



ESPI

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U.S. ASAT TEST BAN PUSHING NORMS OF RESPONSIBLE BEHAVIOURS?



Dear Friends of ESPI,

On April 18th, U.S. Vice President Kamala Harris declared that the **U.S. will no longer conduct destructive, direct-ascent anti-satellite (ASAT) missile tests**. This self-imposed ban for this specific type of ASAT test aims to push ongoing efforts to create a shared understanding and develop norms for responsible behaviour. It also aims to advance the interests of the U.S. in maintaining its freedom of access and use of space by leading the development of new measures for long-term space sustainability. Harris called on all nations to join the U.S. in this commitment.

From May 9th to 13th 2022, the newly created UN Open-Ended Working Group (OEWG) on reducing space threats will meet for the first time. The OEWG was established as a result of the **2021 UNGA resolution 76/231** and aims to develop norms of responsible behaviour in space to preserve stability and security in space (**ESPI Executive Brief 54**). The resolution was a UK-US-led initiative, initiated and sponsored by the U.K. and co-sponsored and backed by the U.S. In preparation of the first session, the OEWG called for contributions to support their work – an opportunity that ESPI took to share ideas in a **contribution paper**.

Russia's military invasion in Ukraine as well as Russia's ASAT test in November broadly **condemned as irresponsible**, put space security even more into the spotlights and security agendas and will push efforts on establishing norms of responsible behaviour.

The ASAT test ban and the work of the OEWG address two dimensions: firstly, - and predominantly - a military dimension (space security) as it pursues the objective to preserve stability and prevent space from becoming a warfighting domain, and indirectly, a civilian dimension (space safety and sustainability) as it contributes to mitigate space debris - which result from ASAT tests.

In addition, two recently published reports based on open-source information, namely the SWF's 2022 edition of the **"Global Counterspace Capabilities: An Open Source Assessment"** and the CSIS report **"Space Threat Assessment 2022"**, **warn that the arms race in space keeps accelerating**. The SWF report details the counterspace capabilities of the U.S., Russia, China, India, Australia, France, Iran, Japan, North Korea, South Korea and the U.K while the CSIS report focuses on the developments of counterspace weapons, threatening U.S. national security interests in space.

The U.S.' ASAT test ban, received strong support from several western countries and is expected to push efforts in international discussions. Through this self-imposed ban, the U.S. aims to lead by example expecting that other countries may join the U.S. in this commitment. China responded with a skeptical reaction, **labelling this initiative "hypocritical practice"**, while **Russia values the U.S. initiative as a good step in the right direction** – though both recalled that the U.S. was the first country to conduct an ASAT test and called on the U.S. to constructively negotiate the **joint initiative** for a treaty banning the placement of weapons in space, which Russia and China have been trying to push forward since 2008.

Questions are to be raised on how European member States and EU will position themselves, taking into account the European support for the work of the OEWG and the EU's ill-fated Code of Conduct for outer space activities initiative. Further it raises the question whether Europe joins the U.S. initiative, and how it might attract other non-European countries to follow suit.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'JJ Tortora', written in a cursive style.

Jean-Jacques Tortora

Director of ESPI



POLICY & PROGRAMMES

ESA re-evaluates cooperation with Russia



Credit: ESA

On April 13th, ESA announced the end of its cooperation with Roscosmos on the Luna missions, a series of robotic lunar expeditions.

The decision came as a **result of a comprehensive review under the initiative of ESA DG Josef Aschbacher** to assess the “new geopolitical context for ESA programmes and activities and to create a more resilient and robust space infrastructure for Europe”. The decision came after the Agency decided to suspend all operations with Roscosmos, including ExoMars.

Besides the end of cooperation with Russia on the Luna 25, 26 and 27 missions, the following are some of the effects in specific programmes of the Agency:

- The PILOT precision landing and hazard avoidance technology originally to be used in Luna-25 and -27 will be redirected to European Lunar exploration activities such as the European Large Logistic Lander (EL3).
- ESA requested Roscosmos to return Pilot-D, an experimental navigation camera to be used in Luna-25, originally scheduled to launch this August, adding that it is not part of the operational spacecraft system, bearing no influence on Russia’s ability to conduct the mission. The Agency is currently procuring a commercial service provider as an alternative to test the camera and expects to integrate it into lunar exploration activities, such as the European large Logistic lander (EL3).
- ESA was expected to develop Prospect, which consists of an analysis package and a lunar drill, to be integrated into Luna-27. Now the Prospect will be flown onboard NASA’s Commercial Lunar Payload Services mission.
- The Exospheric Mass Spectrometer, previously scheduled to study water ice on board the Luna-27 lander, will now be integrated into the JAXA/ISRO LUPEX lunar rover mission after ESA and JAXA signed an agreement on the 5th of April.

Moreover, regarding cooperation with the Ukrainian company Yuzhmash, which provides engines for the Vega rocket, **ESA stated that it has enough engines to meet its demands until 2023**, while a replacement should be contracted by 2026. Between 2023 and 2026 ESA will find a provisional gap-filler engine on the global market.

In response to ESA’s decision, **Russian President Vladimir Putin declared that Russia will have its own lunar program**. Moreover, **Putin stated that Russia will deepen its space cooperation with Belarus** and that Roscosmos will train a Belarusian to fly aboard a Russian spacecraft.

Furthermore, on the occasion of the Space Exploration Day celebrated in China on April 24th, the Russian Ambassador to China, Andrey Denisov, stated in a congratulations message sent to the Head of CNSA, Zhang Kejian, that Russia **“will constantly assume efforts to contribute more to the promotion of joint space exploration projects”**.



The European Investment Fund launches the CASSINI Space Investment Facility

The European Investment Fund (EIF) launched the CASSINI Space Investment Facility and calls on fund managers to **get in touch for further information** if they would like to raise a new fund. The €1B CASSINI facility programme will support risk capital investments over a period of six years (application deadline June 30th 2027) in companies of the space or space-related sector. The “Annex II – Term sheet Growth, Innovation, Impact” (p. 8) describes the facility’s frame as well as the terms and eligibility of the intermediaries and recipients. The CASSINI initiative comprises measures for space start-ups and SMEs, including Hackathons and Mentoring, Seed and Growth Funding Facility, matchmakings, Business Accelerator, myEUspace Competition and prizes.

The launch of the facility **was signed in a joint statement** and kicked-off by European Commissioner for Internal Market Thierry Breton, Vice-President of the European Investment Bank Kris Peeters and Chief Executive of the European Investment Fund Alain Godard on January 25th.

France’s Conseil d’Etat court withdraws Starlink’s spectrum licenses



Credit: Council of State

The Conseil d’Etat court, the highest administrative court of France, **withdrew the decision to approve two radio frequency bands to Starlink** – a license that Starlink received in February 2021 to provide internet access from France’s Arcep regulator.

The withdrawal was due to Arcep having awarded Starlink the license without conducting a public consultation in advance. The court expressed monopolisation concerns, due to SpaceX’s business nature and to the size and scale of Starlink’s operations. In addition, two environmental activist groups, “Priartem” and “Agir Pour L’Environnement” who led the court’s revision and appealed against the license, arguing with impacts of megaconstellations on the environment. In addition, they called for stricter regulations on superconstellations to mitigate space debris risks.

The White House releases National Strategy for In-Space Servicing, Assembly, and Manufacturing

On April 4th, the White House’s Office of Science and Technology Policy (OSTP) **released the National Strategy for In-Space Servicing, Assembly, and Manufacturing (ISAM)**. The new federal strategy outlines how the United States will coordinate its agencies and collaborate with the private sector for ISAM capability development.

Accordingly, the strategy establishes six strategic goals: to advance ISAM R&D, to prioritize expanding scalable ISAM infrastructure, to accelerate the emerging ISAM commercial industry, to promote international cooperation, to prioritize environmental sustainability, to inspire future space workforce.

The strategy seeks to drive the involvement of multiple U.S. government agencies, from NASA to the U.S. Space Force. Ezinne Uzo-Okoro, assistant director for space policy at the OSTP, **stated that there will be a follow-up document on the implementation of the ISAM Strategy**, for which industry will provide its recommendations.



Credit: National Science and Technology Council



NASA awards \$278M in grants to support new Near-Earth communication services

NASA selected six American satellite communications (SATCOM) providers to support the development and demonstration of Near-Earth communications technology. The companies will receive a total of \$278.5M in the form of grants that NASA expects each company to match with internal funding.

- SpaceX will receive \$69.95M to continue the development of Starlink.
- Kuiper Government Solutions will receive \$67M to develop its optical LEO constellation.
- Viasat will receive \$53.3M to develop its GEO Ka-band network for spacecraft in LEO.
- Telesat will receive \$30.65M for its C-band and low Earth-orbiting Ka-band satellites.
- SES will receive \$28.96M to develop its GEO c-band and MEO Ka-band relay networks.
- Inmarsat will receive \$28.5M for its L-band satellite network in GEO.

NASA expects each company to have their services in place by 2025 and to sign multiple long-term contracts for services in near-earth operations by 2030. The Agency will also phase out its systems during this process, such as the Tracking and Data Relay Satellite (TDRS) constellation in GEO.

U.S. Space Command unveils new strategy to acquire commercial satellite services



The U.S. Space Command unveiled an unclassified outline of a new Commercial Integration Strategy to improve the cooperation with the private industry, including procurement of commercial capabilities in defined priority areas. These priority areas encompass satellite communication, space domain awareness command and control, AI and big data management, modelling and simulation and space control systems. The strategy was submitted to the U.S. DoD. Details of the plan remain classified.

Credit: U.S. Space Command The strategy outlines three pillars (“ways”) to reach the “strategic end state”:

- First Pillar: Meeting needs with off-the-shelf technology products to obtain and update capabilities quickly in the defined priority areas.
- Second Pillar: Leveraging mechanisms like “integration as-a-service” contracts and leases in order to complement traditional procurements in the defined priority areas.
- Third Pillar: Establishing partnerships with the commercial sector in order to obtain expertise “in ways that are more relational as opposed to purely transactional”.

Additionally, Rand Corporation released its **Commercial Space Capabilities and Market Overview** report analysing the relationship between the growth of the commercial space industry and the U.S. DoD. Overall, the report noted a changing environment and growth of the commercial space industry potentiated by the entrance of new market players. The report further outlined the development of a growing number of small heavy launch vehicle players and the increasing usage of high-throughput satellites in LEO by the SATCOM sector. Moreover, it emphasised the growing diversification of the satellite constellations in their sensors and analytic products. Rand Corporation also underlined how some new space sectors will serve commercial space operators, while others will have government customers as their main customer base.

Therefore, considering that all space sectors faced significant changes in the last five years, it is recommended that the DoD and other stakeholders, such as the U.S. Space Command, keep their information updated, particularly on developments in technology and commercial viability.



April sees European efforts on space safety and sustainability

April marked a month of European efforts in space safety and sustainability with a new space safety center and two reports published:

- ESA DG Josef Aschbacher **inaugurated a new Space Safety Center at the ESOC Mission Control Center** which aims to monitor space weather, to support the provision of space weather warnings and to exploit data acquired by ESA's space safety missions Vigil, Hera and ClearSpace-1.
- ESA published the **ESA Space Environment Report 2022**.
- ESPI published a new report on **Space Environment Capacity** and in this occasion held the public online event **"Limited Orbital Environments: Capacity Approaches to Outer Space"**. effort
- The Space Sustainability Rating developed by the WEF, ESA, the Massachusetts Institute of Technology, BryceTech and the University of Texas at Austin among others, will be **launched in June**.

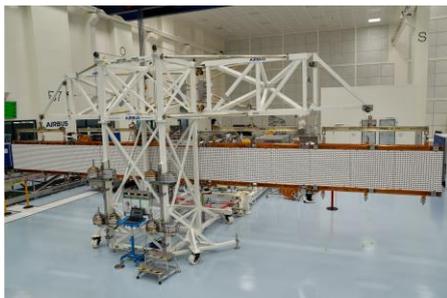


Credit: ESA

U.S. Space Command signs agreements with UK Space Command and Swedish Air Force

During the 37th Space Symposium, **the U.S. Space Command signed bilateral cooperation agreements with the UK Space Command and the Swedish Air Force**. The agreement between the U.S. and UK Space Commands is a MoU for Enhanced Space Cooperation, based on the 2021 Statement of Intent between the U.S. DoD and the UK MoD, aims to optimise resources as well as to increase assurance and resilience of missions, and includes information exchange, reconciling military space requirements and the identification of potential collaborations. In addition, US SPACECOM signed a SSA sharing agreement with the Swedish Air Force.

Arianespace wins contract to launch Sentinel-1C satellite on Vega-C



Credit: ESA

On behalf of the European Commission, **ESA awarded Arianespace a contract for the launch of the Copernicus satellite Sentinel-1C on Vega-C** in the sun-synchronous orbit, planned in the first half of 2023. The new Vega-C launcher has been upgraded for launching Sentinel-1C class satellites. Arianespace already launched the Copernicus satellites Sentinel-1A and -1B in 2014 and 2016. Sentinel-1C will enhance Sentinel-1A and -1B's capacity to provide monitoring for security and environment via radar systems.

UK Space Command signs £22M contract with Surrey Satellite Technology Ltd.

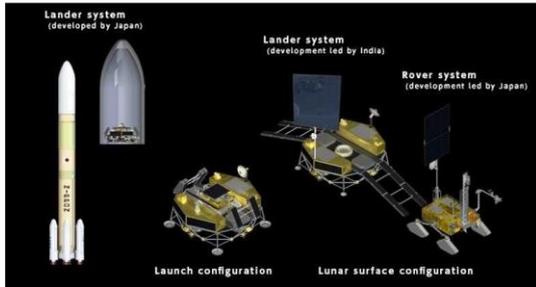
The UK Space Command signed a **£22M contract with Surrey Satellite Technology Ltd. (SSTL)** for a 150kg satellite based on SSTL's Carbonite+. In the frame of the TYCHE project as the first satellite procurement for the MINERVA programme, the Carbonite+ Satellite will be built over 3 years. TYCHE will be compatible with both horizontal and vertical launch vehicles and aims to understand security requirements and risks to identify further activities for improving the ISTARI ISR and to provide an analysis of the integration activities, testing environments and intersections.



China plans to install communications and navigation constellation around the Moon

According to the China National Space Administration (CNSA), **China plans to build a communications and navigation constellation around the Moon** to support future operations and missions, such as Chang'e-6 (sample return) and Chang'e-7 (search for water-ice). The first launches are scheduled for earliest 2023 or 2024. Reportedly, other countries are welcome for joining this programme to build the constellation.

ESA signs MoU with JAXA to provide an instrument for the rover of ISRO-JAXA LUPEX Mission



Credit: JAXA

ESA signed an MoU with JAXA to provide an instrument for the Japanese rover of the ISRO-JAXA Lunar Polar Exploration Mission (LUPEX), scheduled for 2024. The rover instrument will be used in the exploration of the south pole of the Moon. The mission will launch an Indian lander and a Japanese rover to the Moon. Beyond this, ESA and JAXA agreed on cooperation on over cross support in data acquisition, mission operations as well as space navigation.

U.S. Space Force and U.S. Space Command award L3Harris \$117M contract

The U.S. Space Force and the U.S. Space Command awarded a third-year option \$117M contract to L3Harris to continue modernising and maintaining the infrastructure to track objects in space. The company won the "Maintenance Of Space Situational Awareness Integrated Capabilities" (MOSSAIC) contract in February 2020 to upgrade radar and optical sensors as well as command and control systems. The MOSSAIC Program has a contract value of approx. \$1.2B over 10 years.

Australia will build a fleet of four Earth Observation satellites

The Australian government entered the first phase of its first national space mission, aiming to **build a fleet of 4 dual use Earth Observation satellites**, with a 2022-23 budget of \$1.16B until 2038-39 and then with \$38.5M per year ongoing. The mission is led by the Australian Space Agency in partnership with Geoscience Australia, CSIRO, the Bureau of Meteorology and Defence. **According to Melissa Price, Minister for Science and Technology**, the mission marks "the most significant investment ever made" in the civil space sector in Australia and lays "the foundation of industry know-how for more complex space missions next decade".

NASA and SpinLaunch sign Space Act Agreement to test Mass Accelerator Launch System

NASA and SpinLaunch signed a Space Act Agreement, establishing an institutional partnership through which SpinLaunch will develop, integrate NASA's payload and fly it on a developmental test flight later this year on SpinLaunch's A-33 Suborbital Mass Accelerator to test characteristics of its launch system. The testing aims to provide NASA with data and information for potential opportunities for commercial launch – which NASA and SpinLaunch will analyse.



In other news

The UN COPUOS Working Group on Space Resources reaches consensus on the 5-year working plan:

The plan includes collecting and analysing input from States, the private sector, and academia, as well as summarising, reporting, discussing and eventually agreeing by consensus on an international governing framework for the use and exploitation of space resources.

U.S. Commerce Department appointed a new director of the Office of Space Commerce (OSC):

Richard DalBello was appointed to the new position, substituting Kevin O’Connel. Previously, DalBello was working as vice president of global engagement at Virgin Galactic.

France signs an accession agreement with the SKA Observatory (SKAO) to join as a full member:

The signature marks the start of France’s national process of ratifying the Convention. The international accession instrument resulting from this process will be deposited at the British government’s Foreign, Commonwealth and Development Office for the membership process’ formal completion.

The U.S. and India signed a Space Situational Awareness Agreement:

The agreement which is the outcome of a five-year process was signed during the U.S.-India 2+2 Ministerial Dialogue in Washington on April 11th and aims to strengthen space and cyberspace cooperation, implying to expand joint cyber training and to launch a Defence Artificial Intelligence Dialogue.

Atos and OHB will develop a Space Situational Awareness Center for the German Armed Forces:

The German Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support awarded Atos and OHB a contract to supply the “Space Situational Awareness Center Expansion Stage 1” and support the German Armed Forces in the development of a SSA system.

The UK ordered the first defence satellite for the Minerva programme:

Surrey Satellite Technology Ltd. will build the satellite in the frame of a 3-year £22M contract.

DLR and JAXA extend cooperation by adopting an extended framework agreement “Inter-Agency Arrangement for Strategic Partnership”:

Both parties signed the agreement during the 37th Space Symposium to strengthen cooperation in R&D and to promote industry cooperation in aerospace.

European Commission and EUSST launches the EU Industry and Start-ups Forum on STM (EUISF):

The inaugural event of the EUISF took place on April 26th. The forum aims to support the innovation and competitiveness of the European commercial SSA sector.

U.S. Naval Information Warfare Center Pacific awarded Northrop Grumman \$99.6M 5-year contract:

Northrop Grumman will develop the Relay Ground Station-Asia (RGS-A) - the first one of the Next-Generation Relay Ground Stations - to support missile-launch and missile-warning detection satellites.

ESA signs an agreement with OVHcloud to provide a free cloud service package to start-ups:

The service package offering a range of benefits is available to start-ups that have granted a contract as part of ESA Φ-lab, ESA InCubed, ESA BICs or ESA Spark Funding from an ESA Technology Broker.

ESA awards a contract to AAC Hyperion to develop small satellites onboard AI capability with NLR:

ESA will provide project funding of €410.000 through its GSTP. The AI onboard use for small satellites aims to enable increased use of payloads in EO and for climate monitoring and to optimise data links and upgrading constellation control and navigation.



INDUSTRY & INNOVATION

Amazon's record launch contracts cause ripple effects in space industry

On April 5th, Amazon signed three contracts with three separate rocket companies (Arianespace, Blue Origin and United Launch Alliance) for a total of 83 launches. The launches aim to deploy the majority of the 3,236 satellites comprising the Project Kuiper broadband constellation over a five-year period. Moreover, Amazon also contracted Swiss-based Beyond Gravity to deploy its satellites into orbit.

Europe: Arianespace and Beyond Gravity

Arianespace will conduct 18 launches aboard its Ariane 6 rocket over three years, making it **the largest single contract for the French company**. 16 of the launches will use the advanced iteration of the rocket Ariane 64 with the upgraded P120C+ boosters, carrying between 35 and 40 satellites at a time.

Beyond Gravity, a Swiss-based company formerly known as RUAG Space also received its **largest contract so far**. Accordingly, all Kuiper satellites will reach the desired altitudes for insertion into orbit using Beyond Gravity's dispenser systems. The company will build a new facility in Linköping, Sweden, scheduled to open in 2023, to double its production capacity and fulfil the contract. Moreover, Beyond Gravity stated that it will source its components and materials from a range of European suppliers.

United States: Blue Origin and United Launch Alliance (ULA)

Amazon contracted 12 satellite launches, plus an option for 15 more, to Blue Origin aboard the New Glenn rocket and ULA will perform 38 launches with its Vulcan Centaur rocket. Notably, the Vulcan uses the BE-4 engine, which is produced by Blue Origin and is the same used by the New Glenn rocket. This means that **78% of the contracted launches will use the same engine**, produced by Blue Origin.

As a result of this deal, ULA has contracted L3 Harris Technologies and Aerojet Rocketdyne. L3 Harris will provide the necessary equipment avionics and communication equipment and Aerojet Rocketdyne to deliver 116 RL10C-X upper stage engines for the Vulcan Centaur rocket.

Axiom Space operates first all-private mission to the ISS



Credit: Axiom Space

Axiom Mission 1 (Ax-1), the **first-all private mission to the ISS**, arrived on the 8th of April aboard the SpaceX Dragon spacecraft. The crew members, comprised of two former NASA astronauts and three passengers who paid an undisclosed amount for the trip, conducted various scientific experiments during their time in the ISS.

Moreover, Axiom Space and the Mohammed bin Rashid Space Center, located in the UAE, signed an **agreement to fly a UAE astronaut to the ISS**. The mission, to take place in 2023, will last for six months and will represent the first long-duration flight from an Arab astronaut.

Additionally, in another deal, Axiom Space and Japanese company Mitsui, a trading and investment company, established a **joint venture to expand on-orbit services** to commercial and government customers in Japan. The companies aim to entice non-traditional users to take advantage of the ISS and the future Axiom commercial space station for research, manufacturing, and human spaceflight.



Credit: ESA



OneWeb secures launch contract with ISRO

The UK-based company OneWeb will use India's Geosynchronous Satellite Launch Vehicle (GSLV) to launch its LEO broadband satellites. The mission will take place in 2022 from the Satish Dhawan Space Centre in Sriharikota, India. Neither the value of the contract nor the number of launches was disclosed. The new launch agreement comes after OneWeb's launches with Roscosmos were cancelled in March, prompting the company to find alternatives.

Palantir launches first satellite in partnership with Satellogic

The U.S. software company together with Satellogic, launched its first satellite this month. Up to this point, Palantir has been providing imaging processing services with the use of its A.I. technology, but its new spacecraft will now allow for the collected data to be processed in orbit, instead of being sent back to Earth. According to Palantir, this will improve the speed and quality of the data processing.



Credit: Palantir

Rocket Lab and HawkEye 360 sign multi-launch agreement

On April 15th, Rocket Lab signed a contract with HawkEye 360 to provide launch services using its Electron small orbital launch vehicle. There will be a total of three missions set to deliver 15 satellites. The first launch will take place no earlier than December 2022, during the inaugural flight from the Launch Complex 2 in Virginia, U.S. The remaining missions will take place until 2024. With this launch contract, HawkEye aims to grow its constellation to provide a more precise mapping of radiofrequency emissions in the world.



Credit: Orbit Fab

Orbit Fab signs first in-orbit refuel agreement

The U.S.-based company Orbit Fab signed a commercial agreement with the U.S. branch of the Japanese company Astroscale for in-orbit refuelling. Under the contract, Orbit Fab will provide up to 1,000 kilograms of Xenon propellant to the Life Extension In-Orbit (LEXI) Servicer satellites. The companies are currently integrating the Rapidly Attachable Fluid Transfer Interface (RAFTI) into the LEXI Servicer, the first of which will launch in 2026 to Geosynchronous Orbit.

Lonestar reaches agreement with Intuitive Machines and Skycorp to help develop Moon data centre

Lonestar, a U.S.-based data services and communications company contracted the American companies to establish data storage and edge processing infrastructure on the Moon. Consequently, Intuitive Machine's IM-1 and IM-2 missions will perform a series of tests on the Moon's surface, namely the Marius Hills and Oceanus Procellarum. IM-2 will fly Lonestar's first data services payload to the lunar pole. On the other hand, Skycorp, which is currently operating the first web server on the ISS, will support Lonestar to build the first data centre payload.



In other news

OHB Group signs MoU to use Orbital Reef space station: With the agreement, the German-based OHB Group and the U.S.-based company Sierra Space will cooperate in the use of the future space station. OHB will use the station for research and astronautics.

Exotrail signs launch service agreement with SpaceX: The French company will launch its SpaceVan satellite deployer aboard a Falcon 9 in October 2023. This will mark the operationalisation of its service to deploy satellites to their assigned orbits. The company is planning at least three additional missions throughout 2024 aboard different launchers.

Hughes Network Systems signs distribution agreement with OneWeb Technologies: With the deal, the American company Hughes, which specialises in satellite and multi-transport technologies and networks, will deliver LEO services to the U.S. DoD with OneWeb LEO broadband constellation support.

Slingshot Aerospace receives \$25.2M in contract with U.S. Space Force: The signal processing and analytics company will develop technology for war gaming and mission planning for space training. Accordingly, Slingshot will help model and assess the best way for the launch of satellites into orbit.

York Space triples production capacity: The U.S.-based company will build a second factory facility to produce 540 S-class and LX-class satellites. Accordingly, the company will triple its satellite production to meet increased military and commercial needs.

Teledyne Brown Engineering partners with Sierra Space and Nissan U.S.: The U.S.-based companies have partnered under the leadership of Teledyne, the prime contractor, to design NASA's crewed Lunar Terrain Vehicle (LTV). Teledyne is a system engineering and advanced manufacturing company.

MDA joins Lockheed Martin and General Motors in the development of Lunar Rover: MDA, a Canadian company dedicated to robotics, satellite systems, and geointelligence, joined the other two companies to integrate its commercial robotic arm technology into the Lunar Mobility Vehicle.

Kongsberg Satellite Services (KSAT) subcontracted by OHB Sweden and Thales Alenia consortium: The Norwegian company dedicated to the ground segment business was awarded a contract to provide a single interface aggregating ESA's Arctic Weather Satellite operational needs, such as data processing and satellite operations as-a-service.

D-Orbit signs sub-contract with Beyond Gravity: Under the sub-contract of an undisclosed amount, D-Orbit, an Italy-based company dedicated to in-space transportation, will produce lightweight carbon fibre-reinforced polymer tools and metallic structural components for ESA's Space Rider reusable space vehicle.



ECONOMY & BUSINESS

Rocket Factory Augsburg (RFA) awarded €11M in DLR competition

The German-based launch service provider Rocket Factory Augsburg (RFA) was selected by the DLR as the **winner of the 2022 Microlauncher competition** second round. The awardee received a prize of €11M and will transport a payload of up to 150kg from the German government aboard its RFA One rocket's first two flights. The first launch of RFA One is scheduled for the end of 2022.



Credit: RFA

Capella Space raises \$97M in Series C

On April 25th, the U.S.-based synthetic aperture radar (SAR) start-up **secured \$97M in a Series C investment round led by NightDragon**, with the participation of DCVC and Cota Capital. The company will invest the capital in the expansion of its AI-enabled geospatial analytics and earth observation capabilities. Consequently, Capella Space plans to increase the size of its constellation, currently comprising seven satellites, with the launch of more satellites in 2022 and 2023. Moreover, the company projects that over the next twelve months its customer base will grow by 400%.

Airbus Defence and Space acquires DSI Datensicherheit

Airbus reached an agreement to acquire DSI Datensicherheit for an undisclosed amount. With the transaction, Airbus aims to leverage the German company's cryptography and communications experience, enhancing end-to-end secured systems. DSI will be fully owned by Airbus and operate under a new name, Aerospace Data Security.

Audacia and Starburst Ventures partner in new venture capital fund to finance European space start-ups

The French asset management company Audacia and the U.S.-based Starburst VC fund **established a joint VC fund called Expansion**. The new VC fund aims to lead the European private investment in start-up companies connected with the aerospace and defence sector. Accordingly, Expansion plans to raise €100M by the end of 2022. Specifically, in the space sector, the fund will focus its investments on micro-launchers, satellite constellations, space data exploitation and in-orbit services.

ConstellR acquires Scanworld



Credit: ConstellR

ConstellR, a German thermal remote sensing start-up, **acquired the Belgian hyperspectral start-up Scanworld**. The takeover is part of the company's strategy to assert itself as a European market leader in hyperspectral services for smart agriculture.

To that end, ConstellR aims to combine its technology with the Belgian counterpart, allowing it to address additional applications of their capabilities, such as optimising irrigation processes and fertilisation practices and as a consequence also more markets.



Avanti cuts \$550M in debt for equity swap

Avanti, a UK-based satellite technology provider with a fleet of five Ka-band satellites, **secured \$550M in a debt for equity swap** from hedge funds Solus Alternative Asset Management and HPS Investment Partners, making them the largest shareholders.

The company has now reduced its debt to \$260M and stated that it will maintain its activities in the same business sector. Before the transaction, Blackrock and Great Elm Capital were the largest shareholders. Currently, the two companies remain shareholders, with the investment firms Robus and MSD.



Credit: Avanti

X-Bow Systems secures \$27M in series A funding round

X-Bow Systems, a U.S.-based small launch services and rocket propulsion technology company, **raised \$27M in a Series A investment round**. It was co-led by Crosslink Capital and Razor's Edge Ventures, with Lockheed Martin and Broom Ventures participation. The investment will be used to improve customer support, grow the team, and product expansion.

Adranos Energetics closes \$20M Series A funding round

On April 26th, the American solid rocket motor manufacturer **raised \$20M in a Series A funding round** led by Bob Bishop and Impala Asset Management, with participation from Explorer1 Fund, and Elevate Ventures, among others. The round of investment was conducted after the successful testing of the company's ALITEC-fueled rocket, which increases the motor's performance. Bob Bishop stated that the Adranos rocket motor has the potential to enter markets such as hypersonic boosters and small launch companies. The company will use the capital to grow its staff and increase production capacity.

In other news

Prométhée raises €4.7M: The French start-up aims to launch a constellation of nanosatellites while providing emerging countries with the tools to make use of its data. The funds will allow the company to launch its first satellite, Prométhée-1, and to develop its digital analysis platform. The investment counted on the participation of Hemeria, ADF, and BPI France, among others.

Airborne International and EIB reach agreement for €16M venture debt financing: The Dutch company will use the capital to continue the development of production methods for composites involving automated and digital manufacturing and products for new space and big science.

ArkEdge Space secures \$5.2M in series A funding round: The Japanese start-up dedicated to design, manufacturing and operational services for micro-satellites, will use the funds to accelerate the construction and reinforcement of the satellite development system. The funding round was led by Incubate Fund, with the participation of Real Tech Fund and Mitsui Sumitomo Insurance Capital.

Earthbanc closes \$1.5M in pre-seed round: The Swedish start-up dedicated to the development of carbon projects and auditing using remote sensing and selling carbon credits will use the funds to launch its protocol and web3 platform. The investment round had the participation of Katalista Ventures, the European Space Agency Incubator in Sweden, among others.

Maritime Launch Services becomes public through reverse merger: The Canadian start-up, which plans to provide maritime launch services with a spaceport in Nova Scotia, closed a reverse takeover with Jaguar Financial Corporation for \$7M. Following the transaction, Jaguar took on the start-up's name.

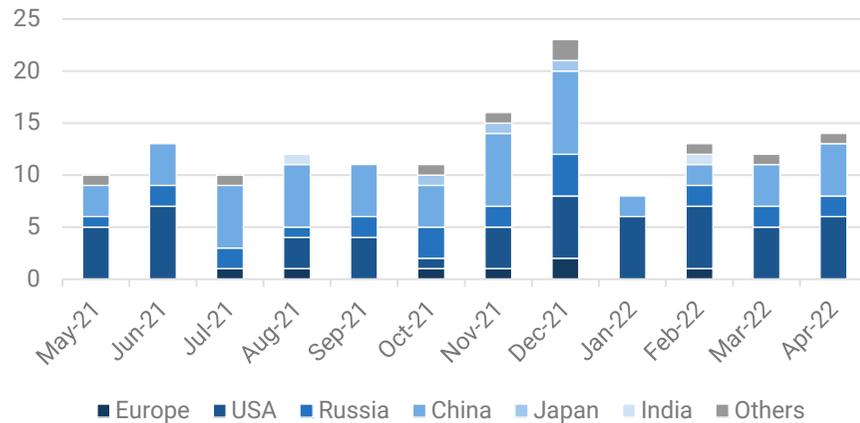


LAUNCHES & SATELLITES

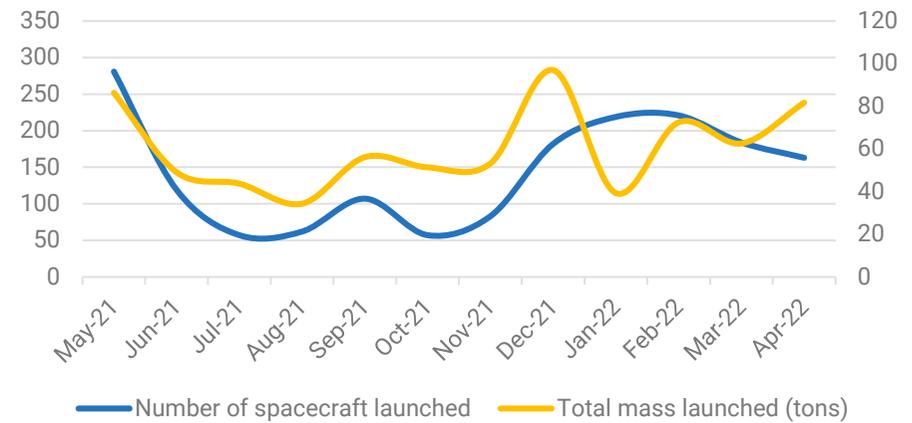
Global space activity statistics

April 2022	USA	Russia	China	Others	Total
Number of launches	6	2	5	1	14
Number of spacecraft launched	149	2	10	2	163
Mass launched (in kg)	63 420	6150	11 993	112	81 675

Launch activity over the year



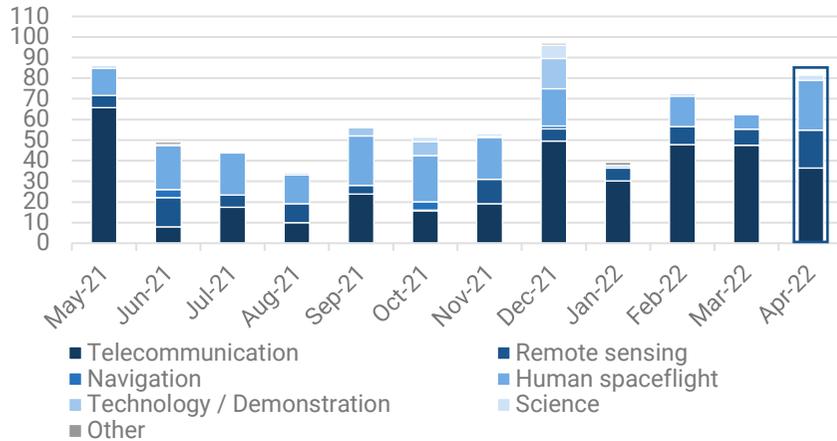
Evolution of the number of launches per launch country



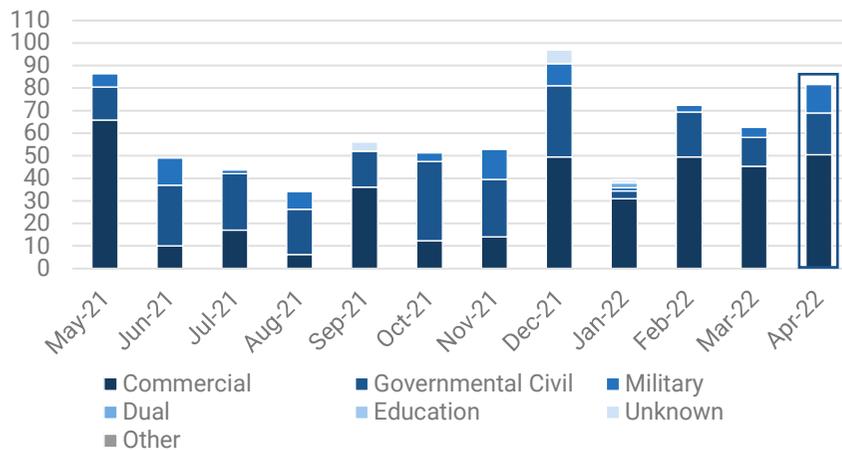
Evolution of launch activity over the year 2021-2022



Satellite missions and markets



Evolution of the total mass launched (tons) per mission (Mai 2021-Apr. 2022)



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

April 2022	Telecom	Remote sensing	Human Spaceflight	Technology/ Demonstration	Science	Other
Europe		974		51		102
USA	31 334.8	6717	24 110	10		
Russia		6150				
China	5100	4923			2600	
India				15		
Others		205		1	12	

Total mass (kg) launched by mission and customer country

April 2022	Commercial	Governmental Civil	Military	Education
Europe	180	937	10	
USA	43 616.8	12 055	6500	
Russia			6150	
China	6443	5550		
India	15			
Others	205			13

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
01/04/2022	USA	Falcon-9 v1.2 (Block 5)	AlfaCruz	University of Brasilia	Brazil	Alén Space	Spain	1	Tech / Demo	Education
			ARCSAT	Norwegian Defence Research Establishment	Norway	GOMSpace	Denmark	10	Tech / Demo	Military
			BD-Sat	CEITEC	Czech Republic	CEITEC	Czech Republic	1	Tech / Demo	Governmental Civil
			BRO 7	UnseenLabs	France	GOMSpace	Denmark	6	Signal Intelligence	Commercial
			EnMAP	DLR	Germany	OHB	Germany	936	Earth Observation	Governmental Civil
			GNOMES 3	PlanetiQ	USA	Blue Canyon Technology	USA	30	Meteorology	Commercial
			Hawk 4 (A, B & C)	HawkEye 360	USA	UTIAS/SFL	Canada	25 (each)	Signal Intelligence	Commercial
			ION-SCV 005	D-Orbit	Italy	D-Orbit	Italy	100	Other	Commercial
			KSF 2 (4 satellites)	Kleos Space	Luxembourg	ISIS	Netherlands	8 (each)	Signal Intelligence	Commercial
			Lynk 05 / Lynk Tower 1	Lynk	USA	Lynk	USA	60	Telecommunication	Commercial
			MP42	NanoAvionics	Lithuania	NanoAvionics	Lithuania	40	Tech / Demo	Commercial
			ÑuSat (5 satellites)	Satellogic SA	Argentina	Satellogic SA	Argentina	41 (each)	Earth Observation	Commercial
			Pixxel-TD 2 / Shakuntala	Pixxel	India	NanoAvionics	Lithuania	15	Tech / Demo	Commercial
			PlantSat	University of Chile	Chile	GOMSpace	Denmark	4	Biology	Education
			SpaceBEE (12 satellites)	Swarm Technologies	USA	Swarm Technologies	USA	0,4 (each)	Telecommunication	Commercial
			Spark 1	Omnispace	USA	NanoAvionics	Lithuania	10	Tech / Demo	Commercial
			SUCHAI (2 & 3)	University of Chile	Chile	University of Chile	Chile	4 (each)	Space Science	Education
			UP-Box	Upmosphere	Italy	Upmosphere	Italy	2	Other	Commercial
02/04/2022	New Zealand	Electron KS	BlackSky (16 & 17)	BlackSky Global	USA	LeoStella	USA	56 (each)	Earth Observation	Commercial
06/04/2022	China	CZ-4C	Gaofen 3-03	CNSA	China	CAST	China	2950	Earth Observation	Governmental Civil
07/04/2022	Russia	Soyuz-2-1b	Kosmos 2554 / Lotos-S1 5	Russian Aerospace Forces	Russia	Progress Rocket Space Center	Russia	6000	Signal Intelligence	Military
08/04/2022	USA	Falcon-9 v1.2 (Block 5)	Crew Dragon Ax-1	Axiom Space	USA	SpaceX	USA	12055	Space Tourism	Commercial
15/04/2022	China	CZ-4C	Daqi 1	CNSA	China	SAST	China	2600	Earth Science	Governmental Civil



Launches & Satellites

15/04/2022	China	CZ-3B/G3	ZhongXing 6D / ChinaSat 6D	China Satcom	China	CAST	China	5100	Telecommunication	Commercial
17/04/2022	USA	Falcon-9 v1.2 (Block 5)	Intruder 13 (A & B)	NRO	USA	Lockheed Martin	USA	3250 (each)	Signal Intelligence	Military
21/04/2022	USA	Falcon-9 v1.2 (Block 5)	Starlink (53 satellites)	SpaceX	USA	SpaceX	USA	295 (each)	Telecommunication	Commercial
27/04/2022	USA	Falcon-9 v1.2 (Block 5)	Crew Dragon USCV-4	NASA	USA	SpaceX	USA	12055	Crew Transfer	Governmental Civil
29/04/2022	USA	Falcon-9 v1.2 (Block 5)	Starlink (53 satellites)	SpaceX	USA	SpaceX	USA	295 (each)	Telecommunication	Commercial
29/04/2022	China	CZ-2C(3)	Siwei Gaojing 1 (-01 & -02)	China Siwei Survey and Mapping Technology	China	CAST	China	540 (each)	Earth Observation	Commercial
29/04/2022	Russia	Angara-1.2	Kosmos 2555 / MKA-R 1	Ministry of Defense of the Russian Federation	Russia	Unknown (Russia)	Russia	150	Earth Observation	Military
30/04/2022	China	CZ-11H	Jilin-1 Gaofen-03D (4 satellites)	Chang Guang Satellite Technology	China	Chang Guang Satellite Technology	China	42 (each)	Earth Observation	Commercial
30/04/2022	China	CZ-11H	Jilin-1 Gaofen-04A	Chang Guang Satellite Technology	China	Chang Guang Satellite Technology	China	95	Earth Observation	Commercial

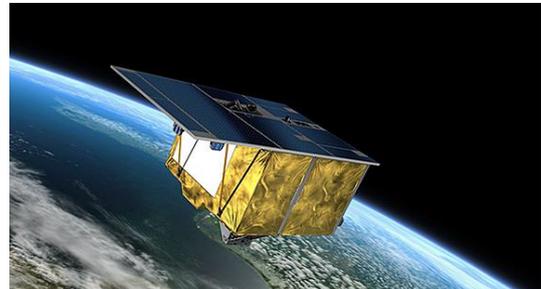


Launch Highlights

SpaceX's Transporter-4 mission

On April 1st, SpaceX launched the fourth of its Transporter missions, which provide rideshare opportunities for a multitude of small satellites; however, contrary to the previous missions, which each launched more than 100 satellites, **Transporter-4** only carried around 40 spacecraft to space.

Several payloads of the mission are remarkable: first, the **EnMAP satellite**, operated by DLR, will provide hyperspectral imagery to monitor the evolution of the environment, a kind of data that is currently not common. Another hyperspectral satellite for the Indian start-up Pixxel was also onboard the ride. Second, the company Lynk, which aims at directly connecting unmodified smartphones to satellites, launched its **first operational cell tower in space** that can be used to provide a commercial service. Finally, three companies, from the United States, Luxembourg and France, launched 8 satellites (20% of the payloads) that will serve the growing market of commercial satellite intelligence.



Credit: DLR



Credit: Axiom Space

First fully private mission to the ISS

On April 8th, SpaceX launched the **Ax-1 mission** for the private company Axiom Space, whose objective is to develop space tourism. Following the steps of Inspiration4, which was the first fully private mission to orbit Earth, Ax-1 is the first all-private mission to reach the ISS. The crew, made of two American citizens, one Israeli and one Canadian, spent 17 days in orbit, including 15 onboard the station. It was commanded by Michael López-Alegría, a former NASA astronaut. Members of the crew performed more than 25 experiments during their stay on the ISS (e.g. on self-assembling technology for future space habitats, cancer research, and devices to purify air on space stations), including some managed by Axiom itself. Axiom Space is currently negotiating details with NASA for its second mission, Ax-2.

Russia flies a new launcher for the first time

On April 29th, a new version of a rocket from the Angara family was launched by the Russian Aerospace Forces from the Plesetsk cosmodrome. The **Angara-1.2** rocket is expected to provide a light-weight orbital delivery capability to the Russian Ministry of Defence and Roscosmos. The payload sent to orbit on this inaugural flight was a military satellite, likely used for radar observation purposes.

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