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SUCCESS WITHIN POLITICAL BOUNDARIES – BUT WIDENING THE GAP

The ESA Council Meeting on Ministerial Level CM22 this month in Paris was a success when considering the current energy, security, and economic crises. With subscriptions totalling €16.9B for the next 3-5 years it represents a 17% increase compared to ESA Space19+. All ESA Member States demonstrated their full commitment to ESA, with almost all Member States increasing their contributions. The outcome also confirms the European dimension of space. It provides a **clear message that space is on the agenda of all European economies and societies**

Germany, chairing ESA CM22, provided the highest contribution of €3.5B confirming its leading position on European level taken three years ago. France follows with €3.2B (+20%), provided from the highest national space budget in Europe of €9B. Italy with €3B made a most remarkable statement with an increase of +35% and the UK confirmed its European ambition with €1.8B, an increase of +14%. The budget entrusted to ESA by its Member States continues to represent the **largest public funding for space on European level**, about double the funding for the EU Space Programme of €14.9B over 7 years.

All individual programme proposals were approved, resulting in the **most complete European space programme to date, with a continued rise in space applications programmes**. Most prominently, ESA's programme related to EU Secure Connectivity (IRIS^2) has been subscribed with €650M. Just 5 days after the adoption of IRIS^2 at EU level this provides an **excellent example of EU and ESA with its Member States working hand-in-hand when it matters**. In addition, navigation saw a remarkable increase to €351M, up from €72M in 2019. Also, the young domain of safety and security, initiated at Space19+ found increased support, Space Safety with €731M from €432M in 2019 and with the start of a new programme Civil Security from Space. Other new programmes were initiated, the Commercialisation Programme "ScaleUp" was oversubscribed by 17%, while Moonlight will provide Europe with an element in support to its future lunar ambitions.

Yet, when measuring against Europe's ambition to become an autonomous space power, next to the US and China, and measuring against rising public and private space investments globally, the result translates into a **further widening of the gap between Europe and other world regions**. With a space budget share of GDP in the range of 0.05% in Europe compared to about 0.25% in the US, space in Europe fails to live up to its full potential. The European challenge goes well beyond CM22, ESA or the current EU-ESA cooperation in the EU Space Programme. In fact, both mechanisms, at ESA and EU may be considered as performing well, within the boundaries resulting from political priorities. However, with exception of France and Luxembourg, space has not earned its place in the European political priorities of our time. It is **not seen as part of a solution to today's challenges, for energy and mobility transition, security and defence, climate action** (beyond monitoring).

At a time, when stakeholders in other world regions have since long recognised the strategic importance of space and invest accordingly, when commercial infrastructures are deployed at a speed unseen in the history of space, when space powers go back to the Moon and aim further, Europe still fails to step-up. The next three years will be decisive. Countries like Germany are defining their space strategies and have the opportunity to give new political weight to space in the light of Europe's geopolitical challenges. The European Space Summit 2023 will be the next point of measure as will be the Mid-Term Review of the EU Space Programme and ultimately ESA CM25 A bold whole-of-Europe political vision is a pre-requisite to ensure European political and technological autonomy in space. A 2023-2025 match-plan for space is needed, if Europe wants to be with the space powers, which will set the rules and shape the future of space for the foreseeable future. …"Nach dem Spiel ist vor dem Spiel".

Yours sincerely,

Hermann Ludwig Moeller
Director of ESPI

POLICY & PROGRAMMES

Strong Support for European space: Outcomes of ESA Ministerial Council CM22

Credit: ESA

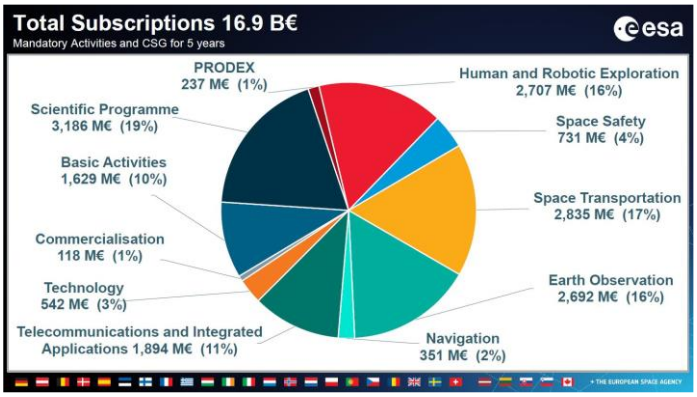
On November 22nd and 23rd, the **ESA Ministerial Council CM22 took place in Paris**, chaired by Germany and hosted by France. **ESA drew Member State contributions of €16.9B** (17% increase compared to the €14.4B drawn at CM19) for the next 3-5 years, with the four main contributors (~70% of total budget) being Germany (€3.5B), France (€3.2B), Italy (€3B) and the UK (€1.8B). All programmes proposed were approved. Space for Earth remains high on the agenda with EO in response to climate action. In support of the sovereign and security needs of Europe, a new ESA programme related to EU secure connectivity, while civil security from space receives new attention through a dedicated programme. Commercialisation activities also received a first boost (see Economy & Business).

The €16.9B budget was allocated to the programmes as follows:

Earth Observation (€2.7B): For the continuity of the space component of Copernicus, for the Aeolus-2 mission, for InCubed-2 initiative, development of a digital twin Earth model, for continuing the TRUTHS mission, for expanding the network of third-party EO missions and approval of FutureEO (Earth Explorer missions, incl. the newly selected missions Harmony and MAGIC).

Space Science (€3.2B): For the implementation of missions of the Cosmic Vision programme, for preparing the new Voyage 2050 programme, for the launch of Juice and Euclid in 2023, for the extrasolar planet exploration missions Plato and Ariel to launch in 2026 and 2029.

Human and Robotic Space Exploration (€2.7B): For the next phase of Terrae Novae, for the extension of European participation in the ISS up to 2030, for the large logistic lander "Argonaut", for work on the next batch of ESMs and reinforced role of ESA in Artemis, (incl. flights of 3 ESA astronauts to the Lunar Gateway and for a continuation to build ESA's elements of the Gateway, and to support the development of international lunar services with the Lunar Pathfinder satellite. Moreover, for building a European lander to take the Rosalind Franklin (€360M) rover to the surface of Mars (ExoMars mission) cooperation with NASA was envisaged, and the next steps were confirmed for ESA's cooperation with NASA on Mars Sample Return.



Credit: ESA

Connectivity (TIA) (€1.9B): ESA contribution for IRIS^2: for the first phase €35M for preparatory activities that will lead to the development and validation of the constellation are firmly subscribed. As for the second phase, €685M are due to be confirmed in 2023. In addition, funded plans include the Moonlight programme and the new programme Civil Security from Space (CSS).

Navigation (€351M): For the FutureNAV programme, incl. a LEO-PNT-satellites in-orbit demonstration, the single satellite mission "GENESIS" and continuation of the NAVISP programme.

Space safety (€731M): For Vigil to monitor the Sun's activity, for Hera probe that will perform a detailed post-impact survey of the Dimorphos asteroid, for the first removal of space debris from orbit scheduled for 2026, for kick-starting a new market for in-orbit servicing, while developing new technologies to help ensure a sustainable, circular economy in space.

Space transportation (€2.8B): For further strengthening Ariane 6 and Vega-C launchers, for completion of the development of the reusable Space Rider, for developing a green hydrogen system to fuel Ariane launchers in Kourou, for preparatory activities for human space transportation capabilities, and for increasing the efforts of the ESA Boost! Programme.

Technology and Commercialisation (€542M): For the kick-off of the new programme "ScaleUp" to support space commercialisation and the development of a European New Space ecosystem.

In addition, for the remaining budget, €237M is allocated for PRODEX and €1,6M for basic activities.

Credit: ESA

The ESA CM22 concluded with the **announcements of the new ESA astronaut class comprised of 17 astronauts**. Thereof, the 5 career astronauts Sophie Adenot (France), Pablo Álvarez Fernández, (Spain) Rosemary Coogan (UK), Raphaël Liégeois (Belgium) and Marco Sieber (Switzerland) were selected who will start training full-time at the EAC in Germany in April. 2023 and will join ESA's 7 current career astronauts, after one year of basic training. For the first time, ESA selected a "parastronaut", John McFall, a British doctor and Paralympian, to be part of a study to see if people with physical disabilities could fly in space. The remaining 11 candidates of the astronaut class will serve in reserve.

Moreover, on this occasion in Paris, prior to CM22, **Germany, France and Italy signed a Joint Statement on the Future of Launcher Exploitation,** which grants a renewal of public funding to "equilibrate the Ariane 6 and Vega-C institutional and commercial exploitation" and ESA and 22 European space actors, **including ESPI**, signed the **"Statement for a Responsible Space Sector"** to express their commitment to contribute to the sustainability of space missions and to the socially and environmentally responsible management of space activities.

Credit: ESA

Moreover, remarkable statements and announcements of CM22 include:

- **Hungary plans to spend $100M on a 1-month private astronaut mission with Axiom Space to ISS**, having **signed an MoU,** with a planned launch in late 2024/early 2025.
- Norway announced plans **to launch a constellation of 3 small satellites in collaboration with ESA for continuous real-time maritime surveillance**.
- Slovenia having increased its subscription by 300%, aims to further increase the value of contributions in 2023 and **seeks to become an ESA member state by 2024**. In addition, Slovenia will develop a national space strategy during 2023.
- **Cyprus disclosed plans to develop a space programme**, incl. the plan to become ESA associate member and increasing its level of subscription to ESA programmes in 2022 and 2023, as well as developing a national space strategy and space law, and a national space BIC.

Moon calls Earth: Artemis I launch kickstarts Artemis Program

Credit: NASA

Initially scheduled for **launch on August 29th** and multiple postponements, on November 16th, the **Artemis I mission was launched with NASA's Space Launch System (SLS)**. Artemis I is the first mission of the Artemis Program and aims to test the Orion spacecraft (uncrewed) in cislunar space. Orion was sent towards the moon and entered a distant retrograde orbit - with a maximum distance from Earth of 480,500 km. To enable entry into this orbit, Orion successfully performed two critical manoeuvres, **on November 21st** and **November 25th**. Orion will remain in this orbit for 5 days and is planned to return to Earth on December 11th.

ESA's major contribution to the mission is the €650M **European Service Module (ESM)** which provides power, propulsion, life support and other services for Orion. In exchange for these contributions, ESA **will receive three seats on future Artemis missions**. The ESM-1 on Artemis 1 is the first of six ESA has agreed to provide to date, with Airbus D&S as prime contractor. ESM-2 was delivered to KSC in 2021, with ESM-3 and -4 under construction at an Airbus facility in Bremen, Germany.

Ten cubesats were also carried to orbit within the SLS' Interim Cryogenic Propulsion Stage (ICPS), including the Italian Space Agency's (ASI) ArgoMoon, designed to take detailed imagery of the ICPS. Of the nine other cubesats, six are operational and two have yet to establish contact with NASA Mission Control. The last cubesat, JAXA's OMOTENASHI lunar lander, is **confirmed to have missed its intended trajectory** and is therefore considered a mission failure. In addition, **DLR contributes with the Matroshka AstroRad Radiation Experiment (MARE)**, which uses two mannequins seated in the Orion crew module to investigate radiation exposure on female bodies throughout the flight.

Moreover, for Artemis IV, **NASA awarded SpaceX a $1.15B contract** (modification of NASA's Human Landing System (HLS) contract (Option B)) to develop an upgraded version of its Starship lunar lander and fly a second crewed demonstration landing mission **in 2027, as part of Artemis IV**. Initially, NASA selected Starship for HLS in April 2021 for $2.9B. Under the new contract, SpaceX is required to demonstrate that the Starship lunar lander meets NASA's requirements for Artemis IV.

EU Trialogue concludes with approval of satellite constellation IRIS²

Credit: EU

On November 17th, the EU-Trialogue (EP, EC and Council) concluded with the achievement of a provisional agreement on a regulation for establishing the EU Secure Connectivity Programme for the period 2023-2027, named **"IRIS² ("Infrastructure for Resilience, Interconnectivity and Security by Satellite")**. The IRIS² multi-orbital satellite constellation will be developed from 2023 onwards, with initial services to begin in 2024 and full operational capability expected by 2027. The system will consist of a governmental and a commercial component. The EC will be the owner of (in)tangible assets relating to the governmental infrastructure and will develop the infrastructure through a public-private partnership (PPP) via competitive contracts to industry for the governmental infrastructure. In addition, the programme will also use commercial infrastructure to provide governmental and commercial services. The programme will be implemented in cooperation with ESA and the European space industry and will be financed through the EU MFF 2021-2027, deploying €2.4B from the EU space programme, Horizon Europe and NDICI - covering nearly half of the €6B total programme cost.

Cybersecurity of space assets in the spotlight

Credit: Via Satellite/ Freepik illustration

The European Parliament and the Council of the EU released a **Joint Communication on EU Policy on Cyber Defence** in response to address the increasing cyberattacks targeting military and civilian critical infrastructure in the EU. Space is explicitly addressed (p. 10), highlighting the strategic role of space for security and the need to enhance space assets' resilience and cybersecurity. In addition, the **Council adopted new legislation for a high common level of cybersecurity**. The new directive "NIS2" will replace the current directive on the security of network and information systems (NIS).

Furthermore, during **NATO's 2022 Cyber Defence Pledge Conference which took place in Rome on November 9th and 10th**, Secretary General Jens Stoltenberg warned of the growing threat from cyberspace. highlighting the recent cyber-attacks against satellites, critical infrastructure, and government departments, especially as part of Russia's war against Ukraine.

On November 21st, ESPI organised an **Online Launch Event** of the **ESPI Short Report "The War in Ukraine from a Space Cybersecurity Perspective",** a case study of the KA-SAT cyberattack, which enables to draw lessons for cybersecurity of European space infrastructure. Planning to publish a follow-up report, ESPI initiated a **Call for Papers** open until December 9th.

Horizon Europe gets €12.4B budget for 2023, EUSPA opens 2nd call with €48.1M

On November 23rd, the European Parliament voted on the EU budget for 2023, including the allocation of the **€12.4B budget for Horizon Europe** - 1.1% more than in 2022. "Digital, Industry and Space" gets a budget of €1.07B, and "Civil Security for Society" €164M (with several projects using satellite products from the EU Space Programme). In particular, the EU Space Programme will get €2B, the EDF €319.3M, the EU fund "Digital Europe" €1.3B and Invest EU €340.7M.

On November 9th, **EUSPA published its second Horizon Europe call** with a **value of €48.1M** to support the development of innovative space downstream applications. The funding rates are 70% for Innovation Actions (IA) (for non-profit entities rate of 100%) and 100% for Research and Innovation Actions (RIA) and Pre-commercial Procurement actions.

Credit: EUSPA

The €48.1M funding of the second call is distributed in six areas:

- EGNSS applications for Smart mobility (IA) – €9.5M
- Public sector as Galileo and/or Copernicus user (Pre-commercial Procurement) – €5.2M
- Copernicus downstream applications & European Data Economy (IA) – €9.6M
- Large-scale Copernicus data uptake with AI and HPC (RIA) – €9.6M
- Design of space-based downstream applications with international partners (RIA) – €5.1M
- GOVSATCOM Service developments & demonstrations (RIA) – €9.1M

The call, published on the **EU's Funding & tender opportunities portal**, will close on March 2nd 2023. This is the first Horizon Europe call to include GOVSATCOM.

Also in November, the **ENTRUSTED consortium representatives discussed the next GOVSATCOM phase** at EUSPA in Prague. For the first quarter of 2023, a live demonstration is planned to take place on ASI's premises.

The UK CCA issues the UK's first spaceport license for Spaceport Cornwall

On November 16th, **the UK Spaceport Cornwall received the UK's first-ever spaceport licence, issued by the UK Civil Aviation Authority (CCA)**. The CCA is the UK's space regulator since July last year. The spaceport, based at Cornwall Airport Newquay, proved that it met the safety, security and environment requirements to operate a UK spaceport and that it has the infrastructure, equipment and services for horizontal space launches. This marks the UK's first ever spaceport licence which brings the UK's envisaged first orbital space launch one step closer to take-off.

Italy's Ministry of Defence and ASI sign framework agreement for space

Credit: ASI

The Italian Ministry of Defence and the Italian Space Agency (ASI) **signed a framework agreement for cooperation in space activities** through the implementation of programmes and studies of joint interest. The agreement was signed by Chief of Defense Staff, Admiral Cavo Dragone (on behalf of Italy's Minister of Defense Guido Crosetto) and ASI President Giorgio Saccoccia. The MoD-ASI cooperation is an important element in the implementation of the Defense Space Policy.

South Korea unveils new plan for space activities

South Korea's **President Yoon Suk-yeol announced a new plan for space activities**, including doubling the space budget in 5 years, to invest 100T won ($74.7B) by 2045, to land on the Moon in 2032 and on Mars by 2045, as well as to establish a national space agency the "Korean Aerospace Administration (KASA)" (separate from KARI) at the end of 2023, to establish aerospace policies and lead R&D&T acquisition.

Credit: Yonhap

Yoon revealed 6 policy directions: (1) explore Moon and Mars, (2) leap forward as a space technology powerhouse, (3) foster space industry, (4) nurture space talent, (5) realise space security, (6) lead international cooperation.

The White House releases National Cislunar Science and Technology Strategy

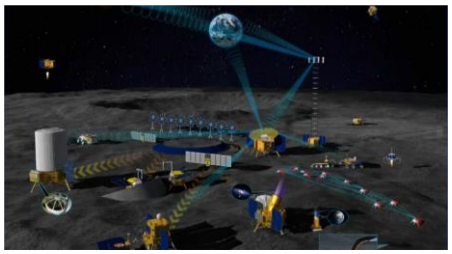
The White House **released a new strategy, the National Cislunar Science and Technology Strategy**, developed by an interagency subcommittee of the NSTC.

The **strategy document** outlines 4 objectives: (1) Support R&D to enable long-term growth in Cislunar space; (2) Expand international S&T cooperation in Cislunar space; (3) Extend U.S. SSA capabilities into Cislunar space; (4) Implement Cislunar communications and PNT capabilities with scalable and interoperable approaches.

Canadian Government awards Canadensys Aerospace Lunar Rover Contract

The Canadian Government awarded the Canadian space systems company Canadensys Aerospace **a $43M contract to design and build Canada's first lunar rover** (mission phases B, C, D1), leading a broad team of partners. The lunar rover mission, initiated under CSA's Lunar Exploration Accelerator Program (LEAP), will demonstrate future lunar activity key technologies and follow scientific objectives in the research areas of geology, shadowed regions and volatiles, as well as astronaut health & life sciences. Canada will send the 30kg lunar rover to the Moon's south pole region by 2026, carrying multiple science payloads from Canada and the U.S.

China outlines plans for space exploration and for testing SBSP on Tiangong



Credit: CNSA

China outlined its pathway for robotic and crewed lunar and deep space exploration, including the 3 upcoming robotic missions Chang'e-6, 7 and 8 which will include landers, orbiters and relay satellites for the construction of the International Lunar Research Station (ILRS) in the 2030s, planned to be habitable after 2035. Chang'e-6 will collect material from the South Pole in 2026, Chang'e-7 will launch around 2026 and investigate permanently shadowed areas at the South Pole, and Chang'e-8 planned to launch by 2028 will be a test mission for in-situ resource utilisation and 3D-printing tech. Additionally, China is preparing for a crewed lunar landing with three astronauts before 2030.

Furthermore, reportedly, **China plans to use its Tiangong space station, which was completed last month, for technology testing for space-based polar power (SBSP)** - in particular, an on-orbit assembly of modules with robotic arms for a SBSP test system.

Space Force establishes a unit in Indo-Pacom, Space Command creates a new task force

On November 15th, the **U.S. Space Command announced the creation of a new task force, the "Combined Joint Task Force-Space Operations" (CJTF-SO)** to support operations coordination and to accelerate the provision of satellite-based services and capabilities to military forces. In particular, the CJTF-SO will serve as a bridge between the Space Command's HQ at Peterson Space Force Base and the Combined Force Space Component Command (CFSCC) at Vandenberg Air Force Base and the Joint Task Force Space Defense (JTF-SD) at Schriever Air Force Base. CJTF-SO will also include an operations centre to track objects and activities in space. CJTF-SO will temporarily be led by Maj. Gen. T. James, until a permanent three-star commander is appointed.

Credit: Spacenews/U.S. Indo-Pacom

Furthermore, on November 22th, the **Space Force formally established a permanent presence (unit) within the Hawaii-based U.S. Indo-Pacific Command (Indo-Pacom)**. The Space Force unit, which will be led by Brig. Gen. Anthony Mastalir, a former Commander of the space launch wing of the Space

Space Force awards contracts for TacRS-3 mission "Victus Nox"

The **U.S. Space Force awarded a contract to Firefly Aerospace and Millenium Space to launch the Tactically Responsive Space TacRS-3 mission "Victus Nox"** in 2023, with a Millennium small-satellite bus carrying an SDA sensor as payload, which will be delivered in late April. The mission aims to demonstrate the capability "tactically responsive space" which was requested by Congress to be acquired for Space Force in order to quickly replace satellites that are shot down. Furthermore, Gen. J. Dickinson, Head of U.S. Space Command, endorsed the **idea to partner with commercial launch companies that can demonstrate tactically responsive space** and highlighted that the U.S. Space Command needs to prepare for "dynamic space operations", which will include rapid software updates, responsive launch, and manoeuvre capabilities.

UN COP27 highlights the role of space for climate action

Credit: Groundstation

From November 6th to 18th, the **UN Climate Conference 2022 (COP27) took place in Egypt** (in Sharm el-Sheikh). The use of space for climate action was addressed in the context of COP27:

UNOOSA and UKSA published a report on space-related climate action efforts. The **report** aims to enhance the understanding of the potential of the use of space for climate action, to support strategic decision-making and to outline opportunities for cooperation.

The **UN Environment Programme (UNEP) signed the Space Climate Observatory (SCO) International Charter**. The signature concretises the collaboration of the SCO with the UN World Environment Situation Room (WESR), which gathers environmental studies and data that the SCO will regularly populate.

UN Secretary-General Guterres **announced a 3.1B plan** to invest in the Early Warnings for All initiative. A **text approved by the UN Subsidiary Body for Scientific and Technological Advice (SBSTA)** highlights the need to address climate change through robust EO data.

The Copernicus Climate Change Service (C3S) and the Copernicus Atmosphere Monitoring Service (CAMS) highlighted during COP27 **how the Copernicus programme contributes to climate mitigation and adaptation** and supports policy-making with EO data and science.

Egypt unveiled plans to launch two new climate monitoring satellites, a satellite which will support climate change monitoring in Africa and a plasma satellite which will monitor the atmosphere's upper layers' climate properties.

In addition, **Net Zero Space Conference** took place as part of the Paris Peace Forum, including space-related sessions. In this frame, eSpace, Secure World Foundation (SWF), SES, Amazon Project Kuiper and Astralintu Space joined the Net Zero Space Initiative.

In other news

Japan formally agrees on ISS extension through 2030 and the lunar Gateway contributions: NASA and Japanese government officials signed an agreement on Japan contributions for the Gateway and NASA to fly a Japanese astronaut to the Gateway on a future Artemis mission.

France commits not to conduct ASAT tests: The commitment was expressed in a joint press release from the Ministries of the Armed Forces and Ministry of Foreign Affairs.

South Korea's robotic lunar orbiter Danuri demonstrates "space internet" on its way to moon: According to Danuri's operator KARI, Danuri sent video/photo files at a distance of more than 1.2M km to Earth. The demonstration supervised by KARI, ETRI, and NASA.

FCC proposes creation of new FCC office for space: The new office shall be established in addition to the existing international bureau, in order to handle the increasing work with space systems and to give satellite licensing and regulatory work. The proposal is still under discussion.

NASA continues Lunar Trailblazer smallsat mission for mid-2023 launch despite cost overrun: The costs of the mission, in which the smallsat will orbit the moon to map the abundance of water ice deposits, were initially valued $55M but are now reaching $72M.

INDUSTRY & INNOVATION

November sees progress for Ariane 6 launcher

The **first flight of Ariane 6 was recently postponed and is currently planned for Q4 2023.** Backed by ESA Member States through the €2.8B funding for ESA's Space Transportation Programme subscribed at ESA CM22, this month sees progress in the development of the Ariane 6 launcher.

ArianeGroup received €50M contract from ESA to continue the development of PHOEBUS

Credit: ArianeGroup

On November 2nd, **ArianeGroup received a €50M contract from ESA to continue the development of the PHOEBUS ("Prototype for a Highly OptimizEd Black Upper Stage") technology demonstrator**, which is a core element for the development (and a demonstrator) of Ariane 6's new super-light carbon composite upper stage ICARUS ("Innovative Carbon Ariane Upper Stage") and aims to confirm the possible use of carbon fibre (instead of metallic pieces) for cryogenic tanks. Through the PHOEBUS technology, a lightweight composite upper stage based on CFRP (Carbon Fiber Reinforced Polymers), which reduces mass, increases payload capacity and makes aerospace more sustainable, will be developed for the new European launch vehicles. The new contract is a follow-up of ESA contracts signed in 2019 and 2021.

ArianeGroup as prime contractor signed a €35M subcontract with MT Aerospace, a subsidiary of OHB, for the testing and demonstration of PHOEBUS in two phases: phase 1 until mid-2023, and phase 2 until 2025. The German Aerospace Center (DLR) will evaluate the performance of the PHOEBUS demonstrator at its test centre in Lampoldshausen.

Airbus and ArianeGroup sign contract for next Ariane 6 transition batch

Airbus and ArianeGroup signed a **contract for the next transition batch of Ariane 6 large lightweight carbon fibre structures** which Airbus will manufacture and supply for the next 14 Ariane 6 launcher until 2025, which will support ArianeGroup's ramp-up to full production rate until 2025. For each Ariane 6 launcher, Airbus will manufacture up to 4 carbon fibre structures at its innovative industrial facility in Getafe, Spain, which provides a manufacturing and assembly line for the structures for Ariane 6 launcher. The facility enabled Airbus to achieve a reduced mass and a stronger structure than before and to build the single-piece structure more cost-efficient at a lower cost. The Interface Structure is the largest space carbon fibre structure which was ever produced in Europe. The other structures include the upper stage's Launch Vehicle Adapter as well as the Equipped Solid Rocket upper part of each rocket booster.

Credit: ESA

New Ariane 6 upper stage successfully completes hot-fire test conducted by DLR

The new Ariane 6 upper stage successfully completed the first hot-fire test conducted by the German Aerospace Center (DLR) on behalf of ArianeGroup on the ESA P5.2 test stand at DLR site in Lampoldshausen.

ispace receives first Japan commercial license and world's first commercial insurance for lunar missions

Credit: ispace

Japanese robotics company ispace has been **granted a license to conduct commercial activities on the moon**, making it the first such license issued under the Japanese 2021 Space Resources Act.

The license permits ispace to fulfil a contract signed with NASA in December 2020 for the conduct of "Mission 1", under which the company's Hakuto-R lander will collect lunar regolith and return it for transfer to NASA. If successful, this will represent the first-ever case of commercial space resource utilisation. Initially **slated for launch on November 28th,** the mission launch was postponed multiple times. A new launch date was not announced so far.

Yet even before launching, Mission 1 has already set another global milestone by becoming **the first lunar mission to be commercially insured.** A contract signed between ispace and Mitsui Sumitomo Insurance covers the mission from launch until Hakuto-R's landing on the Moon.

U.S. Space Force shakes up procurement

The U.S. Space Force's Commercial Services Office (COMSO), formed earlier this year to devise innovative methodologies for procurement from the private sector, has **shined a light on its intended model**. Instead of traditional top-down procurement in which private contractors provide bespoke solutions in response to governmental requests, COMSO is seeking to purchase commercially-available services off the shelf – or, in the words of COMSO director Jeremy Leader, to "exploit what we have, buy what we can and only build what we must."

Traditional procurement methods are still on the table, however. The **Space Force has launched an RFI** for hosting an open competition for private industry to integrate and operate secondary payloads on space launches conducted as part of US national security programs. This would be the second iteration of an earlier competition, Launch Manifest Systems Integration, which concluded with winner Parsons Corp. securing a $94 million contract to develop the technical and organizational infrastructure for such multi-mission rideshares.

Cognitive Space gets $1.2M Air Force contract extension for CNTIENT software

Credit: Cognitive Space

The **U.S. start-up Cognitive Space won a $1.2M contract extension** (Tactical Funding Increase -TACFI), composed of government and private funding, from the U.S. Air Force to continue the development of its AI-driven satellite tasking software, the "Cognitive Inference Tasking (CNTIENT) Software", for the U.S. Air Force Research Laboratory. The 2-year extension will fund the development of a tailored version of CNTIENT for dynamic satellite scheduling on a cloud platform and builds on the $1.5M SBIR Phase 2 contract that Cognitive Space won in 2020.

The Air Force uses the software to prototype a hybrid architecture of government and commercial remote-sensing satellites and the software will support the Air Force to automate satellites command and control and conducting experiments in virtual and operational settings.

OneWeb eyes African market with Paratus, Airtel and Q-KON deals

Throughout November, OneWeb has inked three separate deals aimed at providing low-latency connectivity services from its LEO constellation to African consumers:

- In the **deal signed with the South African firm Paratus Group**, OneWeb has agreed to establish a Satellite Network Portal (SNP) in the Angolan capital of Luanda, which will integrate OneWeb satellite connectivity into terrestrial networks for several countries in southern Africa.

Credit: OneWeb

- A **similar deal signed with another South African firm, Q-KON**, will involve OneWeb connectivity being made available to enterprise users in remote locations across southern Africa, which until now typically lack access to terrestrial networks.
- Finally, a **deal with Airtel Africa** will bring OneWeb services to western, central, and eastern Africa.

These agreements are the latest in a series of major investments OneWeb has made in joining the African market; **the first SNP was completed in May in Ghana's capital Accra**, with several more on the way across the continent.

U.S. and European companies provide space-based services for Africa

In November, **U.S. and European companies engaged in providing satellite-based services for Africa**:

- **Planet and Justdiggit announced to enable nature-based solutions for projects to regreen Africa**. The Dutch-based non-profit organisation Justdiggit which supports land restoration in sub-Saharan Africa will be using Planet Lab's high-resolution satellite imagery data for the quantification, evaluation and scaling of their regreening projects.
- **Planet Labs and Microsoft expanded their partnership to apply AI technology and satellite data to support climate adaptation projects** in Africa. Moreover, this new cooperation will extend the usage to the Global South, making "the use of geospatial data become commonplace in the response to natural disasters", such as hurricanes, wildfires and earthquakes.
- **Malawi Communications Regulatory Authority (MACRA) granted SpaceX Starlink a license to provide internet services in Malawi**. MACRA made the announcement during the Malawi Space Conference from November 9th to 11th. SpaceX has already received licenses for Starlink services in various African countries, most recently, in Mozambique and Nigeria.

Credit: SpaceX

Apple launches satellite SOS capability on iPhone 14 models

In a partnership with Globalsat and other SATCOM infrastructure firms, **Apple is rolling out** the ability for iPhone 14s to transmit distress signals via Globalsat's constellation of 24 LEO satellites. This comes on the back of a $450 million investment by Apple into deploying infrastructure and training personnel at ground stations to process and forward the SOS messages to local emergency services. **European users will be able to access the service in December.**

First Spanish rocket MIURA 1 ready for its maiden flight

Credit: PDL Space

The Spanish launcher company PLD Space **successfully completed the European flight mission test of the reusable suborbital micro-launcher MIURA 1** which is now ready for its first launch, scheduled for the end of 2022/early 2023 from El Arenosillo Test Centre in Spain. MIURA-1 is designed to reach a max altitude of 150 km while carrying a payload of up to 100 kg. The **launch of the suborbital MIURA 1 is considered a step towards the envisaged MIURA 5 orbital rocket.**

Moreover, last month, **PLD Space signed a cooperation agreement with Repsol** to conduct feasibility studies on replacing current fuels and designing new renewable fuels - which will be custom-made at Repsol.

SES selects Arianespace for EAGLE-1 satellite launch

SES selected Arianespace to launch its EAGLE-1 satellite on a Vega C rocket as early as Q4/2024. The EAGLE-1 project, developed by SES leading a consortium of 20 European partners, will provide a satellite-based end-to-end secure Quantum Key Distribution (QKD) system for Europe.

Credit: ESA

EAGLE-1 is co-funded by the ESA contribution of Germany, Luxembourg, Austria, Italy, the Netherlands, Switzerland, Belgium, and the Czech Republic under the ARTES programme and the European Commission contributes to the project through Horizon Europe.

Virgin Galactic picks suppliers for Delta-class spaceplanes but delays SpaceShip III

Virgin Galactic has **announced that it is partnering with Bell Textron and Qarbon Aerospace** to produce the Delta-class suborbital spaceplane, which will act as the full-scale production model for Virgin Galactic's upcoming SpaceShip III spaceplane.

Yet just two days later**, Virgin Galactic informed investors that it was delaying the introduction of its first SpaceShip III craft**, the VSS Imagine, to focus on refurbishing its currently active VSS Unity spaceplane and Eve carrier plane. It is unclear when Imagine will be ready for action, but Unity is expected to provide a demonstration flight for the Italian Air Force in early 2023 before hosting private astronauts by the second quarter of the year.

SES and Hughes demonstrate multi-orbit connectivity in General Atomics' SkyGuardian

After SES and Hughes installed satellite internet service on General Atomics' MQ-9B SkyGuardian, the surveillance RPA – used by the US military – **proved to successfully communicate with SES' MEO and GEO satellites**. This demonstrated how multi-orbit connectivity integrated into RPAs with increasingly complex payloads would provide higher data rates with the bandwidth, security and robustness to bring critical data to command centres on the ground.

Japan Space Imaging Corporation signs deal with Satellite Vu

Following the opening of its Early Access Option Programme (EAOP), the British satellite operator **Satellite Vu signed a multi-million pound purchase option with the Japan Space Imaging Corporation (JSI)**, which provides geospatial information to Japanese defence and intelligence customers and commercial markets. Through the EAOP and Satellite Vu's imagery, JSI is able to add high-resolution global thermal data to its portfolio. Satellite Vu's first satellite is scheduled to launch in May 2023.

Space Perspective acquires ship for an ocean-based balloon launch platform

Credit: Space Perspective

On November 15th, Space Perspective announced it **acquired the MS Voyager ship and is working to convert it into an oceangoing launch platform for its Spaceship Neptune balloon system**. The Florida-based company originally planned to launch its balloons from land but decided to use a marine spaceport after going international, as it allows for more flexibility in the flights. The MS Voyager, which should be ready by the end of this year, will support the next test phases as Space Perspective aims to start flying people into the stratosphere by the end of 2024, with tickets currently sold at $125.000.

Exotrail signs launch agreement with Isar Aerospace for spacevan launch

The French Exotrail **signed a launch services agreement** with the German Isar Aerospace. Isar's Spectrum rocket will launch Exotrail's spacevan vehicle on multiple missions between 2024 and 2029, from Andøya and Kourou. Exotrail is developing a spacevan orbital transfer vehicle (OTV) with electric propulsion systems and software that will allocate smallsats into their orbits. Isar's Spectrum is under development and is scheduled to make its first launch in 2023.

In other news

X-37B spaceplane lands after completing sixth mission: The U.S. X-37B unmanned spaceplane landed at the Kennedy Space Centre on November 14th, having spent 908 days in orbit.

LightSail 2 completes mission with atmospheric reentry: LightSail 2, a solar sail launched by the Planetary Society in 2019, also completed its mission a few days later, burning up in the atmosphere on November 17th.

Rivada Space Networks issues Request for Proposals for constellation of 600 LEO satellites: The company envisaged to select a prime contractor for the space segment, parts of the ground segment, and system integration for the constellation by the end of this year.

SES delays launch of the O3b mPower broadband satellites to early 2023: Initially, four of the six O3b mPower satellites were planned to launch this year with SpaceX, with the launch for the first pair of O3b mPower scheduled for December – now pushed in January 2023.

RFA and DLR sign agreement for Helix engine tests at DLR site Lampoldshausen: RFA will build and operate its own test stand at DLR's P2.4 test site which RFA will use and lease, to test its Helix engine from mid-2023. So far, DLR shared their test site only with ESA and ArianeGroup. The agreement will enable the first Helix engine test in Germany (so far at Esrange in Sweden).

Eutelsat appoints Christophe Caudrelier as its Chief Financial Officer: Effective at the latest on January 2nd 2023, his appointment follows Sandrine Téran's announcement to step down.

ECONOMY & BUSINESS

Three new VC Funds for European Space companies with AUM total of €615M

Three European VC firms have established new funds this month with a planned total Assets Under Management (AUM) of €615M:

Einstein Industries Ventures plans a €300M fund

The Munich-based **Einstein Industries Ventures plans a €300M fund**. The fund's first close is expected to end in Q1 next year and the final close will follow in Q4 of 2023, with the possibility of another round in between. The firm recognised a gap in European investment in post-seed rounds. Accordingly, it will invest in Series B and C-plus downstream applications with a combination of institutional and corporate investors. Moreover, Einstein has signed an agreement with ESA to become a member of the ESA Investor Network to access targets and technical expertise.

VSquared Ventures initiates a €165M fund to invest in deep tech start-ups

Another Munich-based firm, **VSquared Ventures, initiated a €165M fund** to invest in deep tech start-ups including space and quantum computing. This is the firm's third early-stage fund, bringing its total AUM to €400M.

OTB Ventures launchs a new €150M OTB Fund II

OTB Ventures launched a new €150M OTB Fund II to invest in early growth, post-product deep tech start-ups, including space. The Polish VC firm is supported by the European Investment Fund (EIF) and by the Invest European programme.

ESA boosts commercialisation with new €117.6M ScaleUp Programme

Credit: ESA

At the ESA Ministerial Council Meeting, **Ministers pledged €117.6M to ESA's ScaleUp programme**. Member states oversubscribed by 17%. ScaleUp is a new programme under the helm of the directorate of Commercialisation, Industry and Procurement. Divided into two elements, ScaleUp aims to boost entrepreneurship and commercialisation across all ESA programmes by supporting companies throughout their life cycles: the first segment, ScaleUp Innovate provides incubation, acceleration, intellectual property and technology transfer services, while the second one, ScaleUp Invest, supports the scaling up of products on new markets.

Terran Orbital receives $100M from Lockheed Martin

Lockheed Martin invested in $100M in Terran Orbital, **putting the total investment of Lockheed to $160M**. **Terran will use the money** to acquire additional satellite assembly space, increase module production, and satisfy working capital needs while expanding advanced manufacturing abilities. Terran recently shifted its strategy from making cubesats to manufacturing larger satellites to tap into the defence market.

Australia approves Inmarsat-Viasat deal

The Australian Government's Foreign Investment Review Board has given its **approval for the merger of the two companies**. Australia is an important market, in which companies have significant business and customer relationships. Previously, UK and US regulators had already given green light for the combination of the two businesses.

Credit: Viasat/Inmarsat

Eutelsat and OneWeb sign final combination agreement

On 14th November, Eutelsat and the main shareholders of OneWeb (Bharti, the UK Government, Softbank and Hanwha) **signed the final combination agreement** to confirm the merger of the two companies. The completion of the merger remains subject to the conditions, namely approval by relevant regulatory bodies. The companies expect the finalisation of the transaction to be held in the second or third quarter of 2023.

SatixFy goes public in SPAC

Credit: SatixFy

Israel-based satellite communications technology company SatixFy Communications has gone public by completing its merger with the Special Purpose Acquisition Company (SPAC) Endurance Acquisition.

SatixFy received $200M in IPO proceeds and $29M in gross proceeds from private investment in public equity (PIPE). SatixFy is now listed on Nasdaq under the ticker symbol "SATX". The company announced the planned merger in March this year and **cut down its valuation from a planned $813M post-money valuation to $365M**.

Nofence raises €12.5M

Nofence, a Norwegian company in the business of replacing physical fences with GNSS animal collars, has **raised more than €12.5M**. Using the company's app, farmers can control the roaming of their flock from their phones and adjust virtual fences as needed. They can save money, time and make better use of their pastures. The company is preparing for its market pilot in the US.

Credit: Nofence/wardinthewild

Constellr secures €10M in seed round

Constellr, a German start-up building a water monitoring system, secured €10M in a seed round. The **funding round** was co-led by Lakestar and VSquared and included early and new supporters of the company. The Fraunhofer spin-off is building a globally scalable crop water monitoring system to determine water need and availability for every field on the planet to help save water and reduce the risk of crop loss. Constellr will put the €10M it raised towards its first two satellites, concluding its existing pilot programmes, and developing its processing platform.

Safran acquires Syrlinks

Safran Electronics & Defense has completed its acquisition for an undisclosed amount of Syrlinks, a French mid-sized firm specialised in radiocommunications, radio navigation, and PNT. With this move, Safran hopes to consolidate its position as an equipment manufacturer delivering sovereign space solutions and extends its coverage of the complete ground-space communications sector. Furthermore, Syrlinks' expertise in GNSS and miniature atomic clocks will complement Safran's PNT capabilities.

Maxar increasingly interested in gaming markets

Credit Maxar Technologies

Maxar Technologies, a provider of comprehensive space solutions and geospatial intelligence, **acquired Puerto Rican AI and software company Wovenware** for an undisclosed amount. Accordingly, Wovenware will leverage AI and machine learning to help develop new solutions for Maxar's customers. Earlier this year, Maxar had made a strategic investment in Blackshark.ai – the company to thank for the crisp 3D surface images on Microsoft's Flight Simulator 2020.

Also this year, the Blackshark.ai CEO and a senior Maxar executive held a presentation at **Unreal Fest**, a gaming industry event, to discuss the marriage between gaming and space: using Maxar's satellite imagery and Blackshark.ai's AI to open up the entire Earth to game developers. These moves show Maxar is looking for alternative ways to market its satellite imagery to the gaming and media industry.

In other news

Thorium space raises 10M in a grant: The Polish company received its largest grant so far of almost €10M, putting the company at a valuation of almost €22M. The company is also pursuing its transformation into a joint-stock company.

Deutsche Bank assesses EO's TAM at ca. $6B: Deutsche Bank used numbers from Euroconsult and Allied Research to assess EO's current total addressable market (TAM) at approximately $6B and expects it to grow to $10B by 2025. Over the coming decades, the bank expects the TAM to top out between $19B and $40B.

AE Industrial Partners acquires York Space Systems: AEI, a private equity firm focused on aerospace and defence, has acquired Denver-based York Space Systems for an undisclosed amount. York is a producer of small satellites, components, and turnkey mission operations.

Kayhan and Morpheus announce strategic partnership: Kayhan makes STM software and Morpheus creates electric thrusters to charge satellite owners for the fuel consumed in each manoeuvre. Through the strategic partnership, customers will get a noticification to manoeuver their satellite from Kayhan's software, and Morpheus' software will calculate the costs for the different options.

Gravitics raises $20M in seed round: the Seattle-based designer and manufacturer of space station modules emerged from stealth with the announcement. It will use the funds to expand its operation and development efforts.

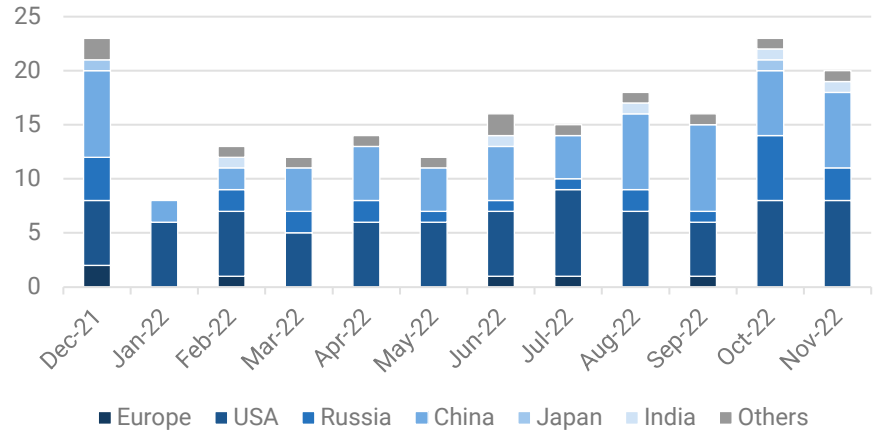
Eoliann raises €1.35M in seed round: The Italian company uses satellite data and machine learning algorithms to forecast the probability and impact of climate risk events to improve insurance policy creation. It will use the funds to expand operations.

LAUNCHES & SATELLITES

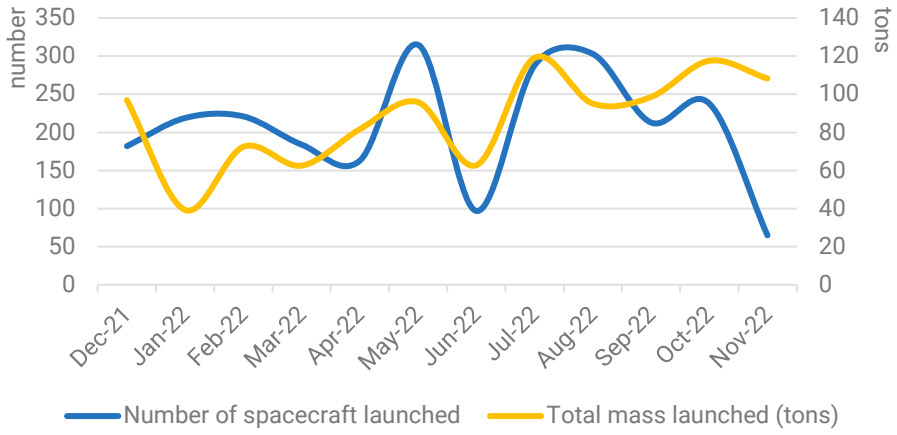
Global space activity statistics

November 2022	USA	Russia	China	India	Others	Total
Number of launches	8	3	7	1	1	20
Number of spacecraft launched	38	3	14	9	1	65
Mass launched (in kg)	68 393	8915	29 810	1169	50	108 337

Launch activity over the year

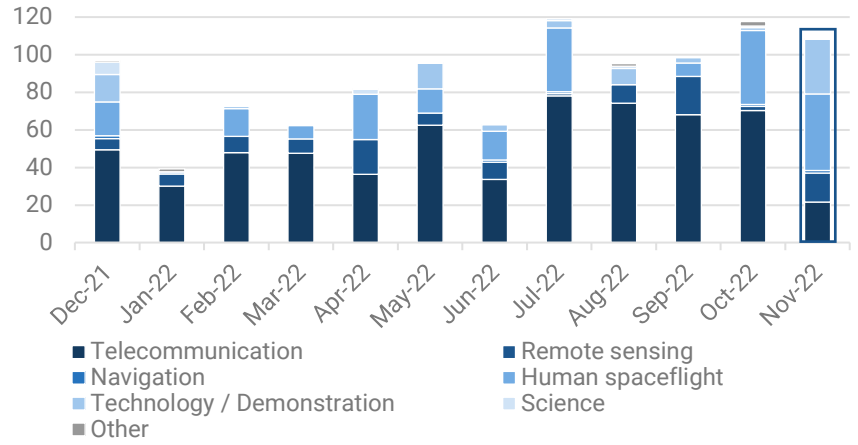


Evolution of the number of launches per launch country



Evolution of launch activity over the year 2021-2022

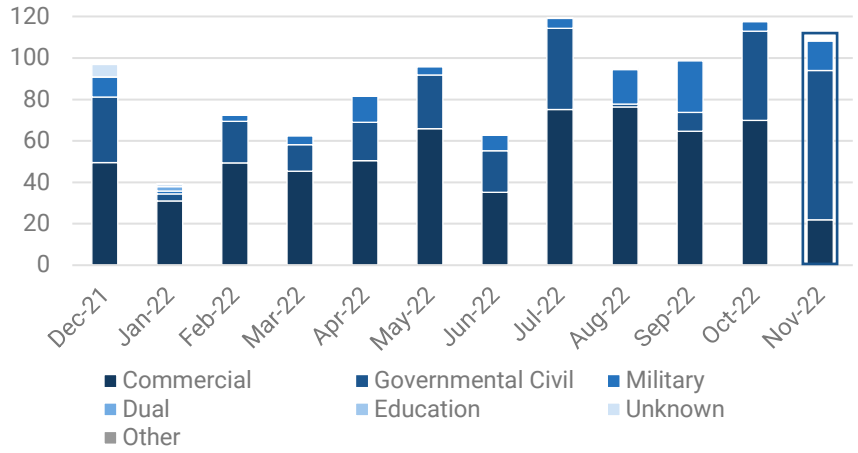
Satellite missions and markets



Evolution of the total mass launched (tons) per mission (Dec. 2021-Nov. 2022)

November 2022	Telecom	Remote sensing	Nav.	Human Spaceflight	Tech/ Demo	Science	Other
Europe	10 016				14	50	3
USA	6600	2930		19 692	29 040	80.2	
Russia		7500	1415				
China	5000	3810		20 992			8
Japan					17.6	11.5	
India		1133.5			19		
Others	3	2					

Total mass (kg) launched by mission and customer country



Evolution of the total mass launched (tons), per market (Nov. 2021-Oct. 2022)

November 2022	Commercial	Governmental Civil	Military	Education	Other
Europe	10 016	64		3	
USA	6671	49 779.2	1890	2	
Russia			8915		
China	5210	21 092	3500		8
Japan		26.1		3	
India	17.5	1135			
Others				2	3

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
01/11/2022	USA	Falcon Heavy	LDPE-2	US Space Force	USA	Northrop Grumman	USA	850	Tech / Demo	Military
			LINUSS (1 & 2)	Lockheed Martin	USA	Tyvak Nano-Satellite Systems	USA	21,5 (each)	Tech / Demo	Commercial
			Shepherd Demonstration / USA 339	US Space Force	USA	Unknown (USA, Private)	USA	1000	Tech / Demo	Military
			Tetra 1	US Space Force	USA	Millennium Space Systems	USA	20	Tech / Demo	Military
			USUVL	US Space Force	USA	Unknown (USA, Private)	USA	20	Tech / Demo	Military
02/11/2022	Russia	Soyuz-2-1b Fregat	Kosmos 2563	Russian Aerospace Forces	Russia	RKK Energia	Russia	1500	Early Warning	Military
03/11/2022	USA	Falcon-9 v1.2 (Block 5)	Hotbird 13G	Eutelsat	France	Airbus	France	4500	Telecom	Commercial
04/11/2022	New Zealand	Electron KS (R)	MATS	Stockholm University	Sweden	OHB	Germany	50	Earth Science	Gov. Civil
05/11/2022	China	CZ-3B/G2(2)	ZhongXing 19 / ChinaSat 19	China Satcom	China	CAST	China	5000	Telecom	Commercial
07/11/2022	USA	Antares-230+	Cygnus CRS-18	NASA	USA	Northrop Grumman	USA	7492	Cargo Transfer	Gov. Civil
			PearlAfricaSat 1	Ministry of Science and Technology of Uganda	Uganda	Kyushu Institute of Technology	Japan	1	Earth Observation	Education
			SpaceTuna 1	Kindai University	Japan	Kindai University	Japan	1	Tech / Demo	Education
			Taka	Kyushu Institute of Technology	Japan	Kyushu Institute of Technology	Japan	2	Tech / Demo	Education
			ZimSat 1	ZINGSA	Zimbabwe	Kyushu Institute of Technology	Japan	1	Earth Observation	Education
09/11/2022	USA	Atlas-5(401)	JPSS-2 / NOAA 21	NOAA	USA	Northrop Grumman	USA	2930	Meteorology	Gov. Civil
			LOFTID	NASA	USA	NASA	USA	1224	Tech / Demo	Gov. Civil
11/11/2022	China	CZ-6A	Yunhai-3 01	CAS	China	CAST	China	100	Meteorology	Gov. Civil
12/11/2022	USA	Falcon-9 v1.2 (Block 5)	Galaxy (31 & 32)	Intelsat	USA	Maxar	USA	3300 (each)	Telecom	Commercial
12/11/2022	China	CZ-7	Tianzhou 5	CNSA	China	CAST	China	12910	Cargo Transfer	Gov. Civil
			XW 4 / CAS 10	CAMSAT	China	CAMSAT	China	8	Radio Amateur	Amateur
15/11/2022	China	CZ-4C	Yaogan 34-03	People's Liberation Army	China	CAST	China	2300	Earth Observation	Military
16/11/2022	USA	SLS (Block 1) iCPS	ArgoMoon	ASI	Italy	Argotec	Italy	14	Tech / Demo	Gov. Civil
			BioSentinel	NASA	USA	NASA	USA	14	Biology	Gov. Civil
			CuSP	Southwest Research Institute	USA	Southwest Research Institute	USA	10,2	Astronomy	Gov. Civil

			EQUULEUS	JAXA	Japan	University of Tokyo	Japan	11,5	Earth Science	Gov. Civil
			LunaH-Map	NASA	USA	Arizona State University	USA	14	Planetary Science	Gov. Civil
			Lunar-IceCube	Morehead State University	USA	Morehead State University	USA	14	Planetary Science	Gov. Civil
			LunIR	Lockheed Martin	USA	Tyvak Nano-Satellite Systems	USA	14	Tech / Demo	Commercial
			Miles	Miles Space	USA	Miles Space	USA	14	Tech / Demo	Commercial
			NEA-Scout	NASA	USA	NASA	USA	12	Planetary Science	Gov. Civil
			OMOTENASHI	JAXA	Japan	University of Tokyo	Japan	14,6	Tech / Demo	Gov. Civil
			Orion CM-002 / Artemis 1	NASA	USA	Lockheed Martin	USA	25848	Tech / Demo	Gov. Civil
16/11/2022	China	Ceres-1 (2)	Jilin-1 Gaofen-03D (5 satellites)	Chang Guang Satellite Technology	China	Chang Guang Satellite Technology	China	42	Earth Observation	Commercial
23/11/2022	USA	Falcon-9 v1.2 (Block 5)	Eutelsat 10B	Eutelsat	France	Thales Alenia Space	France	5500	Telecom	Commercial
26/11/2022	USA	Falcon-9 v1.2 (Block 5)	Dragon CRS-26	NASA	USA	SpaceX	USA	11000	Cargo Transfer	Gov. Civil
			DanteSat	Spacemind	Italy	Spacemind	Italy	3	Other	Education
			iROSA (1A & 3B)	Redwire	USA	Redwire	USA	600 (each)	Space Station Infrastructure	Gov. Civil
			MARIO	University of Michigan	USA	University of Michigan	USA	5	Tech / Demo	Gov. Civil
			NUTSat	National Formosa University	Taiwan	National Formosa University	Taiwan	2	Telecom	Amateur
			PetitSat	NASA	USA	NASA	USA	8	Earth Science	Gov. Civil
			SPORT	NASA	USA	ITA	Brazil	8	Earth Science	Gov. Civil
			Surya Satellite 1 / SS 1	Surya University	Indonesia	Surya University	Indonesia	1	Telecom	Amateur
			TJREVERB	Thomas Jefferson High School	USA	Thomas Jefferson High School	USA	2	Tech / Demo	Education
26/11/2022	India	PSLV-XL	Oceansat 3 / EOS 6	ISRO	India	ISRO	India	1117	Earth Observation	Gov. Civil
			Astrocast (4 satellites)	Astrocast	Switzerland	Astrocast	Switzerland	4 (each)	Telecom	Commercial
			INS 2B / BhutanSat	ISRO	India	ISRO	India	18	Tech / Demo	Gov. Civil
			Pixxel-TD 1 / Anand	Pixxel	India	Pixxel	India	16,5	Earth Observation	Commercial
			Thybolt (1 & 2)	Dhruva Space	India	Dhruva Space	India	0,5 (each)	Tech / Demo	Commercial
27/11/2022	China	CZ-2D(2)	Yaogan 36-03 (A, B & C)	People's Liberation Army	China	CAST	China	400 (each)	Earth Observation	Military
28/11/2022	Russia	Soyuz-2-1b Fregat	Kosmos 2564 / Glonass-M 761	Roscosmos	Russia	ISS Reshetnev	Russia	1415	Navigation	Military
29/11/2022	China	CZ-2F/G	Shenzhou 15	CMSA	China	CAST	China	8082	Crew Transfer	Gov. Civil
30/11/2022	Russia	Soyuz-2-1b Fregat	Kosmos 2565 / Lotos S1 6	Russian Aerospace Forces	Russia	Progress Rocket Space Center	Russia	6000	Signal Intelligence	Military

Launch Highlights

Artemis 1: the first step for a return to the Moon

Credit: NASA

On November 16th, NASA performed the launch of the **Artemis 1 mission**, a first in a series that aims at bringing humans back to the Moon. The mission was the first launch of the long-delayed Space Launch System (SLS), a rocket whose original maiden flight was planned for 2016 and that has suffered several postponements. The rocket was carrying the Orion capsule, a spacecraft built by both U.S. and European (for the service module) partners, as well as ten CubeSats that were released around the Moon. Orion reached the farthest distance from the Earth for a human-rated spacecraft (435.000 kilometres) and performed some tests around the Moon before flying back to Earth.

Uganda and Zimbabwe launch their first satellites

Credit: BIRDS-5

On November 7th, Northrop Grumman launched a Cygnus spacecraft to resupply the International Space Station with cargo. Several CubeSats were also onboard the flight, including the **first satellites of Uganda and Zimbabwe**. The satellites have been built in partnership with Japan, in the framework of the Joint Global Multi-Nations BIRDS Satellite project led by JAXA and the Kyushu Institute of Technology. ZimSat-1, the Zimbabwean satellite, will provide imagery to monitor the status of natural resources and get information on natural disasters. On its end, the PearlAfricaSat-1 satellite launched for Uganda will support the development of the agricultural sector and the oil and gas business in the country.

Falcon Heavy flies after three years of absence

Figure 1: Credit: NASASpaceFlight.com

On November 1st, SpaceX launched a **Falcon Heavy rocket** to directly inject into geosynchronous orbit, after more than six hours of travel, several spacecraft for the U.S. Space Force. This was the fourth launch of the rocket, which flew for the last time on June 25th, 2019, and was the first National Security Space Launch taking place on a Falcon Heavy. The primary payload, the Shepherd Demonstration spacecraft, will allow testing technologies related to rendezvous and proximity operations.

Credit: ISRO

India performs its last launch of the year

On November 26th, ISRO conducted its **fifth and last launch of the year**. A PSLV-XL rocket launched the EOS-6 and a few Cubesats in LEO. EOS-6 is the first satellite in the third generation of Oceansat, which provides oceanography data to Indian authorities. The spacecraft also carries a French-built ARGOS payload, which collects environmental data. Among the Cubesats launched, one of them was built in cooperation with Bhutan while another one is a test spacecraft for the upcoming constellation that the startup Pixxel wants to deploy to provide hyperspectral imagery. The launch took place a few days after the startup Skyroot Aerospace launched for the **first time a private rocket** (Vikram-S) in India, which successfully performed a suborbital flight.

About ESPI

Policy & Strategy

Economy & Business

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International & Legal

ESPI is the European think-tank for space. The Institute is a not-for-profit organisation based in Vienna, the 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.

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