



ESPI
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ESA PROPOSAL TO PUSH SPACE-BASED SOLAR POWER - SOLUTION TO INCREASE EUROPE'S ENERGY AUTONOMY?



Dear Friends of ESPI,

On August 16th, ESA DG Josef Aschbacher **informally announced** that the development of Space-based Solar Power (SBSP) should be considered to increase Europe's energy independence and reduce GHG emissions. Obviously, such "Space-based Solar Power would be an important step towards carbon neutrality and energy independence for Europe. Two recent independent studies strongly recommend investments to advance the SBSP technologies needed to address our growing energy crisis in Europe." This concept has been contemplated since the 1970s but only the current tensions around energy motivate to give it a fresh look.

The UK, in particular, announced high ambitions to boost the development of SBSP in July: the UK government unveiled **an investment of £3M** of space tech funding for SBSP projects, and in May, the UK announced the plan to **build a demonstrator for a solar power station in space** already by 2035. Additionally, two **cost-vs-benefit studies contracted by ESA** and conducted by **Frazer-Nash** and **Roland Berger and OHB** on the feasibility and potential of SBSP were published in August. Beyond Europe, it was reported in June, that China **aims to conduct two SBSP tests in LEO in 2028 and in GEO in 2030** and **NASA recently announced to re-examine the concept of SBSP**.

The SBSP concept in a nutshell: satellites in orbit collect solar energy and convert it into energy which is then beamed back to Earth via microwaves, where it is captured by photovoltaic cells or antennas and converted into electricity.

The advantage of SBSP, in particular for Northern Europe, is that night or clouds are not interfering with the energy collection and that the solar incidence is much higher. But the concept is controversial because the development and deployment of SBSP systems would be expensive, given that it would require a large satellite constellation. Furthermore, SBSP might not be able to compete financially with terrestrial energy sources.

This concept also raises major concerns regarding safety and security. As a matter of fact, microwave beaming areas might be forbidden to any kind of air traffic and might also become hazardous in large areas around the ground spot targeted. Additionally, the microwaves might also create interferences with regular radiofrequencies locally compromising satellites telecommunications and tracking, telemetry, and control operations.

ESA will soon ask its Member States in the frame of the upcoming ESA's ministerial meeting in November **to fund a preparatory programme for a feasibility study of SBSP** called **Solaris**. For the preparation of the Solaris proposal, ESA just released a new **Request for Information** for SBSP.

Putting space to work to mitigate energy and carbon emissions issues on Earth is for sure an attractive endeavour. So far, the technical hurdles identified have been showstoppers preventing any further investments worldwide. In the current context, it is definitely worth investigating technical and ambitious options to mitigate them. Last, but not least, the economic rationale and the competitiveness of such energy sources against terrestrial sources of supply needs also to be carefully assessed.

Yours sincerely,



Jean-Jacques Tortora
Director of ESPI



POLICY & PROGRAMMES

EIC Board calls for an end of EIC funding delays

Since the beginning of 2021, there were reports of delays in the distribution of the European Innovation Council Accelerator (EIC) financing to start-ups, which the European Commission tried to solve by starting to move management responsibilities to the European Investment Bank (EIB), but so far, the delays have remained.



Credit: EIC

In response, on August 16th, the EIC Board **released an official statement** calling for the EIC Accelerator to be operational as soon as possible and emphasises the importance of the programme in the current economic environment, to serve as a counter-cyclical tool. Therefore, the Board urges the European Commission to “immediately complete the restructuring of the EIC Fund to make it fully operational”. In particular, among multiple recommendations, the Board recommends that the transition of the management to the EIB is fully concluded to clear the backlog of companies waiting for funding. Then, this solution would be subject to an evaluation to determine if it had the desired performance, including an assessment of the merits of establishing the EIC as a Union Agency or other institutional form, in time for the mid-term review of Horizon Europe in 2024. Moreover, it advocates for the immediate removal of single award decisions, where the College of Commissioners have to approve each investment and grant decision, given that it contradicts the spirit of the programme. Additionally, the EIC Board voiced its opposition to the European Parliament Committee on Industry, Research and Energy (ITRE) proposal to hold a portion of the EIC Accelerator budget for 2023 in case there is no solution to the matter, advocating that “the focus should be getting funding to flow immediately”.

NASA and Roscosmos restate intention to operate ISS beyond 2024

On August 4th, **NASA and Roscosmos officials restated their previous statements about future cooperation on the ISS after 2024** during a briefing about the upcoming SpaceX Crew-5 mission to the ISS. While **NASA stated not having receive a notification of a planned withdrawal** of Russia, Borisov, who became new Head of Roscosmos in July, **restated that Russia would withdraw only at some time after 2024** (until 2030), which does not necessarily mean a withdrawal immediately after 2024 – referring to translation mistakes that might have led to the misunderstanding. Sergei Krikalev, Executive Director of Roscosmos' human space flight programmes added: “After 2024’ could mean 2025, 2028 or 2030”. The two space agencies, who **signed a seat barter agreement in July**, expect to continue ISS operations beyond 2024 and to work on flying integrated crews on all future spacecrafts - not only limited to Soyuz and Crew Dragon. The current agreement of the two agencies on integrated crews, covers one mission a year in 2022 until 2024 and only involves exchanges between Soyuz and Crew Dragon missions. For the upcoming mission to launch on September 21st, NASA astronaut Frank Rubio **is preparing for the flight to the ISS on the Soyuz MS-22 spacecraft** jointly with the Russian cosmonauts Sergey Prokopyev and Dmitri Petelin.

Furthermore, on August 19th, **NASA issued a request for Information (RFI)** to receive input from the U.S. industry about their capabilities to develop a spacecraft to reenter the ISS at the end of its lifetime. Specifically, the spacecraft should conduct final reentry maneuvers to push the ISS into the atmosphere to break up over the South Pacific Ocean. NASA issued this endeavor in order not to rely on the ISS' own thrusters and Russia's Progress Spacecraft, which utilisation NASA mentioned in an ISS transition plan in January.



Ukraine receives SAR satellite data from the Finnish ICEYE to support its armed forces



Credit: ICEYE

The Finnish startup **ICEYE will support the Ukraine by delivering SAR satellite data and imagery**. ICEYE signed a contract (undisclosed value) with the Kiev-based Ukrainian Serhiy Prytula Charity Foundation, which supports the Ukrainian armed forces in the war. As part of the agreement, ICEYE will transfer full capabilities of one of its SAR satellites in orbit, operated by ICEYE for the Ukrainian Government. Beyond this, ICEYE will provide access to its SAR satellites constellation which will allow the Ukrainian Armed Forces to receive radar satellite imagery.

Airbus modernises SATCOMbw infrastructure of the German Armed Forces

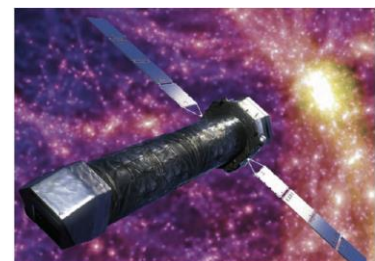
Airbus D&S **completed the performance enhancements** of the SATCOMBw military satellite communications network for the German Armed Forces, which are required for the NATO commitment VJTF23. SATCOMBw Level 2 will ensure the autonomy, security and reliability of the satellite-based telecommunications of the Bundeswehr. Airbus D&S is the prime contractor and responsible for designing, integrating, and delivering of the operational system. Specifically, the BSg-A ground station which became operationally ready end of July and is operated by Airbus, was now fully integrated into the SATCOMBw network. To meet the requirements of VJTF2023, Airbus modernised the infrastructure by replacing ISDN technology with IP-based services, increasing transmission bandwidth, and modernising the cross-sectional management module.

The U.S. Air Force awards \$4.8B in a multi-award contract to 5 companies

The U.S. Air Force selected the five companies Altamira Technologies, Epsilon Systems Solutions, Modern Technology Solutions, Radiance Technologies and Xandar for **a \$4.8B multi-award contract** for the provision of R&D as well as software services over a period of 10 years, in support of the National Air and Space Intelligence Center (NASIC). NASIC analyses foreign air and space capabilities and implications for U.S. national security. The companies will compete for task orders under a so-called indefinite-delivery/indefinite-quantity contract called NOVASTAR (NASIC Scientific and Technical Intelligence Capability Support Services).

ESA redesigns X-ray astronomy mission Athena to decrease evaluated costs to €1.3B

ESA is looking for ways to redesign the Athena X-ray astronomy mission by reducing the scope, to **decrease the calculated costs down to max. €1.3B**. The Advanced Telescope for High-Energy Astrophysics (Athena) mission, planned to launch by the mid-2030s, aims to study supermassive black holes, supernova explosions and other X-rays sources, by using a large X-ray mirror. In 2014, ESA selected Athena and the Laser Interferometer Space Antenna (LISA) mission as two flagship astrophysics missions - initially valued with estimated cost of €1.05B, but the cost estimation decreased up to €1.5B for LISA and to €1.9B for Athena (May 2022). Currently, ESA is preparing to move Athena or LISA into the next development phase in November 2023 - and adopt the other one in 2024 or 2025. Furthermore, the funding available for the missions in the upcoming years is unclear but will be decided on at the ESA Ministerial Council Meeting in November.



Credit: ESA



ESA and ERTICO sign agreement to cooperate for safer mobility on European roads



Credit: ESA

On August 22nd, **ESA and ERTICO signed a Memorandum of Intent (MoI)** at ESTEC in the Netherlands to cooperate for safer and smarter mobility on European roads by exploring space technology and services for safety and reliability improvement of assisted and automated vehicles. The agreement was signed by Joost Vantomme, CEO of ERTICO, and Javier Benedicto, ESA Director of Navigation.

UK requests EU Commission for formal consultations on access to EU scientific programmes

In August, the UK government requested the EU Commission to launch formal consultations - a mechanism set out in the UK-EU TCA - for dispute resolution proceedings over the **access for the UK to EU science programmes**, in particular Horizon Europe. In 2020, the UK negotiated access to a range of EU R&I programmes, but until now the EU is still not finalising the UK access. Reportedly, the UK has planned and secured approx. £15 billion for Horizon Europe. Similarly, the UK government has prepared an **alternative national science programme**.

The U.S. Air Force awards SpaceX \$1.9M contract for Starlink services in Europe and Africa

The U.S. Air Force Special Operations Command **awarded SpaceX a sole-source 1-year \$1.9M contract** starting in August, to evaluate Starlink internet services in Europe and Africa. The contract is for hardware and services in support of military airlift units based at Ramstein Air Base in Germany and includes satellite terminals and internet services. The contract's general requirement was for a commercial satellite internet solution which is using satellites in LEO with available services in Europe and Africa to support the Air Force's 86th Airlift Wing.

NASA selects companies to push forward in lunar solar array technology

NASA has selected the three companies Astrobotic Technology, Honeybee Robotics and Lockheed Martin, to advance working on deployable lunar solar array systems that will power NASA's human and robotic exploration of the Moon during the Artemis program. **NASA will award the companies in total \$19.4M** (Astrobotic \$6.2M; Honeybee \$7M; Lockheed Martin \$6.2M) for prototype development and conducting environmental testing. Furthermore, NASA selected Astrobotic for the development, testing, and flying of **technologies for lunar night survival and communication aboard the CubeRover platform**, which has recently passed its CCR. In particular, the CubeRover will be flown to the Moon to demonstrate its ability to survive the lunar night when the temperature can drop to minus 200°C.



Credit: NASA



China claims progress on rockets reusability for crewed lunar landings and Moon base



Credit: CASC

According to Chinese officials, **China is in progress with the development of "Long March 9"**, a new generation of super-heavy carrier launchers designed to conduct landing on the Moon by 2030, as well as launch elements for the planned International Lunar Research Station (ILRS) jointly planned by China and Russia. Though not stated, the new engine configuration would also be expected to be more amenable to first stage reusability into LEO, as demonstrated by a long series **launches of another spacecraft, "Long march 2F"**. Among the innovations brought into space by the new heavy-lift rocket, reportedly, **large collective space-based solar power facilities** are planned to be constructed 35,786 kilometers above the Earth. Thanks to the absence of atmosphere and seasonal changes affecting energy level, converted energy would be then transmitted to Earth via microwaves or lasers.

The U.S. Space Force awards contracts for on-orbit servicing

The Space Force awards Orion Space Solutions \$44.5M contract for the Tetra-5 mission

The U.S. Space Force's Space Enterprise Consortium awarded the Colorado-based company Orion Space Solutions **a \$44.5M contract to develop three small satellites** for a demonstration of on-orbit services in GEO, as part of the Space Force's Tetra-5 mission. The Tetra-5 satellites, which are planned to be delivered in 5 years, will be equipped with sensors for rendezvous and proximity operations (RPO) as well as with docking interfaces for refueling. Orion Space will work with several subcontractors, among others, Hera Systems, Booz Allen Hamilton, and Scout Space. The contract comprises spacecraft and payload design, assembly, integration, testing and ground support.

The Space Force awards Scout Space two contracts for on-orbit servicing project

The In-space services technology company **Scout Space won two Space Force Small Business Technology Transfer contracts each worth \$250,000** for supporting the first phase of the debris-cleanup project "Orbital Prime" led by the U.S. Space Force's innovation arm SpaceWERX, for whose assignment it worked jointly with the Stanford University and the Florida Institute of Technology. The two contracts are for Real-time Autonomous Uncertainty and Risk Monitoring, as well as for Robust Optical Tracking integration into Real-time Orbital Determination (RTOD).

Israel selects first experiment for the Beresheet2 mission to the Moon in 2025

Israel selected the first experiment for its Beresheet2 mission to the Moon to be launched in 2025. The experiment, led by the Hebrew University in Jerusalem, will test various medicines with regards to their durability under conditions of cosmic radiation for astronauts on deep space missions to be used in emergency cases. The experiment will be conducted in a container attached to the spacecraft that will remain in lunar orbit for 2-5 years. The data will be transmitted on a regular basis for analysis to a laboratory of the Israeli company Space Pharma, which will monitor the drugs with lasers that are integrated into the container. The selection of other experiments to be integrated for the Beresheet2 mission, is currently in process and will be done by the mission operator SpaceIL.



Credit: SpaceNews



The Korea Aerospace Research Institute requests \$459M budget for lunar lander project



Credit: KARI

During a public hearing on August 24th, the Korea Aerospace Research Institute (KARI) presented details of a **plan of South Korea's second lunar exploration mission and requested a budget of \$459M** for the mission to build a robotic lunar lander and payload to fly to the Moon with the country's currently developed carrier rocket for a 1-year mission in 2031. The plan proposes the start of the development in 2024. Aboard the lander would be a detector of volatile substances in the regolith, an autonomous navigation

system to ensure a soft landing of the lander, a nuclear power generator, and a rover which could carry a high-resolution camera and an electron gun for imaging and analysing lunar dust. The presented mission plan can be modified in a feasibility study by the Finance Ministry.

DARPA selects companies for the inter-satellite laser communications Space-BACN program

The U.S. **DARPA kicked-off a new inter-satellite laser communications project called Space-Based Adaptive Communications Node (Space-BACN)** and selected 11 organisations to participate in the programme's 14-months Phase 1. With the **SpaceBACN program**, the DARPA is pursuing the development of a new laser terminal design to be compatible with any constellation and to facilitate the connection between commercial and governmental satellite constellations. Out of 11 organisations DARPA selected the five commercial satellites operators SpaceX, Telesat, **SpaceLink**, Viasat and Amazon's Kuiper who will support defining the command-and-control requirements to support optical intersatellite link communications between constellations. Furthermore, CACI, MBryonics and Mynaric were selected for the development of a small optical terminal, while II-VI Aerospace and Defense, the Arizona State University and Intel Federal join forces to work on a reconfigurable optical modem and to support in the definition of the interface between system components. After phase 1, which will be completed by a preliminary design review and a connectivity demonstration, some of the providers will be selected for further participation the 18-month phase 2 to develop engineering design units of the components of optical terminals - while all selected operators will continue developing concepts for cross-constellation satcom during phase 2.



Credit: DARPA

Moreover, one of the 5 operators, **SpaceLink entered into a cooperative R&D agreement with the U.S. Army**, joining forces to explore alternative space communications pathways to ensure resiliency and reduce sensor-to-shooter latency. SpaceLink's MEO satellite relay system will be equipped with optical and RF links to speed up data flow and will complement the U.S. national security space architecture.

U.S. DISA awards Inmarsat Government \$578M contract for commercial satcom services

The U.S. Defense Information System Agency (DISA) awarded Inmarsat Government a NexGen Wideband (NGW) Indefinite-Delivery, Indefinite Quantity (IDIQ) Follow-On (FO) **10-year Contract valued \$578M for the U.S. Navy Military Sealift Command (MSC)** to operate end-to-end, commercial satellite communications services and infrastructure, including satellite systems, teleport and terrestrial services.

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In other news

ESA and the European Commission declare end of Sentinel-1B Copernicus satellite mission:

In December 2021, Sentinel-1B became unable to deliver radar data, due to an anomaly related to the instrument electronics power supply provided by the satellite platform.

The U.S. and the New Zealand sign a Framework Agreement to boost cooperation in space:

the cooperation including space science, technology, cooperation between civil and research communities, data and personnel exchange, and education and public outreach. In addition, it will enable government regulatory cooperation to conduct launches from New Zealand.

COSPAR elects Pascale Ehrenfreund new President for the next four years:

Prof. Ehrenfreund is succeeding Len Fisk and has been a permanent active COSPAR Associate and served as Chair of COSPAR's Exploration-Panel between 2010-2019.

ESA announces "Nordic Launch" a new 2022 startup acceleration programme:

The ESA BICs in Sweden, Denmark, Norway, Finland, and Estonia launched the new programme, which will bring together startups and industry expertise and aims to support the participants to reach the ESA BIC Programme.

UKSA and UK Dstl agree to intensify collaboration:

The agreement was a result of the first visit of UKSA CEO Paul Bate to Dstl's space facilities and his meeting with Dstl CEO Paul Hollinshead. Their synergies of activities and relation have already been intensified during the preparation of the first satellite launch from UK.

NASA revises requirements for ISS private astronaut missions:

Drawing lessons-learned of the experiences from the first Axiom Space's Ax-1 flight mission in April, the changes include the requirement that a former flown NASA astronaut is leading the mission as a commander and that the mission's time schedule should not be too tight to give the astronauts time to adapt to the new environment and conditions.

The Republic of Moldova deploys its first satellite TUMnanoSAT from the ISS Kibo module:

the UNOOSA and JAXA supported the deployment of the satellite built by the Technical University of Moldova under the KiboCUBE programme, which is part of the "Access to Space for All – initiative" enabling developing nations to develop and deploy CubeSats.

Prof. Sherif Mohamed Sedky appointed as CEO of Egyptian Space Agency for one year:

appointed by Egypt's President Abdel Fattah El-Sisi, Sedky is succeeding Dr. Mohamed Al-Qousi who had this position since 2019.

Rockefeller Foundation launches 3-year \$5.5M investment project for satellite data and AI to accelerate Africa's economic development:

in cooperation with the e-GUIDE initiative and the start-up Atlas AI, the foundation specifically aims to create a digital platform to boost investment for climate resilient infrastructure in Kenya, Nigeria, Rwanda, and Uganda. The platform will cover the sector development of agriculture, energy, and transportation sectors' development.

ITU issues a warning to its Member States on harmful interference and calls for actions:

having received 329 reports of harmful interference in one year, the ITU urged to take preventative measures, including improving the resilience of navigation systems, develop mitigation measures for the loss of services, to enhance cooperation between relevant authorities as well as to further strengthen civil-military coordination.



INDUSTRY & INNOVATION

SpaceX and T-Mobile create technological partnership for connectivity

On August 25th, SpaceX and T-Mobile unveiled a new **partnership to provide satellite-to-smartphone messaging services** in areas without available traditional service. The service will consist of only text messages (including messaging apps, albeit dependent on interoperability talks between the tech partnership and the messaging apps companies) and will start in the rural U.S. in 2023, eventually expanding to the rest of the country.

Accordingly, the next generation of Starlink Satellites, to be launched next year, will be fitted with 5 to 6-metre antennas to be able to connect directly to cell phones without any need for modification by the end user.



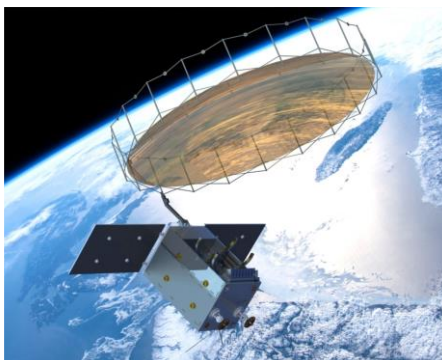
Credit: SpaceX

Moreover, there are plans to expand the service “globally” and the CEOs of both companies invited the world’s carriers to collaborate with the SpaceX-T-Mobile partnership. Importantly, there are concerns regarding spectrum rights, particularly outside the U.S., where T-Mobile may not have them to provide its services in other countries and international waters, thus the need for collaboration with other carriers to expand the network globally.

Isotropic Systems rebrands to All.Space and unveils new “smart terminal”

On August 1st, the UK-based start-up All.Space (formerly Isotropic Systems) **announced its rebranding along with a new fifth-generation “small terminal”**, to be available at the end of 2022. All.Space’s terminals allow users to connect to multiple constellations across various orbits with 3G, 4G and 5G cellular multi-network integration plug-and-play options. John Finney, CEO of All.Space, **stated that the rebranding reflects the evolution of its technology** beyond the scientific term that was behind the original name, which described a specific feature of its technology optics. Moreover, the company now plans to expand its workforce and build a second factory, while also growing its customer base among different sectors.

Space Norway AS signs contracts with several vendors



Credit: Space Norway AS

On August 25th, **Space Norway AS signed contracts with multiple vendors to build MicroSAR**, a radar satellite system optimised for maritime surveillance in Norwegian areas of interest.

The payload will be developed and built by Norwegian suppliers WideNorth, Eidsvoll Electronics, Kongsberg Seatex and the Norwegian Defence Research Establishment, while the satellite bus and the radar antenna will be built in the UK by Surrey Satellite Technology and its subcontractor Oxford Space Systems.



Skyrora submits licence to launch

The UK-based start-up Skyrora applied to the UK Civil Authority (CAA) to obtain the **licence required for commercial spaceflight activities**. The process is expected to take 9 to 18 months, after which the company will receive the necessary regulatory approvals to undertake the planned maiden flight of the three-stage Skyrora XL rocket in 2023. Moreover, Skyrora has recently **successfully test-fired** its second stage of the Skyrora XL.



Credit: Skyrora

Astra Space unveils new strategy in earnings call

A shift from Rocket 3 to Rocket 4

On August 4th, during its earnings call, the U.S.-based spaceflight company Astra Space unveiled it would **stop developing the small launch vehicle Rocket 3 to focus on the larger Rocket 4**. Regarding the decision, the company stated that it comes amid increasing demand from large constellation operators for higher capacity, lower costs and more reliable launch services.

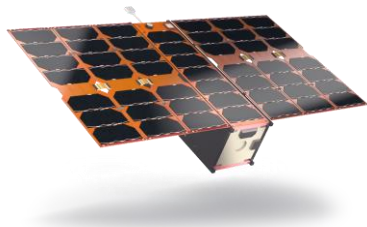
Accordingly, Rocket 4 will have a capacity to carry payloads up to 600kg and a price per launch of \$5M. Moreover, the company will increase its investments in the testing of the launch system. The previous iteration, Rocket 3, had a maximum payload capacity of 50kg and in seven launches performed five have failed.

The company stated that customers with contracts for Rocket 3 launches will be re-manifested to Rocket 4 launches, which will only commence in 2023. One of those customers NASA was already looking for launch alternatives after the Rocket 3 launch failures, which after the Agency lost two TROPICS cubesats. Nevertheless, NASA was surprised by the shift to Rocket 4 and mentioned that it would represent **increased costs and schedule challenges** for its TROPICS mission.

New contract with Airbus OneWeb Satellites

During its earnings call, Astra Space also mentioned that it had taken more than 100 orders for its Astra Spacecraft Engine, an electric propulsion system, and that it would lease a new facility to meet up the production demand. On 29th August, Astra unveiled it had **won a contract from Airbus OneWeb Satellites** to supply its Arrow satellites with electric propulsion systems, although the number of systems remained undisclosed.

D-Orbit and Astrocast sign multi-deployment contract



Credit: Astrocast

On August 9th, the Italian space tug start-up **D-Orbit signed a three-year multi-deployment deal with Astrocast**, a Swiss IoT nanosatellite company. Accordingly, D-Orbit will use its orbital transfer vehicle (OTV) ION Satellite Carrier to deploy 20 of Astrocast's satellites over a period of three years and multiple missions. The first launch is scheduled to occur no sooner than November 2022 aboard a SpaceX Falcon 9, to carry a batch of four 3U satellites, which will then be carried to the desired orbit by D-Orbit's OTV. In 2023 six 6U satellites are scheduled to be

deployed and in the following year ten 6U.



Spaceflight signs agreement with SAB-LS to fly Sherpa aboard Vega C rockets

The U.S.-based launch services and mission management provider **reached an agreement** with the Italian launch broker SAB Launch Services (SAB-LS) to fly its Sherpa orbital transfer vehicles (OTVs) aboard the Vega-C rocket, managed by Arianespace. SAB-LS CEO Marco Mariani stated that Spaceflight is a strategic partner that helps its company access the U.S. market. Spaceflight's CEO Curt Blake mentioned that the deal further builds upon the existing relationship and expands the portfolio of Sherpa vehicles' launch partners.



Credit: ESA

Northrop Grumman and Firefly Aerospace partner to develop Antares rocket

The U.S.-based companies established a **partnership to develop a fully American-made version of the Antares rocket** named Antares 330, to serve the Cygnus space station commercial resupply services. The Antares 330 will have seven Miranda engines produced by Firefly as well as leverage its composites technology, while Northrop Grumman will contribute with avionics, software, upper-stage structures and its Castor 30XL motor.

Orbital Reef space station completes System Definition Review

On August 22nd, Sierra Space, one of the parties developing the Orbital Reef space station in conjunction with Blue Origin, stated that the **Orbital Reef space station passed the System Definition Review** (SDR). The SDR is a programme to demonstrate to NASA the feasibility and viability of its space station, necessary to have NASA's further support in the development of the system architecture and design. The system review was conducted per the requirements of the \$130M Space Act CLD award, which Orbital Reef received in December 2021.

Blue Canyon Technologies wins its largest constellation order to date

On August 9th, the satellite manufacturer Blue Canyon Technologies, a subsidiary of Raytheon Technologies, **signed a contract with the weather satellite company Tomorrow.io**. Under the agreement, Blue Canyon will provide products, such as cubesat buses, and services, such as payload integration, space vehicle testing and pre-launch operations services, for 18 cubesats. Tomorrow.io stated it chose Blue Canyon due to its experience in delivering a small-sat to orbit with the TROPICS mission.

Orbit Fab plans to offer in-space refuelling service in 2025



Credit: ESA

The U.S.-based start-up Orbit Fab **announced it will start an in-orbit hydrazine fuel refuelling service in GEO** in 2025. The service will cost \$20M for 100kg of hydrazine and will consist of a depot and a fuel shuttle spacecraft. The initial service will be limited to a depot, located 300km above GEO, between the active belt of GEO satellites and the graveyard orbit, to where servicing vehicles can travel for self-service refuelling. Additionally, Orbit Fab is also developing a shuttle to transport fuel to the satellites servicing vehicles such as Astroscale and Northrop Grumman.



In other news

RocketLab provides solar power units to U.S. Space Force: The U.S.-based launch provider will provide solar cells and radiation-hardened assemblies for three GEO Next-Generation Overhead Persistent Infrared satellites, which Lockheed Martin is building for the Space Force.

Intelsat and OneWeb partner for multi-orbit connectivity services for airlines: Intelsat will distribute OneWeb's LEO satellite services to airlines, to result in a multi-orbit solution for the aviation sector, leveraging the benefits of both networks, which is expected to be in service by 2024.

LuxSpace and Momentus sign payload agreement: In 2023, Luxembourg-based LuxSpace will fly its Triton-X platform for small LEO satellites aboard the Vigoride Orbital Transfer Vehicle of the U.S.-based company Momentus in an on-orbit demonstration mission of key Triton-X subsystems and other technologies.

Intelsat lost control of its Galaxy 15 broadcast satellite: Intelsat will distribute OneWeb's LEO satellite services to airlines worldwide in a multi-orbit solution for the aviation community, leveraging the benefits of both networks, which is expected to be in service by 2024.

The U.S. appeals court upholds Starlink plan to deploy 2.824 satellites in LEO: SpaceX's competitor Viasat Inc. valued the decision of the Court as a setback for space safety and environmental protection.

BlackSky and Airbus sign reseller agreement to expands BlackSky's dynamic monitoring capabilities: The reseller agreement enables BlackSky to expand its AI monitoring platform's all-weather, day and night, with Airbus range of 23 different tasking and archive imagery products.

Capella unveils a new generation of SAR satellites "Acadia": the new SAR satellites generation is scheduled to launch in early 2023. While the number of satellites being launched is still unknown, Capella revealed an increase in radar bandwidth from 500 to 700 megahertz and power by more than 40%.

DHV Technology signs agreement with UARX Space for the provision of solar panels and power units for 7 years: the agreed provision includes DHV of Solar Panels, SADA, PCDU, and batteries for UARX Space's OSSIE Spacecraft and collaboration with R&D&I projects.

Starlink hacked by Belgian researcher: Lennert Wouters hacked the Starlink internet system by stripping down a Starlink user terminal dish and attaching a \$25 modchip to launch a fault injection attack, which helped bypass the system's security protections. In response, Starlink stated it will issue a public update, but declined to disclose any further details.



ECONOMY & BUSINESS

D-Orbit terminates merger



Credit: D-Orbit

On August 12th, the Italy-based space logistics company D-Orbit and the SPAC Breeze Holdings Acquisition Corp. **agreed on the termination of the planned merger**. The CEO of Breeze Holdings, Douglas Ramsey, stated that "The financial markets have changed substantially, and we believe that terminating our merger is in the best interest of both D-Orbit and Breeze shareholders", mentioning particularly the rising interest rates and inflation and the war in Ukraine.

The SPAC was set to raise \$185M, which D-Orbit was going to invest in the expansion of the staff and increase the funding of its orbital transfer vehicle ION Satellite Carrier. The company's CEO, Luca Rossetini, mentioned that the company's growth trajectory did not change despite the changing market conditions.

SES completes acquisition of DRS Global Enterprise Solutions for \$450M

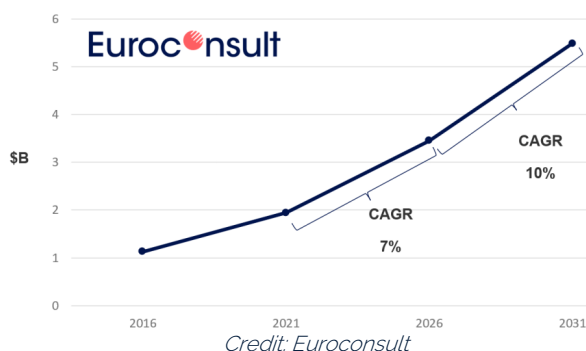
On August 1st, the Luxembourg-based SES and its U.S. subsidiary SES Government Solutions (SES GS) **confirmed the acquisition of DRS Global Enterprise Solutions** (GES), from the U.S.-based Leonardo DRS for \$450M. The deal, previously announced in March 2022, was awaiting the necessary regulatory authorisations. GES will now be combined with SES GS to scale the companies' multi-orbit satellite communications solutions focusing on the needs of the U.S. Government.

Euroconsult releases new report on In-Flight Connectivity

On August 16th, the consulting firm released its report on the **"Prospects of In-Flight Entertainment & Connectivity"**.

Overall, Euroconsult estimates that although the industry is still affected by the COVID-19 pandemic, with numbers below 2019, in 2021 the number of commercial aircraft connected to in-flight connectivity (IFC) services grew 10% in comparison to the previous year, totalling 9,900 planes.

Moreover, Euroconsult states that the mergers and acquisitions stemming from the pandemic left the industry with companies in a favourable position to sign new contracts. Accordingly, 1,500 new aircraft were signed on to be equipped with IFC capabilities during 2021. Therefore, the report presents a positive outlook up to 2031, expecting the number of aircraft using these services to double in the next decade to 21,000, driven by an increase in consumer demand and greater bandwidth availability.





Hispasat concludes acquisition of Axess Networks for \$124M



Credit: Hispasat

On August 9th, the Spanish companies **obtained all necessary regulatory approvals to conclude the \$124M deal**, first announced in March 2022. Of the total paid by the GEO operator Hispasat, \$95.4M were paid for 100% of Axess Networks shares, \$24M for debts and \$4.5M for minority shareholdings in its Chilean subsidiary. With the acquisition of Axess, a telecommunications company focused on satellite services and solutions, Hispasat plans to upgrade its position in the value chain of satellite-managed services, particularly in emerging markets such as Latin America.

Space in Africa releases African Space Industry Annual Report

The **report published by Space in Africa**, states that the African space industry was valued at \$19.5B at the end of 2021 and estimates the African space industry will grow by 16.16% to reach a valuation of \$22.6B in 2026.

About the fabric of the African space industry, the report mentions that it is currently dominated by the global navigation satellite system (GNSS) and satellite TV companies. Nevertheless, it also notes an increasing demand for smaller satellites from the larger GEO satellites. So far, 13 African nations have manufactured 48 satellites, and there are presently 272 New Space companies on the continent.

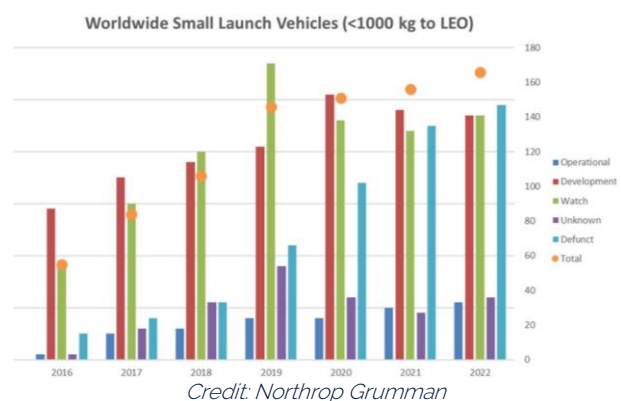
Investments from African governments into their space programmes saw consistent growth from 289.3M in 2019 to 534.9M in 2022. The report also found that the biggest employer is the public sector, which employs around 11.000 out of the 19.000 of the workforce in the African space industry.

Northrop Grumman survey points to slow down of small launch industry

On August 4th, Northrop Grumman **released the 2022 edition of its annual industry survey**, this year titled "A Small Launch per Month?". The report now includes 166 launch vehicle projects, a number higher than its previous iteration in 2015, which counted with only 31.

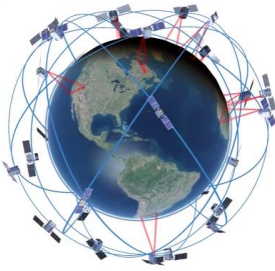
Nevertheless, overall, the document notes that the growth of small launch vehicles (that is, commercially available launch vehicles with a maximum capacity of carrying 1000kg to LEO) has been slowing down, having peaked between 2015-2019.

Accordingly, on the one hand, the number of planned small launch systems and organisations involved in such projects has gone down. On the other hand, the number of cancelled projects has gone up due to a plethora of different reasons, including technical and financial.





Muon Space secures \$25M in Series A



Credit: Muon Space

On August 9th, the satellite intelligence company Muon Space **secured \$25M in a Series A funding round** led by Radical Ventures. The company will use the funding to help deploy satellite constellations companies who want to use Earth data collection from space to optimise their business, namely by designing the sensors, the bus, navigation and telemetry systems and the downlink and ground infrastructure. Muon Space claims this solution is less costly and better suited for these companies than buying satellite imagery of existing earth observation companies or building their satellite and putting it into orbit on their own.

Atlas Space Operations closes \$26M Series B funding round

On August 25th, the U.S.-based ground software-as-a-service (G-SaaS) communications provider Atlas Space Operations unveiled it had **closed a \$26M Series B funding round** led by Mitsui & Co. With the investment, the company will accelerate its international growth, increase its market share, and expand its team to provide G-SaaS solutions to the U.S. Department of Defence's Hybrid Space Architecture.

LiveEO raises €19M in Series B

On August 5th, the German start-up **LiveEO secured €19M in a Series B round of investment** led by MMC Ventures, with participation from the European Commission and Investitionsbank Berlin. The Earth observation company will use the proceeds to accelerate the global market expansion for its core product, which is a solution to monitor infrastructures, such as railways and power lines, through the analysis of Earth observation data. Moreover, the company will also use the investment to fund its entry into the insurance sector.

Slingshot Aerospace acquires two companies

On August 3rd, the U.S.-based company dedicated to space simulation and analytics solutions **acquired** Numerica's Space Domain Awareness (SDA) division and the UK-based space data analysis company Seradata. The mergers, of an undisclosed amount, already obtained the necessary regulatory approvals and are set to increase the quality of its data and the insights it can provide to its clients. In particular, the merger with SDA means that Slingshot now owns its network of ground-based telescopes, while Seradata will both provide its SpaceTrak satellite and launch database and serve as an entry for the UK and European markets.

Xona Space Systems raises approx. \$15M

On August 3rd, Xona Space systems, a U.S.-based start-up dedicated to building a navigation constellation in LEO named "Pulsar" **raised approx. \$15M**. The funding round was led by First Spark Ventures and had the participation of Lockheed Martin Ventures. Xona Space Systems will use the funds to expand its team. The company is expected to deploy its second satellite prototype "Muginn" early next year and stated that the first, named "Huginn", launched in May this year has so far been working as planned.



Credit: Xona Space Systems



Yun Yao Yuhang closes \$14.8M funding round



The Chinese-based company Yun Yao Yuhang focused on weather and earthquake forecasting **raised \$14.8M in an early stage funding round** led by Zhongwei Yihe Investment. To that end, the company plans to fly its GNSS occultation and GNSS reflectometry payloads aboard 80 satellites of other companies. Yun Yao Yuhang already has several payloads in orbit, such as the Baoyun satellite launched in December 2021 and operated by Changguang Satellite Technology, a remote sensing satellite company.

SpaceData raises \$10.2M in seed round

The Japan-based company **SpaceData raised \$10.2M in a seed round** to develop a virtual replica of the Earth, a technology known as a digital twin. The company plans to use artificial intelligence to process satellite imagery and create a digital twin of Earth. The funding round had the participation of Spiral Capital, Sparx Innovation for Future, and KDDI Open Innovation Fund, among other venture capital funds and angel investors.

Astraea secures \$6.5M in a Series A funding round

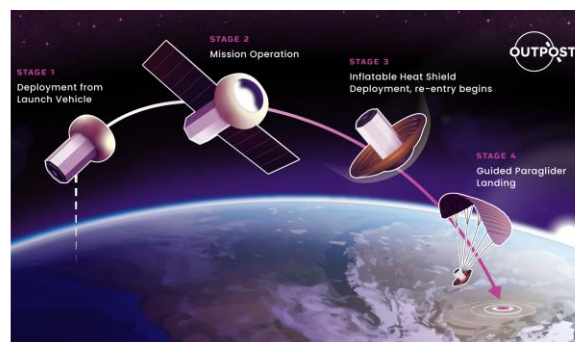
The U.S.-based start-up dedicated to satellite intelligence **secured \$6.5M in a Series A funding round** led by Aligned Climate Capital and Carbon Drawdown Collective. The investment will be used to support its business development, hire data scientists and expand commercial partnerships with satellite data providers.

Antarctica Capital acquires Descartes Labs

On August 4th, the U.S.-based private equity firm **Antarctica Capital stated it had acquired the American company Descartes Labs** for an undisclosed amount. With the transaction, the private equity firm's partners Richard Davis will serve as CEO and Graeme Shaw as COO of Descartes Labs. Antarctica Capital further stated that it is committed to maintaining Descartes' current business with the necessary capital and expertise.

Outpost Technologies secures \$7.1M in seed round

On August 30th, the U.S.-based start-up **Outpost Technologies secured \$7.1M in a seed round** led by Moonshots capital. The company states it developed a new two-stage re-entry system for satellites to return to Earth with precision landing, thus enabling operators to re-use them. Outpost de-orbiting system consists of a 200kg platform capable of carrying customer payloads to and from space. It has been developed considering that the number of satellites to be deorbited and consumed in the Earth's atmosphere will grow in the coming years, especially due to mega-constellations, and the company's solution would save resources.



Credit: Outpost Technologies



In other news

Astra Space enters into a \$100M committed equity facility: The U.S.-based launch service provider entered into a committed equity facility with B.Riley Principal Capital II to sell and issue up to \$100M of its Class A common stock over the course of 2 years.

Lockheed Martin increases its venture fund size to \$400M: Lockheed Martin revealed it is doubling the size of its venture capital fund from \$200M to \$400M. With the increase in capital, the company stated that it will be able to expand its fund's portfolio, which is dedicated to technology start-ups and already invested in companies related to space services.

Antaris raises \$4.2M in seed round: The U.S.-based space software company Antaris raised \$4.2M in a seed round led by Acequia Capital and Possible Ventures. The investment will be used to expand the workforce and accelerate the development of its platform Antaris Open Space.

Satixfy valuation lowered amid SPAC merger: Endurance Acquisition Corp. amended its merger with the Israel-based producer of satellite communication components Satixfy, lowering the valuation of the latter by 27%, from \$500M to \$365M.

The UK Space Agency releases the Space Accelerator Impact Report: The Report measures the effects of the Space Accelerator Impact programme. Between 2020 and 2022 programme, organised in partnership with Entrepreneurial Spark, was awarded approx. €437k by the UK Space Agency, with which it catalyzed approx. €10.1M in investments in 88 businesses and created 80 jobs.

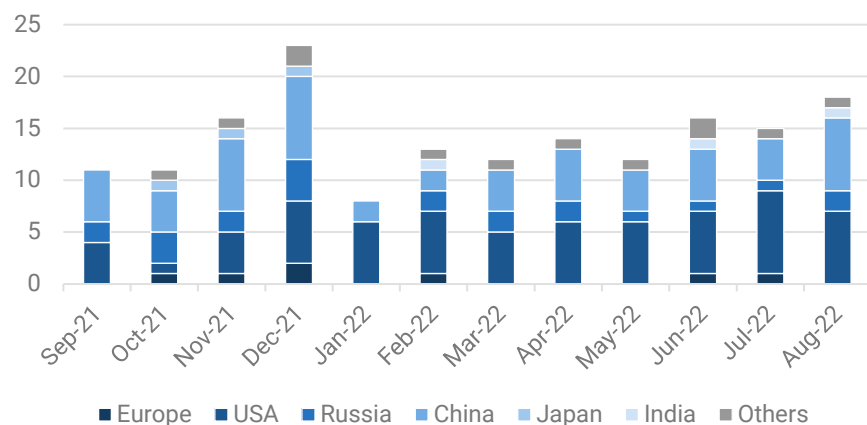


LAUNCHES & SATELLITES

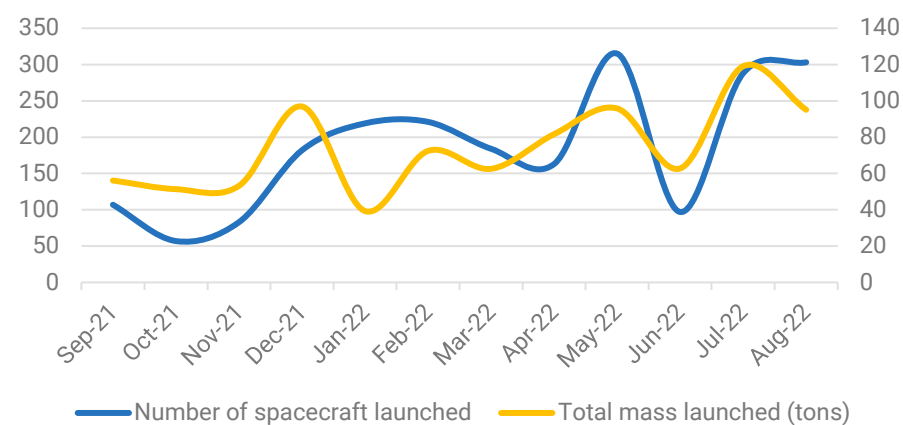
Global space activity statistics

August 2022	USA	Russia	China	India	Others	Total
Number of launches	7	2	7	1	1	18
Number of spacecraft launched	253	18	29	2	1	303
Mass launched (in kg)	79 223	1905	13 782	150	80	95 140

Launch activity over the year



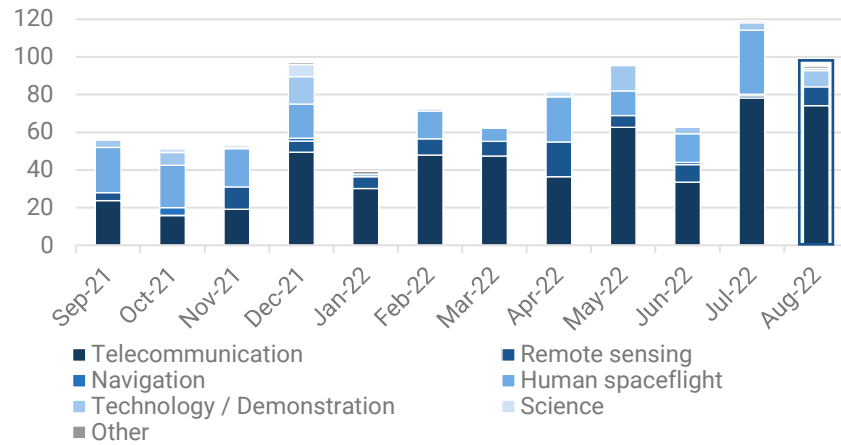
Evolution of the number of launches per launch country



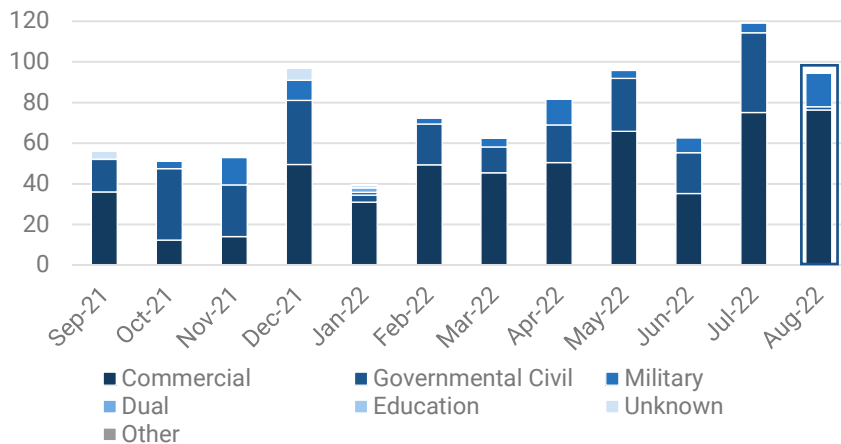
Evolution of launch activity over the year 2021-2022



Satellite missions and markets



Evolution of the total mass launched (tons) per mission (Sep. 2021-Aug. 2022)



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

August 2022	Telecom	Remote sensing	Technology/ Demonstration	Science	Other
USA	74 045	4580			
Russia	9.1	13.1	17.6	15	1200
China	45	3062	8625	500	50
India		142	8		
Others		2150		678	

Total mass (kg) launched by mission and customer country

August 2022	Commercial	Governmental Civil	Military	Dual	Education
USA	74 045		4580		
Russia			1200		54.8
China	882	600	10 750		50
India		142			8
Others	1500	678		650	

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
01/08/2022	Russia	Soyuz-2-1v Volga	Kosmos 2558	Ministry of Defense	Russia	Unknown (Russia)	Russia	1200	Other	Military
04/08/2022	USA	Falcon-9 v1.2 (Block 5)	KPLO / Danuri	Korea Aerospace Research Institute	South Korea	Korea Aerospace Research Institute	South Korea	678	Planetary Science	Governmental Civil
04/08/2022	USA	Atlas-5(421)	SBIRS-GEO 6	US Space Force	USA	Lockheed Martin	USA	4500	Early Warning	Military
04/08/2022	China	CZ-2F/T	Chongfu Shiyong Shiyang Hangtian Qi 2 / CSSHQ 2	People's Liberation Army	China	CAST	China	8500	Tech / Demo	Military
04/08/2022	New Zealand	Electron KS	USA 335	NRO	USA	NRO	USA	80	EO	Military
04/08/2022	China	CZ-4B	HEAD 2G	HEAD Aerospace	China	SAST	China	45	AIS	Commercial
			Minhang Shaonian	Unknown (China, Public)	China	SAST	China	50	Unknown	Education
			TECIS / Guomang	China National Forestry and Grassland Administration	China	CAST	China	500	Earth Science	Governmental Civil
07/08/2022	India	SSLV	AzaadiSAT	Space Kidz India	India	Space Kidz India	India	8	Tech / Demo	Education
			Microsat 2A / EOS 02	ISRO	India	ISRO	India	142	EO	Governmental Civil
09/08/2022	Russia	Soyuz-2-1b Fregat	CubeSX-HSE 2	HSE University	Russia	SPUTNIX	Russia	3.4	AIS	Education
09/08/2022	Russia	Soyuz-2-1b Fregat	CYCLOPS	Tyumen State University	Russia	SPUTNIX	Russia	3	Tech / Demo	Education
			Geoscan-Edelweis	GK Geoscan	Russia	GK Geoscan	Russia	2.9	Tech / Demo	Education
			ISOI	ISOI RAS	Russia	SPUTNIX	Russia	3.5	EO	Education
			KAI 1	Kazan National Technical University	Russia	NILAKT DOSAAF	Russia	3.6	EO	Education
			Khayyam 1	Iran Space Agency	Iran	VNIEM	Russia	650	EO	Dual
			Kuzbass-300	Kuzbass State Technical University	Russia	SPUTNIX	Russia	3	EO	Education
			MIET-AIS	Moscow Institute of Electronic Technology	Russia	SPUTNIX	Russia	3.4	AIS	Education
			Monitor 1	Moscow State University	Russia	SPUTNIX	Russia	2.8	Space Science	Education
			Polytech Universe (1 & 2)	Peter the Great St. Petersburg Polytechnic University	Russia	Peter the Great St. Petersburg Polytechnic University	Russia	4.5 (each)	Earth Science	Education



Launches & Satellites

			ReshUCube	Siberian State University of Science and Technology	Russia	SPUTNIX	Russia	3.4	Tech / Demo	Education
			Siren / LILAC	Belgorod State University	Russia	SPUTNIX	Russia	3.2	Biology	Education
			Skoltech B1	Skolkovo Institute of Science and Technology	Russia	Skolkovo Institute of Science and Technology	Russia	4.2	Tech / Demo	Education
			Skoltech B2	Skolkovo Institute of Science and Technology	Russia	Skolkovo Institute of Science and Technology	Russia	4.1	Tech / Demo	Education
			UTMN	Tyumen State University	Russia	SPUTNIX	Russia	3	EO	Education
			Vizard SS1	NIS LLC	Russia	SPUTNIX	Russia	2.3	Telecom	Education
09/08/2022	China	Ceres-1	Donghai 1	Shanghai ASES Spaceflight Technology	China	Shanghai ASES Spaceflight Technology	China	25	Tech / Demo	Commercial
			Taijing-1 (01 & 02)	MinoSpace Technology	China	MinoSpace Technology	China	70 (each)	EO	Commercial
10/08/2022	USA	Falcon-9 v1.2 (Block 5)	Starlink (52 satellites)	SpaceX	USA	SpaceX	USA	295 (each)	Telecom	Commercial
10/08/2022	China	CZ-6	Jilin-1 Gaofen-03D (10 satellites)	Chang Guang Satellite Technology Co.	China	Chang Guang Satellite Technology Co.	China	42 (each)	EO	Commercial
			Jilin-1 Hongwai-A (6 satellites)	Chang Guang Satellite Technology Co.	China	Chang Guang Satellite Technology Co.	China	42 (each)	EO	Commercial
12/08/2022	USA	Falcon-9 v1.2 (Block 5)	Starlink (46 satellites)	SpaceX	USA	SpaceX	USA	295 (each)	Telecom	Commercial
19/08/2022	USA	Falcon-9 v1.2 (Block 5)	Starlink (53 satellites)	SpaceX	USA	SpaceX	USA	295 (each)	Telecom	Commercial
19/08/2022	China	CZ-2D(2)	Yaogan 35-04 (A, B & C)	People's Liberation Army	China	DFH Satellite Co.	China	750 (each)	EO	Military
23/08/2022	China	Kuaizhou-1A	CX 16 (A & B)	CAS	China	CAS	China	50 (each)	Tech / Demo	Governmental Civil
24/08/2022	China	CZ-2D(2)	Beijing 3B / Nanning 1	21AT	Singapore	CAST	China	1500	EO	Commercial
28/08/2022	USA	Falcon-9 v1.2 (Block 5)	Starlink (54 satellites)	SpaceX	USA	SpaceX	USA	295 (each)	Telecom	Commercial
31/08/2022	USA	Falcon-9 v1.2 (Block 5)	Starlink (46 satellites)	SpaceX	USA	SpaceX	USA	295 (each)	Telecom	Commercial



Launch Highlights

South Korea initiates its Moon programme

On August 4th, SpaceX launched Danuri (also called the Korean Pathfinder Lunar Orbiter) for the Korea Aerospace Research Institute (KARI). Danuri is the **first mission of the country to the Moon** and the first step towards a more ambitious Moon exploration programme. It carries four Korean payloads, aiming at providing data on the Moon surface and at helping the preparation of future human missions, as well as an ultrasensitive camera developed by NASA (ShadowCam), which will look into the permanently shadowed areas of the Moon, in particular to assess the presence of water. Beyond this payload, NASA also supported KARI in the development of the mission.



Credit: KARI



Credit: ISRO

The first launch of India's SSLV fails

On August 7th, ISRO launched the first iteration of a new rocket, the **Small Satellite Launch Vehicle (SSLV)**. SSLV is a three-stage vehicle able to place up to 500 kg in LEO. The rocket was carrying two satellites, EOS-2, an Earth observation satellite dedicated to civilian applications, and AzaadiSAT, a CubeSat built by Indian students. However, the launch failed due to a **computer issue** with the injection module, which deployed the two payloads in an unintended orbit, then leading to their destruction in the atmosphere. According to ISRO leadership, all other phases of the launch went smoothly, and a quick return to flight is expected for the rocket.

China launches a secret spaceplane for the second time

On August 4th, a Long March 2F **launched** a Chinese Reusable Experimental Spacecraft for the second time. This spacecraft is a secretive spaceplane, which is thought to be similar to the X37-B developed by Boeing for the U.S. Space Force and belongs to a broader programme also including suborbital launches. The plane, which is being used to validate reusable and in-orbit servicing technologies, and had not yet returned to Earth by the end of the month. In September 2020, a first launch of a spaceplane had taken place but the spacecraft stayed in orbit for only two days.



Credit: SpaceNews



Credit: Roscosmos

Russia launches a satellite for Iran

On August 9th, Russia launched a Soyuz rocket carrying several satellites from Russian universities as well as one satellite built for the Islamic Republic of Iran, **Khayyam**. Some U.S. observers **worried** that the satellite could be used to provide intelligence capabilities to Russia for its war in Ukraine, but Iran denied these claims, asserting that it gained full control of the satellite from day one. The country said that Khayyam is designed for scientific research including radiation and environmental monitoring for agricultural purposes, although Western security services emphasised its military capabilities. Iran plans to order three more Khayyam-like satellites from Russia.

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