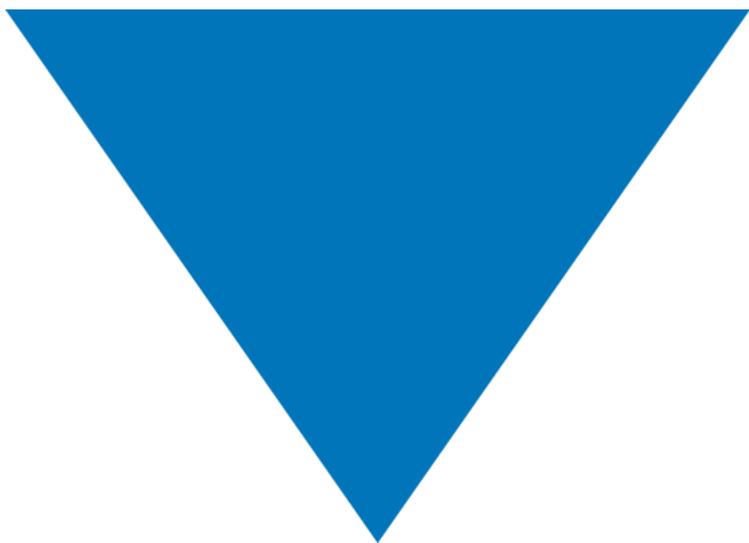


ESPInsights

The Global Space Activity Monitor



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FOCUS

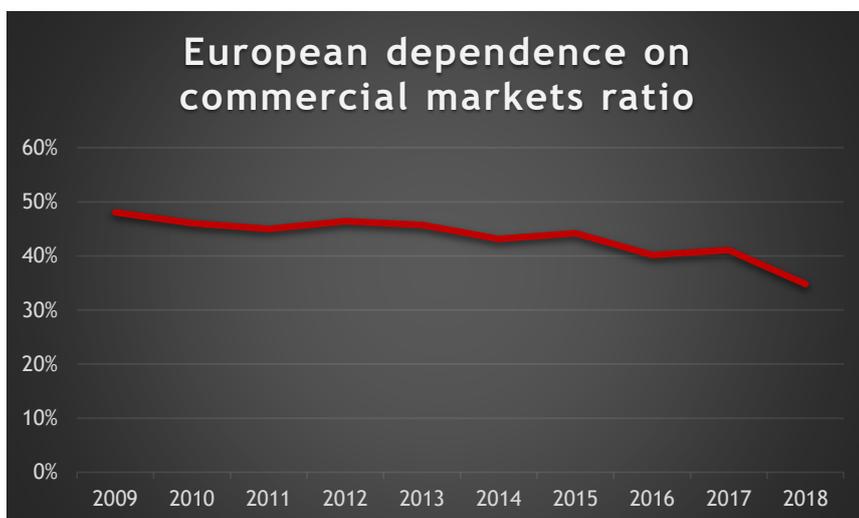
European industrial leadership at stake

On the 11th of June, Eurospace, the trade association of the European space manufacturing industry, released its annual *Facts & Figures*, presenting the major indicators on the performance of the sector. The results unveil a slowdown in the activities of the space sector marking the first decline of about -3% of its overall turnover over the last decade. In a global context of ambitious announcements made by the two biggest space powers, namely the U.S. and China, the figures issued by Eurospace seem to convey an alarming signal potentially undermining the leading role played by the European industry on the global commercial markets.

However, from a budgetary standpoint, 2018 has been remarkable since the overall public space expenditures across major European and national institutions raised as compared to the previous year, peaking at €9B. These efforts have partially bridged the gap generated by the contraction of commercial orders. In terms of business, Eurospace survey shows that in 2018 the turnover generated on the institutional market, aggregating final sales to ESA, EUMETSAT, EU, national civil and military actors increased to €5.4B up from €5.1B in 2017. In contrast, the performance of the European space industry on the commercial and export markets experienced a slight downturn totalling €3.06B down from €3.5B last year. The decrease of about €500M is modest in size but it is a consequence of a contraction of 20% of the orders placed by satellite operators that are facing fluctuations of their business. Actually, the data provided by Eurospace highlight a downturn for the European industry of 26 to 30% on their sales of complete satellite systems on commercial export markets.

Given the perspective of the telecommunications sector, this trend is not likely to reverse in the short term and it is clear that today the promises of the New Space are still far from offsetting the downturn observed on the traditional space markets.

Historically, the European space strategy has been very successful at supporting the competitiveness of industry and allowing it to gain major market shares. Commercial markets have thus been catering for the critical mass of activities while EU institutions were offered access to space at the best conditions. This orientation has been confirmed in the document *Space Strategy for Europe*, released in the late 2016, where the European Union urges “to work together to promote the position of Europe as a leader in space, increase its share on the world space markets, and seize the benefits and opportunities offered by space”. This strategy supposes the existence of sizable, open and accessible commercial markets. Such a global shrinking of the commercial demand was certainly not envisioned.



The immediate impact on the breakdown of industrial activities between institutional and commercial customers is illustrated by the graph hereto which shows the variation of the ratio of reliance of the European space industry on commercial markets. Over a decade, this ratio has decreased from 50% to about 35% in 2018. Although in sharp decrease, it remains quite significant. In this respect, the situation of European companies is getting closer to its main competitors overseas.

A key question to be addressed by policy makers is to decide whether or not the European space policy should be adapted to the reality of global markets, which might have in-depth implications on the public mechanisms supporting industry competitiveness.

SPACE POLICY AND PROGRAMMES

EUROPE

9th EU-ESA Space Council

The 9th EU-ESA Space Council took place on the 28th of May in Brussels. Convened for the last time in 2011, this EU-ESA Space Council in particular provided the opportunity to put into perspective the upcoming ESA Space19+ Ministerial Council and the new regulation on the *Space Programme of the Union and European Union Agency for the Space Programme*, aiming at providing an overarching legislative and operational framework for the European space sector.

Delegations unanimously approved the EU Council Conclusions (under Romanian presidency) and the ESA Council Resolution (under Spanish presidency) on “Space as an enabler”.

Read the [ESPI Executive Brief 33](#) for further details regarding the context and perspectives on the EU-ESA Space Council.

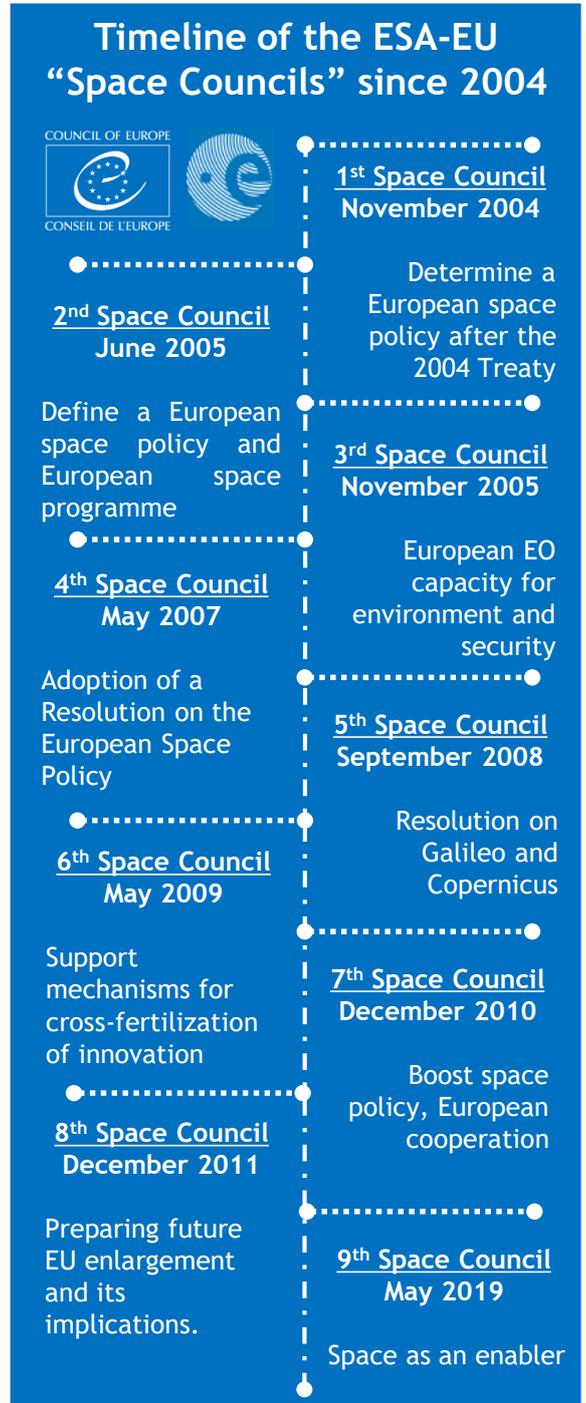
Europe’s Martian ambitions take shape

Details of the European Space Agency’s [Mars Sample Return campaign](#), in partnership with NASA, were unveiled. Part of [ESA’s Mars exploration ambitions](#), the future of the sampling mission, to be carried on between 2020 and 2030, will be decided during the ESA Space19+ Council. In the meantime, the ExoMars Trace Gas Orbiter initiated manoeuvres in preparation for the landing of the [Rosalind Franklin rover](#), due to land in 2021.

ESA’s advancements on Planetary Defence Systems

The European Space Agency further revealed technical details on the failure-proof [on-board computer](#) of the satellite destined to the Didymos asteroid pair, as well as on the [Juventas](#) and [APEX CubeSats](#) that will assist the main Hera spacecraft with probing and surveying of the asteroids.

ESA also contracted the Danish satellite manufacturer [GomSpace](#) (through its subsidiary in Luxembourg) to develop a 12U CubeSat spacecraft, as a demonstrator for a Miniaturised Asteroid Remote Geophysical Observer (M-ARGO). The mission, subject to further funding, is poised to become the first ever nanosatellite rendezvous with an asteroid for identification of in-situ resources. The €400,000 contract puts GomSpace in charge of mission design, implementation and planning. The launch of the mission is scheduled for 2023. In parallel, a new mission called [Comet Interceptor](#), which was proposed by the UK, has been selected by ESA as the first of its new “Fast” missions using existing flight-proven technology. It has been targeted for launch in 2028.



Finally, as part of its citizen engagement effort, the European Space Agency launched the [Hubble Asteroid Hunter](#) project, a citizen science initiative. This project was launched to support scientists' efforts to determine the orbit and characterization of asteroids, in the context of the Asteroid Day (30th of June).

ESA prepares for rescuing Humans on Moon



Credit: ESA

The European Space Agency, as a partner in NASA's future lunar manned mission, tested the [Lunar Evacuation System Assembly \(LESA\)](#), designed to be deployed by a single astronaut in lunar gravity to rescue an incapacitated crewmate. Commissioned by ESA and led by French company Comex, this practical test aims at determining if the 10m deep pool at ESA's astronaut centre in Cologne, Germany, could be used to simulate lunar gravity underwater for testing equipment, tools and operational concepts testing for the Moon.

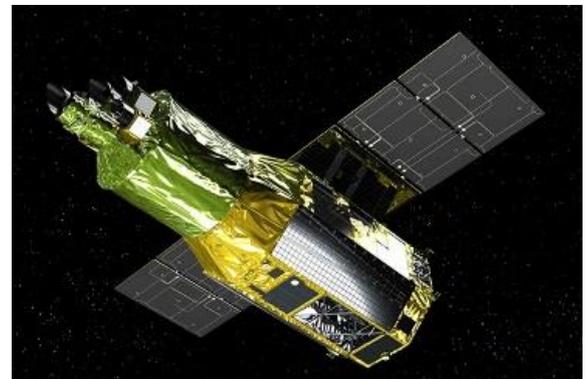
ESA's private partnerships

In May, the European Space Agency Business Incubation Centres (ESA BICs) together with EBAN Space and Thales Alenia Space took part in the first edition of [Innovation Showcase](#), in Cannes. The event brought together 6 among the most innovative European space start-ups, namely: Hiber (Netherlands), Infinite Orbits (UK), Kleos Global (Luxembourg), OroraTech (Germany), Sofant Technologies (UK), Zubax Robotics (Estonia), to explore potential synergies and partnerships.

Also, negotiations are currently undergoing to extend the activities of the [ESA Business Incubation Centre](#) in Africa. The goal is to boost indigenous commercial space innovations and access to European based satellite infrastructure to maximise socio-economic benefits.

ESA's international cooperation with Japan

On the 14th of June, JAXA took part in the 282nd meeting of the ESA Council, during which the Japanese and European Space Agency signed an agreement on the [X-Ray Imaging and Spectroscopy Mission \(XRISM\)](#), to be launched in the early 2020s from the Tanegashima Space Center to study the most energetic phenomena of the Universe. Hardware components and support for science management and planning will be provided by ESA in exchange of observation time for the use of scientist across its Member States.



Credit: JAXA

New EU Parliament, new EU European Space Policy?

The elections of the new European Parliament occurred on 23rd-26th of May 2019. Although space affairs were not at the forefront of electoral debates, the European Parliament nonetheless holds a growing role in shaping the European space policy.

Read the [ESPI Executive Brief 32](#) to learn what await the new 2019-2024 European parliament regarding European space affairs.

France reflects on its competitiveness and defence posture in space

France seems to be looking into a new space defence strategy. As such, the [ONERA](#) (National Office for Aerospace Study and Research, attached to the French Ministry of Defence) revealed working on anti-satellite lasers capable of rendering satellites on LEO inoperable. In general, the [French defence community](#) is engaged in a [reflection](#) on its space posture regarding military applications. Furthermore,

during the [5th PSSI Space Security Conference](#) in Prague - during which ESPI Director Jean-Jacques Tortora moderated a panel focusing on the space resilience and risk management - it was announced the imminent release of the French Space Defence Policy by the end of July. On the 13th of July, the French President Emmanuel Macron announced the [creation of a space command](#) integrated within the Air Force, for which the precise scope and budget are yet to be disclosed at this stage.

For instance, the head of the [French Army](#) declared wanting to be a “space actor”, as “space will become tomorrow the relay of [the Army’s] eyes and ears in the field”. During the Paris Air Show, the French Ministry of Defence announced developing [two new space programmes](#): Iris (successor of CSO for optical observation) and Celeste (successor of Ceres for intelligence missions).

On the 22nd of May, a [Senatorial hearing](#) took place with the Executive President of ArianeGroup André-Hubert Roussel, and the Head of CNES Jean-Yves Le Gall. For Le Gall, European space autonomy could be threatened because European launchers rested on the commercial market, which evolved - however, there is a European-wide will to better organize the European space transportation sector. For Roussel, the autonomy is threatened, but not by the launcher’s dependence on the commercial market per se but rather by a dependence on the U.S.A. for space objects surveillance.

Finally, the Paris Air Show was the occasion for France to extend its “space diplomacy” through the Space Climate Observatory, with the signing of Joint Declarations with [Ukraine](#), [United Arab Emirates](#) and [Vietnam](#). Furthermore, The French Space Agency (CNES), through its Connect-by-CNES programme, and the Government of Kerala, through the Kerala Start-Up Mission, signed a [Letter of Intent](#) to signal their shared interest in creating a French-Indian ‘cross-border’ ecosystem to boost entrepreneurship in NewSpace.

Germany joins consortium to support a European reusable rocket

The German Aerospace Center (DLR) announced joining a consortium with five private companies (CFS Engineering, Elecnor Deimos, MT Aerospace, Alamatech and Amorim Cork Composites) to study and investigate reusable Upright-Landing rocket systems. This project, [RETALT \(RETropulsion Assisted Landing Technologies\)](#) benefited from €3M in funding in the frame of Horizon 2020.



Credit: retalt.eu

Luxembourg to cooperate with U.S.A. in space

[Luxembourg and the U.S.A.](#) signed a Memorandum of Understanding on space cooperation. This MoU will serve as a framework for future formal dialogue, exchange of expertise and information.

Norwegian Arctic Satellite Broadband Mission takes shape

Space Norway is close to conclude planning for its [Arctic Satellite Broadband Mission \(ASBM\) system](#). The ASBM system aims at tackling the problem of communications in the arctic - an underserved region, for which reliable communication is needed for security, emergency responsiveness and crisis management. Space Norway has established a subsidiary limited liability company, Space Norway HEOSAT, which will conduct the programme and later operate the highly elliptical satellites. The Norwegian Government confirmed the provision of €88.7M as equity to the Arctic Satellite Broadband Mission.

Portugal's future launch site gets ESA expertise

On the 21st of June, [Portugal and the European Space Agency](#) signed an agreement on expertise and technical assistance. Requested by Portugal, this agreement will allow Portugal Space's future launching site in the Azores to benefit from ESA's expertise, while retaining technical and financial responsibility.

Swedish Space Corporation to establish SubOrbital Express

The Swedish Space Corporation (SSC), in the framework of the EuroLaunch partnership, leverages the DLR's mobile infrastructure and hardware "Mobile Rocket Base" ("Mobile Raketenbasis", MORABA) to develop the Esrange Space Center in northern Sweden. Esrange, as a ground station for satellite control and data reception, will soon expand the offer of suborbital launching services (including launch and recovery) for microgravity experiments: [SubOrbital Express](#).

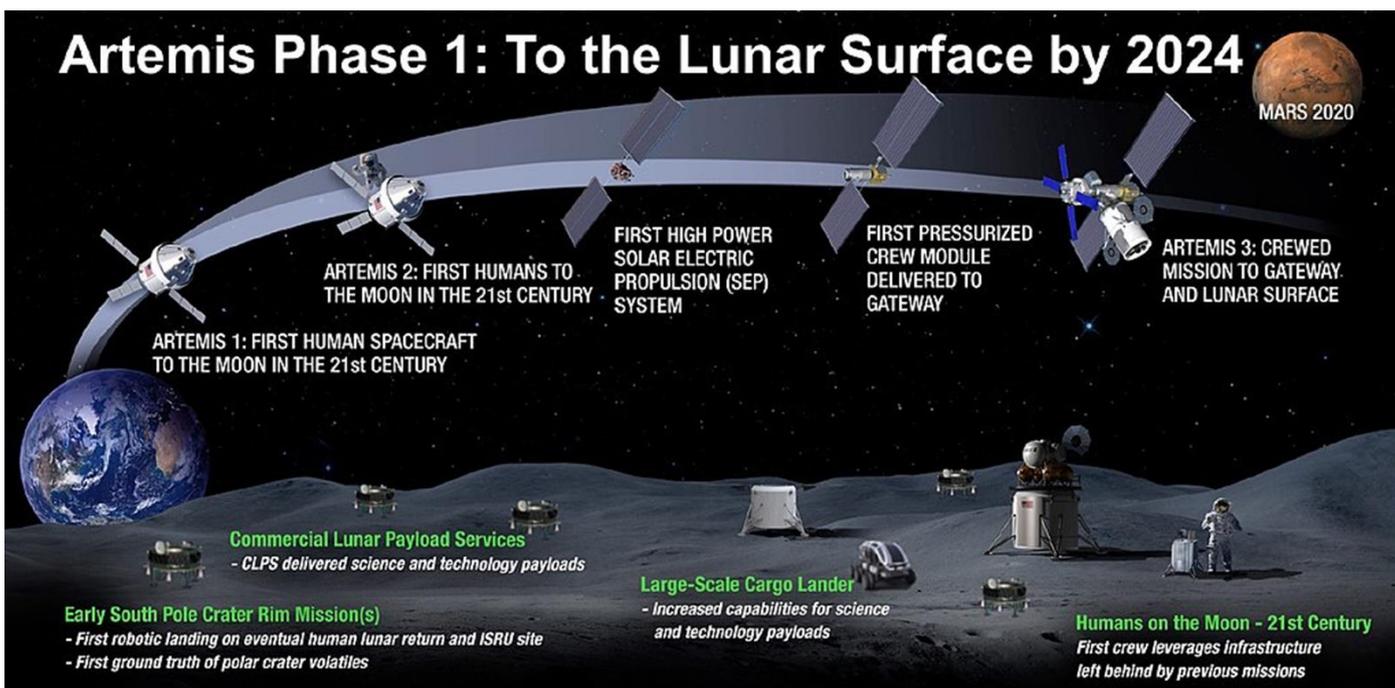
UK continues to reach out to the private sector

LaunchUK, the UK's commercial spaceflight programme run jointly between the Department for Transport, the UK Space Agency and the Civil Aviation Authority, published in May a summary of the responses to the [call for evidence on the Space Industry Act 2018](#) provisions on liabilities, insurance and charging. Respondents consisted of 14 private organizations, including satellite operators, launch vehicle operators and insurers, among others. Most respondents declared they would prefer a set limit on liabilities for launch activities from the UK rather than a set limits on a case-by-case basis using a Maximum Probable Loss approach. Otherwise, British companies would be at a disadvantage when competing internationally (notably due to cost and/availability of insurances).

The UK further continues to cater to an "astropreneurship spirit": young entrepreneurs (11 to 22 years old) pitched the UK Space Agency and space industry experts in a "[Dragon's Den](#)" format - the winner is a 17 Years old who won a €8,400 prize for the idea to track abandoned supermarket trolleys and was offered mentoring from Satellite Applications Catapult.

U.S.A.

Artemis revealed: NASA budget and lunar programme debated



Credit: NASA

NASA revealed the name of its Moon 2024 Mission (Artemis) in its [updated strategic plan for lunar exploration](#). NASA FY2020 Budget Amendment features an increase of \$1.6B (€1.4B) above the [President's initial \\$21B](#) (€18.6B) budget request to accelerate a return to the lunar surface. More precisely, the [NASA budget amendment](#) includes:

- ▶ **Human Lunar Landing System:** \$1B (€885M) to support the development of commercial human lunar landing systems;
- ▶ **Space Launch System Rocket and Orion Spacecraft:** \$651M (€578M) for SLS and Orion;
- ▶ **Exploration Technology:** \$132M (€117M) for key precursor capabilities on the lunar surface;
- ▶ **Science:** \$90M (€80M) for prior exploration of the Moon's polar regions.

According to the NASA administrator, a lunar landing will require between [\\$20B \(€17.7B\)](#) and [\\$30B \(€26.6B\)](#).

On the 22nd of May the House Appropriations Committee voted on a Commerce, Justice and Science Funding Bill for FY2020, which [funds NASA](#) with \$22.32B (€19.7B). \$5.1B (€4.5B) in funding will go to “Exploration”, which encompasses the development of the Orion crew vehicle, the SLS and related ground systems.

In parallel, NASA [selected three commercial Moon landing service providers](#) under the Commercial Lunar Payload Services (CLPS) to carry NASA-provided unmanned payloads to the lunar surface, as part of the Artemis programme. NASA further [selected 11 companies](#) in order to study and develop prototypes for a human lunar landers.

Lunar Gateway looking for commercial resupply

Following a call late last year for companies to submit ideas on how NASA can best resupply its upcoming [Lunar Gateway outpost](#), the U.S. federal space agency has taken its initiative one step further, releasing a draft Request for Proposals for Gateway Logistics Services. The document was released for comments on the 14th of June to the commercial space industry and seeks input on the agency's final Gateway resupply contract plan. NASA anticipates the maximum contract award for all Gateway services over the course of 15 years will be valued at \$7B (€6.2B).

SLS pushes through despite slowdowns



Credit: NASA

The SLS programme, challenged by delays and costs overruns, is now under heavy scrutiny from observers. The Government Accountability Office (GAO) looked into how the SLS-related [delays impact](#) other space programmes (notably Orion). According to the GAO, the \$1B additional cost advanced by NASA for the SLS programme is understated, rather demonstrating an over cost of \$1.8B (€1.6B). A similar type of conclusion emerged from the NASA's office of Inspector General: the Europa Clipper launch [may face delays](#) and significant cost increases.

Delays to Boeing's rocket have [prompted various ideas](#) for making up for lost time, including even the consideration of alternative launch vehicles.

The SLS programme still progresses nevertheless. The first integrated Orion and [Space Launch System \(SLS\) vehicles](#) underwent simulations last month in the Launch Control Center at the Kennedy Space Center in Florida.

Advances in NASA’s space exploration plans and programmes

Eight new research teams were selected as part of the [Solar System Exploration Research Virtual Institute](#) (SSERVI - formerly the NASA Lunar Science Institute) for the next 5 years (at about €9.3M per year). SSERVI’s mission is to provide scientific, technical and mission-defining analyses for NASA programmes at large.

Furthermore, two new missions were selected to study the [Sun and its effects on space weather](#). The first mission, PUNCH (Polarimeter to Unify the Corona and Heliosphere) will consist of a spacecraft to study the Sun’s corona. The second mission, TRACERS (Tandem Reconnection and Cusp Electrodynamics Reconnaissance Satellites) will involve a secondary payload to PUNCH, which will observe the Earth’s northern magnetic field. The cost of TRACERS is estimated (including launch cost) at \$165M (€146.5M) and PUNCH (excluding rideshare cost) at \$115M (€102M).

NASA is also in the stages of completing its [Mars 2020 rover](#).

NASA invests in SMEs

[363 proposals](#) from SMEs and research institutions were selected by NASA to receive \$45M (€40M) in funding, as part of Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programmes.

In parallel, NASA awarded a total of \$106M (€94M) for [142 proposals from 129 U.S. SMEs](#) to receive Phase II contracts as part the agency’s Small Business Innovation Research (SBIR) program.

Space Force, now “Space Corps”, under intense negotiations

Congressional debates over the National Defence Authorization Bill for FY2020 continues to unfold - complemented by [estimations of the implementation costs of SPD-4 issued](#) by the Congressional Budget Office (COB) in June. Previously in May, the COB published a report focusing on [personnel requirements and costs](#) of new military space organizations. The COB analysed additional personnel and related additional costs required across five types of space organizations the DoD could create: Military Department (akin to the Department of the Army), a new Military Service (within the Department of the Air Force), a new combatant command (USSPACECOM), a new Development and Acquisition Agency (the SDA), and a new Policy Directorate (such as the office of the Under Secretary of Defence for Intelligence, but focused on space).



In parallel, Congressional debate regarding funding of the [Space Development Agency in FY2020](#) also continues to unfold - as the head of the SDA, Fred Kennedy, [stepped down](#) to re-join DARPA. Derek Tournear, the Pentagon’s assistant director for space within the DARPA, became acting director of the [Space Development Agency](#).

Finally, during the annual UNIDIR space security conference, participants pointed out that the domestic debate around national security space is leading to fears about U.S. intentions and sharpening tensions among major space powers and [backfiring outside of the US](#).

U.S. military to make a greater use of commercial small launchers?

Three amendments to the National Defence Authorization Act for Fiscal Year 2020 related to the small launch industry were approved by the Senate Armed Services Committee. These provisions notably push the Department of Defence to make more use of commercial spaceports for small satellite launches, and to better integrate commercial capabilities in the DoD's space operations. Other SASC provisions include a study on Chinese smallsats and small launches industry (to be delivered by the 15th of March 2020), as well as the approval for the DoD's \$26M request for its Space Test Program (STP).

U.S. space governance changes taking small steps

An amendment to the funding bill for NASA and NOAA in the House of Representative, would redirect \$3.6M (€3.2M) from NOAA to the Department of Commerce's Management account. This proposition is intended to facilitate the transfer of the Office of Space Commerce and the Office of Commercial Remote Sensing Regulatory Affairs back from NOAA directly to the Department of Commerce.

In parallel, the Federal Aviation Administration's Office of Commercial Space Transportation (AST) received an additional \$8M (€7M) in funding, bringing the total AST's FY2020 budget to \$33M (€29M).

The debate on the Federal Communications Commission's (FCC) mandates on space debris mitigation of commercial operators resurfaced as the FCC approved a licence for 120 Synthetic Aperture Radar satellites.

U.S.A. reflects on its space heritage

As the U.S.A. is celebrating the 50th anniversary of the Apollo mission, the University of Chicago's NORC Center for Public Affairs Research and the Associated Press conducted a poll in May 2019 on the perceptions of space exploration and the U.S. space programme.

- ▶ 60% say the space programme has provided enough benefit to the country to justify its cost
- ▶ 38% do not consider the country's expenditures on the space programme warranted.
- ▶ 19% consider military presence in space "very important"
- ▶ 80% say the United States is not leading the world in space exploration

The Apollo Mission Control Center has been restored to appear as it did in that era just in time to celebrate the 50th anniversary of the Apollo 11 Moon landing.

CANADA

RADARSAT constellation: a promising success

Launched on the 12th of June on a Falcon 9, the new RADARSAT Constellation (three satellites of 1.400kg each placed in SSO) mission is an Earth Observation system developed to monitor ice formation, and contribute to navigation and disaster management (among others). 14 Canadian government departments and university researchers will exploit the data delivered by the constellation. Some data will be made available commercially, but higher resolution imagery pertaining to national security will not be available to the public.

Canadian robotic expertise consolidates international recognition

When NASA unveiled its Moon plans and submitted its initial budget request, it was announced that the Canadian artificial



Credit: SpaceX

intelligence-based robotic system (Canadarm3) would not be needed for a 2024 lunar landing (justified by internal budgetary reasons). However, NASA, as the leader on the Lunar Gateway international programme, plans to deploy the Canadarm3 in 2027 (for the [EM-6](#)).

In the perspective of a Mars Sample Return mission, the Canadian Space Agency further pushed its robotic expertise by awarding €268,000 to [Canadensys](#). The Ontario-based company will produce a concept study for a Sample Fetch Rover, with the primary objective to retrieve samples collected by NASA's Mars 2020 Rover.

Canadian involvement in European programmes (to the Moon and Mars) is perceived as potential opportunities for the future NASA-led lunar and Martian missions. As such, Canada and the European Space Agency renewed their [cooperation agreement](#) for 10 years on 13th of June. It was noted during the signature of the agreement that Canadian access to ESA programmes depends on funding commitments. ESA invited Canada to participate in the funding decision process at ministerial-level later this November (Space19+) - with a deadline set on mid-October.

Canadian Space Agency fosters R&D and supports local companies

The Canadian Space Agency awarded a total €10M to 25 companies for its [Space Technology Development Programme](#). The projects awarded reflect a variety of technologies at different stages of developments. For instance, MPB Communications received €669,000 to develop a cost-effective ultra-high throughput space-based optical link, while ARTsensing Inc. was granted €332,000 to develop and test nanotechnology-based radiation shields.

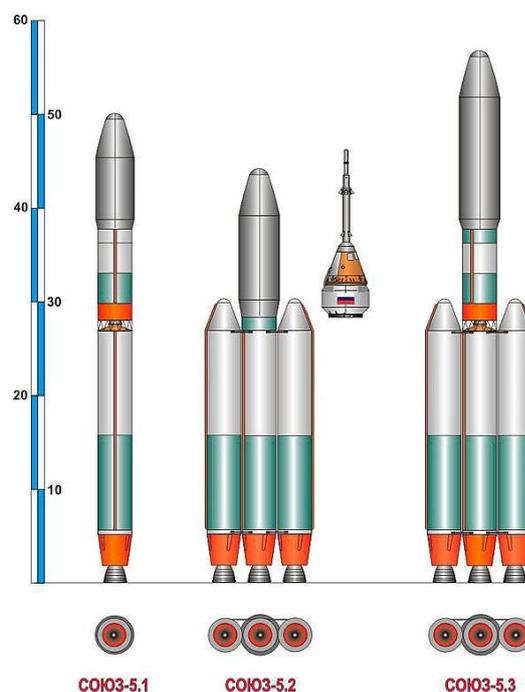
The STDP also allows the Canadian Space Agency to [support strategic companies](#) competing in the space sector globally. UrtheCast Corporation, for instance, was granted two contracts for a total of €1.34M - a welcome input for a company under restructuring. Similarly, Honeywell Corporation was granted €332,000 in order to handle the growing demand for low-cost, high-performance nanosatellites (with the specific intention to generate export revenues).

RUSSIA

Russian launchers facing heavy competition - or rivalry?

The Energia Space Rocket Corporation made a concrete step in the development of its Soyuz-5 carrier rocket, with the creation on the 20th of May of the [Chief Designers Board](#). With the intention of taking a market share of commercial launches, the rocket is expected to be put [on the market by 2021](#) (with planned launches in 2022-2025).

However, the U.S. Department of Defence announced on the 31st of May [banning contracts](#) for Russian commercial satellites services should they represent a cybersecurity risk. More precisely, these restrictions apply to launches carried out from 31st of December, 2022. The head of Roscosmos, Dmitry Rogozin, declared this decision is a move on the part of the U.S.A. to ["edge Russia out"](#) of the launch services market". However, the [Pentagon emphasized](#) that these restrictions only relate to U.S. Department of Defence acquisitions, and that "questions regarding U.S.-Russian cooperation on the International Space Station should be directed to NASA".



Credit: [globalsecurity.org](#)

Russia sends off Glonass-M

On the 27th of May, the Soyuz-2.1b launch vehicle carrying the [Glonass-M](#) navigation satellite blasted off from Russia's Plesetsk cosmodrome. The launch was overseen by the Space Force of Russia's Aerospace Forces. It is not known which satellite of the Glonass constellation this spacecraft will replace exactly, although it should be noted that more than half of the Glonass satellites are [over the designed lifespan](#).

Russia further involved in Africa

During his state visit in South Africa in June 2019, [Russian and South African presidents](#) discussed collaborations on Space and Nuclear projects (South Africa already hosts a ground station that monitors GLONASS and GPS satellites).

On the 13th of June, the president of Uganda Yoweri Museveni welcomed the idea of a [Russian-Ugandan Intergovernmental Commission on Economic Scientific and Technological Cooperation](#) saying it will boost industrial development in Uganda through the use of space technology in carrying out research.

JAPAN

Cooperation with the U.S.A. reinforced

As President Trump met the Japanese Prime Minister Abe in Tokyo on 27th of May, the [U.S.A. and Japan signed agreements](#) to entrench participation of JAXA in the Lunar Gateway, develop an information-sharing network for space debris and "suspicious objects", and cooperation on the Japanese indigenous GPS system.

Japanese Mars programme finds European partners



Credit: JAXA

The German Aerospace Centre (DLR), the Japanese Space Agency (JAXA) and the French Space Agency (CNES) agreed to further collaborate on the [Japanese Martian Moons eXploration \(MMX\) mission](#), which aims at exploring Deimos and Phobos with a rover. The DLR is making scientific findings about Deimos and Phobos available in preparation of the mission and is enabling tests to be conducted at DLR's Landing and Mobility Test Facility (LAMA) and in the drop tower at the Centre of Applied Space Technology and Microgravity (ZARM) in Bremen.

Japan working on enlarging its sovereign PNT satellite constellation

The Japanese Ministry of Defence's National Space Policy Secretariat announced it will deploy three additional satellites as part of the [Quasi Zenith Satellite System \(QZSS\)](#), the Japanese GNSS. These satellites are to be deployed by 2023.

Japan creates new "Space Domain Mission Unit"

The Japanese Defence Ministry will place around 100 personnel at a new unit ("[Space Domain Mission Unit](#)") to be set up by fiscal year 2022 to monitor space debris and satellites. The unit will also monitor satellites operated by other countries. Japan aims to establish a system to detect "hunter-killer" satellites that attack other satellites in cooperation with The U.S.A. and Europe. The members of the new unit will work at the Air Self-Defence Force's base in Fuchu, western Tokyo, and may be increased as joint operations with Japan's allies are expected to grow in the future.

In June, JAXA announced it is planning to test in 2020 an infrared sensor for early-warning of ballistic missile launches, by installing the sensor on an [Advanced Optical Satellite \(ALOS-3\)](#). The system can be launched on a H2A rocket, and is expected to test the sensor until 2024.

New landing for Hayabusa2

Japan's space agency conducted a [second touchdown](#) of the Hayabusa2 space probe on the asteroid Ryugu. The project manager for the mission underlined the risk of this operation, notably because of the possibility to lose the samples collected during the first landing.

CHINA

China remains on schedule for Mars

[China's Mars 2020](#) mission is currently undergoing integration, according to Wang Chi, director of the National Space Science Center (NSSC). The mission consists of both an orbiter and a rover, with a total of 13 science payloads. A successful launch of the Long March 5 will be required for China to be ready for the Mars Hohmann transfer window in 2020, and missing this low-energy launch period would bring a wait of 26 months until the next mission launch opportunity.

“Belt and Road” initiative and climate as stepping stone for space cooperation



Credit: CMA/NSCM

China's two ocean observation satellites, [HY-1C and HY-2B](#), have completed their in-orbit delivery, according to the Ministry of Natural Resources.

During the 18th World Meteorological Congress, China Meteorological Administration (CMA) signed [cooperation agreements](#) on applications of the FengYun satellites series with Mozambique and Oman. The CAM also consulted on deepening cooperation and promoting “Belt and Road” meteorological cooperation with meteorological departments of South Africa and Namibia. Another FengYun

satellite application agreement was also signed with [Kyrgyzstan](#), during an official state visit of Chinese President Xi Jinping in June.

China multiplies agreements

The beginning of May was marked by a high-level agreement between the Pakistan Space and Upper Atmosphere Research Commission (SUPARCO) and the Chinese National Space Administration (CNSA), signed in the presence of Pakistani Prime Minister Imran Khan. The agreement creates a [China-Pakistan space committee](#) to address collaboration in manned space missions, Earth monitoring and space applications.



SUPARCO

The [Kazakh-Chinese Working Group](#) for Cooperation in Space Activities met for the second time in the end of May in Beijing. The delegation from Kascosmos and CNSA agreed on short-term interaction for space development activity, and discussed communication satellites compatibility.

[China and South Africa](#) signed a partnership agreement on the 24th of June: this agreement constitutes a framework for the Chinese entities to partner with South Africa on the Square Kilometre Array project (a radiotelescope with a total collecting area of 1 square kilometre, under construction).

New Chinese regulation to boost space activities

For the first time, the Chinese government [released guidelines](#) for regulating commercial rocket manufacturing, test flights and launches. The main objective of this release is to further boost the development of the Chinese commercial space sector by defining clear rules on qualifications, operational boundaries and national guarantees of private Chinese space actors.

INDIA

ISRO unveils ambitious decade of space missions

The Indian Space Research Organisation (ISRO) revealed it is working on [six large missions planned over the next 10 years](#). At this stage, two are planned out: XPosat (X-Ray Polarimeter Satellite, to be launched next year) and Aditya-L1 (planned to be launched on 2021, to study the solar corona). The other missions consist of Mangalyaan-2 (Mars Orbiter 2, planned in 2022), a Lunar Polar Exploration (Chandrayaan-3, for 2023), a Venus mission and Exoworlds (outer solar system exploration in 2028).



Credit: ISRO

India is currently close to launch [Chandrayaan-2](#), a lunar mission consisting of an orbiter, a lander (named Vikram, in honour of Vikram Sarabhai, the “Father of the Indian Space Programme”) and a rover which will study the surface of the South Pole region of the Moon. The cost of the mission totals at €125.3M, and would make the fourth nation to have launched a comprehensive lunar exploration mission.

On the 13th of June, ISRO finally announced it plans to build a [20t space station](#), capable of accommodating astronauts for 15-20 days. This project will be an extension of the Gaganyaan programme human space mission.

Indian human spaceflight advances

On the 28th of May, the Indian Air Force announced it signed an agreement with ISRO for [crew selection and training](#) for the country's maiden manned mission Gaganyaan by 2021-2022. The crew selection and training will be conducted at ISRO's Human Space Flight Centre, opened on the 31st of January adjacent to its headquarters in the city, to develop technologies for the manned space missions.

Towards an “Indian Space Force”?

The current reconfiguration of the Indian Air Forces (IAF) will include a [new agency for space-based missions](#), under the command of an IAF officer. This Defence Space Agency (DSA) will merge the existing Defence Imagery Processing and Analysis Centre in Delhi, the Defence Satellite Control Centre in Bhopal, and the Defence Information Assurance and Research Agency. Although more details are yet to be revealed, it was announced the DSA would be operational in October-November 2019. An institutional question remains open regarding the [relationship between ISRO and the DSA](#).

In June, Prime Minister Modi and the Cabinet Committee on Security approved the creation of a new agency, the [Defence Space Research Agency \(DSRO\)](#), which will provide research and development support to the Defence Space Agency (DSA).

EMERGING SPACE NATIONS

The Third African Space Stakeholders Dialogue took place in Dakar

The third [African Space Stakeholders Dialogue](#) took place in Dakar, Senegal, from the 12th to 14th of June 2019. Organized by the African Union Commission (AUC), this event provides a platform for African stakeholders to exchange on the developments of African space activities. In the context of the implementation of the AUC's African Space Policy, the primary topics tackled during the Dialogue included:

- Governance and collaboration between national agencies and Pan-African initiatives;
- The implementation of the Earth Observation segment (notably on GMES & Africa as well as the AUC-EC agreement on the COPERNICUS data);
- Studies on infrastructure, satellite communication and space science in Africa.

Algerian Space Agency looks at geospatial data

In June, experts of the European Union's [DG ECHO](#) visited the Algerian Agency for technical exchanges on space-based solution for disaster management. In parallel, the first [international conference on the Exploitation of Geospatial Data](#) was announced to take place on 15th-16th of December in Arzew, Algeria.

Angola approves National Space Strategy 2019-2022 and pushes cooperation



On the 9th of May at the first Board of Directors of the Ministry of Telecommunications and Information Technology of the Republic of Angola the [2019 - 2022 Strategic Plan of the National Space Program Management Office \(GGPEN\)](#) was approved. Primarily, the Plan presents a strategic diagnosis for the revision and approval of the legislative acts that govern the space activities in the country, the construction, launch and operation of the ANGOSAT-2 satellite, future satellites and studies for the implementation of the space agency. It details 14 growth and sustainability guidelines and their results-based performance indicators to ensure that the objectives set out are met.

In parallel, Angola's President, João Lourenço, has signed a presidential decree for the signature of a contract between Angola and Airbus for the construction of an Earth Observation satellite named [AngoSat-3](#). This will be Angola's third attempt to put a satellite in orbit. AngoSat-1 had a launch failure in December 2018, and its replacement, AngoSat-2, is currently being developed in Russia.

GGPEN, Inframat and Thales Alenia kicked off the [OpenGeoLab in Angola](#), a platform allowing space-capacity building for the exploitation of Earth Observation satellites (such as ANGOSAT-3, Sentinels, and Landsat, among others).

[Angola and Finland](#) established cooperation in the field of telecommunications, information technology and weather.

[Rwanda and Angola](#) signed a Memorandum of Understanding on Telecommunications and Space Cooperation.

New agreement signed for joint China-Ethiopia satellite

[Ethiopia and China](#) have signed an agreement to jointly build a communication and broadcast satellite. This satellite will be the second one to be built in cooperation with Chinese experts and the Ethiopian Space Science and Technology Institute for the Ethiopian government.



Credit: Thales Group

Indonesia orders Satria

The Indonesian government contracted Thales Alenia Space to build a multifunction satellite that is expected to be put into orbit and begin operations in 2023. The French manufacturer plans to start assembling the satellite, to be called the [Satelit Republik Indonesia \(Satria\)](#), in late 2019 and finish by 2022 satellite. It is expected to improve internet and telecommunications connectivity for public facilities, defence establishments, security administrations and all regional government offices across Indonesia including in frontier, outermost and remote regions.

Israel may not go back to the Moon now, but shows confidence

The non-profit SpacEL, the team behind the manufacture of the Beresheet rover/lander, announced that [will not be reattempting its mission](#) to land on the Moon. This announcement was made despite the [Israeli Space Agency's](#) announcement to put €5M in a second attempt.

The partnerships and capacities built through the Beresheet mission encouraged Israel to sign a Memorandum of Understanding between [Space Florida and the Israel Space Agency](#), to establish cooperation in research and science, technology, engineering education.

Philippines to get its Space Agency

The Senate and the House of Representatives of Philippines approved the creation of the [Philippine Space Agency](#) and the Philippine Space Development and Utilization Policy. Once signed into law with the signature of President Duterte, the PhilSA will be an agency attached to the Office of the President and will be immediately enacted with a €34.5M funding on its first year.

Rwanda to benefit from Chinese aid and infrastructure projects

In the context of the “Access to Satellite TV for 10,000 African Villages” China-Africa cooperation project, the Chinese embassy in Rwanda handed over a [China-funded satellite television project](#) to the Rwandan government, with the support of TV satellite company StarTimes. The project will provide 6.000 households in 300 villages across Rwanda with access to digital television. During the ceremony, China also announced it will commit €52.9B on infrastructural development.

Indian cooperation with Tunisia

India and Tunisia signed a [Memorandum of Understanding](#) on cooperation in the exploration and use of outer space for peaceful purposes, on the 11th of June.

UAE gets involved in meteorite monitoring

The UAE Space Agency has launched the [UAE Meteor Monitoring Network \(UAEMMN\)](#) in collaboration with the Sharjah Centre for Astronomy and Space Sciences (SCASS). It will include three monitoring towers in different parts of the country. The network has been launched just a few months after tight laws and regulations were announced in regards to space activity in the UAE.

Venezuela looks at Russia and China for nanosatellites

The Venezuelan government announced it plans to deliver its own nanosatellites to orbit and hopes for [assistance from Russia and China](#). Venezuelan Defence Minister Vladimir Padrino Lopez said that in the future, “the system of nanosatellites may replace Venezuelan satellites that are currently on orbit.”

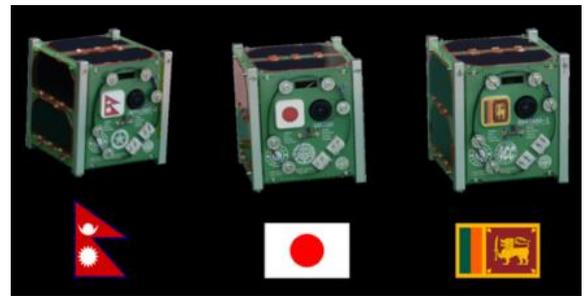
Manufacturers declared that to produce and deliver to orbit an order of magnitude of around 100 nanosatellite the total cost will be around €884.5M.

BIRDS 3 puts Nepal and Sri Lanka in orbit

The BIRDS 3 programme offered the opportunity for Nepal and Sri Lanka to launch their first satellites. Led by the Japanese university, the Kyushu Institute of Technology, this programme consists of three CubeSats launched on April 17th, to be deployed from the Japanese [Kibo module on the ISS](#).

Nepal's first satellite, [NepaliSat-1](#), was successfully deployed from the ISS on the 17th of June. Since Nepal does not have its own ground station, officials at the Nepal Academy of Science and Technology (NAST) asked the Ministry of Communications in Bhutan to send information about the satellite. Nepal's Minister of Education, Science and Technology and Vice-chancellor of NAST attended the live deployment of the satellite at JAXA's offices in Japan.

Sri Lanka's first cube research satellite [Raavana-1](#) was released on the same day.



Credit: birds3.birds-project.com

MULTILATERAL ORGANISATIONS

COPUOS sets guidelines for Space Sustainability

The COPUOS adopted the [Long Term Sustainability Guidelines](#). The LTS Guidelines (2019 COPUOS Report Annex 2, AC.105/L.38/Add.4), defines “long-term sustainability of outer space activities” as “the ability to maintain the conduct of space activities indefinitely into the future in a manner that realizes the objectives of equitable access to the benefits of the exploration and use of outer space for peaceful purposes, in order to meet the needs of the present generations while preserving the outer space environment for future generations.”

[The 21 Guidelines](#) provide non-legally binding guidance on:

- The policy and regulatory framework for space activities;
- Safety of space operations;
- International cooperation, capacity-building and awareness;
- Scientific and technical research and development.

In parallel, The World Economic Forum (WEF) has selected a consortium of companies, Universities and agencies to develop a [system to rate the sustainability of space systems](#), one that its backers hope will encourage good behaviour in space.

[Commentators](#) underlined the adoption by Russia of the guidelines despite its previous veto - while [China](#) demonstrated commitment to space sustainability.

UNOOSA and ESA cooperation for SDGs

The United Nations Office for Outer Space Affairs (UNOOSA) and the European Space Agency (ESA) signed a Memorandum of Understanding (MoU) to cooperate on helping all countries identify how space can sustain their efforts to reach the United Nations Sustainable Development Goals (SDGs), with a view to facilitate access to [space solutions](#) and with particular attention to developing countries.

The ITU stresses the need for better regulations for megaconstellations

The International Telecommunication Union is looking into introducing [stricter rules](#) in order to prevent would-be constellation operators to use a single satellite to hoard radio frequency spectrum intended for

hundreds or thousands of spacecraft. In general, the ITU proposes that constellation operators be required to launch their multiple satellites within an explicit time frames. This reflection takes shape ahead of the upcoming 2019 World Radiocommunication Conference.

NATO looks into space

NATO is poised to consider space as a [domain of warfare](#) this year, four senior diplomats said, partly to show U.S. President Donald Trump that the alliance is relevant and adapting to new threats after he signed off on the creation of a U.S. Space Force. Ministers will address the implementation of NATO's strengthened deterrence and defence posture, including the NATO Readiness Initiative. Ministers are also expected to [approve NATO's first overarching space policy](#). "NATO can serve as a key forum, bringing Allies together to share capabilities and information," said the Secretary General. NATO indeed [approved](#) a new "overarching space policy", although details have not yet been disclosed at this stage.

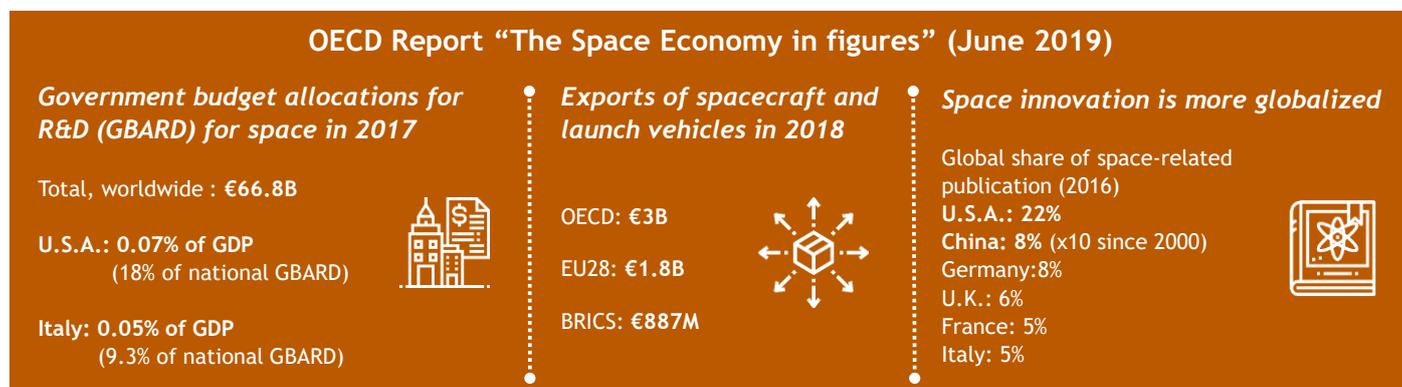
SPACE ECONOMY AND FINANCE

SPACE ECONOMY

OECD publishes study on how space contributes to the global economy

The [OECD published a study](#) in June examining trends and indicators of the impact of space activities on the economy, social wellbeing and science globally and across the OECD Members. The report highlights that the space sector is undergoing profound transformation, driven by unprecedented public budgets unmatched since the Apollo era (€66.5B total worldwide budget in 2017), multiplication of start-ups, and digitalisation, the unprecedented private investments from angel and Venture Capital funds in new markets (such as small launchers).

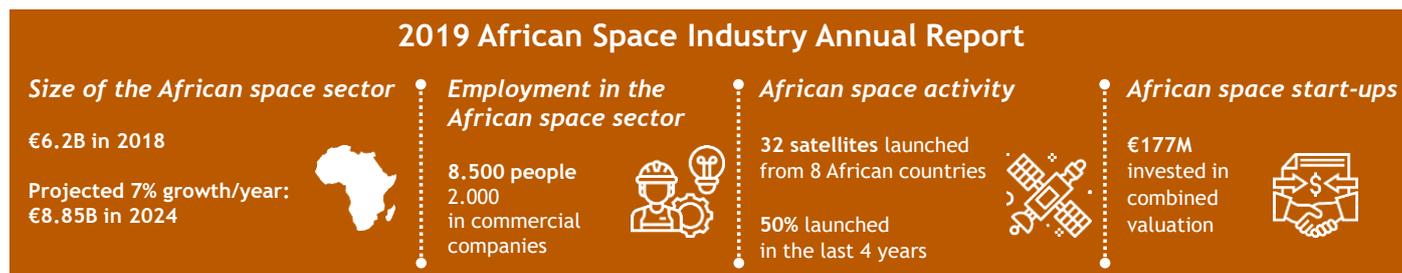
The OECD report also discusses the new challenges facing the space sector: change of customer demands regarding digital products, stronger competition (concentration and/or multiplication of actors across segments), and space debris. Finally, the report suggests policy-oriented actions organised in four key areas: increase governmental use of commercial solutions, map national space economies, address the human resources needs, and finally identify solutions to mitigate space debris.



Space Industry in Africa to reach €8.85B in 2024

Space in Africa released a study of the [African space industry](#) from 1998 to May 2019. The study looks into satellites programmes and history, investment deals, the commercial landscape (including start-ups), and includes a detailed policy segment describing multilateral and cross-sectorial programmes.

The report highlights the [growing opportunity for global private companies](#) to work alongside local industry development. Native commercial space companies are indeed generating revenues (such as Niger’s NIGCOMSAT or South Africa’s SCS Space). Furthermore, the growth in the global private space sector allows to further national and regional strategic priorities - for instance the African Union Agenda 2063 - with the inclusion of non-African entities to expand African space capabilities.

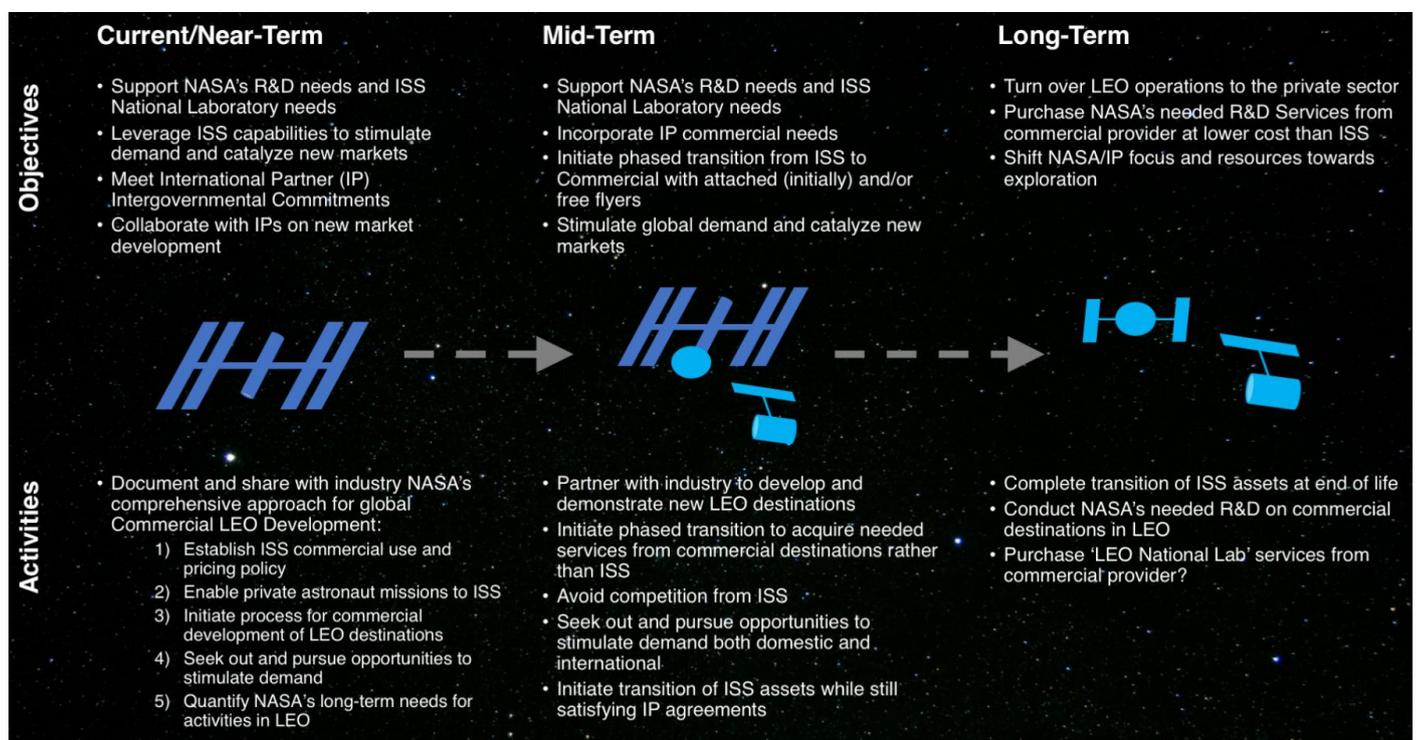


NASA explores commercialization of LEO and ISS

In the context of the new [NASA Interim Directive \(NID\)](#) on the Use of the International Space Station (ISS) for Commercial and Marketing Activities adopted on the 6th of June, NASA is pushing to accelerate the [commercial economy in low-Earth orbit](#). Notably, NASA’s short term vision encompasses: [commercial activities](#) aboard the ISS (including, among others, commercial manufacturing and production) and private astronaut missions. Furthermore, NASA released its [commercial and marketing pricing policy](#).

Last year, NASA published [insights collected](#) from companies who answered a call put out by the Agency. They are intended to inform the agency on potential concepts for future commercialization of [Low-Earth orbit economy](#) - including the commercial potential of the ISS. According to NASA, the main barrier to market entry remains the high costs for crew and cargo transportation.

However, it is pointed out that economies of scale can be achieved by enlarging the market. In this context, NASA would be expected to be a key customer. Profitable opportunities could be found in in-space R&D, assembly and servicing, transportation, tourism, or manufacturing.



Credit: NASA

SPACE FINANCE

ESPI Space Venture Europe Q2 2019

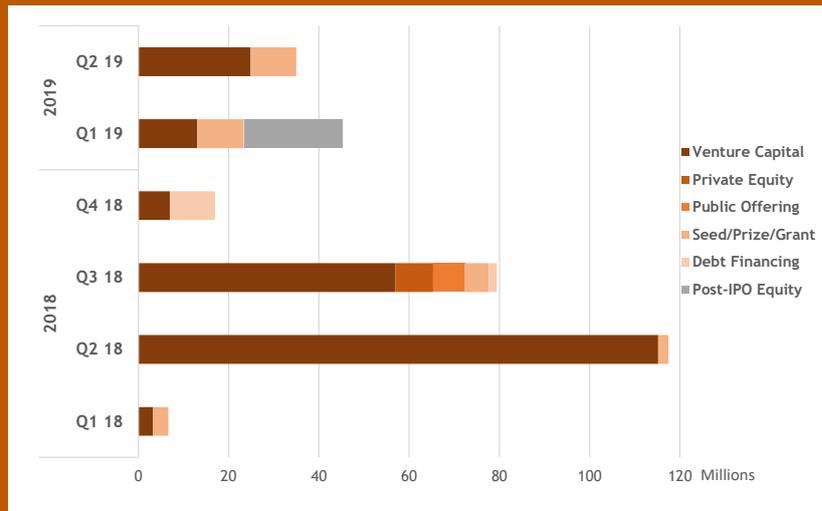
METHODOLOGY NOTE

The assessment of private investments provided in this report is based on the ESPI dataset including exclusively publicly available data on announced operations and deals. Information is collected by screening a high number of sources including investment firms’, incubators’ and accelerators’ portfolios, articles and specialised news outlets or specialised sources such as CrunchBase. Cross checking was systematically performed. ESPI database includes deals for the period 2014-2019. The following definitions were applied to delineate the perimeter of the analysis:

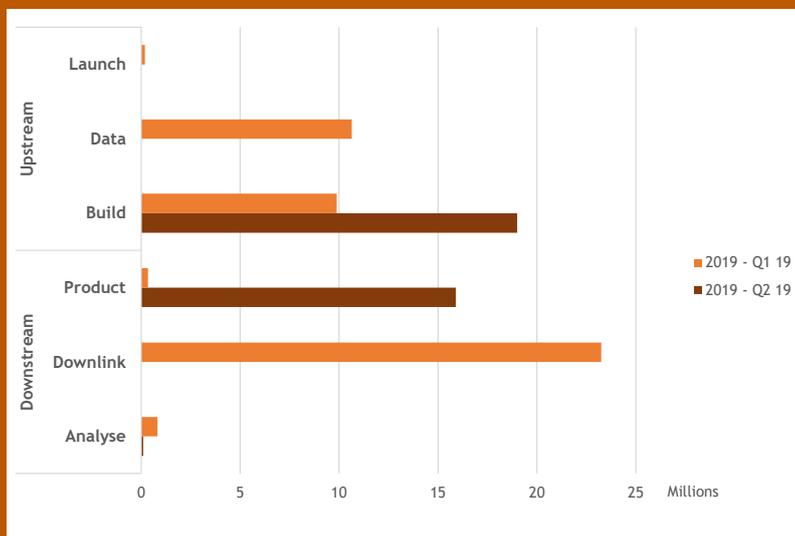
- Start-up: is a company younger than 10 years and who has not yet reached business maturity (defined according to business stage: Public Offering and or Acquisition, annual turnover <€50 million, or number of employees <250);
- Space company: is a company which main business (in revenue share) is part of the space value chain;
- European company: is a company for which the headquarters, or the majority of its business operations are conducted in Europe (EU Member States + ESA Member States).

More detailed information on definitions applied and investors and investment categories used for the purposes of this research, are available in the [Space Venture Europe 2018 Report](#) free for download here.

Q2 2019 private investments in European space start-ups



In the second quarter of 2019, the total amount of private investments to European space start-ups recorded is about €35M, marking a steady increase compared to the previous quarter of the year (+149.20%). As in previous quarters, Venture Capital remains again the main form of private funding for start-ups, totalling about €25M, doubling its amount compared to the previous quarter and representing 71.15% of the total investments for Q2 2019. This quarter, not included in the figure above but worth mentioning, are three major acquisitions involving two German companies active in the development of ground terminals: SatService and Apexsat and a deal reaching €1B for the acquisition by Canal+ of the Luxembourgish M7 Group, one of the largest European satellite TV operators.



Private investments across the space value chain:

The UPSTREAM segment includes

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

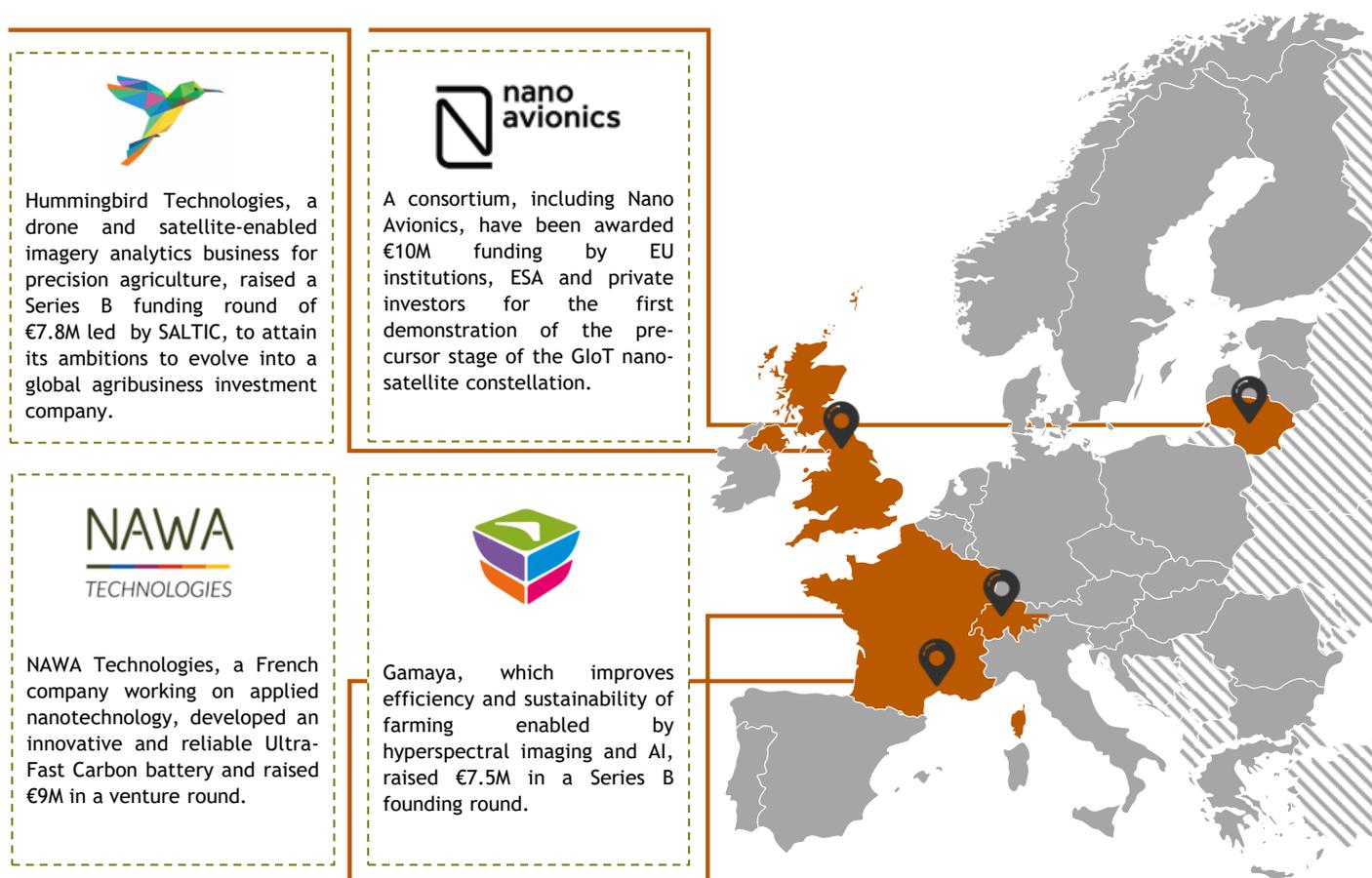
The DOWNSTREAM segment includes:

- **Downlink:** development and manufacturing of the ground support infrastructure and services (e.g. relay systems, communications, ground terminals, cryptography);
- **Store:** solutions for satellite data storage and processing;
- **Analyse:** solutions for satellite capabilities and data exploitation (e.g. big data analytics, machine learning and AI, algorithms);
- **Product:** space-enabled products to end-users (e.g. mapping & 3D, data platforms, location and tracking).
- Business activities beyond earth orbit (e.g. space exploration, resources, logistics, research) is clustered in a parallel category.

During the second quarter of 2019, the distribution of the investments across the space value chain result to be much more balanced compared to previous quarters. The upstream segment with 54.29% of the quarter's total recorded two major deals: a Series A round for NAWATechnologies and a consortium led by Nano Avionics including KSAT and Antwerp Space to build a constellation for Internet of Things connectivity.

As for the downstream segment (45.71%), the largest amount of investment was directed towards product related industries.

Distribution of Top 4 Transactions in Europe



Space Angels: Space Investment Quarterly Q2 2019 released

The U.S. angel and Venture Capital firm Space Angels released its [Space Investment Quarterly for Q2 2019](#), which offers a comprehensive review of global investments in the space sector. The report covers all types of investments by source, region and industry segmentation. It also features the evolution of investment activity over time (since 2009). It is worthy to mention that the perimeter of the scope of the Space Investment Quarterly goes far beyond the definition of SMEs applied in Europe, encompassing more mature companies such as OneWeb or SpaceX.

According to the quarterly report, the total amount of worldwide investments in the space sector in Q2 amounts to \$1.3B (€1.16B), which brings the total amount of investment in 2019 at \$2.9B (€2.6B): 88% of the total investments in 2018. Over the period, SpaceX concentrated the investments with \$981.5M (€872M)

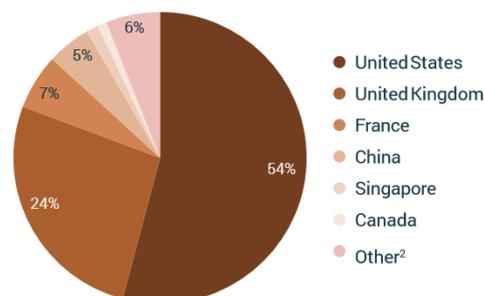
in three rounds of funding, led by Softbank Group, Grupo Salinas, the Ontario's Teachers' Pension Fund and Baillie Gifford. The report finally looks at the investment stages, observing a steady rate of seed rounds, and a potentially growing number of later stage investment rounds in the coming quarters (notably Series B and C).

Finally, the quarterly report looks at the geographic distribution of investments as well as the type of investor since 2009. The U.S. stands out as the country where the vast majority of investments deals were recorded with 54% of cumulated global investments since 2009, followed by the U.K. (24%), France (7%), and China (5%). A noticeable increase in investments in Asia was observed this Q2 2019. As for the type of investors, Q1 and Q2 received inflows mainly from Corporate and Venture Capital.

Annual Investment Source



Cumulative Investment Location



Credit: Space Angels

Announced Investment deals

- ▶ [Inmarsat](#) investors voted to sell the British satellite firm to a private equity-led consortium for €3B following a recommendation from the company's board.
- ▶ [Loon](#) raised €111M from HAPSMobile.
- ▶ [Avanti](#) secured a €49.3M credit line.
- ▶ [Astroscale](#) raised €26.6M in Series D funding round, led by Innovation Network Corporation.
- ▶ [NAWA Technologies](#) is preparing for mass production of its next-generation ultracapacitor, the Ultra Fast Carbon Battery, following a €9M funding round.
- ▶ [Hummingbird Technologies](#) received a €7.9M funding round led by The Saudi Agricultural and Livestock Investment Co. (SALIC), bringing the company's valuation to €34M.
- ▶ [Bellatrix Aerospace](#), an Indian private rocket start-up, has raised €2.6M in pre-Series A funding led by IDFC-Parampara, StartupXseed and Bollywood superstar Deepika Padukone.
- ▶ [VC Antler](#) has announced an injection of €1.26M into its first batch of European startups in Stockholm, Sweden.
- ▶ [Forsway](#) received a €50,000 grant from the EU's Horizon 2020 research and innovation project to further develop its technology.
- ▶ [SatSure](#), a geospatial data analytics company which leverages advances in satellites, machine learning, and big data analytics, has won the Imkan Innovation Award worth €8,900 at startAD's Venture Launchpad.

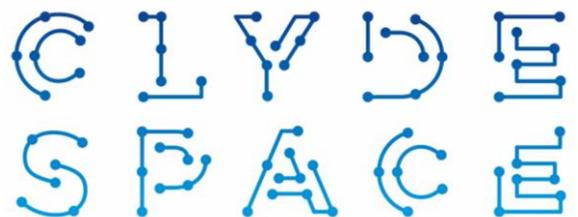


- ▶ [Calian Group Ltd.](#) has acquired SatService, Gesellschaft für Kommunikationssysteme GmbH. ("SatService").

SPACE BUSINESS

Major contracts

- ▶ [Arianespace](#) has been selected by exactEarth to launch the ESAIL satellite using a Vega as part of the launcher's Small Spacecraft Mission Service (SSMS) Proof of Concept (POC) flight. It is the final contract signed by Arianespace for this POC flight, which is now completely booked with 42 payloads on-board.
- ▶ [Airbus](#) has signed a contract with Inmarsat to design, manufacture and build the first three next generation geostationary Ka-band satellites, Inmarsat GX7. The three satellites are the first to be based on Airbus' new OneSat product line, which is fully reconfigurable in orbit.
- ▶ [Airbus](#) has been selected by MEASAT Global Berhad, the leading Malaysian satellite operator, to build MEASAT-3d, a new multimission telecommunications satellite to replace capacity and increase its core business in Malaysia, Asia, Middle East and Africa.
- ▶ [Airbus and the government of Angola](#) signed a contract for the construction of an Earth Observation satellite (AngoSat-3).
- ▶ [Airbus and Thales Alenia Space consortium](#) has been selected by Hisdesat Servicios Estratégicos S.A. (Spanish Governmental Satellite Operator) to build two SpainSAT NG satellites. Used for governmental communications, these new generation satellites will replace the existing Spainsat and Xtar-EUR satellites. Airbus will act as "lead partner" of the consortium.
- ▶ [Avanti](#) announced signing a long term bandwidth contract with Türksat.
- ▶ [BlackSky](#) announced it has signed an agreement with HawkEye 360. As part of the agreement, HawkEye 360 will provide API access to selected RF data for customers interested in global spectrum monitoring.
- ▶ [CGI and Thales Alenia Space France](#) signed a €14M contract to enhance and maintain security software for the Galileo satellite navigation system until the end of 2020.
- ▶ [ClydeSpace](#) (subsidiary of ÅAC Microtec AB) will manufacture Ireland's first satellite, EIRSAT-1.
- ▶ [Equatorial Launch Australia \(ELA\)](#) secured a contract with NASA to launch commercial rockets from an Australian spaceport in 2020.
- ▶ [GomSpace ApS](#), a subsidiary of GomSpace Group AB, has been selected by and has entered into a procurement contract with UnseenLabs SAS to develop and deliver a system based on nanosatellites to provide disruptive spectrum monitoring services from space. [GomSpace](#) also announced its quarterly results for Q1 2019.
- ▶ [Innovative Solutions In Space](#) was selected by the University of Hawaii at Manoa's Hawaii Space Flight Laboratory (HSFL) to realize their 6U platform. ISISpace and HSFL will work closely on the design for this challenging mission. ISISpace will provide the platform while the payload integration and flight preparation will be completed by HSFL.



- ▶ [Intelsat](#) announced it has been selected by PT. Aplikasi Lintasartato: the 5-years agreement is intended to support the deployment and expansion of Indonesia's broadband and wireless communications infrastructure.
- ▶ [LeoSat Enterprises](#), was selected by X2nSat to support new infrastructure solutions to specifically address the needs of the healthcare industry.
- ▶ [LeoStella](#), U.S.-European joint venture, was chosen by Cloud Constellation Corp. to build satellites for its cloud-based data storage service. The satellite constellation, known as SpaceBelt, is scheduled to go into operation in late 2021.
- ▶ [Maxar Technologies](#) today announced that it was awarded multiple contracts in the first quarter of 2019 to provide innovative Earth intelligence solutions to U.S. government agencies, with a total value of more than €84.6M.
- ▶ [Relativity](#) announced it signed a LaunchServices Agreement (LSA) with Spaceflight. The agreement includes the purchase of a first launch, scheduled for Q3 2021, with options for additional rideshare launches in the future.
- ▶ [RUAG Space and Rocket Crafters](#) will collaborate to support an initial test of the company's STAR-3DTM hybrid rocket engines.
- ▶ [SES](#) has been selected by Ivory Coast's Société Ivoirienne de Télédiffusion (SIDT) as its digital partner in a major move to meet the country's 2020 deadline for switching over from analogue to digital broadcasting.
- ▶ [Sierra Nevada Corporation \(SNC\)](#) - teamed with the Marubun Corporation of Tokyo, Japan - has been awarded a contract to supply critical hardware for Japan's HTV-X cargo spacecraft.



- ▶ [SpinLaunch](#) secures first contract for revolutionary New Space launch services (a [catapult](#)): a responsive launch prototype contract from the Department of Defense (DOD), facilitated by the Defense Innovation Unit (DIU).

- ▶ [Viasat Inc.](#) has been awarded a contract by the Administrator of the Space Enterprise Consortium, under the Air Force Research Laboratory Space Vehicles XVI program, to deliver and test the first-ever Link 16-capable LEO spacecraft.
- ▶ [Viasat Inc. and Arianespace](#) announced a modification to their original ViaSat-3 satellite launch contract, signed in 2016. Under the new agreement, the two companies agreed to move the ViaSat-3 satellite from an Ariane 5 ECA launch vehicle to the next-generation Ariane 64 (A64) launcher. With this contract, Viasat will become the first commercial customer to commit to launch on the A64.
- ▶ [Viasat-Telebras](#) contract approval enables quick provision of high-speed satellite broadband services across Brazil.

Major announcements

- ▶ [Amazon Web Services \(AWS\)](#) announces general availability of AWS Ground Station.
- ▶ [Astrobotic](#) has been selected by Toronto-based Canadensys Aerospace to fly a lunar science and technology payload that promotes science education on Astrobotic first mission to the Moon in 2021.
- ▶ [Avanti](#) was granted its first landing right permit (license for satellite internet) for hosting of its HYLAS 4 Satellite space segment over Nigerian territory by the Nigerian Communications Commission.
- ▶ [Bigelow Space Operations \(BSO\)](#) announced it secured four SpaceX launches to ISS.

- ▶ [Eutelsat](#)'s introduction of satellite broadband across Africa (Konnect Africa) faces challenges.
 - ▶ [Globalsat Group](#) announced that its Argentina affiliate has been authorized by the national telecommunications authority ENACOM to provide services throughout the second largest South American country.
 - ▶ [Globalstar](#) announced the successful completion of MSS and terrestrial authorizations across Africa, covering a population in excess of 100 million.
 - ▶ [HISPASAT](#) announced a partnership with Facebook to offer satellite-based Wi-Fi connectivity in Brazil, supported by the Facebook Express Wi-Fi platform.
 - ▶ [hiSky](#) has established a UK limited company - hiSkySat Limited - based in London, with an R&D centre at Harwell to develop a satellite communications network management system (NMS) and operation centre. The UK Space Agency provided €10M of funding.
- 
- ▶ [The Houston Airport System](#) started the phase 1 (€16.7M) of the future Houston Spaceport.
 - ▶ [Hub71](#), a global tech hub driven by Mubadala in collaboration with Microsoft, SoftBank Vision Fund and Abu Dhabi Global Market announced that two new partners, Techstars and Starburst, will join the tech this year.
 - ▶ [Hughes Communications India Ltd.](#), a majority-owned subsidiary of Hughes Network Systems LLC, the world's leading provider of broadband satellite networks and services, and Bharti Airtel Limited announced an agreement to combine their Very Small Aperture Terminal (VSAT) operations in India.
 - ▶ [Iridium Communications Inc.](#) announced the completion of its €2.7B satellite constellation upgrade campaign.
 - ▶ [Kinéis](#) (subsidiary of CLS) is officially launching its industrial programme along with strategic partnerships with experts in the Internet of Things: Objenious (subsidiary of Bouygues Telecom) and Wize Alliance (SUEZ, GRDF, Sagemcom).
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- ▶ [Kymeta](#) has announced a new partnership deal with Türksat.
 - ▶ [L3Harris Technologies merger](#) (Harris Corporation with L3 Technologies) was successfully completed.
 - ▶ [LeoLabs](#) created a tool for the New Zealand Space Agency to track satellites in low Earth orbit (the "Space Regulatory and Sustainability Platform"). The Platform provides independent, on-going monitoring of satellites and will be able to alert the NZSA when a satellite is outside of its regulatory limits and at risk of collision with other objects.
 - ▶ [Maxar Technologies](#) is exploring the sale of its space robotics business, which could fetch more than €889M and allow it to pay down some of its debt. The sale of the business would help address concerns about Maxar's €2.8B debt pile. Its WorldView-4 satellite failed in January, causing shares to slide.
 - ▶ [NanoRacks Space Outpost S.r.l.](#) opened its offices in Turin on April 1st, where will be based the newly appointed Director of Global Engagement (Europe) Veronica La Regina as well as the NanoRacks Head of European Operations Peter Bak.
 - ▶ [Newtec](#) announced it is working with QinetiQ on two key projects as it enters the Belgian space market.
 - ▶ [Ovzon and Hispasat](#) have entered into a strategic partnership agreement to jointly offer a high-capacity portable broadband solution. Hispasat will provide the satellite capacity to power the services in Europe and Latin America, where the companies will jointly market this solution.
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- ▶ [Peraton](#) has completed second acquisition of Solers.
- ▶ [Qualitynet](#) announced that it has won the license to provide Internet, telecommunications and satellite services in Iraq.
- ▶ [SES and Briskom](#) has announced a partnership to deliver SES Networks' Signature Solutions in Brazil.
- ▶ [Siemens Digital Industries Software](#) was selected by the European Space Agency to develop aerospace design applications for metal additive manufacturing.
- ▶ [Sky and Space Global and GomSpace](#) have entered into a Heads of Agreement consisting of the delivery of 6U satellites - a delivery of the first batch of 8 nanosatellites by Q1 2020 - and an optional batch of 8 more nanosatellites planned for the first half of 2020.
- ▶ [Space Hub Sutherland](#) at the Highlands and Islands Enterprise (located in the A'Mhoine peninsula, north of Scotland) is expected to begin with vertical launches of small satellites in the 2020s.
- ▶ [TeamIndus](#) performed the design and engineering of Orbit Beyond's lander proposal, which was selected for NASA's Commercial Lunar Payload Services (CLPS).
- ▶ [TELNET Holding, SPUTNIX and GK Launch Services](#) have signed a trilateral memorandum of understanding under which the parties intend to cooperate in building smallsat components and entire satellites, their orbiting and deployment of constellations.
- ▶ [Turkish Aerospace Industries Inc. and INVAP](#) have partnered to establish a joint venture company, GSATCOM Space Technologies. The new company, GSATCOM has initiated its first program to develop, manufacture and market the small geostationary telecommunication satellites. The new satellite family will offer a range of telecommunication solutions which will be implemented on a full electric platform in the small size GEO satellite concept.
- ▶ [Virgin Galactic announced moving activities to New Mexico](#), with the finalization of the €178M publicly funded spaceport.
- ▶ [Vulcan](#), the holding company of Stratolaunch, put up for sale the 226t plane along with intellectual property and operations facilities for €352M.
- ▶ [Yahsat](#) announced a strategic partnership with Zimbabwean operator, Zodsat.



Credit: Highlands and Islands Enterprise

SPACE INDUSTRY AND INNOVATION

LAUNCHERS

Developments of future European and U.S. launchers

Having started the mass production of Ariane 6 recently, at the Satellite 2019 Conference in Washington D.C. ArianeGroup confirmed that the first flights of Ariane 6 and [Vega C](#) will take place as early as 2020, kicking off the transition period from Ariane 5 to Ariane 6 and from Vega to Vega C in the 2021-2023 timeframe. In particular, around [6 to 7 launch contracts](#) for Vega C were already signed, with more in the pipeline.



Credit: ESA

[MT Aerospace and ArianeGroup](#) signed a contract with ESA to develop a “Prototype of a Highly Optimised Black Upper Stage” (“Phoebus”). This partnership aims developing technology to deliver an integrated stage demonstrator for cryogenic ground testing purposes in 2022, with possible applications for Ariane 6 in 2025.

RUAG launched a new product line: [thermal insulation](#) for launch vehicles. This new line builds on the already existing knowledge and capacity of satellite thermal insulation. The Swiss company will be delivering this insulation solutions for Ariane 6.



Credit: ArianeGroup

ArianeGroup and CNES Arianeworks recently-launched platform for space launchers innovation, ArianeWorks, is accelerating the development of the low-cost, reusable first-stage demonstrator [THEMIS](#), with the development of a small test vehicle built by the rapid-prototyping firm MyCTO.

ESA completed hot-firing tests to prove technologies to be used for “intelligent” engines powering the upper stages of next-generation launchers. This concludes a nine-month of testing the [Expander-cycle Technology Integrated Demonstrator \(ETID\)](#) at the DLR Lampoldshausen site in Germany. During the test the versatility of the ETID, design to operate over wide mixture ratio and chamber pressure ranges, was demonstrated. ETID is being carried out within ESA’s FLPP.

NASA tested a scale model of the Block 1 Cargo configuration of its [SLS in wind tunnels](#), to refine analysis and modelling of the vehicle’s atmospheric trajectories, Guidance, Navigation, and Control (GNC), and structural loading. This configuration is under consideration for the Europa Clipper.

In the beginning of May, Blue Origin successfully performed the 11th test flight of New Shepard. Both the New Shepard rocket and capsule touched down safely back at the company’s West Texas facility around 10 minutes after lift-off. The capsule reached about 105km. The mission flew [38 research payloads](#) for a variety of schools, universities, governmental agencies and private companies.

Northrup Grumman conducted a static fire test of the first stage of [OmegA rocket](#), which is being developed aiming at launching in orbit U.S. national security payloads, with a planned first launch in 2021 and operational capability in 2022. Another full-scale static fire test will occur later in the year.

Sierra Nevada Corporation opened to the public a test-firing of its patented [VORTEX rocket engine](#), which uses green and clean propellants to be used on Dream Chaser spacecraft for ISS missions starting in 2021.

VirginOrbit also conducted a “full scale, full duration and full thrust” test firing of [LauncherOne’s main stage](#). According to the company, this conclusive 3-minutes test opens the way for final assembly of the orbital rocket.

A.I. for future Chinese launchers?

The Chinese start-up Interstellar Glory Space Technology Co. won the first prize (€64.000) of the competition “China International Big Data Fusion Innovation and AI Global Competition”, for developing an [artificial intelligence control system](#) for launch vehicles. The system is designed to help reduce the cost of recycling launch vehicles through controllable recovery and reuse.

EARTH OBSERVATION

Disaster management testing

The German Aerospace Center (DLR) conducted a comprehensive flood scenario project in The Hague as part of the [Driving Innovation in Crisis Management for European Resilience](#) (DRIVER+) project. Deemed a success, the experiment was based on innovative 2D and 3D maps and a traffic routing system, which allowed crisis managers to simulate response in case of an intense flooding.

Release of ICESat-2 data

First [ICESat-2 Global Data Released](#): NASA’s ICESat-2 mission, launched in September 2018, the took these measurements of polar height data with a laser altimeter in a dense grid across the Arctic as well as Antarctica, recording each spot every season to track both seasonal and annual changes in ice.

TELECOMMUNICATIONS

New chip for China’s BeiDou-3

Chinese UniStrong unveiled [Lyra-II](#), a high-precision baseband chip designed for the BeiDou-3 satellite navigation system. Among other features, the company announced that the chip possesses a new anti-interference technology which can detect and suppress interfering signals.

Validation of Ka-band optical devices

Isotropic Systems announced successful completion of validation testing for its [Ka-band optical devices](#), planned for 2021. This will allow cost-effective and increased high-performance capacity, notably for key partner-customers such as SES Networks and Inmarsat.

Testing 5G

A 5G connectivity test was successfully conducted at the University of Surrey’s [5G Innovation Centre](#) (5GIC), where Telesat’s LEO Phase 1 satellite (built by Surrey Satellite Technology Ltd, launched in 2018) demonstrated up to 60Mbps throughputs for most visible orbits. This is the world’s first 5G connection over a LEO satellite.



Credit: SSTL

HUMAN SPACEFLIGHT

ISS crew returns to Earth

Anne McClain (NASA), David Saint-Jacques (Canadian Space Agency) and Oleg Kononenko (Roscosmos) safely returned to Earth on the 25th of June, ending the 7-months mission of the [Expedition 59](#).

DNA experiment aboard ISS

For the first time, astronauts aboard the ISS have used CRISPR-Cas9 to [edit the DNA](#) of brewer's yeast. The company miniPCR Bio designed the DNA lab aboard the ISS, and the idea of this experiment stems from NASA's Genes in Space contest. The results will give insights into the impact of cosmic radiation on DNA in the context of long interplanetary voyages (to Mars, for instance).

Boeing's Starliner completes tests

At ASA's White Sands Test Facility in New Mexico, Boeing has completed ground testing of the propulsion systems for its CST-100 Starliner commercial crew vehicle. Teams ran multiple tests on Starliner's [in-space manoeuvring system](#) and the spacecraft's launch abort system.

Advances in Lunar habitats and transportation

The [EM-1 Orion spacecraft](#), currently in its final assembly stage, will be tested in the Space Simulation Vacuum Chamber at NASA Plum Brook's Space Power Facility. The spacecraft, in its in-space configuration, will be run through different thermal vacuum and electromagnetic testing that should take a few months.

Northrop Grumman Innovation Systems (NGIS) and NASA announced the completion of tests on a full-scale mock-up of NGIS's proposed [Deep Space Gateway habitat modules](#). To fully simulate Cislunar Gateway missions, the mock-up was fitted with crew exercise equipment, life support systems, a toilet, a viewing window, a galley, sleeping quarters, science racks, a radiation shelter, robotics workstations, and an airlock/tunnel.



Credit: Firefly

New orbital transfer vehicle

Firefly unveiled its [Orbital Transfer Vehicle](#), a solar-electric third stage intended for the company's Alpha and Beta launch vehicles. It aims at providing in-space propulsion and can serve as a payload bus for missions lasting up to five years.

NAVIGATION

Chinese to put to use satellites for plane-tracking

The China Electronics Technology Group Corp's 54th Research Institute in Shijia-Zhuang, is developing a satellite-based monitoring system capable of tracking and monitoring in real-time planes in flight. The system, called "[Sky Mirror](#)", will consist of a series of LEO satellites receiving and emitting ADS-B signals - combined with the accuracy of the BeiDou Navigation Satellite System. China is currently the second nation with the U.S.A. to develop and build a space-based air traffic surveillance network.

New antenna for faster data

The company Analytical Space Inc. is launching a technology demonstration spacecraft. A 3U CubeSat (Meshbed) is to be equipped with a [MITRE Frequency-scaled Ultra-wide Spectrum Element \(FUSE\)](#) antenna, built using metal additive manufacturing technologies

ROBOTIC EXPLORATION

ESA's PLATO gets its "eyes"

The European Space Agency's has received the first [CCD Bruyères image sensor](#) to be used for the PLANetary Transits and Oscillations of stars mission (PLATO). Developed by Teledyne e2v, this is the first delivery of a €42M order for sensors. PLATO will consist of 26 telescopes mounted on a single satellite platform, and should be launched in 2026.

Chang'e continues to offer knowledge on far side of the Moon

The Yutu-2 lunar rover [travelled 190.66 meters](#) on the far side of the Moon, and sent back to Earth data from the Visible and Near Infrared Spectrometer (VNIS) on-board the rover, as part of the Chang'e mission. The data is continuously analysed by the [Key Laboratory of Lunar and Deep Space Exploration](#) of the Chinese Academy of Sciences in Beijing, China.



Credit: ESA

TECHNOLOGY DEMONSTRATION



Credit: Planetary Society

Success of new de-orbiting sail

Surrey Satellite Technology Ltd successfully deployed the 6.7m² innovative "[space sail](#)" (Icarus-1) aboard the TechDemoSat-1, launched in 2014 and deployed at an altitude of 635km in LEO. The sail is intended to increase the small amount of atmospheric drag which still affects satellites up to orbit heights of 1.000km or more, thus possibly providing solutions to their de-orbiting, and ultimately reduce future space debris.

Promising successes for ChipSats

NASA Ames Research Center and Stanford University announced the successful deployment in orbit and data acquisition of [105 ChipSats](#): miniaturized satellites the size of a post stamp, each built for under €900. The project was initially crowdfunded (315 contributors, €65,800 collected), with additional grants from NASA and the Breakthrough foundation.

Demonstrating LightSail 2

The solar sailing spacecraft [LightSail 2](#), developed and funded by the Planetary Society, announced 22nd June as a launch date, aboard a SpaceX Falcon Heavy rocket. LightSail 2, which aims at demonstrating the power of sunlight for propulsion, will deploy a boxing ring-sized solar sail and attempt to raise its orbit using the push from solar photons.

"Wafercraft" aims for deep space

Students of UC Santa Barbara developed a [prototype wafer scale spacecraft \(WSS\)](#), launched into the stratosphere (32km), which among other tests collected over 4.000 Earth Observation images. The long term goal, according to experimental cosmologist Philip Lubin, is to use directed energy propulsion

technology (“laser propulsion”) to make the tiny spacecraft reach up to 20% of the speed of light. This could allow the spacecraft to reach the Alpha Centauri system in around 20 years.

Greener propellants for satellites under testing

The U.S. Air Force’s ASCENT (Advanced Spacecraft Energetic Non-Toxic Propellant), was launched on 24th June on a Falcon Heavy rocket, aiming at in-orbit testing of a new spacecraft [green propellant](#). The mission will demonstrate the practical capabilities of AF-M315E, a Hydroxyl Ammonium Nitrate fuel and oxidizer monopropellant developed by the Air Force Research Laboratory, intended to replace the highly toxic and hazardous hydrazine commonly in use for spacecraft propulsion.

COMPUTING

Square Kilometer Array (SKA) gets its “brain”

The Square Kilometre Array’s (SKA) [Science Data Processor consortium](#), formed by 11 countries and led by the University of Cambridge, finished the design work on one of the two supercomputers. One of them will be located in South Africa, the other in Australia. The SKA’s supercomputers will be able, for instance, to detect and remove manmade radio frequency interference (RFI) by itself. The consortium further underlines that this system is poised to bring other applications in domains such as weather forecasting, climate research or drug development.

Advanced equipment arrives at the ISS

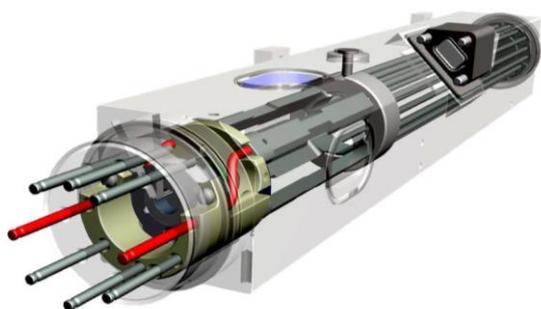
MEI Technologies Inc. announced the successful arrival aboard the ISS of the [Space Test Program-Houston 6 \(STP-H6\) and the RED-EYE](#). The STP-H6 payload includes several experimental payloads: supercomputing experiments, an electro-static analyser, a positioning and attitude control system, a communication and tracking system, an infra-red camera to make night-time observations of airglow, and a Star Tracker Experiment to demonstrate technology for star detection accuracy. MEI Technologies Inc.’s RED-EYE microsatellite will also be deployed from the ISS for technology demonstration of satellite communications and attitude control technologies.

Cheaper radiation-hardened chips to roll out

Cobham Advanced Electronic Solutions unveiled a new family of [radiation-hardened chips](#) (“LeanRE product family”), targeting the small satellite and “non-traditional” spacecraft market with the aim of proposing up to 60% in savings compared to other similar chips.

China launches Space Cloud Cubic Platform

The Chinese Academy of Sciences (CAS) has unveiled a cloud technology-based data platform tailored to the commercial space industry. CAS Tianta and Alibaba Cloud, the data intelligence branch of Alibaba Group, have signed a framework cooperation agreement in joint development of products and services under the [Space Cloud Cubic platform](#).



Deep space atomic clock is ticking

Late June, a [Deep Space Atomic Clock](#) developed by NASA’s JPL - the first atomic clock to be sent on-board a spacecraft destined beyond the Earth’s orbit. This system will allow to improve navigation of spacecraft. Beyond the short-term technology demonstration purposes, this atomic clock is also intended [to support](#) Moon to Mars missions, radio-based science, and GPS clock stability.

Credit: NASA

SPACE ACTIVITY OVERVIEW

KEY INDICATORS AND GRAPHS

Methodology note

ESPI tracks all launch events and related data since 2000. The ESPI Space Launch Activity Database encloses those worldwide data allowing for detailed quantitative analysis rendered into graphs and charts. The database is a repository of publically available information on global space activity such as:

- Launch events: date, launch site, outcome, launcher, spacecraft and service provider;
- Spacecraft: customer, orbit, mass, manufacturer, payloads, mission and market.

The database architecture allows the user to create dedicated field and categories to tailor specific analysis.

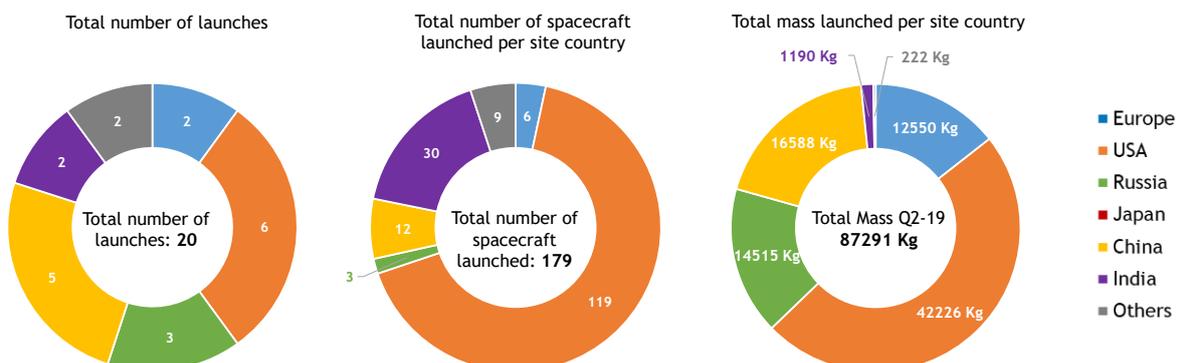
In order to provide the reader with a spacecraft’s categorization taking into account both the capacity of the launchers and the different sizes of satellites, ESPI team defined and applied to the dataset the following categories:

Large spacecraft >500kg	Extra heavy-class	>8,000kg
	Heavy-class	2,000-8,000kg
	Medium-class	500-2,000kg
Small spacecraft <500kg	Mini-class	100-500kg
	Micro-class	10-100kg
	Nano-class	<10kg

Detailed information about all the satellites deployed are available in the Launch Log section.

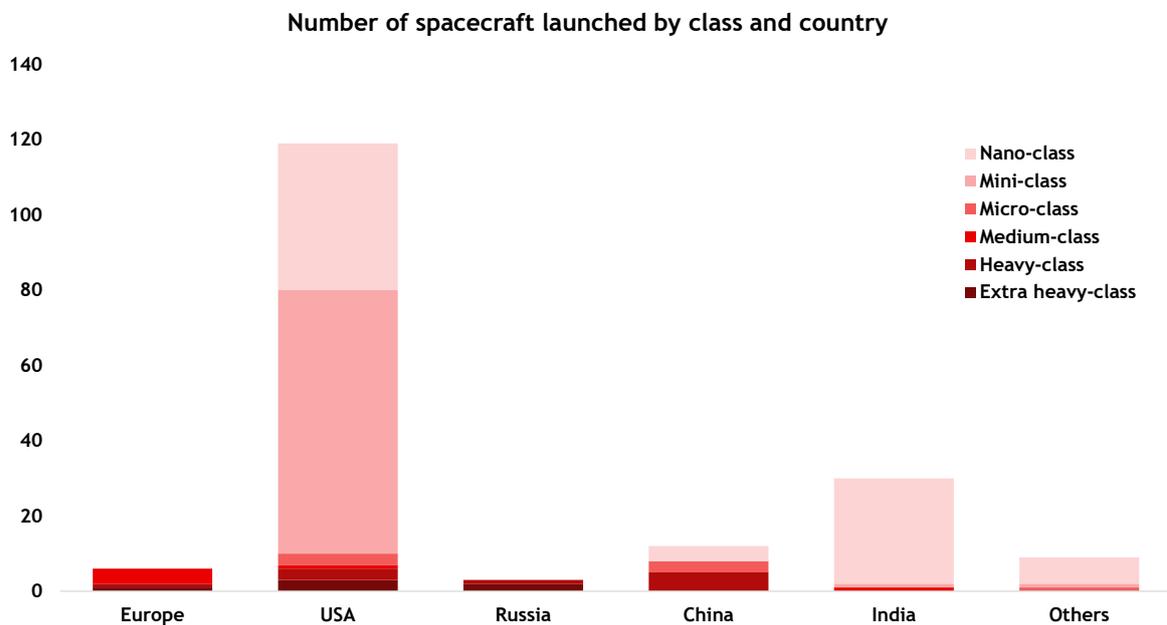
Launches by country

Q2 2019 continues to echo the outcomes of Q1, mirroring a U.S. dominance in the overall launch activity, with a little over 42t launched in orbit - the largest share of total mass launched (48.37%) and by far the highest number of satellites: 119 (66.5%). The mass launched is relatively balanced compared with Q1 2019 (+7.52%) with Europe, Russia and China sharing the majority of the rest of the total mass launched (Europe: 14.38%, Russia 16.63% and China 19%). However, the nature of the spacecraft launched from these respective regions sensibly differ. This is reflected by the number of launches and spacecraft launched. A noticeable difference with Q1 2019 is the increased Indian activity: with 2 launches, India launched 30 spacecraft, although it only represents 1.1t.



Spacecraft launched by class

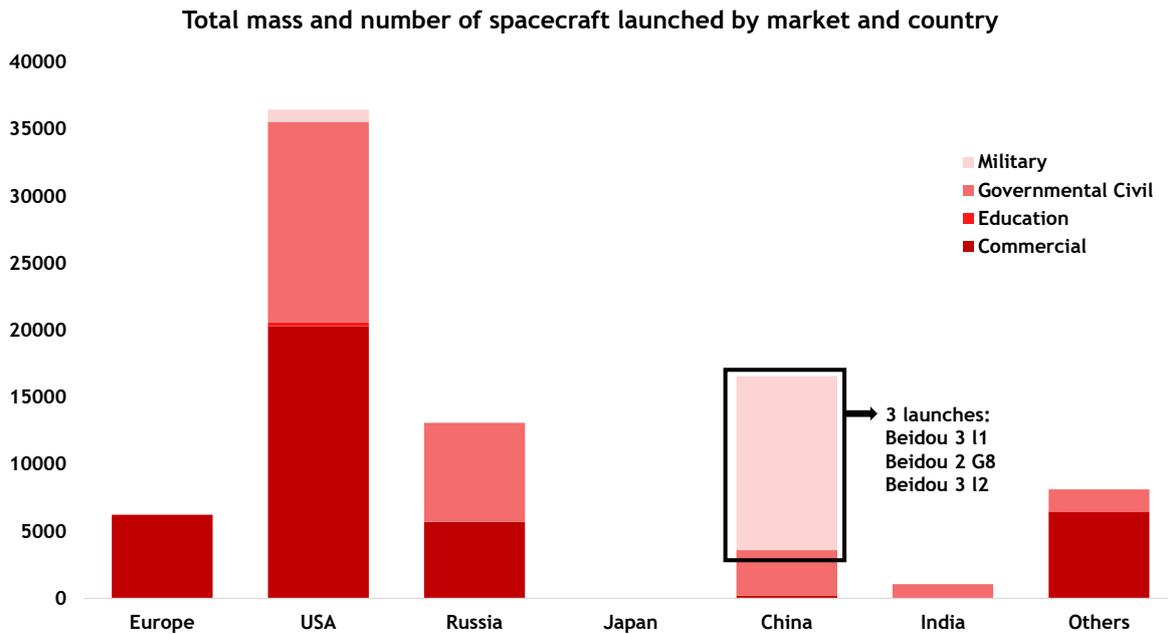
This Q2 2019, a total of 6 satellites can be categorized as Extra heavy, the heaviest being the Cygnus CRS-11 cargo transfer for the resupply of the ISS launched to LEO for NASA. This quarter two additional cargo transfer have been launched respectively from Russia (MS-11 of 7.4t) and the U.S.A. (Dragon CRS-17 of 6.7t). Among the 10 Heavy-class satellites put into orbit in Q2 2019, 50% pertains to China. With three Beidou satellites (2 G8, 3I1, and 3 I2) weighting over 4t, each commissioned by the People’s Liberation Army, this class represents 41.7% of the total Chinese spacecraft launched. In this quarter Europe launched one Extra heavy- (AT&T T-16) and one Heavy-class (Eutelsat 7C) satellites, both of them commercial telecommunication satellites deployed in GEO. In this quarter a total of 157 small satellites have been launched, among them 7 are categorized as micro-, 72 as mini- and 78 as nano-class. Interestingly, out of the 72 Mini-class satellites launched, 60 of them (83.33%) belong to the Starlink constellation, launched with a unique Falcon-9 v1.2 rocket. Indian spacecraft launched this quarter were almost exclusively Nano-class (28 out of 30 total spacecraft launched), 24 of which were commercial Earth Observation satellites (20 Flock-4a for Planet and the 3 Lemur-2 for Spire).



Spacecraft launched by market

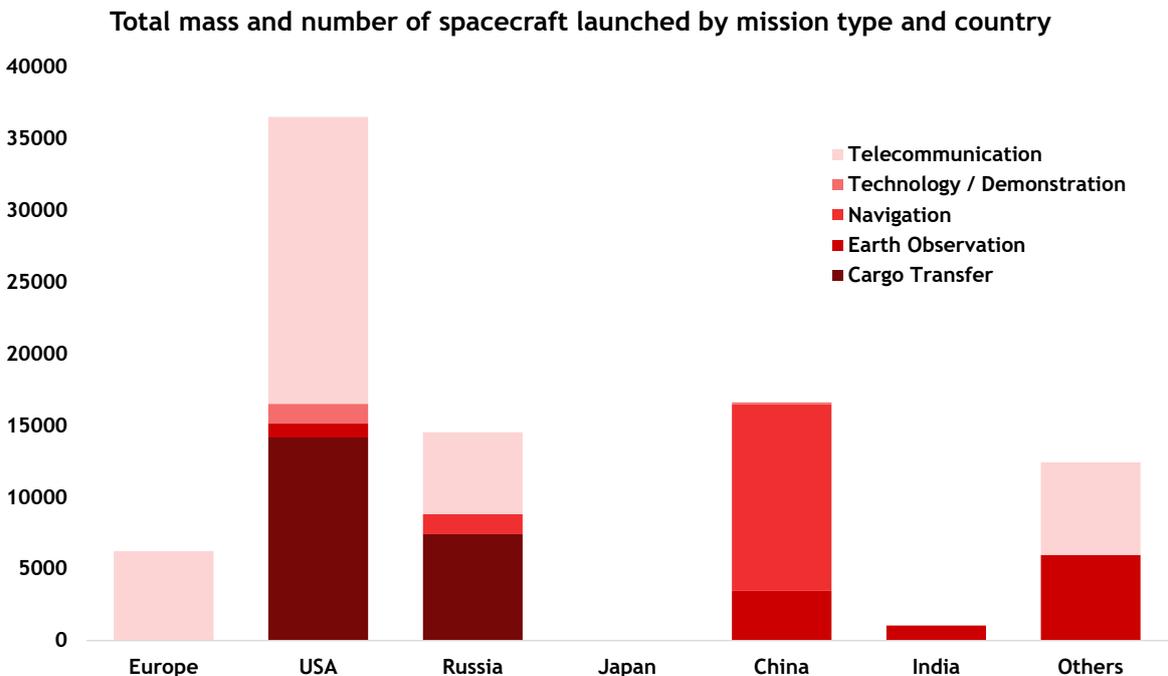
This Q2 2019, institutional market (52%) captured the vast majority of the total mass put into orbit: the share of governmental civil mass represents 35% of the total, whilst the proportion of mass launched for military missions amounted to 17%. The commercial mass at launch accounts for 47.6% in Q2 2019. Europe launched almost entirely commercial satellites (99.8% of its total mass launched), which represents 16% of the total commercial mass launched over the period - a noticeable difference with the U.S., for which the commercial mass launched represents the 55.6% of the national mass launched and 52.2% of the commercial mass launched across all the countries over the period. This quarter, China takes by far the largest share of total military mass launched: 93.4% (which represents 78.5% of total mass launched by China across markets).

SPACE ACTIVITY OVERVIEW



Spacecraft launched by mission

This Q2 2019 continues the trend of telecommunication satellites as the largest mass delivered to orbit: 43.9% of total mass launched across missions, followed by Cargo transfer (24.7%), Navigation (16.5%), Earth Observation (13%) and Technology / Demonstration satellites (1.8%). The U.S. launched more than half of the total mass of telecommunication satellites (52.1%), more than Europe (16.1%) and Russia (14%) combined. The overwhelming majority of navigation satellites were launched by China, (78.4%). The total mass of Earth Observation satellites is mostly shared by Canada and Taiwan (“others”, 52% - made up of the Taiwanese Formosat 7 and the Canadian RADARSAT) and China (30.2%).



ESPI LAUNCH LOG

Launch date	Launch country	Launcher	Spacecraft name	Main customer	Customer country	Prime manufacturer	Manufacturer country	Mass (kg)	Mission	Market
01/04/2019	India	PSLV-QL	AISTECHSAT 3	Aistech	Spain	GomSpace	Denmark	3,00	Technology / Demonstration	Commercial
			Astrocast 0.2	Astrocast	Switzerland	Astrocast	Switzerland	4,00	Technology / Demonstration	Commercial
			BlueWalker 1	NanoAvionics	Lithuania	NanoAvionics	Lithuania	8,00	Technology / Demonstration	Commercial
			EMISAT	ISRO	India	ISRO	India	436,00	Earth Observation	Governmental Civil
			Flock-4a (01 to 20)	Planet	USA	Planet	USA	100,00	Earth Observation	Commercial
			Lemur-2 (96 to 99)	Spire	USA	Spire	USA	16,00	Earth Observation	Commercial
			M6P	NanoAvionics	Lithuania	NanoAvionics	Lithuania	8,00	Technology / Demonstration	Commercial
			Progress-MS 11	Roscosmos	Russia	RKK Energia	Russia	7400,00	Cargo Transfer	Governmental Civil
04/04/2019	Russia	Soyuz-2-1a	Progress-MS 11	Roscosmos	Russia	RKK Energia	Russia	7400,00	Cargo Transfer	Governmental Civil
04/04/2019	France	Soyuz-ST-B Fregat-MT	O3b (FM17 to FM20)	O3b Networks Ltd	Netherlands	Thales Alenia Space	France	2800,00	Telecommunication	Commercial
11/04/2019	USA	Falcon Heavy	Arabsat 6A	Arabsat	Saudi Arabia	Lockheed Martin	USA	6465,00	Telecommunication	Commercial
17/04/2019	USA	Antares-230	AeroCube 10A and 10B	The Aerospace Corporation	USA	The Aerospace Corporation	USA	4,00	Technology / Demonstration	Commercial
			Bird (JPN, LKA, NPL)	Kyushu Institute of Technology	Japan	Kyushu Institute of Technology	Japan	3,00	Technology / Demonstration	Education
			Cygnus CRS-11	NASA	USA	Northrop Grumman Innovation Systems	USA	7492,00	Cargo Transfer	Governmental Civil
			EntrySat	ISAE	France	ISAE	France	4,00	Technology / Demonstration	Governmental Civil
			IOD-GEMS	Satellite Applications Catapult	United Kingdom	Clyde Space	United Kingdom	4,00	Technology / Demonstration	Governmental Civil
			Kenobi	NASA	USA	NASA	USA	8,00	Technology / Demonstration	Governmental Civil
			KrakSat	AGH University of Science and Technology	Poland	SatRevolution SA	Poland	1,00	Technology / Demonstration	Education
			SASSI2	University Of Illinois	USA	University Of Illinois	USA	4,00	Technology / Demonstration	Education
			Seeker	NASA	USA	NASA	USA	8,00	Technology / Demonstration	Governmental Civil
			Swiatowid	SatRevolution SA	Poland	SatRevolution SA	Poland	2,00	Technology / Demonstration	Commercial
			ThinSat (1A to 1L)	Virginia Space	USA	Virginia Space	USA	21,00	Technology / Demonstration	Education
			VCC (A, B, C)	Old Dominion University	USA	Old Dominion University	USA	3,00	Technology / Demonstration	Education
			Beidou 3 I1	People's Liberation Army	China	CAST	China	4200,00	Navigation	Military
20/04/2019	China	CZ-3B/G2	Beidou 3 I1	People's Liberation Army	China	CAST	China	4200,00	Navigation	Military
29/04/2019	China	CZ-4B	Tianhui 2-01A and 01B	CASC	China	CASC	China	3000,00	Earth Observation	Governmental Civil
04/05/2019	USA	Falcon-9 v1.2	Dragon CRS-17	NASA	USA	SpaceX	USA	6650,00	Cargo Transfer	Governmental Civil
			OCO 3	NASA	USA	NASA	USA	500,00	Earth Observation	Governmental Civil
			STP-H6	USAF	USA	USAF	USA	300,00	Earth Observation	Military
			Falcon-ODE	USAF Academy	USA	USAF Academy	USA	1,00	Technology / Demonstration	Military
05/05/2019	New Zealand	Electron	Harbinger	York Space Systems	USA	York Space Systems	USA	150,00	Technology / Demonstration	Commercial
			SPARC 1	Air Force Research Laboratory	USA	COSMIAC	USA	8,00	Technology / Demonstration	Military
			BeiDou 2 G8	People's Liberation Army	China	CAST	China	4600,00	Navigation	Military
17/05/2019	China	CZ-3C/G2	BeiDou 2 G8	People's Liberation Army	China	CAST	China	4600,00	Navigation	Military
22/05/2019	India	PSLV-CA	RISAT 2B	ISRO	India	ISRO	India	615,00	Earth Observation	Governmental Civil
24/05/2019	USA	Falcon-9 v1.2	Starlink (1 to 60)	SpaceX	USA	SpaceX	USA	13620,00	Telecommunication	Commercial
27/05/2019	Russia	Soyuz-2-1b Fregat-M	Kosmos 2534	Russian Aerospace Forces	Russia	ISS Reshetnev	Russia	1415,00	Navigation	Dual
30/05/2019	Russia	Proton-M Briz-M (Ph.3)	Yamal 601	Gazprom Space Systems	Russia	Thales Alenia Space	France	5700,00	Telecommunication	Commercial
05/06/2019	China	CZ-11	Bufeng 1A and 1B	CAST	China	CAST	China	400,00	Earth Observation	Governmental Civil
			Jilin-1 03A	Chang Guang Satellite Technology Co.	China	Chang Guang Satellite Technology Co.	China	42,00	Earth Observation	Commercial
			Tianqi 3	Guodian Gaoke	China	Guodian Gaoke	China	8,00	Earth Observation	Commercial
			Tianxiang 1 and 2	China Electronics Technology Group Corporation	China	China Electronics Technology Group Corporation	China	130,00	Technology / Demonstration	Commercial
			Xiaoxiang 1-04	Spacety Co.	China	Spacety Co.	China	8,00	Earth Observation	Commercial
			RCM (1 to 3)	CSA	Canada	MacDonald, Dettwiler and Associates	Canada	4290,00	Earth Observation	Dual
12/06/2019	USA	Falcon-9 v1.2	RCM (1 to 3)	CSA	Canada	MacDonald, Dettwiler and Associates	Canada	4290,00	Earth Observation	Dual
20/06/2019	France	Ariane-5ECA	AT&T T-16	DirecTV	USA	Airbus	France	6350,00	Telecommunication	Commercial
24/06/2019	China	CZ-3B/G2	Eutelsat 7C	Eutelsat	France	Space Systems Loral	USA	3400,00	Telecommunication	Commercial
			Beidou 3 I2	People's Liberation Army	China	CAST	China	4200,00	Navigation	Military
25/06/2019	USA	Falcon Heavy	ARMADILLO	University of Texas at Austin	USA	University of Texas at Austin	USA	4,00	Technology / Demonstration	Education
			BRICSat 2	US Naval Academy	USA	US Naval Academy	USA	1,00	Technology / Demonstration	Education
			CP 9	PolySat	USA	PolySat	USA	2,00	Technology / Demonstration	Education
			DSX	Air Force Research Laboratory	USA	Sierra Nevada Corporation	USA	600,00	Technology / Demonstration	Military
			E-TBEx (A and B)	NASA	USA	SRI International	USA	8,00	Technology / Demonstration	Governmental Civil
			FalconSat 7	USAF Academy	USA	USAF Academy	USA	5,00	Technology / Demonstration	Education
			FORMOSAT (7A to 7F)	NSPO	Taiwan	SSTL	United Kingdom	1668,00	Earth Observation	Governmental Civil
			GPIM	NASA	USA	Ball Aerospace	USA	180,00	Technology / Demonstration	Governmental Civil
			LightSail B	The Planetary Society	USA	The Planetary Society	USA	5,00	Technology / Demonstration	Education
			Nanosat (6 and 7)	Michigan Technological University Aerospace Enterprise	USA	Michigan Technological University Aerospace Enterprise	USA	141,00	Technology / Demonstration	Education
			NPSat 1	Naval Postgraduate School	USA	USAF	USA	86,00	Technology / Demonstration	Education
			OTB 1	NASA	USA	SSTL	United Kingdom	138,00	Technology / Demonstration	Governmental Civil
			Prometheus 2 05	Los Alamos National Laboratory	USA	Los Alamos National Laboratory	USA	2,00	Technology / Demonstration	Education
			PSat 2	US Naval Academy	USA	US Naval Academy	USA	2,00	Technology / Demonstration	Education
			StangSat	Merritt Island High School	USA	Merritt Island High School	USA	1,00	Technology / Demonstration	Education
			TEPCE (1 and 2)	NASA	USA	Naval Research Laboratory	USA	4,00	Technology / Demonstration	Governmental Civil
28/06/2019	New Zealand	Electron	ACRUX 1	Melbourne Space Program	Australia	Melbourne Space Program	Australia	1,00	Technology / Demonstration	Education
			BlackSky Global 3	BlackSky Global	USA	L3Harris Technologies	USA	56,00	Earth Observation	Commercial
			Prometheus 2 (06 and 07)	Los Alamos National Laboratory	USA	Los Alamos National Laboratory	USA	4,00	Telecommunication	Military
			SpaceBEE (8 and 9)	Swarm Technologies	USA	Swarm Technologies	USA	2,00	Technology / Demonstration	Commercial

LAUNCH HIGHLIGHTS

Falcon Heavy milestone launches: the question of reusability

This quarter was marked by two Falcon Heavy (FH) launches, both flying with the same side boosters.

The first commercial flight of the Falcon Heavy put the telecommunications satellite [Arabsat-6A](#) (6t) in orbit on the 11th of April. The second launch took place on 25th of June and carried 24 satellites as part of the U.S. Department of Defense [Space Test Program-2 \(STP-2\) mission](#).

A key aspect of these two launches was the reuse of side boosters. During the first launch, the core booster landed on the droneship but toppled in heavy seas before crews could secure the stage to the ship's deck. The two Block 5 boosters (in use for the first time) were however successfully retrieved and used again for the STP-2 mission 2 months later, marking a new milestone in SpaceX reusability developments. A part of the fairing was also retrieved for future launch.

This second commercial launch of the Falcon Heavy was described by SpaceX as “the most challenging launches in SpaceX history” due to the number of upper stage burns and deployments.



Credit: SpaceX

First launch of SpaceX megaconstellation Starlink

Credit: SpaceX

On May 24th, SpaceX successfully launched and deployed 60 test satellites (227kg each) for its planned 12,000 satellites [Starlink](#) constellation. To note, the ion thrusters of the Starlink satellites use [krypton-gas](#) as a cheaper alternative to xenon - the first commercial satellites to do so.

The Starlink launch was highly debated by the astronomers' community who expressed concerns about how these shining spacecraft would [affect observations](#) but also by the space sustainability community who also [expressed concerns](#) about mega-constellations impact as 3 satellites were declared derelict soon after launch.

Cargo resupply missions: end of CRS-1 cycle for Cygnus, extension continues for SpaceX's Dragon

On the 19th of April, the [Cygnus spacecraft](#) was successfully launched for a resupply mission to the ISS, the last from the Commercial Resupply Services (CRS-1) with NASA. The next missions will be conducted under the CRS-2. The next Cygnus mission (Cygnus NG-12) is scheduled for October 2019. The Cygnus spacecraft was named the [S.S. Roger Chaffee](#) for the duration of the mission, in honour of Apollo 1 astronaut Roger Chaffee who lost his life during training in 1967. Launched aboard an Antares-230 rocket, the Cygnus delivered supplies and scientific equipment for experiments. Antares also put in orbit Technology / Demonstration payloads (mostly CubeSats).

This quarter was also marked by two other cargo resupply missions to the ISS. The Soyuz MS-11, which mission will finish by the end of July 2019 - and the SpaceX [CRS-17](#), which docked to the ISS on the 6th of May and returned safely on Earth on the 3rd of June. The CRS-17 mission occurred in the midst of investigation following the [anomaly](#) of the Crew Dragon testing.



Credit: NASA

First Chinese launch at sea



Credit: twitter.com/launchstuff

The China National Space Administration (CNSA) successfully performed the launch of a [Long March 11](#) rocket from a semi-submersible barge in the Yellow Sea (Tai Rui). The rocket was first pushed above the barge, before ignition of the main engine - [commentators noted](#) the similarity with a ballistic missile launch. This new type of launch capacity is intended to complement the “Belt and Road” commercial space offer.

About ESPI

The European Space Policy Institute (ESPI) is an independent public think-tank based in Vienna and specialized in international and European space affairs.

ESPI provides decision-makers with an informed view on mid- to long-term issues relevant to Europe's space activities. In this context, ESPI acts as an independent platform for developing positions and strategies. The Institute fulfils its objectives through various multidisciplinary research activities leading to the publication of books, reports, papers, articles, executive briefs, proceedings and position papers, and to the organisation of conferences and events including the annual ESPI Autumn Conference.

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ESPIinsights is a publication of the European Space Policy Institute available on the ESPI website. It offers a synthetic overview of major developments in the global space sector on the covered period and provides useful links to official documents, public reports, web articles or conference websites for further details on the issue.

The publication is organised around four thematic sections:

- ▶ **Space Policy and Programmes** outlines important space policy developments in the World by country and region. This includes political decisions, institutional affairs, public budgets and programmatic plans.
- ▶ **Space Economy and Finance** provides statistics and information on space markets and industry results as well as on major investment and contractual deals in the European and global space sector.
- ▶ **Space Industry and Innovation** addresses major programmatic and industrial announcements and developments.
- ▶ **Space Activity Overview** is based on quarterly statistics from ESPI space activity database. It includes key indicators and graphs, a launch log and space mission highlights.

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