ESPI

European Space Policy Institute

# ESPI Insights

## Space Sector Watch

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# WHAT'S NEXT FOR THE EUROPEAN SPACE SECTOR IN 2022?

Dear Friends of ESPI,

2022 will be a defining year for establishing bold European ambitions in space.

Space policy: The European Space Summit that will be held in Toulouse in February will be a key milestone to define the European vision for the future of the space sector. The high-level event will be a timely opportunity for decisions on outstanding topics such as the secure connectivity initiative, the European approach to Space Traffic Management or the new accelerator and inspirator initiatives proposed by ESA. The place of space in broader policy issues such as the Digital Agenda or the Green Deal will probably be at the heart of such vision. In this respect, the adoption of the Strategic Compass (planned for March), which will define EU strategic priorities in the areas of security and defence, will also raise new questions for space. The space community will carefully watch the outcome of the ESA Council at Ministerial level in the second half of the year, which will hopefully provide the necessary backing for the implementation of a bold and ambitious vision. Finally, in line with recent trends, we can expect space to be on the agenda of the G7 and G20 summits scheduled in June and October 2022, which would confirm that space is now high on the global political agenda.

Space exploration: In September, the Rosalind Franklin rover co-developed by ESA and Roscosmos will launch to Mars, providing new insights on the red planet. The space community also eagerly awaits the first data from the James Webb Telescope, successfully launched by Arianespace. In 2022, ESA will also finalize its two-year stakeholder consultation to define the Terrae Novae 2030+ long-term exploration strategy. Looking ahead to the ISS and to an active private sector increasingly interested in private space stations, ESA invited European companies to collaborate on the development of commercial concepts for the post-ISS era and to ensure Europe's presence in LEO. The participating companies can apply to the SciHab project, which ESA added to its Terrae Novae Strategy Roadmap.

Launchers: 2022 will be a pivotal year for the European launcher sector as well with the maiden flight of Vega C, the newest small-lift launcher of Europe, planned for the end of April and the first launch of Ariane 6 in the second part of the year. The European microlauncher ecosystem is expected to show concrete developments: two German companies, Isar Aerospace and Rocket Factory Augsburg, will attempt the first flight of their rockets from the Andøya spaceport in Norway and two UK companies, Skyrora and Orbex, will launch from UK spaceports. The space community and the general public will also follow with great interest the outcome of future discussions on Human spaceflight capabilities in Europe.

NewSpace. ESPI's Space Venture Europe 2021 points out that in 2021 European space start-ups raised a record amount of €610M and it is likely to see this record beaten in 2022. This happened hand in hand with Europe seeing its first space "unicorn" ICEYE. On January 25th at the EU Space Conference, EU Commissioner Thierry Breton announced the launch of the €1bn Cassini fund to boost investment into space start-ups. Additionally, in line with its 2025 Agenda and with the development of a new Directorate of Commercialisation, Industry & Procurement, ESA is ambitiously updating its overall procurement strategy which will allow start-ups and SMEs to get easier access contracts.

Beyond these specific trends, 2022 will bring its lot of space policy, programmes, industry, business and international developments that we will continue reporting on in upcoming editions of ESPI Insights.

Yours sincerely,

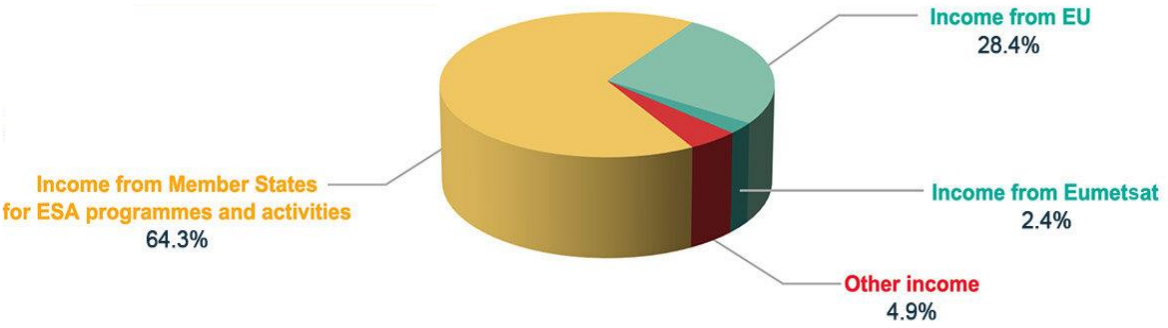
*Jean-Jacques Tortora*

*Director of ESPI*

# POLICY & PROGRAMMES

## ESA budget for Fiscal Year 2022 raises to €7.2 billion

On January 14th, during the Director General's annual press conference, ESA DG Josef Aschbacher presented an ESA budget 2022 of €7.2 billion, which has been increased by 10.9% compared to 2021. ESA member states and the European Commission increased ESA funding by 3.2% and 17% respectively. The EC mainly steered funds to ESA for the technical management of Galileo and Copernicus programmes, for a cost of €2 billion in 2022 compared to €1.69 billion in 2021. The sources of funding coming from Italy and Greece are excluded from the mentioned figures.




*Credit: ESA*

Both Italy and Greece decided to use part of their Covid recovery budgets for space projects that they will turn over to ESA for technical management:

- Italy signed an agreement with ESA on December 16th for an EO constellation including satellites with optical and radar instruments, and able to provide services for institutional and commercial users. The constellation's budget amounts at €1.07 billion.
- Greece will direct €200M from its recovery fund to ESA for the management of technologies on quantum key distribution from space. The project is connected to the EU's quantum and secure connectivity satellite constellation which has not received funding yet and remains in the study phase.

Other third-party contributions account for approx. €500M, about 10% more than in 2021. Among these third-party fundings, EUMETSAT is the main source.

## European stakeholders discuss solutions to Copernicus funding shortfall after Brexit

*Credit: ESA*

On December 15th, at the latest ESA Council meeting, the issue of the funding shortfall in the Copernicus programme that the EU is facing post-Brexit was addressed, including UK contribution of €750M to the programme over the 7 years of the European Commission's budget 2021-2027. The British and European negotiators failed to reach an agreement on UK participation in the Copernicus programme by November 30th. The lack of funding from UK is raising difficulties for six new Copernicus satellite missions adopted during the ESA's 2019 ministerial meeting and contracted by ESA in July 2020. ESA DG Josef Aschbacher spoke of the issue at a media briefing following ESA Council meeting and mentioned the possible postponement of the decision regarding UK contribution until the EO missions' critical design review (CDR) scheduled for late 2023 and 2024.

## The 14th European Space Conference highlights EU future priorities for space

*Credit: Space Conference*

Between January 25th and 26th, the 14th European Space Conference took place in a hybrid format in Brussels. Many topics have been addressed. In particular, the EU Commissioner for the Internal Market Thierry Breton outlined the EU`s priorities for 2022:

- Consolidating "existing assets while developing to face the upcoming challenges": Galileo's second generation "will operate real technological breakthroughs"; "a Copernicus' modernisation strategy" will be presented in the upcoming weeks; it will be necessary to " develop a fully-fledged European launcher strategy that will ensure its needs, its global position and its autonomy for the next 20 to 30 years"; the European Space Launcher Alliance defining "a technological roadmap and a holistic European approach to launchers" will be formally launched.
- Preparing and projecting "Europe into the realities of tomorrow, anticipating the future challenges and avoiding potential strategic dependencies": upcoming weeks' targets will be a legislative proposal on the secured connectivity infrastructure and a European strategy for Space Traffic Management, with the objective to reduce Europe's dependence on the U.S. system, while ensuring interoperability.
- Developing a "real strategy to spur innovation in space" using all available instruments: the first ever Space Partnership that will bring together industrial, public, and academic stakeholders to define technological roadmaps, long-term plans, and coordinate investment in space innovation; public procurement used in a strategic way, including in the EU's large space projects and to stimulate the launcher ecosystem; increasing cooperation between the EU and EIC.
- In the frame of a "defence dimension of the EU's space policy", future targets are: proposing to draft a Space and Defence Strategy by 2023 in the context of the Strategic Compass; expanding the "defence dimension in existing and upcoming EU infrastructures"; developing "new infrastructures as dual-use by design, integrating the defence needs from the outset"; reducing Europe's technological dependencies and reinforcing "the resilience of its value chains in critical sectors for space; setting up "a new governance for the EU space programme to best reply to threats". The mid-, long-term goal "could be to establish a true European Space Command".

## European Commission awards €10M EIC Horizon price to Isar Aerospace

European micro-launcher start-up Isar Aerospace won the European Commission EIC Horizon "Low-Cost Space Launch award" for its launch service solution spectrum, a two-stage vehicle offering cost efficient access to space for small to medium-sized satellites. Isar Aerospace is receiving a total of €10M in prize money. The company has raised a total of €150M up to date.

## The EU signs €1 billion space fund to support European space start-ups


*Credit: European Commission*

In January 2021, at the 14th European Space Conference, Commissioner Breton announced the setting-up of the €1 billion European Space Fund CASSINI to boost start-ups and space innovation. One year later, in January 2022, at the 14th European Space Conference, officials from the European Commission, the European Investment Bank and the European Investment Fund confirmed and committed to the programme over the next five years. In line with this, ESA, EUSPA, the EIB and the EC signed a MoU on principles of cooperation to support SMEs in the space sector, fostering information exchange and engaging in joint space entrepreneurship's cross functional actions.

## NATO releases first public space policy document

On January 17th, NATO released its first public space policy document. NATO's space policy outlined the increased importance of space for NATO and its Allies' security and prosperity and recalled some key principles. The policy addresses four key roles that will characterise NATO's overall approach to space:

- Integrating space-related considerations into NATO's core tasks delivery.
- Serving as a political-military consultations and information sharing forum on deterrence and defence-related space developments.
- Ensuring space support to NATO's operations, missions, and other activities.
- Facilitating compatibility and interoperability development between Allies' space services, products, and capabilities.

*Credit: NATO*

NATO will pursue several lines of effort to support these key roles, including space systems support in fields such as SSA, monitoring, intelligence, surveillance, and reconnaissance; continuing the development of space domain awareness; supporting strategic communications and responsible space behaviour; foster cooperation with space-related industry and the commercial sector; and so forth.

## ESA partners with Avio to boost the competitiveness of the Vega-C rocket

ESA and Avio signed a two and a half year €51M contract to improve the competitiveness of the Vega-C rocket. Avio will collaborate with industrial partners to implement multiple enhancements. The objective is to enable Vega-C to meet a wider range of market needs, extending its capabilities, offering increased performance for all orbits and mission flexibility while also reducing launch system costs by 10% and complying with the ESA Council's payload allocation policy.

## French Economy Minister delivers a speech on France's space policy

During a visit of ArianeGroup's site in Vernon on December 6th, French Economy Minister Bruno Le Maire delivered a speech on France's reindustrialisation and space strategy, addressing strategic choices:

- ArianeGroup will develop Maia, a reusable mini launcher scheduled to be launched by 2026.
- France is planning to release a call for project on reusable micro-launchers by the end of the year. CNES will support the winners by contracting launch services and will invest €80M to develop a launch pad for mini and micro-launchers in Kourou.
- The "France 2030" investment plan will support both the EC satellite constellation project and activities in new space-related fields, such as in-orbit refuelling and relocation, space surveillance to locate space debris and satellites and maximise space data value.


*Credit: ArianeGroup*

Bruno Le Maire highlighted that the new launchers will not replace Ariane 6, whose profitability strongly relies on the application of the European preference for the launch of European satellites. European countries said they will commit to four institutional launches per year on Ariane 6, and France, Italy, and Germany agreed to allocate €140M per year to support its development.

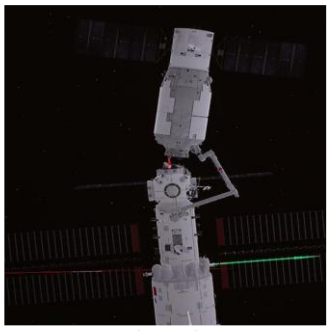
## China updates its space-related future plans

### China establishes satellite cluster in Chongqing to help with the mega-constellation project

On December 29th, according to the Science and Technology Daily newspaper, China Satellite Network Group founded two new firms to build a "national satellite Internet application industry" in the city of Chongqing. China Satellite Network Group is leading China's LEO mega-constellations plans and established the two new enterprises to help in the development of the project. The firms are:

- China Star Network Application Corporation, which will be responsible for the national satellite Internet application industry development, as well as for other activities. For instance, the company will be in charge of building the industry system with Chongqing City and establishing an innovation special zone for the cluster.
- The second firm is Chongqing Satellite Network System Research Institute Corporation, which will build, operate, and maintain the satellite Internet ground systems; it will develop and verify the system protocols and simulation systems.

### China plans three lunar missions and aims to complete Tiangong space station



*Credit: Xinhua*

In early January, China revealed information about its plans for the Moon. According to the China National Space Administration (CNSA), China approved its lunar exploration program's fourth stage, including the launch of three missions to the Moon's south pole. Chang'e-7 will be the first to be launched, Chang'e-6 will be a lunar sample return mission backing Chang'e-5, while Chang'e-8 will bring China closer to build a model lunar scientific research station.

Additionally, China Aerospace Science and Technology Corporation (CASC) plans to carry out more than forty orbital launches in 2022, including six missions to complete the Tiangong space station by the end of the year. On January 5th, China conducted a successful experiment grasping and maneuvering the Tianzhou 2 cargo spacecraft with Tiangong's 10-meter-long robotic arm. This was the first time the robotic arm had been used on a large spacecraft. The experiment aimed to test the procedures and equipment required for the movement and addition of the other two space station modules that will complete Tiangong.

### China releases white paper document highlighting the country's priorities in the space domain

On January 28th, China's State Council Information Office released "China's Space Program: A 2021 Perspective", a five-year white paper document. The document highlights the importance of space for China's overall national strategy and addresses the country's major space-related plans for the next five years in six different areas: space technologies and systems, space applications, space science, space governance and international cooperation. In line with China's 2014 policy shift towards a space sector more open to private capital, the new white paper places greater emphasis on commercial activities and applications. On the other hand, the document remains silent on such topics as national satellite internet and mega-constellation projects, space resources or space-related military activities.

### China confirms partnership with Russia to build a lunar research base by 2035

On January 31st, the China National Space Administration (CNSA) confirmed that China and Russia partnered to build a research base on the Moon by 2035. The project was first revealed in June 2021 after the two countries signed a MoU in March. The International Lunar Research Station (ILRS) will be a multidisciplinary and multipurpose research infrastructure and will include an orbiter, a base on the lunar surface, and multiple exploration rovers. The project is open for other countries to join.

## The White House releases the United States Space Priorities Framework

The White House released the United States Space Priorities Framework document, which aims at guiding the Council's efforts in the development and implementation of national space policy and strategy. The document was released ahead of the National Space Council's first meeting under the Biden administration and represents the first formal space policy act of the new administration. The document first highlights the benefits the U.S. gains from space activities and then groups the U.S. space policy priorities into two categories:

*Credit: White House*

- "Maintaining a robust and responsible U.S. space enterprise", including continued U.S. leadership in space exploration and science, use of space-based capabilities in different fields, national security interests defence from growing space and counterspace threats, space-based critical infrastructures protection, and support of commercial space sector-enabler regulations.
- "Preserving space for current and future generations", addressing topics related to the long-term sustainability of space activities, the continued development of civil STM capabilities, and efforts in tracking and potentially mitigating threatening near Earth objects.

## U.S. Government commits to extending ISS operations through 2030

According to NASA Administrator Bill Nelson, the U.S. President Joe Biden's administration has committed to extending the operations on the International Space Station through 2030. NASA published an ISS blog on December 31st including the U.S. Government's statement on the matter. Nevertheless, to be final the decision would have to be approved by international partners and funded by the U.S. Congress, which has currently approved funding until 2024.

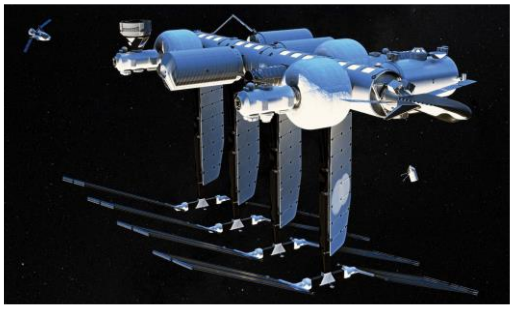
## NASA plans new line of probe class missions

*Credit: NASA*

During an online town hall meeting on January 11th, NASA stated it started implementing the recommendations of the "Pathways to Discovery in Astronomy and Astrophysics for the 2020s" report that the National Academies released on November 4th. In particular, NASA launched a new line of "probe" class missions with a $1 billion cost cap (excluding launch costs and potential international contributions). NASA is planning to select two or three proposals for Phase A concept studies with a value of $5M each in early 2024 and choose the winning mission in mid-2025. Due to budgetary reasons, NASA will launch one astrophysics probe mission a decade. NASA is also adopting a multistage approach to implement the creation of a "Great Observatories Mission and Technology Maturation Program". NASA will work to enable the required science and technology for the three future Great Observatories and start the program once the funding is available.

## NASA signs Space Act Agreements for commercial space stations projects

NASA selected three companies for the development of space stations designs and other commercial destinations in space, to strengthen the US economic presence in LEO and facilitate the transition after the ISS disposal. The total value of the Space Act Agreements is $415.6M, distributed as follow:



*Credit: Blue Origin*

- $130M to Blue Origin, which partnered with Sierra Space and other companies to develop Orbital Reef planned to start operations in the second half of this decade. Orbital Reef aims to support all HSF activities in LEO as well as new potential markets.
- $160M to Nanoracks, which developed Starlab in partnership with Voyager Space and Lockheed Martin. Starlab is planned for launch in 2027, will have the same power, volume, and payload capacity of the ISS, and will house advanced research and boost commercial industrial activity.
- $125.6M to Northrop Grumman, which partnered with Dynetics and other companies to design a free flying space station using the current flight systems and crew-focused technology. The design shows a space station that could permanently house four humans, expandible to eight, for 15 years.

In the second phase of the program, that should start in 2025, NASA aims to certify the commercial LEO destinations of these or other competitors for NASA crew members use and then purchase services.

## Updates on the Artemis program and accords


*Credit: NASA*

On December 17th, NASA disclosed its decision to postpone Artemis 1 flight from February 12th to no earlier than March or April due to an anomaly in the rocket's avionics communications that led to the replacement of one of the four RS-25 engines' flight controller. During the Advisory Council's Human Exploration and Operations Committee meeting that took place between January 18th and 19th, NASA officials also declared that Artemis 4 will not attempt a lunar landing and will rather focus on the assembly of the Lunar Gateway and on the SLS Block 1B version's first flight. Artemis 5, which will include the delivery of ESA's ESPRIT module, the Gateway's robotic arm system, and an unpressurized lunar rover, should be the first mission to both land on the Moon and use the Gateway.

Artemis 3 is currently planned for mid-2025 and there are no official dates for Artemis 4 or 5.

Additionally, on December 9th and January 26th respectively, Mexico and Israel signed the Artemis Accords becoming the fourteenth and fifteenth signatory states. Mexico`s Foreign Secretary Marcelo Ebrard did not disclose any detail regarding the country's participation in NASA's Artemis program. While Israel Space Agency's Director-General Uri Oron said Israel joined the Accords in view of a future staying on the Moon for research and developments. Israel is already participating in the Artemis 1 mission.

## In other news

ESA selects Leonardo as prime contractor for its new Cyber-Security Operations Centre (C-SOC): Based on the contract, Leonardo will lead a consortium of 19 European companies to design, implement, build, validate and operate ESA's C-SOC, which will start operations in 2024. C-SOC aims to be a key infrastructure in protecting the European space systems from cyber threats and attacks.

Dr Kathryn Hadler is the new Director of the European Space Resources Innovation Centre (ESRIC): Dr Hadler has been appointed on January 31st and will take up duty on April 1st. The Luxembourg National Research Fund (FNR) backed Dr Hadler nomination with an endowment of €3.7M over five years under the PEARL programme.

SpaceDataHighway enables real-time data transmission between the ISS and Earth through antenna: the Columbus Ka-band (ColKa) terminal was installed on the ISS, fully tested and now activated, giving the ISS' Columbus laboratory direct access to SpaceDataHighway, the satellite that Airbus developed with the support of ESA.

European Commission awards €1.4M each to two consortiums for broadband constellation study: The selected consortia are the UNSEENLABS and EUROCONSULT-led New Symphonie and the Mynaric, Isar Aerospace, and Reflex Aerospace-led UN:IO. The consortia will carry on a six-month study, investigating the most optimal infrastructure for secure connectivity markets.

German government appoints new Coordinator of the Federal Government for German Aerospace: The newly nominated Anna Christmann will be responsible for the implementation of Germany's space-related strategic objectives as defined in the traffic-light government's coalition contract.

NASA appoints new JPL director and chief scientist and senior climate advisor in January: Laurie Leshin was nominated director of NASA's Jet Propulsion Laboratory on January 27th and will take office on May 16th, succeeding Mike Watkins who step down in August. JPL is currently run by deputy director Larry James. Dr. Katherine Calvin will be NASA's new chief scientist and senior climate advisor, Jim Green who retired on January 1st and Gavin Schmidt who has been senior climate advisor since the creation of the position in February 2021.

China's Mars Tianwen-1 probe and ESA's Mars Express spacecraft test in-orbit communications: The successful test involved China's Mars Zhurong rover that sent data to the Mars Express from approx. 4,000 km, which then forwarded it to ESA's Deep Space Survey Station, and other centres. The test results show that Zhurong and Mars Express' transmissions were complete, correct, and conformed to international standards. The cooperation between China and ESA's teams will continue in the future.

Spain approves National Security Strategy contemplating the creation of the Spanish Space Agency: On December 28th, the Council of Ministers approved the Royal Decree endorsing the National Security Strategy. The Spanish space sector has been requesting the creation of a national Space Agency for a while now and the topic was more recently discussed at the Meeting of the National Aerospace Security Council on December 14th.

# Industry & Innovation

## 23 French space companies launch the SpaceEarth initiative

*Credit: Safran Group*

23 French space companies launched the SpaceEarth Initiative aiming to promote space and its contribution to citizens' life, the environment, and to strengthen cooperation among each other. The coalition involves companies such as Airbus Defense and Space, Thales Alenia Space, ArianeGroup, Dassault Aviation, Safran, and Sodern. The coalition drafted ten suggestions, resulting from a survey on the perception of space in France following space tourism news, to strengthen the European space sector addressing topics such as Earth observation, European constellation, access to space, promoting collaboration between industrial players and start-ups, strengthening the space supply chain, and so forth.

## ispace Europe and ArianeGroup aim to establish European space transportation partnership

ispace Europe (EU) and ArianeGroup have been selected by ESA to participate in a pilot phase mission to establish European commercial partnerships for lunar transportation and exploration. The pilot phase officially started with the signing of a MoU between ESA and the Europe-based companies on November 24th. ispace EU and ArianeGroup will be responsible for the business, technical and socio-economic evaluations of their lunar transportation service, which will then be presented to ESA for final selection. ispace EU will supply ESA with over 15 kg of lander payload capacity or 5 kg of rover capacity for the Agency's future lunar lander missions from 2024 onwards. ArianeGroup will support the Luxembourg-based company with mission assurance activities and leveraging its experience in qualifying space transportation systems.

## Airbus delivers OneWeb constellation's core satellite platforms to Loft Orbital

Airbus was awarded a contract from Loft Orbital to deliver more than fifteen satellite platforms derived from OneWeb constellation's core platform Airbus Arrow. Airbus will also upgrade the Arrow platform in order to allow its use in a wider range of missions and for longer-term applications. With this contract, Loft Orbital aims to grow its presence in France and the French Minister of the Economy, Finance and Recovery Bruno Le Maire positively welcomed this new partnership. Additionally, Loft Orbital was selected by the Canada-based company EarthDaily Analytics (EDA) to develop, launch, and operate EDA's super-spectral constellation of ten satellites planned for launch in 2023. The contract is valued at $150M, and includes the integration of the Airbus Arrow Loft Orbital into EDA's payloads. Loft Orbital operates with an innovative satellite-as-a-service business model and recently closed a $140 million Series B round led by BlackRock.

## Skyrora builds the largest hybrid 3D-printer in Europe to manufacture rockets' engine parts

Skyrora created Skyprint 2, the largest hybrid 3D printer in Europe, to optimise the manufacture of rocket parts. Skyprint 2 reduces process complexity, cost, and printing time by approx. 30% compared to other printers currently on the market. Additionally, it can repair parts and machine items that were not originally printed. Skyrora's objective is to offer cost-effective, bi-metallic, hybrid manufacturing services to meet the growing demand for small satellite launches. The UK-based company aims to start reducing its rockets manufacturing time using Skyprint 2 from 2022.

*Credit: Skyrora*

## Satellite operators discuss multi-orbit systems at World Satellite Business Week


*Credit: Euroconsult*

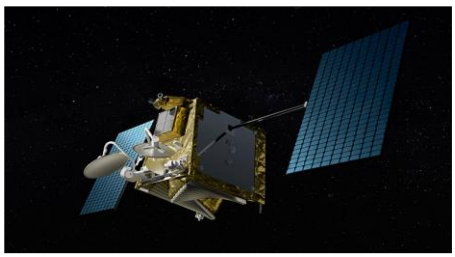
At the Euroconsult's World Satellite Business Week, multi-orbits and GEO satellite operators' strategies have been at the heart of the discussion. Satellite operators have been showing a growing interest in multi-orbit systems combining GEO satellites with non-geostationary orbit (NGSO) constellations to provide new solutions and services. At the conference, GEO satellite operators spoke of the benefits of multi-orbit constellations, with GEO satellites providing the capacity to efficiently serve very high-density populated areas added on top the global coverage and low latency offered by LEO mega-constellations. Additionally, executives highlighted that the increased use of software-defined payloads on GEO satellites enabling operators to shift capacity, and of electronically steered antennas compatible with multiple satellite systems is what makes these multi-orbit constellations more feasible. At the conference, GEO satellite operators spoke of their companies' strategic approaches to multi-orbit systems as well:

- Telesat and SES are developing their own constellations, while others prefer to establish partnerships, such as Eutelsat and OneWeb. Inmarsat and Viasat's executives did not disclose any information on whether Viasat's acquisition of Inmarsat will affect the companies' initial plans to develop their own multi-orbit solutions. Intelsat said the company is still evaluating its options and has not yet made a decision on whether it wants to develop its own NGSO satellites or partner with other companies.
- Smaller GEO satellite operators, like Hispasat, have also expressed their interest in multi-orbit systems and in partnering with mega-constellations companies. However, some operators such as Yahsat raised concerns about a potential oversupply relative to demand in the broadband constellation market and what this may do to their businesses.
- SpaceX said it is open to explore the potential of multi-orbit systems but is not rushing to enter the market.

## Arianespace receives launch contracts for four Galileo satellites

Arianespace received EUSPA's launch contracts for four satellites of the European GNSS Galileo. This order follows a previous one EUSPA commissioned to Arianespace for four other Galileo satellites in October 2021. The launch of the first two satellites from the previous order will lead to the Full Operational Capability of Galileo open service and is planned for the first half of 2022. The next three missions will complete the first-generation satellite constellation, increasing its resiliency, and are expected to be launched between 2023 and 2025.

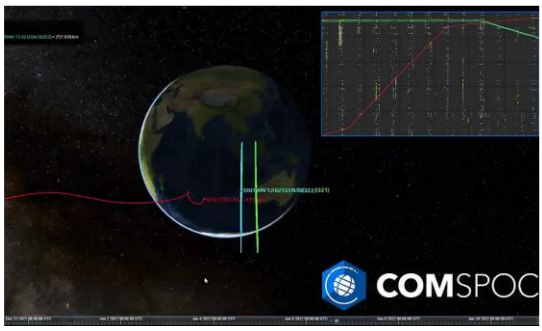
## Airbus and OneWeb provide connectivity to European defence and security forces



*Credit: Airbus*

Airbus signed a distribution partner agreement with OneWeb to supply new LEO satellite communication services for military and governmental use through OneWeb's constellation, starting from the end of 2021. Airbus and OneWeb's new satellite communication services will provide customers with high-speed and real-time communications, able to prioritise data flows, ensure high-level availability and security standards, and support future multi-domain cloud applications. Customers will also be given the ability to switch between LEO and GEO networks throughout operations.

## In-Orbit Services: China moves defunct satellite, Astroscale pauses ELSA-d mission




*Credit: COMSPOC*

China's Shijian-21 docked with the dead navigation satellite Beidou-2 G2, took it beyond the graveyard orbit and then returned to its GEO orbit. The operation was explained by Brien Flewelling, ExoAnalytic Solutions' chief architect for space situational awareness during a webinar hosted by the Center for Strategic and International Studies (CSIS) and Secure World Foundation (SWF). After the U.S., China is the second country to demonstrate such capabilities.

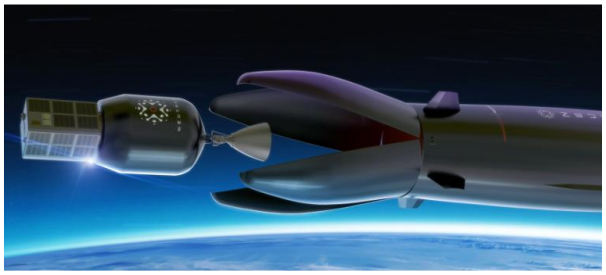
On January 25th, Astroscale was attempting to autonomously capture an in-orbit client satellite for the first time with its ELSA-d servicer spacecraft but had to interrupt the test due "anomalous spacecraft conditions". The mission also included the release of the client satellite at a greater distance than in previous tests and its recapture. To carry on such operation Astroscale was aiming to employ full-scale rendezvous and proximity operations for the first time. The Japan-based company did not mention when it will resume the mission.

## Northrop Grumman builds next-generation rocket boosters for the Artemis program

Northrop Grumman Corporation won a NASA's contract to support the Space Launch System (SLS) rocket through 2031. The contract is valued $3.2 billion and comprises the production and flight sets for Artemis IV through Artemis VIII, as well as the design, development and testing of the next generation five-segment solid rocket Booster Obsolescence and Life Extension (BOLE) for Artemis IX. This contract follows a previous agreement signed in June 2021 between NASA and the U.S.-based company authorizing Northrop Grumman to order long-life items and build twin boosters for the next six SLS flights.

## Rocket Lab updates on the progress of its reusable rocket Neutron

On December 2nd, Rocket Lab provided updates on its Neutron reusable rocket's progress, highlighting significant changes from previous announcements. The announced changes concern:

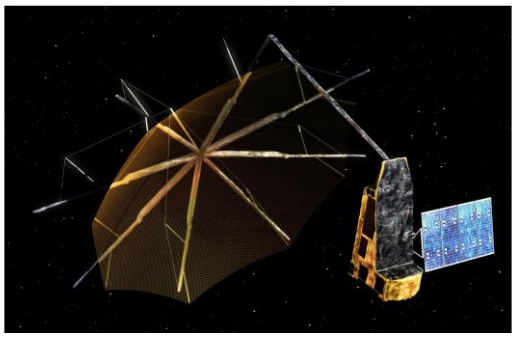


*Credit: Rocket Lab*

- New engine: Archimedes will be a Meganewton thrust engine fuelled with liquid methane and liquid oxygen, instead of RP-1 kerosene and liquid oxygen mixture as previously said. Rocket Lab will use seven Archimedes to power the rocket's first stage.
- Payload deployment and landing: Neutron's second stage will take the payloads to their final orbit or interplanetary destination, while its first stage and payload fairing combination will perform a Return to Launch Site (RTLS) landing. Rocket Lab abandoned its initial idea of an ocean landing. If RTLS is not feasible, the mission will be expended.
- Design and material: Rocket Lab decided to simplify the design and use a fixed structure rather than deployable landing legs. Additionally, Rocket Lab will build the rocket with its own carbon composite material and plans to accelerate the process using metallic 3-D printing.

Rocket Lab aims to build the lightest and highest performance upper stage ever, but also at a lower cost since Neutron's upper stage will be disposable, at least for the time being. The prototype tanks for Neutron's two stages have already been developed and the first new Archimedes engine's hot-fire test is scheduled for 2022.

## TICRA develops software that forecasts antenna's discrepancies before building



*Credit: ESA*

TICRA partnered with ESA to develop a method to forecast antenna's discrepancies before they are built. While TICRA has been already investigating the issue for a while, ESA got inspired in the frame of its Biomass mission for which the Agency cannot test the Biomass antenna on Earth due to its large size and the signals it uses. The Denmark-based company is in charge of developing a software that can simulate the expected antenna's performances, leading to design optimization, and with the potential to boost the European space industry's competitiveness. The software should be commercially launched later this year.

## Twelve companies win contracts to provide NASA with low-cost launches

On January 26th, twelve companies secured contracts from NASA to provide low-cost small satellites launches. The contracts have been awarded in the framework of NASA's Venture-Class Acquisition of Dedicated and Rideshare (VADR) program, which aims at providing smallsats launches on dedicated or rideshare payloads missions. Among the selected companies:

- Six have successfully carried on at least one orbital launch: Astra, Northrop Grumman, Rocket Lab, SpaceX, United Launch Alliance, and Virgin Orbit.
- Four are developing their first launchers with plans to launch in upcoming years: ABL Space Systems, Blue Origin, Phantom Space and Relativity.
- Two are launch brokers: Spaceflight and L2 Solutions, also known as OmniTeq.

The maximum value across all contracts is $300M over five years.

## Federal Trade Commission sues Lockheed Martin to block $4.4 billion Aerojet's acquisition

The Federal Trade Commission (FTC) sued Lockheed Martin Corporation to block its $4.4 billion vertical acquisition of Aerojet Rocketdyne Holdings. Aerojet is a U.S. supplier of advanced power, propulsion, and armament systems, which are critical missile components for prime contractors in the defence domain. FTC declared that if the deal goes through, Lockheed Martin would be able to control the supply of critical components since Aerojet is the last independent supplier of such systems. According to FTC, this operation would endanger both Lockheed Martin's competitors and the U.S. government, threatening national security and defense interests. The Federal Communications Commission (FCC) authorised FTC to file a complaint in the U.S. District Court for the District of Columbia and ask for a Preliminary Injunction to stop the deal pending the administrative trial, which is scheduled to begin on June 16th.

## Boeing supports engineering operational satellites through $330M contract

Boeing won a ten-year contract to support the U.S. Space Force engineering operational GPS Block IIF satellites. The Block IIF satellites have been manufactured by Boeing, and the U.S.-based company will contribute to support the satellites' on-orbit operations under this new contract of a value of $329.3M. The Space Systems Command issued the contract to deal with the mission requirements of the Block IIF satellites across the military and is planning to conclude work by December 2031.

*Credit: U.S. Air Force*

## In other news

Airbus leads the European industrial consortium in charge of ESA's Ariel exoplanet mission: Airbus won a €200M ESA's contract to participate in the Agency's Atmospheric Remote-sensing Infrared Exoplanet Large-survey (Ariel) mission. Airbus will contribute to the building of the satellite planned for launch in 2029, and support ESA in the development of the payload module.

SpaceX wins $102M five-year contract to demonstrate point-to-point space transportation: The U.S. Air Force selected SpaceX to test the company's technologies and capabilities to use a heavy rocket for the transportation of military cargo and humanitarian aid around the world in the frame of AFRL's rocket cargo program. SpaceX's contract is the largest ever awarded for rocket cargo. AFRL did not disclosed timeline information but said it might select other launch vehicle providers in the future.

Airbus Crisa wins contract to develop HALO's Power Management and Distribution (PMAD) System: The contract values more than $50M and was awarded by Northrop Grumman. According to the CEO Fernando Gómez-Carpintero, Airbus Crisa aims to design a PMAD that could become a standard modular power management system for all future space stations and human vehicles.

Eutelsat appoints Danish telco and IT manager Eva Berneke as new CEO: The announcement was made on December 19th and Berneke took duty on January 1st. Eva Berneke succeeded Rodolphe Belmer, who became head of the IT group Atos.

Intelsat orders two next-generation software-defined satellites to Thales Alenia Space: Intelsat 41 and Intelsat 44 will be based on Thales Alenia Space's Space Inspire fully flexible product line and are scheduled to begin service in 2025. With this new order Intelsat aims to advance its software-defined 5G GEO network and move forward its objective to unify the global telecommunications ecosystem.

The EMEA Satellite Operators Association (ESOA) goes global and adds seven new members: ESOA, now Global Satellite Operators' Association (GSOA), disclosed the information on December 15th and welcomed Amazon, APT, ARSAT, Intersputnik, Lockheed Martin, Omnispace and Star One.

ABL Space Systems reports RS1 second stage destruction during testing: The test anomaly that led to the destruction of ABL's two-stage small launch vehicle RS1 occurred while the U.S.-based company was testing the rocket at Mojave Air and Space Port, California. ABL was supposed to launch RS1 for the first time in February, but it is now expecting a three-month delay because of the accident.

Mynaric wins DARPA's contract for new optical communications terminal architectural design: The objective is to have next-generation terminals compatible with any constellation, that could facilitate communications between government and commercial satellites, and be used for national security.

Viasat releases new large-aperture antenna class for space-to-Earth communications: Viasat stated this new class of antennas is the most advanced in the market today. Viasat's new antennas will be able to support multi-orbit missions, including EO, defence, crewed and uncrewed deep lunar and Mars missions.

OneWeb signs six-year distribution deal with the India-based Hughes Communications India Private: HCIPL, which has currently more than 200 thousand VSATs connected to GEO satellites, is planning to introduce multi-orbit capabilities once OneWeb gets India's regulatory approval to distribute broadband services in the country. OneWeb could become the first foreign satellite operator authorised to serve India in the long term.

# Economy & Business

## EUSPA releases it Earth Observation and GNSS market report 2022

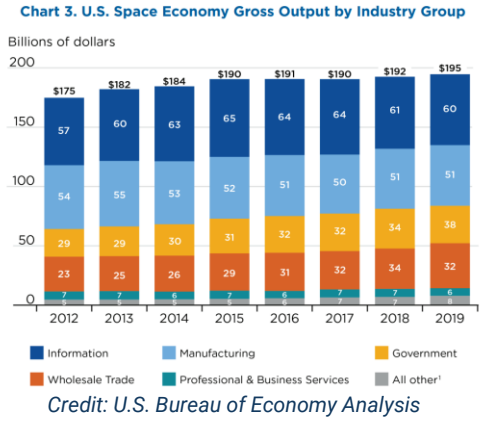
*Credit: EUSPA*

On January 25, EUSPA released the Earth Observation (EO) and GNSS market report for 2022. The aim of the report is to provide insights on how EO and GNSS programmes contribute to various global market segments across different verticals. The report also gives an estimate of the current size of the global EO and GNSS markets as well as their growth. With regards to EO, the report finds that the current global market size in terms of demand is approx. €2.8 billion and estimates that it will grow to €5.5 billion in 2031. EUSPA estimates that, within the EO market, revenues attributable to the sale of EO data account for approx. 15% of the total market, while revenues stemming from added-value services account for roughly €2.4 billion. With regards to the GNSS market, EUSPA values its size in 2021 at approx. €200 billion and projects that it will grow by 6.7% every year to reach a €500 billion valuation in 2031. Revenues coming from added-value and augmentation service once again make up the largest part of the market (over 75%), while revenues from the sale of GNSS receivers and terminals are valued at €50 billion in 2021.

## Euroconsult estimates the Global Space Economy at $370 billion in 2021

Euroconsult released its annual "Space Economy Report" for 2021. In this edition, Euroconsult estimates that the global space economy was valued at $370 billion in 2021. In their estimation, the company considers both the space market, defined as commercial space revenues and government procurement for space activities contracted to the private sector, as well as other spending from government organisation to conduct their space activities. The space market segment is valued at $337 billion, while activities falling under other government spending is estimated at $33 billion in 2021. In terms of growth, Euroconsult finds that the space economy renewed its growth pattern last year following a drop in 2020, largely due to the Covid crisis and its impact on commercial space services. The report also states that the space economy is expected to grow 74% by 2030.

## U.S. Bureau of Economic Analysis revises its U.S. space economy estimates



*Credit: U.S. Bureau of Economy Analysis*

On January 26, the U.S. Bureau of Economy Analysis (BEA) released its updated and revised estimates of the U.S. space Economy for the 2012-2019 period. The updated report finds that the U.S space economy accounted for $194.4 billion of real gross output in 2019. It also shows that the average annual growth rate of the sector in the 2012-2019 period was 1.6%, which is slightly lower than the 2.3% growth rate of the U.S. economy for those years. Manufacturing, wholesale trade, and information represented the three largest industries in terms of real gross output during those years, with the first being the largest contributor from 2016 to 2019. While real manufacturing and government contributions experienced a steady growth in the period, information and wholesale trade contributions declined by 4.5% and 11.6% respectively. In addition to these statistics, the BEA also found that U.S. private sector employment for the space economy totalled approx. 354 000 in 2019, with the manufacturing industry being the largest contributor for that year. Private sector compensation also grew by 0.8% on average between 2012 and 2019, going from $40.3 billion to $42.4 billion.

## Descartes Underwriting raises €107 million Series B round

*Credit: Descartes Underwriting*

On January 30, the French start-up Descartes Underwriting raised approx. €107 million in Series B funding, becoming one of the most well-funded space companies in Europe. The investment round was led by private equity firm Highland Europe and Eurazeo, with participation form existing investors such as Cathay Innovation and Blackfin Capital Partners. The company plans to use the funding in order to scale up its business, as it aims to become a global category leader in the field of corporate insurance. Specifically, the company is looking to grow its existing technology platform and expand into new lines of business while continuing its global expansion. The start-up is currently offering cutting-edge insurance solutions that rely on space-based data to enable users to better manage their risk exposure to climate change related threats in particular. Descartes Underwriting previously raised a 2020 Series A round worth €16.2 million.

## NSR estimates space traffic data volumes to increase 14 times over the next decade

Northern Sky Research (NSR) released their new Space Traffic Study, in which they estimate that the amount of data going to and from space will reach more than 500 exabytes of information by 2030. This increase is driven by the need for satellite-based connectivity and EO data. Satellite communications account for the largest source of data volume and are expected to grow at 27% from 2020 to 2030. Emerging technologies including space tourism, in-orbit servicing, and increasing demand for EO data also drive the increase in volume. The commercialisation of LEO for a variety of purposes is also a significant driver in the growth, as non-GEO will increase to from 5% to roughly 30% of all satellite connectivity traffic by 2030.

## Interest in space SPACs remains high in December

### D-orbit and Tomorrow.io set to go public through SPAC mergers

On January 27, the Italian start-up D-Orbit signed a business combination agreement with the Breeze Holdings Acquisition SPAC. The company plans to raise approx. $185 million in funds through the merger, with the aim of expanding its staff and support the development of its services. In addition, it is looking to expand its services, in particular through the development of a space-based cloud infrastructure.

Tomorrow.io has also agreed to merge with a SPAC called Pine Technology in December. The company will raise approximately $420 million in gross proceeds in a deal that values the company at approx. $1.2 billion. Tomorrow.io seeks to help agencies manage the impacts of weather events through a proprietary platform to provide useful insights from weather data and make climate change adaptation a focus.

### Satellogic and Virgin Origin successfully de-SPAC

On December 28, Virgin Orbit successfully completed its SPAC merger with the NextGen Acquisition Corp. II. While the deal was projected to raise a total of $438 million for Virgin Orbit, the company stated that the merger will provide only $228 million in gross proceeds. In particular, a high rate of redemptions from initial investors in the SPAC led to only $68 million coming from SPAC proceeds, with the remaining amount coming from the PIPE.

The Argentina-based satellite imagery company Satellogic also completed its SPAC merger January 25. The merger provided approx. $262 million in gross proceeds, with $158 million coming from PIPE investments from Softbank and Cantor Fitzgerald. Although the company raised as much as initially projected, the merger was nonetheless subject to high rate of redemption, with investors electing to redeem roughly 23 million of the 31.85 million outstanding shares initially available.

## China's Galactic Energy completes $200M financing round

*Credit: Galactic Energy*

On January 24th, Galactic Energy (GE) disclosed that it completed two rounds of financing in the second half of 2021, totaling around $200M. The investment, which came from a mix of state-backed investment vehicles and private firms, will be directed towards the development of the two-stage Pallas-1 medium-lift liquid-fueled rocket, whose maiden flight is scheduled in early 2023. This new reusable rocket is designed to carry 5,000 kilograms to low Earth orbit or 3,000 kilograms to a 700-kilometer Sun-synchronous orbit. Galactic Energy is also preparing launch services for overseas customers following the success of the Ceres-1 launches, which garnered attention from potential international clients.

With its new funding, Galactic energy became one of the most well-funded launch companies in China, whose small launcher ecosystem has grown rapidly in the last decade. Galactic Energy is not alone in this race to lead China's commercial launch market, with the likes of Landspace, iSpace and CAS Space expected to debut their own rockets this year.

## The EIC accelerator fund selects more space start-ups for funding

In its largest ever funding round, the newly created EIC Accelerator has selected 99 innovative companies that are set to receive €627 million of EU funding to support them bringing their technologies to market. Four space start-ups were selected among the companies aiming to receive funding from the EIC Accelerator. While French SSA company Share my Space and electric propulsion maker ThrustMe were both selected to receive blended finance from the EIC, the UK companies Dawn Aerospace and Magdrive were selected to receive grant financing. Blended finance solutions are part of the new financing scheme set up under the EIC accelerator and consist of a direct equity investment of up to €15 million managed by the EIC fund, which can also be supported by non-dilutive grant funding up to €2,5 million.

## PLD Space Closes €25 million Series B Funding Round

Spanish micro launcher start-up PLD Space closed its Series B funding round December 27, raising approx. €25 million in new capital. The Series B was led by Arcano Partners, Acituri and the Spanish government's Centre for the Development of Industrial Technology (CDTI), who participated through the co-investment initiative of Innvierte programme. PLD Space aims to use to new funding to support upcoming launch plans by expanding its production capabilities and growing its team. The company is currently developing its MIURA 1 suborbital and MIURA 5 orbital rockets and seeks to offer orbital and suborbital launch services of small payloads and satellites. To date, the company has raised approximately €52 million.

## SpaceX raises additional $337 million


*Credit: SpaceX*

SpaceX has raised an additional $337.4 million in equity financing December 29, as disclosed in its latest regulatory filing on Wednesday. The latest funding brings the total raised by SpaceX in 2021 to $1.85 Billion. This caps an impressive year for the company, which became one of the few private companies to ever reach a $100 billion valuation following a secondary share sale in October. While SpaceX's Falcon and Dragon launch business are stated to be profitable, the development of the next-generation Starship rocket and the Starlink internet satellite constellation creates an increased demand for capital. On average, SpaceX has raised an average of more than $1 billion for the last seven years.

## In other news

Approval of Creditor Settlements Cuts Intelsat's Debt by Half: A judge approved Intelsat's settlement plan for approximately $16 million of the company's debts prior to its Chapter 11 bankruptcy. The plan's terms will allow Intelsat to emerge as a private company with access to approximately $7.9 billion in new capital.

Seraphim Space Invests $25 million in ICEYE: The investment will support ICEYE in the expansion of its SAR satellite constellation. The company has raised over €100 million in capital since its establishment and is one of the most well-funded space companies in Europe.

The Luxembourg Future Fund invests in NorthStar Earth & Space: The fund co-invested €10 million in the Canadian space start-up NorthStar, while the Luxembourg government provided funding through the county's national space programme. In exchange, NorthStar will establish its European headquarters in Luxembourg. The $45 million funding round was led by Telesystem Space.

Astranis releases details of the insurance package for its first commercial small satellite: The insurance covers the launch and one year of satellite operations and its coverage is priced at approximately $40 million. The satellite is set to launch on a Falcon Heavy next spring. According to industry sources.

Hadrian Automation has raised $36.4 million in new funding: The Los Angeles-based start-up previously raised $9.5 million in a seed round last spring. The company focuses on developing manufacturing plants for the aerospace and defence industries.

Corporation founds Space Futures Organisation to connect U.S. military and commercial space: Aerospace Corporation established the Commercial Space Future Organisation following increased interest from the military in purchasing products and services from commercial space companies. The new organisation seeks to bridge the gap between the pentagon and the private sector.

Phoenix-based start-up Mangata Networks has closed a $33 million investment round. The funding is for a satellite constellation for connectivity and edge computing with some satellites in HEO and MEO to optimise connectivity with terrestrial data centres.

Huawei Sky Computing Constellation satellite successfully placed in orbit: The satellite, which carries the computing load of the constellation, constitutes the first of six satellites in the same phase to form a computing network in space to better serve emergency communication, and ecological monitoring, among other things.

Hughes Network Systems to Partner with Bharti Airtel for Satellite Broadband in India: The companies formed a joint venture to provide satellite broadband services in India. The venture, coined HCIPL will combine the very small aperture terminal (VSAT) businesses of both companies to offer network solutions using satellites for primary transport, back-up, and hybrid implementation.

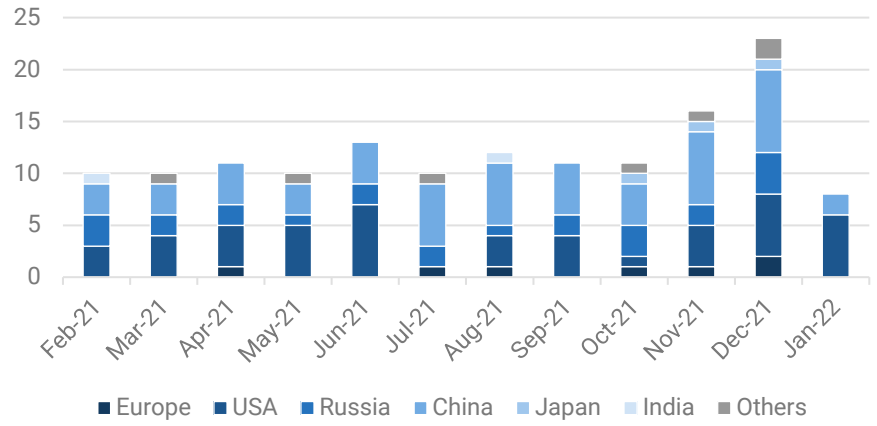
Blockchain Company HashCash to Contribute to U.S. Space Research: HashCash consultants will contribute its expertise on blockchain for orbital assets tokenization for a U.S. Space Research Institute. Orbital assets include structures such as asteroids, orbit vectors, satellites, space debris, and other objects that can be tokenized for stakeholders to record and share information through blockchain networks.

# Launches & Satellites

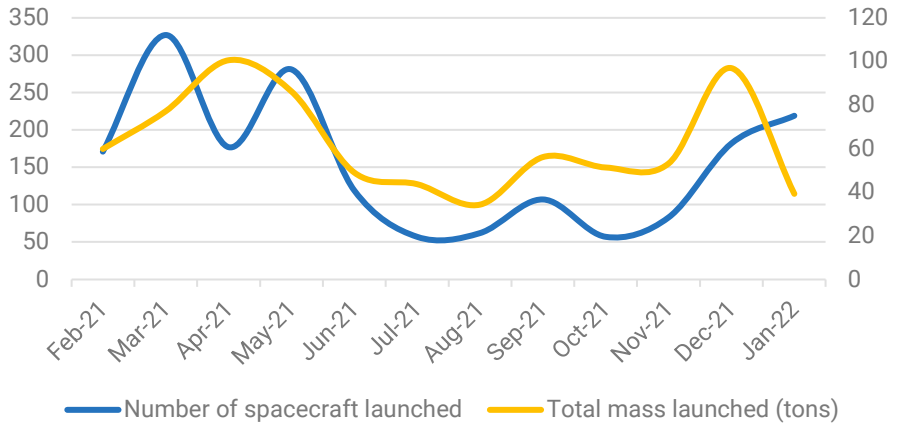
## Global space activity statistics

| December 2021-January 2022 | Europe | USA | Russia | China | Japan | Others | Total |
|---|---|---|---|---|---|---|---|
| Number of launches | 2 | 12 | 4 | 10 | 1 | 2 | 31 |
| Number of spacecraft launched | 3 | 334 | 40 | 18 | 1 | 5 | 401 |
| Mass launched (in kg) | 7628 | 84 647 | 18 902 | 19 334 | 5470 | 202 | 136 183 |

## Launch activity over the year

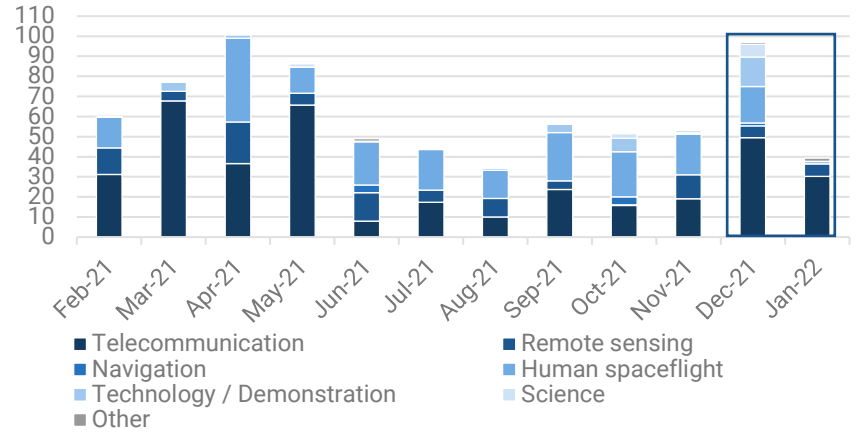



*Evolution of the number of launches per launch country*




*Evolution of launch activity over the year 2021-2022*

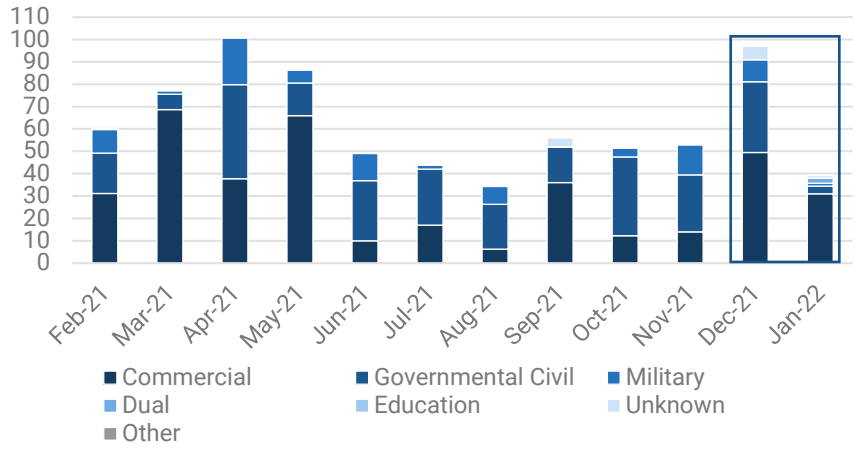
## Satellite missions and markets




*Evolution of the total mass launched (tons) per mission (Feb. 2021-Jan. 2022)*

| Dec 2021-Jan 2022 | Telecom | Remote sensing | Nav. | Human Spaceflight | Tech/ Demo | Science | Other |
|---|---|---|---|---|---|---|---|
| Europe | 10 765 | 2420 | 1466 | | 17.65 | 9 | 100.4 |
| USA | 59 590 | 749 | | 11 000 | 3466.35 | 6505 | 2300 |
| Russia | 4130 | | | 7080 | 2400 | | |
| China | 600 | 8840 | | | 9888 | | 6 |
| Others | 4573 | 170 | | | 96 | 3 | 8.75 |

*Total mass (kg) launched by mission and customer country*




*Evolution of the total mass launched (tons), per market (Feb. 2021-Jan. 2022)*

| Dec 2021-Jan 2022 | Commercial | Gov. Civil | Mili-tary | Dual | Edu-cation | Un-known | Other |
|---|---|---|---|---|---|---|---|
| Europe | 11 088.05 | 1478 | | 2205 | 0.6 | | 6.4 |
| USA | 60 340.9 | 18 411 | 4840 | | 18.45 | | |
| Russia | 4130 | 9480 | | | | | |
| China | 388 | 5340 | 6400 | | | 7200 | 6 |
| Others | 4570.5 | 265 | | | 15.25 | | |

*Total mass (kg) launched by market and customer country*

## Launch Log

| Launch date | Launch country | Launcher | Spacecraft name | Main customer | Customer country | Prime manufacturer | Manufacturer country | Mass (kg) | Mission | Market |
|---|---|---|---|---|---|---|---|---|---|---|
| 02/12/2021 | USA | Falcon-9 v1.2 (Block 5) | BlackSky (12 & 13) | BlackSky Global | USA | LeoStella | USA | 56 (each) | Earth Observation | Commercial |
| | | | Starlink (48 satellites) | SpaceX | USA | SpaceX | USA | 295 (each) | Telecommunication | Commercial |
| 05/12/2021 | France | Soyuz-ST-B Fregat-MT | Galileo (27 & 28) | ESA | Europe | OHB | Germany | 733 (each) | Navigation | Governmental Civil |
| 07/12/2021 | USA | Atlas-5(551) | ASCENT | Air Force Research Laboratory | USA | Blue Canyon Technology | USA | 15 | Technology / Demonstration | Military |
| | | | LDPE-1 | US Space Force | USA | Northrop Grumman | USA | 850 | Technology / Demonstration | Military |
| | | | STPSat 6 | US Space Force | USA | Northrop Grumman | USA | 2572 | Technology / Demonstration | Military |
| 07/12/2021 | China | Ceres-1 | Baoyun | Spacety Co. | China | Spacety Co. | China | 20 | Technology / Demonstration | Commercial |
| | | | Jinzijing 1-03 / Golden Bauhinia 1-03 | HKATG | China | ZeroG Lab | China | 50 | Earth Observation | Commercial |
| | | | Jinzijing 5 / Golden Bauhinia 5 | HKATG | China | Starwiz | China | 50 | Earth Observation | Commercial |
| | | | Lize 1 | Spacety Co. | China | Spacety Co. | China | 8 | Technology / Demonstration | Commercial |
| | | | Tianjin Daxue 1 | Tianjin University | China | Chang Guang Satellite Technology Co. | China | 40 | Earth Observation | Governmental Civil |
| 08/12/2021 | Russia | Soyuz-2-1a | Soyuz-MS 20 | Roscosmos | Russia | RKK Energia | Russia | 7080 | Crew Transfer | Governmental Civil |
| 09/12/2021 | USA | Falcon-9 v1.2 (Block 5) | IXPE | NASA | USA | Ball Aerospace | USA | 337 | Astronomy | Governmental Civil |
| 09/12/2021 | New Zealand | Electron KS | BlackSky (14 & 15) | BlackSky Global | USA | LeoStella | USA | 56 (each) | Earth Observation | Commercial |
| 10/12/2021 | China | CZ-4B | ShiJian 6-05 (A & B) | CAST | China | CAST | China | 1200 (each) | Technology / Demonstration | Military |
| 13/12/2021 | Russia | Proton-M Briz-M (Ph.1 mod. 2) | Ekspress-AMU 3 | RSCC | Russia | ISS Reshetnev | Russia | 2150 | Telecommunication | Commercial |
| | | | Ekspress-AMU 7 | RSCC | Russia | ISS Reshetnev | Russia | 1980 | Telecommunication | Commercial |
| 13/12/2021 | China | CZ-3B/G3 | TianLian 2B | CASC | China | CAST | China | 600 | Telecommunication | Governmental Civil |
| 15/12/2021 | China | Kuaizhou-1A | GeeSAT (1A & 1B) | Geespace | China | Geespace | China | 130 (each) | Technology / Demonstration | Commercial |
| 18/12/2021 | USA | Falcon-9 v1.2 (Block 5) | Starlink (52 satellites) | SpaceX | USA | SpaceX | USA | 295 (each) | Telecommunication | Commercial |
| 19/12/2021 | USA | Falcon-9 v1.2 (Block 5) | Türksat 5B | Turksat | Turkey | Airbus | France | 4500 | Telecommunication | Commercial |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 21/12/2021 | USA | Falcon-9 v1.2 (Block 5) | Dragon CRS-24 | NASA | USA | SpaceX | USA | 11000 | Cargo Transfer | Governmental Civil |
| | | | DAILI | The Aerospace Corporation | USA | The Aerospace Corporation | USA | 6 | Earth Science | Governmental Civil |
| | | | FEES 2 | GP Advanced Projects | Italy | GP Advanced Projects | Italy | 0,3 | Technology / Demonstration | Commercial |
| | | | GASPACS | Utah State University | USA | Utah State University | USA | 1 | Technology / Demonstration | Education |
| | | | GT-1 | Georgia Institute of Technology | USA | Georgia Institute of Technology | USA | 1 | Technology / Demonstration | Education |
| | | | Light 1 | UAE Space Agency | UAE | NanoAvionics | Lithuania | 3 | Earth Science | Governmental Civil |
| | | | PATCOOL | Kennedy Space Center | USA | Kennedy Space Center | USA | 3 | Technology / Demonstration | Governmental Civil |
| | | | STP-H7 | US Space Force | USA | US Space Force | USA | 550 | Other | Governmental Civil |
| | | | STP-H8 | US Space Force | USA | NASA | USA | 350 | Other | Governmental Civil |
| | | | TARGIT | Georgia Institute of Technology | USA | Georgia Institute of Technology | USA | 3 | Technology / Demonstration | Governmental Civil |
| 22/12/2021 | Japan | H-2A-204 | Inmarsat-6 F1 | Inmarsat | UK | Airbus | France | 5470 | Telecommunication | Commercial |
| 23/12/2021 | China | CZ-7A | Shiyan 12 (-01 & -02) | Unknown | China | CAST | China | 3000 (each) | Technology / Demonstration | Unknown |
| 25/12/2021 | France | Ariane-5ECA+ | James Webb Space Telescope | NASA | USA | Northrop Grumman | USA | 6162 | Astronomy | Governmental Civil |
| 26/12/2021 | China | CZ-4C | ZY-1 02E | Center for Earth Observation and Digital Earth | China | CAST | China | 1500 | Earth Observation | Governmental Civil |
| | | | XW 3 / CAS 9 | CAMSAT | China | CAMSAT | China | 6 | Radio Amateur | Amateur |
| 27/12/2021 | Russia | Soyuz-2-1b Fregat | OneWeb (36 satellites) | OneWeb Ltd. | UK | OneWeb Satellites (USA) | USA | 147 (each) | Telecommunication | Commercial |
| 27/12/2021 | Russia | Angara-A5 Persei | IPN 1 | Roscosmos | Russia | Khrunichev | Russia | 2400 | Technology / Demonstration | Governmental Civil |
| 29/12/2021 | China | CZ-2D(2) | Tianhui 4 | People's Liberation Army | China | CAST | China | 1000 | Earth Observation | Military |
| 29/12/2021 | China | CZ-3B/G3 | TJS 9 | People's Liberation Army | China | CAST | China | 3000 | Signal Intelligence | Military |
| 30/12/2021 | Iran | Simorgh | Unknown (3 satellites) | Iran Space Agency | Iran | Unknown | Iran | 30 (each) | Technology / Demonstration | Governmental Civil |
| 06/01/2022 | USA | Falcon-9 v1.2 (Block 5) | Starlink (49 satellites) | SpaceX | USA | SpaceX | USA | 295 (each) | Telecommunication | Commercial |
| 13/01/2022 | USA | Falcon-9 v1.2 (Block 5) | BRO 5 | UnseenLabs | France | GOMSpace | Denmark | 6 | Signal Intelligence | Commercial |
| | | | Capella (7 & 8) | Capella Space | USA | Capella Space | USA | 112 (each) | Earth Observation | Commercial |
| | | | Challenger | Mini-Cubes Space Development | USA | Mini-Cubes Space Development | USA | 0,9 | Technology / Demonstration | Commercial |

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|---|---|---|---|---|---|---|---|
| Delfi-PQ 1 | Delft University of Technology | Netherlands | Delft University of Technology | Netherlands | 0,6 | Technology / Demonstration | Education |
| DEWA-Sat 1 | Dubai Electricity and Water Authority | UAE | NanoAvionics | Lithuania | 3 | Telecommunication | Commercial |
| Dodona | University of Southern California | USA | Lockheed Martin | USA | 4 | Technology / Demonstration | Education |
| EASAT 2 | AMSAT-EA | Spain | AMSAT-EA | Spain | 0,2 | Radio Amateur | Amateur |
| ETV A1 | Sen | UK | NanoAvionics | Lithuania | 20 | Earth Observation | Commercial |
| Flock-4x (44 satellites) | Planet | USA | Planet | USA | 5 (each) | Earth Observation | Commercial |
| FossaSat 2E1 / WISeSat 1 | WISeKey | Switzerland | Fossa Systems | Spain | 0,5 | Telecommunication | Commercial |
| FossaSat 2E2 / WISeSat 2 | WISeKey | Switzerland | Fossa Systems | Spain | 0,5 | Telecommunication | Commercial |
| FossaSat 2E (-3, -4, -5 & -6) | Fossa Systems | Spain | Fossa Systems | Spain | 0,5 (each) | Telecommunication | Commercial |
| Gossamer Piccolomini / Gossamer 1 | Lunasonde | USA | Lunasonde | USA | 1 | Technology / Demonstration | Commercial |
| Grizu-263a | Zonguldak Bülent Ecevit Üniversitesi | Turkey | Zonguldak Bülent Ecevit Üniversitesi | Turkey | 0,25 | Radio Amateur | Education |
| HADES | AMSAT-EA | Spain | AMSAT-EA | Spain | 0,2 | Radio Amateur | Amateur |
| HYPSO 1 | Norwegian University of Science and Technology | Norway | NanoAvionics | Lithuania | 6 | Earth Science | Governmental Civil |
| ICEYE (X14 & X16) | ICEYE | Finland | ICEYE | Finland | 85 (each) | Earth Observation | Commercial |
| ION-SCV 4 | D-Orbit | Italy | D-Orbit | Italy | 100 | Other | Commercial |
| IRIS-A | National Cheng Kung University | Taiwan | National Cheng Kung University | Taiwan | 2 | Technology / Demonstration | Governmental Civil |
| Kepler (4 satellites) | Kepler Communications | Canada | Kepler Communications | Canada | 16 (each) | Telecommunication | Commercial |
| LabSat | Wroclaw University of Science and Technology | Poland | SatRevolution SA | Poland | 3 | Biology | Governmental Civil |
| Lemur-2 (4 satellites) | Spire | USA | Spire | USA | 4 (each) | Earth Observation | Commercial |
| MDASat 1 (3 satellites) | Cape Peninsula University of Technology | South Africa | Cape Peninsula University of Technology | South Africa | 2 (each) | Automatic Identification System | Education |
| MDQube-SAT 1 | Innova Space | Argentina | Innova Space | Argentina | 0,5 | Technology / Demonstration | Commercial |
| NuX 1 | NuSpace | Singapore | NuSpace | Singapore | 3 | Technology / Demonstration | Commercial |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | OroraTech 1 | Orora Technologies | Germany | Spire | USA | 10 | Earth Observation | Commercial |
| | | | PION-BR 1 | Federal University of São Carlos | Brazil | Federal University of São Carlos | Brazil | 0,25 | Radio Amateur | Education |
| | | | SanoSat-1 / Nepal-PQ 1 | AMSAT-Nepal | Nepal | Orion Space | Nepal | 0,25 | Radio Amateur | Education |
| | | | SATTLA 2 (A & B) | Ariel University | Israel | Ariel University | Israel | 0,25 (each) | Technology / Demonstration | Education |
| | | | Sich 2-1 | State Space Agency of Ukraine | Ukraine | Yuzhnoye | Ukraine | 170 | Earth Observation | Governmental Civil |
| | | | STORK (1 & 2) | SatRevolution SA | Poland | SatRevolution SA | Poland | 3 (each) | Earth Observation | Commercial |
| | | | SW1FT | SatRevolution SA | Poland | SatRevolution SA | Poland | 2 | Technology / Demonstration | Commercial |
| | | | Tatan-Artibeus 1 | Carnegie Mellon University | USA | Alba Orbital | UK | 0,25 | Technology / Demonstration | Education |
| | | | Tevel (8 satellites) | Herzliya Science Center | Israel | Herzliya Science Center | Israel | 1 (each) | Radio Amateur | Education |
| | | | Umbra 02 | Umbra Lab | USA | Umbra Lab | USA | 65 | Earth Observation | Commercial |
| | | | Unicorn 1 | Alba Orbital | UK | Alba Orbital | UK | 0,25 | Technology / Demonstration | Commercial |
| | | | Unicorn 2 (-A, -D & -E) | Alba Orbital | UK | Alba Orbital | UK | 0,5 (each) | Technology / Demonstration | Commercial |
| | | | VZLUsat 2 | VZLÚ | Czech Republic | VZLÚ | Czech Republic | 3 | Technology / Demonstration | Governmental Civil |
| 13/01/2022 | USA | LauncherOne | ADLER 1 | Austrian Space Forum | Austria | Spire | USA | 6 | Technology / Demonstration | Amateur |
| | | | GEARRS 3 | NearSpace Launch | USA | NearSpace Launch | USA | 3 | Technology / Demonstration | Military |
| | | | PAN (A & B) | Cornell University | USA | Cornell University | USA | 4,6 (each) | Technology / Demonstration | Education |
| | | | STORK 3 | SatRevolution SA | Poland | SatRevolution SA | Poland | 3 | Earth Observation | Commercial |
| | | | StreamSat 2 | SteamJet Space Systems | UK | SatRevolution SA | Poland | 4 | Technology / Demonstration | Commercial |
| | | | TechEdSat 13 | NASA | USA | NASA | USA | 3 | Technology / Demonstration | Education |
| 17/01/2022 | China | CZ-2D(2) | Shiyan 13 | Unknown (China, Public) | China | CAS | China | 1200 | Technology / Demonstration | Unknown |
| 19/01/2022 | USA | Falcon-9 v1.2 (Block 5) | Starlink (53 satellites) | SpaceX | USA | SpaceX | USA | 295 | Telecommunication | Commercial |
| 21/01/2022 | USA | Atlas-5(511) | GSSAP (5 & 6) | US Space Force | USA | Northrop Grumman | USA | 700 (each) | Space Situational Awareness | Military |
| 26/01/2022 | China | CZ-4C | Ludi Tance 1-01A | CNSA | China | CAST | China | 3200 | Earth Observation | Governmental Civil |
| 31/01/2022 | USA | Falcon-9 v1.2 (Block 5) | CSG 2 | ASI | Italy | Thales Alenia Space | France | 2205 | Earth Observation | Dual |

## Launch Highlights

### Iran conducts a new launch of three satellites

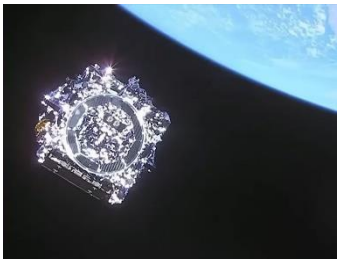
On January 30th, Iran conducted a launch with the Simorgh rocket, the first launch of the country since April 2020. The rocket reached an altitude of 470 kilometers but was not able to reach orbital velocity and, therefore, to inject its payloads in the planned orbit. Information on the satellites to be launched is unavailable. The launch drew condemnation from the United States and France, who expressed concerns related to proliferation activities, while Iran replied that the launch was part of its scientific programme.

### Third and last test for the Angara-A5 rocket

*Credit: mil.ru*

On December 27th, Russia performed a new test of its Angara-A5 rocket, the new heavy-lift launcher of the country. The Angara-A5 already underwent two tests, in December 2014 and December 2020, which were successful. On this third and last test for the launcher, a new upper stage, Persei, was integrated to put in geostationary orbit a dummy payload. However, even though the launch of the rocket fared well, a problem occurred with the engine of the upper stage, which prevented a correct orbital insertion and left the dummy payload stranded in LEO. Despite this issue, Russian authorities announced that the test was a success.

### Launch of the long-awaited James Webb Space Telescope



*Credit: NASA TV*

After ten years of construction and several delays, the James Webb Space Telescope (JWST), the successor of Hubble and most powerful telescope ever launched in space, was sent to orbit by an Ariane 5. The launch occurred on Christmas day and did not encounter any difficulty. It was so successful that no major correction was required from the JWST, which allowed to save fuel, thus enabling the duration of the mission to be doubled (from 5 to 10 years). In the following days, several elements of the telescope were activated, including its five-layer sunshield and its primary and secondary mirrors. The JWST reached its final destination, the L2 Lagrange point, on January 24th.


*Credit: ULA*

### First and only launch of an Atlas 5 (511)

On January 21st, 2022, ULA launched two satellites for the U.S. Space Force. The launch used, for the first and only time, the Atlas 5 (511) configuration. This rocket included a 5-meter payload fairing, one solid rocket booster, and one engine for the Centaur upper stage. The two spacecraft that were launched belong to the secretive Geosynchronous Space Situational Awareness Program, which provides space-based SSA data to the U.S. military. After seven hours, the two spacecraft, built by Northrop Grumman (through a contract originally won by Orbital ATK), reached their destination in near-geosynchronous orbit.

### SpaceX continues its rideshare programme

On January 13th, SpaceX launched 105 satellites during its third Transporter mission, which provides rideshare opportunities for small satellites at low cost. Among them, several satellites were launched for SAR constellations (Umbra Labs, Iceye, Capella Space) while Planet added 44 SuperDove spacecraft to its constellation. A large number of PocketQubes, a satellite format smaller than the CubeSat, was also launched for multiple universities and other organisations; among them was the first satellite developed in, and launched for, Nepal.

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