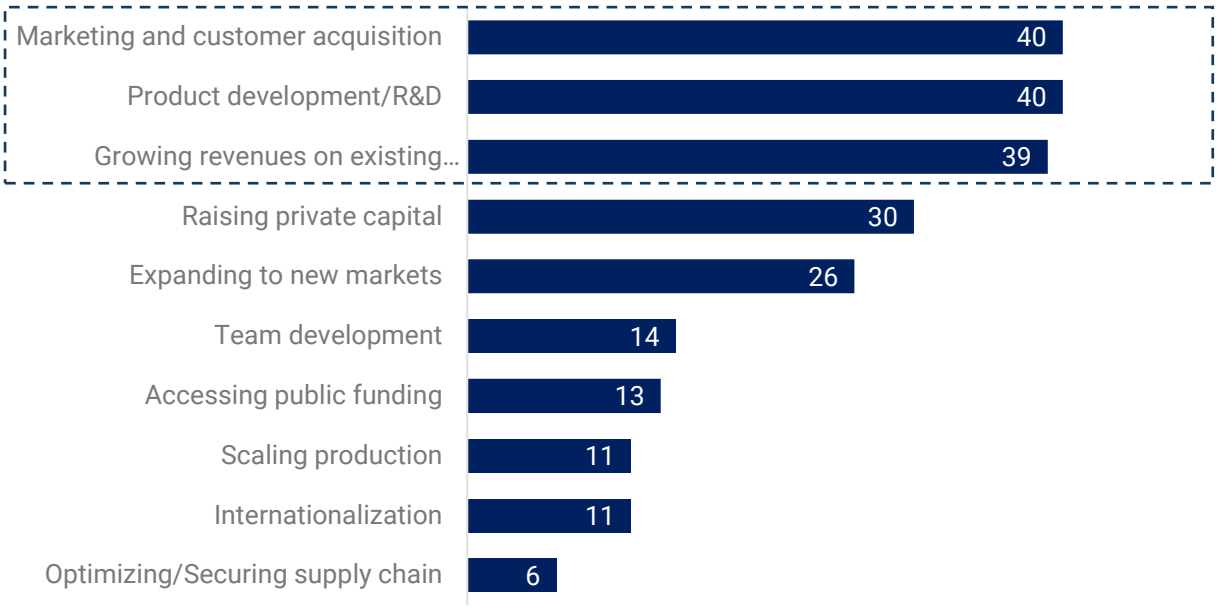


Figure 27: Top three priorities for European space start-ups (number of answers)

- The 2020 survey showed that most start-ups seek first and foremost to establish their business in terms of products and markets. The three priorities that ranked the highest for surveyed companies were "Marketing & customer acquisition", "Product development/R&D" and "Growing revenues on existing markets", with over 50% of start-ups selecting these 3 priorities.
- Interestingly these priorities come before "Raising private capital" and "Accessing public funding" which are two important areas that European public institutions seek to further support in view of fostering entrepreneurship and business innovation in the space sector. Interestingly, raising private capital is a higher priority than access to public funding.
- Goals prioritising growth and expansion were considered secondary by most start-ups, with expansion to new markets selected by 33% of respondents and scaling production and internationalisation each selected by 14% of them.

Once again, businesses confirm that growing revenues through customer acquisition on existing markets remains their main priority.

3.3.4 Progress of public support in Europe

The approach of European governments and public institutions to entrepreneurship and investment in the space sector has considerably changed over the past few years. The fostering and development of New Space trends and ecosystems has become a growing priority for many actors, giving way to several new initiatives.

Interestingly, the survey shows that European start-ups have mixed views on the progress of public action in the New Space domain. While some actions have shown significant progress, some measures such as relief in taxation measures and regulatory and administrative burden still show need for additional improvement.

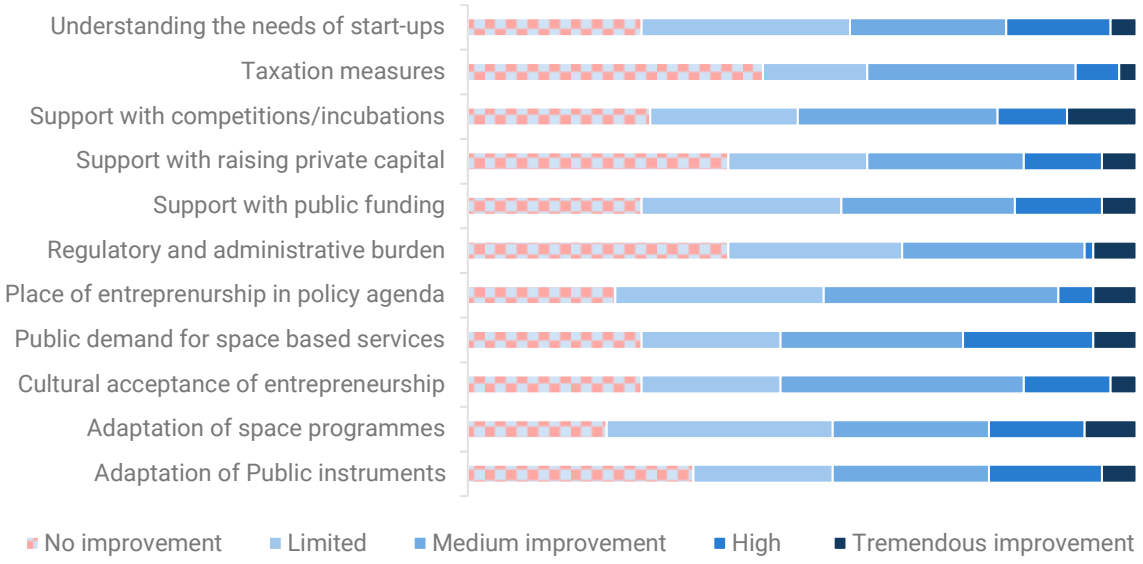


Figure 28: Rate of public support improvement

Some aspects of public support still need to be further improved:

- 65% of start-ups have mentioned that there has been little or no improvement on the front of regulatory or administrative burden.
- 60% of all respondents mentioned that there was little to no improvement on the front of taxation measures and on support with raising private capital.

However, public support has improved across the board for New Space companies

- According to European space start-ups, areas of public support with best improvement (high and tremendously high) include public demand for space services (26%), adaptation of public instruments (22%) and adaptation of space programmes (22%).
- European space start-ups also consider that there was substantial improvement in the domain of cultural acceptance of entrepreneurship and support with competitions/incubations. In these domains a larger number of companies perceives an improvement but consider it to be moderate.

The results suggest that the overall public support to the start-up ecosystem is improving, although European space start-ups still believe that there is room for further improvement. A positive evolution of this situation can legitimately be expected in the coming years as European governments and public institutions are multiplying support initiatives to investment and entrepreneurship trends as part of their respective space policy agenda.

4 TAKEAWAYS

ESPI Space Venture Europe 2020 statistics highlight an outstanding year for investment and entrepreneurship trends in the European space sector. The year was marked by multiple announcements and new initiatives from European public institutions to further support these trends, suggesting that 2020 will not be an extraordinary year but rather a new milestone for Europe.

Investment trends 	• **Record investment in 2020** with €502 million invested in European space start-ups despite the COVID-19 crisis • **Massive growth since 2014** with annual investment growing from €50 million to €500 million in just 6 years - CAGR (2014-2020): 45% • **Number of investment deals is stable** with 57 deals recorded in 2020 across 12 European countries including 12 deals above 10 million. • **Record investment round for start-up Kinéis** (€100 million) to finance IoT constellation. • **Investment highly concentrated in a few large deals** with the top 5 deals representing 65% of the total value of investments. • **Venture Capital accounts for the largest share of investment value** with 75% of the investment originating from Venture-Capital • **Public institutions play a key role in investment** with 60% of investment deals involving at least one public backer (e.g. public investment bank, regional development fund). • **Important domestic dynamic** with 76% of investment deals for European start-ups led by a European investor.
Start-up profiles & priorities 	• **European start-ups are mostly micro enterprises** between 1-5 employees (48%). • **Most start-ups address B2B markets (78%)**, only 14% address B2G markets and 8% address B2C markets. • **Most start-ups already generate revenue (82%)**, with 63% generating a revenue <€1 million and 19% >€1 million. • **Start-ups seek first and foremost to establish their business in terms of products and markets.** Top priorities for start-ups are "Marketing and customer acquisition", "Product development" and "Growing revenues on existing markets". • **Access to private and public funding is a secondary priority** although it is the main area of action of European public institutions
COVID-19 	• **Mixed perception of COVID-19 crisis impact on business:** Half start-ups estimate that COVID-19 had a significant impact on their business while the other half estimate the impact was limited or even negligible. • **Impacts on the demand side** (e.g., payment delays, loss of revenues) **have been more significant than on the operation side** (e.g. operation shutdown, supply chain disruption, productivity loss), leading to cashflow issues. • **Overall deterioration of business situation and confidence**: A smaller share (54%) of start-ups met or exceeded their expectations in 2020. A smaller share of start-ups (69%) except an improvement of their business situation in 2021.

5 European Start-up Stories

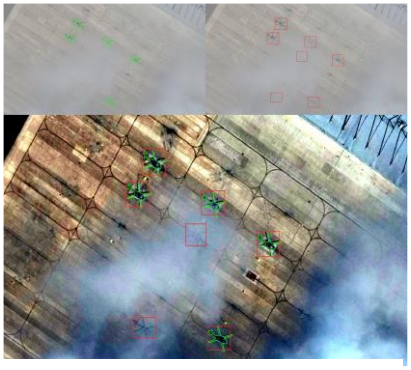
5.1 Preligens/Earthcube

Founded under the name Earthcube in 2016 by Arnaud Guerin and Renaud Allioux, Preligens is a Paris-based start-up that specialises in AI and machine learning-powered geospatial data analysis.

The increasing number of players in the space industry has led to an explosion in the amount of Earth Observation and geospatial data being created every day. Satellite images contain a large amount of information that can be utilised by a variety of actors to make better-informed decisions, but it can take up to a day of work per image for most systems to analyse them.

The company's objective was thus to respond to the demand for services offering a means to analyse geospatial data in a quick and cost-effective manner. Preligens' use of cutting-edge technologies not only enables the company to meet the need for efficient data analysis but also allows users to anticipate possible threats before they occur, thus providing a powerful tool for decision makers working in sensitive fields.

The solution developed by the company allows satellite imagery analysers to optimise the efficiency of their analysis due to the implementation of state-of-the-art artificial intelligence and machine learning, which automate the production of activity indicators. The algorithms then allow for an additional analysis of the collected data to support users in understanding which part of the data is the most relevant to their needs. This functionality is a key added value for the company's solution as it allows for a better contextualisation of each scene, which is an essential feature for a better understanding of the field of operations and allows for more informed decision making.



Credit: Preligens

By going beyond the simple and precise detection of objects of interest, Preligens' technology classifies every object according to a precise and detailed methodology. This allows the in-house AI system to automatically detect the type of object of interest among hundreds of possibilities. Users then have access to the latest information on a dedicated cloud platform, after they have been systematically collected, analysed and rendered by the algorithm. Following its change of name, Preligens particularly aimed to also establish itself as a global player in intelligence-led anticipation services for the armed forces. To do so the company uses its advanced AI system to complete a cross-analysis of information and data collected through multiple sources and sensors such as radars and anti-aircraft defence systems.

To this end, Preligens has collaborated with some of the biggest industrial players in the sector, as is the case with their partnership with Airbus Defence and Space in offering the Defence site Monitoring digital solution. Their AI powered recognition technology has produced some of the best results in the industry, also being able to detect and distinguish objects through clouds. The company's service has since been employed by the operational services of NATO as well as for some of its Member States such as the U.S. and France.

Preligens recently raised €20 million in Series A funding led by Ace Management and Definvest, as it aims to pursue its rapid growth and scale up internationally. The company has opened officed in Washington and now counts over 80 employees.

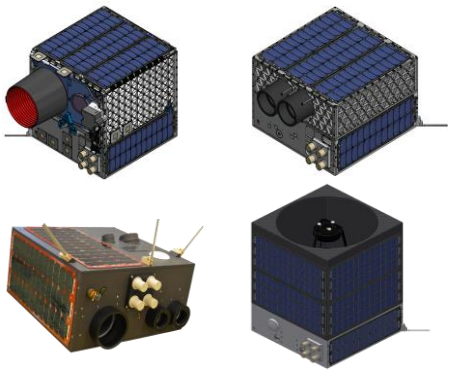
5.2 Berlin Space Technologies

Berlin Space Technology (BST) is one of Germany's leading New Space companies and was founded in 2009 in the "Zentrum für Mikrosysteme und Materialien" in Berlin.

As the New Space economy business model is looking for small and increasingly inexpensive satellite constellations as a solution to bring around the clock surveillance of the surface of the Earth, Berlin Space Technology is presenting themselves as one of the most reliable smallsat and satellite components manufacturers in the industry. The company is vertically integrated, which enables it to have more control over the production cycle and reduce its costs, and offers customers end to end services delivering a range of solutions from payload demonstrations to the manufacture of mega constellations.

The business model with which they run their operations allows the company to have one of the most competitive prices on the market, with each of their small satellites costing an average of €5 million to be produced. This enables BST to manufacture a constellation at a cost that is approximately the same as the one resulting from the development of one large satellite. The ability to operate a constellation of satellites in LEO however allows the company to meet the new industry demand for shorter revisit times for each unit in orbit.

Berlin Space Technology also offer efficient and cost-effective applications for high-resolution Earth Observation Devices, with their subsystems currently operating on over 100 missions including for ESA, NASA and CNES and their state-of-the-art LEOS micro satellites platform supporting even the most demanding missions. In order to meet the growing demand for small satellites, the company has focused on enhancing their model of serial production capabilities to increase production rate. BST calls this innovation the "Henry Ford Moment of satellites".



Credit: Berlin Space Technology (LEOS Platform)

In particular, BST looked to focus on the serial production of small satellite systems and technologies and developed an innovative production model, which aims to minimise production costs while also streamlining the manufacturing process. The resulting model enables the company to respond to the higher global demand for cost-effective missions in sensitive sectors such as Earth Observation.

For this purpose, an essential step was taken when BST signed agreements with companies such a Dhruva Space to build India's first commercial smallsats manufacturing facility. The agreements led to the unveiling of their Azista BST satellite factory in Ahmedabad in 2020, which is built to operate at a rate of 250 satellites produced each year. India also serves as the start-up's main launch site. In addition to their manufacturing site in India, BST also maintains and operates a satellite assembly plan in the USA through a subsidiary which specialises in payload integration and serves as a secondary launch site.

Due to their vertically integrated model the company additionally offers a range of services from Design & manufacturing of demanding payloads to Ground segment & GSE services and are one of the top companies offering capacity building services, as highlighted by the sustainable space program they created together with the National University of Singapore.

5.3 Exotrail

Exotrail was founded in 2015 by David Henri, Nicolas Heitz, Jeal-Luc Maria and Paul Lascombes with headquarters in Massy, in the Île-de-France Region. The company is developing some of the most innovative satellite propulsion system technology in the world with the objective of giving satellite operators more flexibility when choosing their effective operational orbit.

In a context where more private and institutional actors are projecting to launch satellite constellations and mega constellations, having an advanced propulsion system integrated to each satellite is becoming one of the most important aspects related to the mission of many operators. Propulsion systems offer operators the ability to autonomously modify the position of their individual satellites, thus enabling them to correct their orbit and reach better operational positions or to avoid collisions with other satellites.

Credit: Exotrail

In particular, the company makes use of the Hall Effect Technology, which has previously been employed in large satellite thruster but uses ground-breaking technology to reduce its size so that it can be employed on small satellite systems. The benefit of their ion thrusters is their elevated thrust-to-power ratio, which increases the efficiency of every manoeuvre performed and enables operators to reach their chosen orbit expeditiously.

In order to meet the demand in this market, Exotrail has developed an ion thruster electric propulsion system with the objective of optimising satellite operators' launch strategy, while also reducing the cost of each launch. Their solution also enables more flexibility in the assortment of operational orbits operators can chose from. In particular, the company has developed two systems adapted to the size of the satellite to which they need to be integrated; the ExoMG-nano, which is projected to be integrated on satellites ranging from 10kg to 30kg, and the ExoMG-micro, for satellites ranging from 30kg to 100kg. In addition, Exotrail also provides the opportunity to use their ExoMG propulsion systems in a cluster, which can be used on spacecraft ranging from 50kg to 250kg.

Exotrail's technology enables them to generate 1,8mN and 7mN respectively for the ExoMG-nano and the ExoMG-micro systems, which allows satellite operators to reach their operational orbit in relatively less time than would be necessary using other technologies, thus enabling them to start commercial operations earlier. Their use of a modular approach for the manufacture of the ion propulsion system makes it possible to offer each client added flexibility in terms of how the system will be integrated to their platform, meaning that they are highly adaptable to each client's need. An additional advantage of their Exo-MG systems is the use of Xenon to power the propulsion. Xenon is an inert gas, making is relatively safer to use on payloads compared to alternative engines using gases like iodine or titanium.

The company has recently signed their first commercial contract with Europe's leading nanosatellite solutions company AAC Clyde Space for the delivery of their modular Exo-MG system for the ELO 3 and ELO 4 spacecraft. AAC Clyde Space is the main contractor for the manufacture and on orbit delivery of the two satellites, which have been order by Eutelsat as part of a potential constellation in LEO and are expected to be launched in 2021.

Exotrail has received consistent backing by both public and private actors, having received €1.5 million in funding under the French General Secretary for Investment's "French future investment program" after winning the competition and most recently having raised €11million in Series A funding. Their Series A was led by Karista, a venture capital firm which participated through the Paris Region Venture Fund, and Innovacom, and notably also included the participation of Bpifrance.

5.4 LiveEO

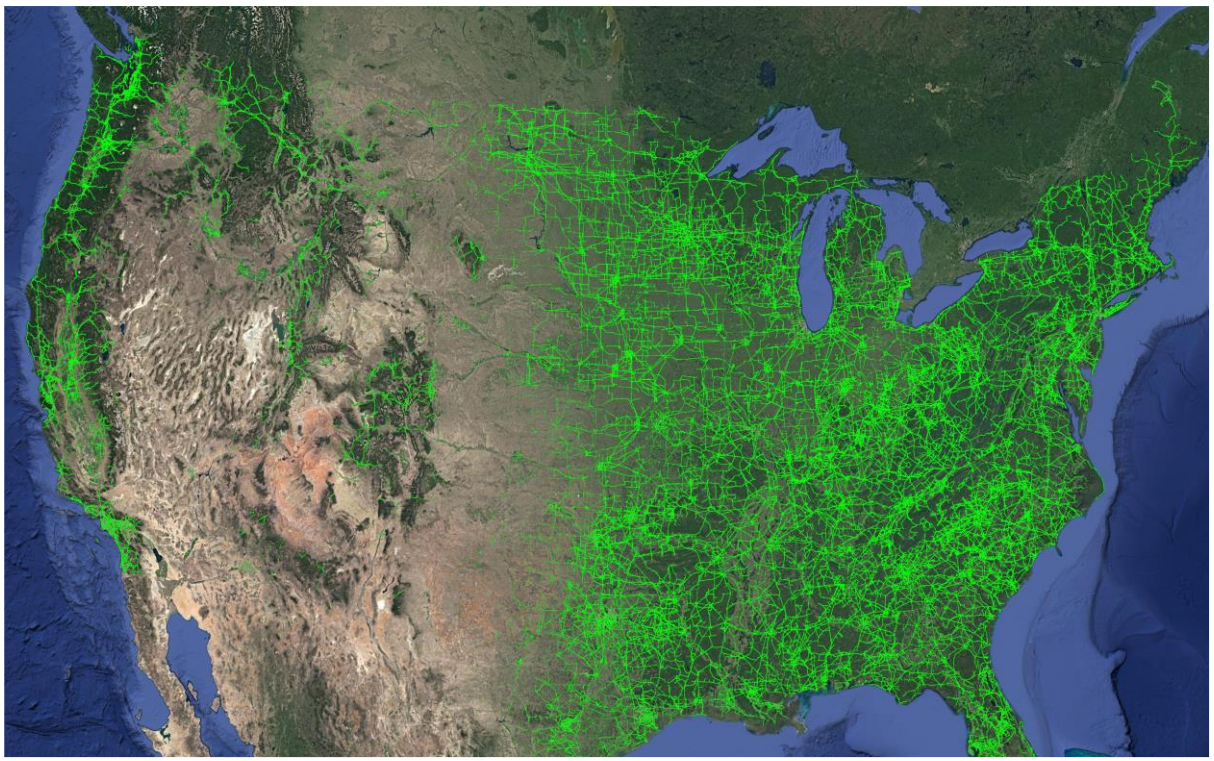
LiveEO is a Berlin-based start-up that was founded in 2017 with the objective of bringing Earth Observation to enterprise customers. For the time being, the company specialises in the provision of monitoring services for critical infrastructures, such as rail networks and power-grids.

LiveEO uses the full potential of Earth Observation data collected daily through the increasing amount of satellite systems in operation around the Earth by using a Software as a Service (SaaS) approach enabling their customers to have access to a cost effective means to monitor possible threats to infrastructures.

By using satellite imagery the company is able to provide an innovative and effective means to monitor very large assets such as railways, electricity power grids and pipelines through their machine learning powered software which turns images into actionable insights. In particular, their algorithms are able to identify threats posed by vegetation or ground movement along the network with a view of facilitating and expediting the monitoring work done by operators to guarantee continued service, increase safety, and lower operational expenses. Their full-stack solution is offered through a web-app in combination with a mobile application which gives managers and ground workers access to the insights generated.

The 50-employee company is providing their service to important institutional actors such as the German Deutsche Bahn, several E.ON subsidiaries and other utilities in the United States and Australia. After expanding their business to the U.S., LiveEO showcased the extent of their solution's potential by providing the world's first ever risk analysis of the entire publicly available U.S. transmission grid to vegetation exposure in 2021.

The company has recently closed a €5.25 million Series A investment round in April with the venture capital firms btov Partners, Helen Ventures, DvH Ventures, Motu Ventures and others. The Berlin start-up has also been backed by ESA, carrying out a demonstration project in collaboration with them in the framework of their Space Solutions programme.



Credit: LiveEO

5.5 QuadSAT

QuadSAT is a Danish company headquartered in Odense and founded in 2017. QuadSAT supplies drone-based antenna testing and tracking solutions to the satellite, defence, wireless, and broadcast markets.

The SATCOM industry is growing and with-it so is radio frequency interference (RFI). Most RFI arises from poorly performing or badly installed antennas. It can cause connection failures and impact bandwidth, ultimately affecting the experience for consumers. Currently, antennas are tested in conventional test ranges prior to network deployment in order to prevent these malfunctions. However, this procedure is expensive, time-consuming, and a logistical challenge. QuadSAT's UAS based system offers location-independent antenna testing. It is an innovative solution that allows for increased test measurements in the SATCOM and RADAR industries.

The main advantages of using drone technology testing to calibrate satellite and VSAT antennas are that it virtually guarantees cost-effective and highly accurate testing and communication, while also reducing interferences and downtime. The increasing number of communications satellites orbiting around the planet represents a practical challenge when performing critical tests on antenna performance because of the high levels of radio frequency interferences coming from poorly performing ground antennas.

Credit: QuadSAT

QuadSAT's system combines advanced drone technology with a custom RF pointing payload. As a compact system, it is transported directly to site and, when launched, it will provide customers with in-situ testing capabilities, resulting in a cost-effective, operationally flexible, and timesaving solution.

The company has successfully performed a testing demonstration of its technology for leading satellite operator SES, with which it has been collaborating for a few years, as well as for Eutelsat. QuadSAT has also recently received a contract from ESA for the development of advanced satellite communications services and products.

With the technology developed by QuadSAT, the regular and time-efficient testing of ground segment antennas will be done using a scalable model and will enable the overall reduction of interference caused by the rising disconnect between ground control and the massive number of satellites expected to be in orbit in the future.

QuadSAT recently received important backing from private investors as well as from the Danish State, raising €2 million in pre-Series A funding in 2020. The investment was led by Seraphim Capital, the first venture fund specialised solely on SpaceTech, and the Danish government's investment fund Vækstfonden, as well as Angel investor, Helge Munk. Seraphim Capital also led the initial €700,000 seed funding in 2019. This accelerated the product testing, allowing QuadSAT to transition its current product, currently offered as a service, to be sold as a product for third party users. This also allowed QuadSAT to expand its UK research and development activities.

QuadSAT plans to raise a Series A round within a year further expanding the revolution of antenna testing in the SATCOM industry.

5.6 ClearSpace

ClearSpace is a start-up founded in 2017 with the objective of developing technologies aiming to clear space debris in orbit around the Earth. The company was created as a spin-off from the Ecole Polytechnique Fédérale de Lausanne (EPFL) and is headquartered in Lausanne.

The Swiss start-up brings together experts in various fields of aerospace including astronauts, engineers and researchers and was founded to respond to the expanding number of tracked objects in orbit resulting from the increase in number of launches every year. With approximately 23 000 objects regularly tracked around the Earth, there is a growing risk for new missions launched into space, in particular related to the higher probability of collision with a space debris. The removal or repair of these debris has previously been done by astronauts through the ISS shuttle but at a high cost. ClearSpace thus aims to develop state of the art technology for the cost-effective removal of satellite debris form orbit to guarantee a clear and safer access to space. Their business model is thus focused on the development of innovative technologies and the application of principles of sustainability to the growing On-Orbit Services market.

For this purpose, the company has adopted the methodology and research conducted at the EPFL in the framework of the Clearspace-1 mission in order to develop a satellite debris removal robot capable of successfully completing rendez-vous, capture and deorbiting manoeuvres to targeted debris. The complexity of the missions, which imply the capture of objects travelling at close to 30 000km/h, means that the technology developed must be exceptionally precise. ClearSpace's solution is currently in the development phase, with the company having recently been selected as lead contractor in ESA's Active Debris Removal/In-Orbit Servicing (ADRIOS) mission. In the framework of the mission, ClearSpace will lead a group of industrial players ranging from across the continent, and will be in charge of the design, research and development, design and construction of the debris removal vehicle.

The objective of ESA's ADRIOS mission is the removal of a carrier structure for a Vega rocket placed in orbit in 2013 and whose components, named Vespa (Vega Secondary Payload Adapter), are still orbiting the Earth. The vehicle developed by ClearSpace will thus be in charge of carrying out a deorbiting manoeuvre for the component, which will weight approximately 112kg. Following the manoeuvre, it is projected that both elements will fall back and disintegrate into Earth's atmosphere. The operational part of the ADRIOS project is set to take place in 2025 following a launch form the Centre Spatial Guyanais in Kourou.

Credit: ClearSpace

The debris removal mission will be made in the framework of ESA's Space Safety Programme and has been studied so that the orbital characteristics of the Vespa spacecraft complies with specific space debris mitigation regulations. The collaboration represents an innovative contractual initiative between public and private actors and the choice of ClearSpace as main contractor for the project following a competitive selection process demonstrates their leadership in this field and their potential for future missions.

As lead contractor, ClearSpace closed a deal worth €86 million with ESA to fund the design and research and development phase, with the overall cost of the project is estimated at €100 million. In addition to the support from ESA, ClearSpace has also received backing from the Foundation for Technological Innovation (FIT), which contributed to the company with €100 thousand in debt financing in 2020.

ANNEXES

Annex A – ESPI Space Investment Database

Dataset and sources

The assessment of investment statistics provided in this report is based on information collected by ESPI in a proprietary database. The ESPI Space Investment Database includes all deals in 2014-2020. The dataset includes publicly available data on announced operations and deals and information is collected by screening a high number of sources including investment firms', incubators' and accelerators' portfolios, articles and specialized news outlets or specialized sources such as CrunchBase. Furthermore, due diligence was made to appropriately filter all press and governmental releases as well as events. Cross checking was systematically performed.

Perimeter and definitions

This study focuses on European space start-ups and aimed to collect data on investment received by these companies and to gather views of these companies on their business, on the environment in which they evolve and on their expectations from public actors. The following definitions and categories were applied to delineate the perimeter of analysis.

European space start-ups

- Start-up: A start-up is defined in Europe as a company younger than 10 years, whose business tend to feature innovative concepts and models and who has not yet reached business maturity (defined according to business stage: Public Offering, annual turnover or number of employees). For the purpose of this study and given the usually longer timeframe required in the space sector to reach business maturity (as compared to other industrial sectors), ESPI included companies founded after the year 2000. Business maturity (end of the start-up stage) is considered achieved if the company meets one of the following criteria (adapted from start-up and SME definitions by the European Commission):
    - Acquisition or Public Offering: the company has been acquired or listed on a stock market.
    - Turnover: the annual turnover of the company exceeds €50 million or the annual balance sheet total exceeds €43 million.
    - Number of employees: the total number of employees exceeds 250.
- Space company: A company is considered a space company if the main business of the company (in revenue share) is part of the space value chain. For this definition, the study followed the space market segmentation provided by Seraphim's Spacetech Market Map 2019, which divides space activities into three segments:
    - Upstream: Build, Launch, Satellites;
    - Downstream: Downlink, Analyse, Store, Product;
    - Beyond Earth: Space Exploration, Space Resources, Space Logistics, Space Research.
- European company: A company was considered European when the headquarters of the business organization are based in Europe (EU Member States + ESA Member States), or if a majority of its business operations is conducted in Europe, a feature that implies, for instance, the eligibility for EU funds as those provided by the Horizon2020 program. Some exceptions exist for companies with multiple headquarters.

In a number of cases, the classification of a company as a European space start-up required an arbitration because of the business setup (e.g. multiple headquarters addressing different regional markets), the situation of the company (e.g. dormant company founded before 2000 but with a net business acceleration after 2000 and following a start-up behavior) or the nature of business (e.g. space is part of the products and services portfolio but not a core market).

For example, the study partially includes, or totally excludes, deals involving companies that reached business maturity during the period considered (2014-2018). This is for example the case of O3b Networks (today part of SES as SES Networks): the company is counted for a single investment in 2014 despite additional investment in 2016 and 2017. According to the definition adopted for this study, the company reached business maturity in 2015, because of annual revenues exceeding by far €50 million. Comparably, companies like GOMSpace and AAC Microtec were excluded after 2016, as they both started to be publicly traded, and that their business structure did not match anymore a start-up model. The British company Reaction Engines was included despite its age, as the company is still actively trying to develop the product for which it was founded, the SABRE engine.

To ensure coherence with existing authoritative studies, ESPI selected the categories used in Bryce's Start-Up Space report series to classify sources and types of investment.

Investor categories

- Angel Investors: individuals or families (to include family offices) that have accumulated a high level of wealth and seek potentially high returns by investing in ventures during their early stages. Such investors may also operate with venture capital firms or other so-called angels. They will typically invest via straight equity, ranging in value from $50,000 to over $1,000,000. There is also a class of "super angels", who work in deals of $100 million or more (Jeff Bezos, as one example).
- Venture Capital Firms: VC firms represent groups of investors that invest in start-up, early stage, and growth companies with high growth potential, and accept a significant degree of risk. The trade of risk for potential high returns results in a high failure rate. Their investment form is equity, typically preferred stock, and comes in a series of rounds, traditionally Series A, B, C, etc.
- Banks: Banks are financial institutions that can support investment through a variety of instruments including, in particular but not only, loans and debt financing.
- Private Equity Firms: Private equity firms or groups are formed by investors to direct-ly invest in companies. They typically invest in established companies, rather than start-ups, through large transactions and often acquire an entire company or a group of related companies that can merge.
- Corporations: Corporations have different methods of engaging in investment. They frequently provide the funding necessary to bring space-based programs to initial operating capability, as well as to sustain on-going programs; they can also fund ventures, typically via straight equity, but also debt, and in the latter case with the option to convert to equity; and they also sometimes act via a corporate venture fund. Lastly, corporations may likewise acquire firms, including start-up space ventures, of which there have been several examples in recent years.
- Accelerators & Incubators: Although they are ultimately distinct types of actors, accelerators and incubators are similar in several core ways. Both aim to support start-ups, offer mentoring in developing their business, and both offer means to at-tract investment. Broadly concerning their differences, "accelerators 'accelerate' growth of an existing company, while incubators 'incubate' disruptive ideas with the hope of building out a business model and company".

Investment categories

- Seed/Prize/Grant: Funding received by a start-up typically at an early stage of development. This category includes a variety of funding instruments that are usually obtained as the result of a selection process (application, competition) and involve limited obligations from the company.
- Acquisition: Situation whereby one company purchases most or all of another company's shares in order to take control. An acquisition occurs when a buying company obtains more than 50% ownership in a tar-get company.
- Debt Financing: Process of raising money by selling debt instruments to individuals and/or institutional investors (e.g. banks). In return for lending the money, the individuals or institutions become creditors and receive a promise that the principal and interest on the debt will be repaid.
- Private Equity: Investment consisting of capital that is not listed on a public ex-change. Private equity is composed of funds and investors that directly invest in private companies.
- Public Offering: Process of offering shares in a private corporation to the public. The first time, the operation is called an Initial Public Offering (IPO).
- Venture Capital: Funds invested by VC firms, usually with medium-term stakes, for high profit, high risk activities.

Space value chain segmentation

The space value chain can be divided into segments. ESPI selected the Seraphim SpaceTech Ecosystem Market Map (available at: https://seraphimcapital.co.uk/insight/news-insights/introducing-seraphim-spacetech-market-map) to organize start-ups business along the value chain.

The upstream part of the space value chain includes all business activities related to the development, production, deployment and operation of space systems. This includes:

- Build: development and manufacturing of space systems (incl. sub-systems, equipment, components and materials) and/or provision of related software and engineering services;
- Launch: development and manufacturing of launch systems and/or provision of launch services;
- Data: operation of space systems to lease or sell satellite capacity data.

The downstream part of the space value chain includes all business activities related to the exploitation of space systems' capabilities or data to provide space-enabled products and services to end-users:

- Downlink: development and manufacturing of the ground support infrastructure and services required to exploit a space system (e.g. relay systems, communications, ground terminals, cryptography);
- Store: provision of solutions for satellite data storage and processing:
- Analyse: provision of value-adding solutions for satellite capabilities and data exploitation (e.g. big data analytics, machine learning and artificial intelligence, algorithms);
- Product: provision of space-enabled products to end-users (e.g. mapping & 3D, data platforms, location and tracking, insight and monitoring).

Seraphim also include in a separate segment companies whose business involve activities beyond Earth orbit including services and products for space exploration, space resources, space logistics or space research.

Annex B – ESPI Space Entrepreneurship Survey

About the survey

This analysis of the European entrepreneurial ecosystem is based on the results of the ESPI Space Entrepreneurship Survey 2020. The survey was issued to 300+ European space start-up and ESPI received more than 120 responses this year.

After careful review, ESPI filtered 77 individual responses from space start-ups located in 19 European countries.

This year, ESPI entrepreneurship survey consisted of 30+ questions addressing 3 main themes:

- *Space start-up ecosystem*: geographical distribution, business and markets, workforce, foundation.
- *Impact of COVID-19*: evaluation of negative effects and potential positive externalities, use of public business continuity measures, expectations and needs for business recovery.
- *Business situation and prospects*: self-assessment in 2020, priorities and prospects for 2021, perception of public support

Responses have been aggregated through multiple choice questions, scores and open comments of the respondents providing additional insights on their reply.

Survey respondents in 2020

ESPI is grateful to the many European space start-ups who took part to the survey and provided substantial information for this report.

The following table excludes the names of 15 start-ups who wished to remain anonymous.

Company	Headquarters	Core business
27G-Technology	Gödöllő, Hungary	Mix
Accurision GmbH	Vorarlberg, Austria	Downstream
Aerospace & Advanced Composites GmbH	Wiener Neustadt, Austria	Upstream
Aerospacelab	Mont-Saint-Guibert, Belgium	Mix
Alén Space	Nigrán, Spain	Upstream
Almatech SA	Lausanne, Switzerland	Downstream
Ambasat Ltd	North Yorkshire, United Kingdom	Mix
Asgard Space S.L	Barcelona, Spain	Upstream
Aviosonic Space Tech	Milan, Italy	Mix
Berlin Space Technologies GmbH	Berlin, Germany	Upstream
Big Terra	Czech Republic	Downstream
BioScope	Wageningen, Netherlands	Downstream
Black Arrow Space Technologies Ltd	Swindon, United Kingdom	Upstream
CloudFerro	Warsaw, Poland	Downstream

Clutch Space Systems	Guildford, United Kingdom	Mix
ConstellR	Freiburg, Germany	Downstream
CYSEC SA	Lausanne, Switzerland	Upstream
Data Science Experts	Grenoble, France	Downstream
Ecometrica Ltd.	Edinburgh, United Kingdom	Downstream
ENVEO Environmental Earth Observation IT	Innsbruck, Austria	Downstream
eoVision GmbH	Salzburg, Austria	Downstream
Everimpact	Bourg-Blanc, France	Downstream
Exotrail	Massy, France	Upstream
FadeOut Software srl	Genova, Italy	Downstream
FENTISS S.L.	Valencia, Spain	Upstream
Geomatics Research & Development srl	Como, Italy	Downstream
Hybrid Propulsion for Space	Mérignac, France	Upstream
I-CONIC Vision	Stockholm, Sweden	Downstream
insar.sk s.r.o.	Prešov, Slovakia	Downstream
In-Space Missions	Alton, United Kingdom	Mix
KAYRROS	Paris, France	Mix
La TeleScop	Castelnau le Lez, France	Downstream
latitudo40	Naples, Italy	Downstream
Lens Research & Development	Noordwijk, Netherlands	Upstream
Lumi Space	London, United Kingdom	Upstream
MDA Space and Robotics Limited	Bristol, United Kingdom	Mix
MURB Space Maciej Urbanowicz	Warsaw, Poland	Mix
Mynaric	Gilching, Germany	Upstream
Needronix	Bratislava, Slovakia	Mix
Orbit Recycling	Orbit Recycling , Germany	Upstream
PASQ AB	Kiruna, Sweden	Upstream
Precision Navigation Systems	Tallinn, Estonia	Downstream
Puli Space Technologies Ltd	Budapest, Hungary	Upstream
QuadSAT	Odense, Denmark	Downstream
ReOrbit	Helsinki, Finland	Upstream
Satellite Vu	London, United Kingdom	Mix
SatRevolution	Wroclaw, Poland	Mix
Satsearch	Noordwijk, Netherlands	Upstream
SOTERSAT BV	Leiden, Netherlands	Downstream

Space Apps Kft.	Kiskőrös, Hungary	Downstream
Spacearth Technology SRL	Roma, Italy	Downstream
SPACELAYER Technologies	Coimbra, Portugal	Downstream
Spacemanic Ltd.	Bratislava, Slovakia	Mix
SpacePharma	Courgenay, Switzerland	Mix
Spacept	Ladugårdsgärdet, Sweden	Downstream
SpaceSense	Paris, France	Downstream
THERE, s.r.o.	Bratislava, Slovakia	Downstream
Ticinum Aerospace	Pavia, Italy	Downstream
U-Space	Toulouse, France	Mix
Valispace	Bremen, Germany	Mix
Wasat	Gdańsk, Poland	Downstream
Weather Logistics Ltd	Nottingham, United Kingdom	Downstream

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About ESPI

Policy & Strategy

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ESPI is the European think-tank for space. The Institute is a not-for-profit organization based in Vienna, World capital of space diplomacy, providing decision-makers with an informed view on mid to long-term issues relevant to Europe's space activities since 2003.

ESPI is supervised by a General Assembly of member organizations and supported by an Advisory Council of independent high-level experts.

ESPI fulfils its objectives through various multi-disciplinary research activities leading to the publication of books, reports, papers, articles, executive briefs, proceedings and position papers, and to the organisation of conferences and events including the annual ESPI Autumn Conference.

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