Dr. MGR-ACS Space Technology Centre

SPACE EXPLORER

"An Ingress to Borderless world"

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ISRO successfully launches 36 satellites for OneWeb



This batch of 36 satellites by the UK-based OneWeb will be its 18th launch to date, its third this year and the second with ISRO

The Indian Space Research Organisation (ISRO) on Sunday successfully launched the second batch of 36 satellites for the UK-based OneWeb.

"We have lift off! Thanks to our colleagues at @isro and @NSIL_India for a successful launch. If you don't already, make sure to follow us for more updates throughout the rest of the mission," OneWeb tweeted at 9.04am on Sunday.

This batch of satellites by the UK-based company will be its 18th launch to date, its third this year and the second with ISRO. This will also complete the company's first-generation LEO (low earth orbit) constellation, enabling the company to initiate global coverage in 2023.

On February 16, these 36 satellites reached India from the US for their launch. On March 15, the satellites were also encapsulated.

The communications satellites were launched by ISRO's Launch Vehicle Mark-III (LVM3). In October last year, the Indian space agency successfully launched the first set of 36 satellites by OneWeb from the Satish Dhawan Space Centre in Sriharikota, marking the rocket's entry into the global commercial launch service market.

A week after that, ISRO successfully conducted the flight acceptance hot test of the CE-20 engine in the high-altitude test facility of its propulsion complex at Tamil Nadu's Mahendragiri for 25 seconds for the second batch of satellites that are expected to be placed on low earth orbit. After its first launch, OneWeb had said that its partnership with NSIL and ISRO demonstrated its commitment to provide connectivity across the length and breadth of India by 2023. ISRO's LVM3 rocket is capable of launching four-tonne class of satellites to geosynchronous transfer orbit. It is a three-stage vehicle with two solid motor strapons, a liquid propellant core stage and a cryogenic stage. The OneWeb satellites will be placed in orbit at an altitude of 1,200km above the earth's surface.

Relativity Space launches world's first 3D-printed rocket on historic test flight, but fails to reach orbit

The world's first 3D-printed rocket didn't earn its wings during its launch debut late Wednesday (March 22), but it did notch some important milestones.

The Relativity Space rocket, called Terran 1, lifted off from Launch Complex 16 at Florida's Cape Canaveral Space Force Station at 8:25 p.m. EST (0025 GMT on March 23), kicking off a test flight called "Good Luck, Have Fun" (GLHF).

Terran 1 performed well initially. For example, it survived Max-Q — the part of flight during which the structural loads are highest on a rocket — and its first and second stages separated successfully. But something went wrong shortly thereafter, at around three minutes into the flight, when the rocket failed to reach orbit.

"No one's ever attempted to launch a 3D-printed rocket into orbit, and, while we didn't make it all the way today, we gathered enough data to show that flying 3D-printed rockets is viable," Relativity Space's Arwa Tizani Kelly said during the company's launch webcast on Wednesday night.

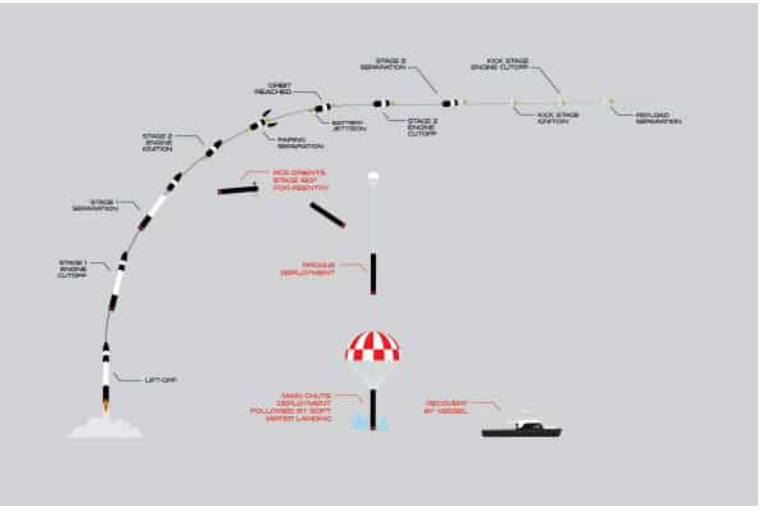
"We just completed a major step in proving to the world that 3D-printed rockets are structurally viable," she added.

Indeed, Relativity Space is likely celebrating at the moment. Rockets rarely perform perfectly on their first-ever liftoff; Japan's new H3 rocket failed during its debut flight earlier this month, for example. And Relativity Space co-founder Tim Ellis said before launch that getting through Max-Q was "the key inflection" for the GLHF mission.

"This will essentially prove the viability of using additive manufacturing tech to produce products that fly. We already effectively did this in ground testing, pushing and prodding well above this max stress successfully on both stages in a simulated worst-case flying environment, and have tested over 12,000 seconds of engine hot fires across dozens of articles — so I think we've done this already, but in flight of course is the most visceral proof," Ellis tweeted on March 7.

Relativity Space aimed to make history in multiple ways on GLHF. Terran 1 is fueled by liquid methane and liquid oxygen, for example, and it tried to become the first such "methalox" rocket to reach orbit (in addition to the first 3D-printed vehicle to do so).

Rocket Lab launches 2 satellites, returns booster to Earth after delay from surprise solar storm



The company's Electron rocket carried two commercial Earth-imaging satellites into orbit Friday (March 24), then splashed down in the ocean. Rocket Lab's early morning launch on Friday (March 24) got delayed by 90 minutes because of an unexpectedly powerful geomagnetic storm that space weather forecasters didn't see coming. Rocket Lab's Electron rocket eventually lifted off without a hitch at 5:15 a.m. EDT (0915 GMT; 10:15 p.m. local New Zealand time) from the company's New Zealand launch site. The mission, called "The Beat Goes On," sent two Earth-observing satellites owned by Seattle-based company BlackSky into low Earth orbit. About 19 minutes after lift-off, Rocket Lab confirmed its crews located Electron's first stage in the Pacific Ocean after its splashdown on parachutes. The company's engineers will now retrieve the stage and transport it on a ship to Rocket Lab's facilities on shore for inspection and possible future reuse. The geomagnetic storm that caused the launch delay was, according to space weather experts, the most powerful in six years, reaching a G4 level on the 5-grade geomagnetic storm scale(opens in new tab). The severity of the storm was completely unexpected. The U.S. National Oceanic and Atmospheric Administration (NOAA), the world's leading space weather forecasting authority, predicted only a minor G2 event one day ahead of the launch. Geomagnetic storms are caused by intense bursts of solar wind, streams of charged particles from the sun's atmosphere. When these particles interact with gases in Earth's atmosphere, they change atmospheric density, which can cause problems to satellites in low Earth orbits. Last year, SpaceX lost a batch of 40 Starlink satellites after launching them into a relatively minor geomagnetic storm. The Friday Electron launch, however, seemed to avoid the space weather trap and the two satellites were successfully released from the rocket's upper stage 54 and 55 minutes after liftoff, respectively. The two BlackSky satellites are headed to a circular orbit with a target altitude of 280 miles (450 kilometers). They'll join 14 other spacecraft in the company's constellation, nine of which were also launched by Rocket Lab. "The two additional high-resolution, multi-spectral Gen-2 satellites will expand BlackSky's network in space and offering of real-time geospatial intelligence and monitoring services," Rocket Lab wrote in the mission's press kit, which you can find here..

"BlackSky's proprietary constellation has one of the highest hourly revisit rates in the world, providing customers with persistent monitoring and change detection over areas of economic activity across the globe," they added.

Axiom Space reveals prototype spacesuit for Artemis astronauts on the moon

The prototype spacesuit features a cover layer designed by the costume designer for "For All Mankind."

A prototype of the commercial spacesuit that U.S. astronauts plan to wear during the next mission to land on the moon was unveiled on Wednesday (March 15). Unlike the iconic garments worn by the Apollo astronauts more than 50 years, this new suit is a "rental" — designed, built and soon to be leased to the space agency by Axiom Space, a space services company.

"We're carrying on NASA's legacy by designing an advanced spacesuit that will allow astronauts to operate safely and effectively on the moon," Mike Suffredini, Axiom Space president and CEO, said in a statement. "Axiom Space's Artemis III spacesuit will be ready to meet the complex challenges of the lunar south pole and help grow our understanding of the moon in order to enable a long-term presence there."

In 2022, NASA awarded Axiom a $228.5 million task order under a $1.26 billion contract to build the agency's next-generation spacesuits to support the Artemis lunar missions. Leveraging the xEMU, a suit that was developed by the engineers at NASA's Johnson Space Center in Houston, the new Axiom Extravehicular Mobility Unit (AxEMU) spacesuit provides increased flexibility, greater protection against the harsh environment and specialized tools to achieve exploration needs and expand scientific opportunities.

Using innovative technologies, the AxEMU will "enable exploration of more of the lunar surface than ever before," an Axiom description read.

The Axiom-furnished spacesuits that NASA astronauts will don on the moon will have a white outer layer to reflect heat, protecting the wearer from the extreme high temperatures when in sunlight. For the purposes of reveal and to conceal the suit's proprietary elements, the prototype was adorned with Axiom's logo and features the company's brand colors of blue, black and orange. Axiom collaborated with costume designer Esther Marquis from the Apple TV+ alternate Apollo history series "For All Mankind" to create the custom cover layer.

In addition to furnishing the AxEMU spacesuits, Axiom Space will also provide systems training and real-time operations support to NASA, among other services.

NASA selects Firefly Aerospace for mission to moon's far side in 2026

Firefly's Blue Ghost lander will carry three payloads to the moon's far side for NASA.

NASA has selected Firefly Aerospace to land payloads on the moon and send another into orbit to provide communications with the lunar far side.

The mission will use Texas-based Firefly Aerospace's robotic Blue Ghost lander to safely deliver two payloads to the far side of the moon, which permanently faces away from Earth.

The launch will first send the European Space Agency's (ESA) Lunar Pathfinder communications and navigation satellite into an elliptical orbit around the moon to relay signals between Earth and the payloads on the surface.

The payloads destined for the surface are the Lunar Surface Electromagnetics Experiment-Night (LuSEE-Night), which is designed to understand the moon's radio environment and peer into the unobserved cosmic "dark ages," and User Terminal (UT), which will provide communications support for LuSEE-Night.

NASA announced on Tuesday (March 14) that it had awarded Firefly the $112 million contract as part of the Commercial Lunar Payload Services (CLPS) program. The initiative is part of the agency's larger Artemis program.

"NASA continues to look at ways to learn more about our universe," said Nicola Fox, associate administrator for the Science Mission Directorate at NASA Headquarters, in a statement. "Going to the lunar far side will help scientists understand some of the fundamental physics processes that occurred during the early evolution of the universe."

"This mission will debut Firefly's unique two-stage Blue Ghost spacecraft, offering NASA and other customers multiple deployment options as we collectively build the infrastructure for ongoing lunar operations and planetary exploration," Bill Weber, CEO of Firefly Aerospace, said in a different statement.

The award is the second CLPS contract for Firefly. In 2021, the firm was selected to put 10 payloads on the near side of the moon. That Blue Ghost mission will launch on a SpaceX Falcon 9 rocket in 2024.

China made the first landing on the lunar far side in 2019 with its Chang'e 4 lander and rover mission.

SpaceX launches 2 rockets less than 5 hours apart

The two orbital missions lifted off on Friday (March 17) at 3:26 p.m. ET and 7:38 p.m. ET.

SpaceX pulled off a St. Patrick's Day double-header, acing two orbital missions on Friday (March 17).

The show began at 3:26 p.m. EDT (1926 GMT), when SpaceX launched 52 of its Starlink internet satellites to orbit from Vandenberg Space Force Base in California.

Then, at 7:38 p.m. EDT (2338 GMT), a Falcon 9 carrying the SES-18 and SES-19 telecommunications satellites lifted off from Cape Canaveral Space Force Station in Florida.

Both missions went according to plan: The Starlink satellites were deployed in low Earth orbit (LEO) on schedule, and the Falcon 9 successfully delivered SES-18 and SES-19 to geosynchronous transfer orbit.

Both Falcon 9 first stages came back to Earth safely as well, touching down at sea on SpaceX droneships less than nine minutes after liftoff.

It was the eighth liftoff and touchdown for the Starlink-launching Falcon 9 and the sixth for the rocket that lofted SES-18 and SES-19, according to SpaceX.

The 52 Starlink satellites are joining more than 3,700 other spacecraft in SpaceX's huge broadband constellation, which will continue to grow far into the future: Elon Musk's company has approval to deploy 12,000 Starlink satellites in LEO, and it has applied for permission to loft 30,000 more on top of that.

SES-18 and SES-19 went farther afield. The duo are headed for geostationary orbit, about 22,200 miles (35,700 kilometers) above our planet. From that perch, they'll provide digital broadcasting coverage to North America, according to EverydayAstronaut.com.

Friday's launches were the 18th and 19th of the year already for SpaceX. And the liftoffs will keep on coming: Musk said last summer that SpaceX could launch up to 100 orbital missions in 2023.

Rolls-Royce gets funding to develop miniature nuclear reactor for moon base

The company hopes to have a demonstration model for a modular micro-reactor ready to deliver to the moon by 2029.

The U.K. Space Agency has decided to continue funding a project by Rolls-Royce to create a small nuclear-powered reactor that could serve as a long-term energy source for lunar bases.

The new boost to Rolls-Royce's research pot follows a previous $303,495 (£249,000) study funded by the U.K. Space Agency in 2022. With the new funds, the company hopes to have a demonstration model for a modular micro-reactor ready to deliver to the moon by 2029.

In a March 17 press release, Rolls-Royce and the U.K. Space Agency state that the micro-reactor program will help to "develop technology that will provide power needed for humans to live and work on the moon."

The continuing research will focus on three critical aspects of the micro-reactor: generating heat, transferring that heat and converting that heat into usable energy.

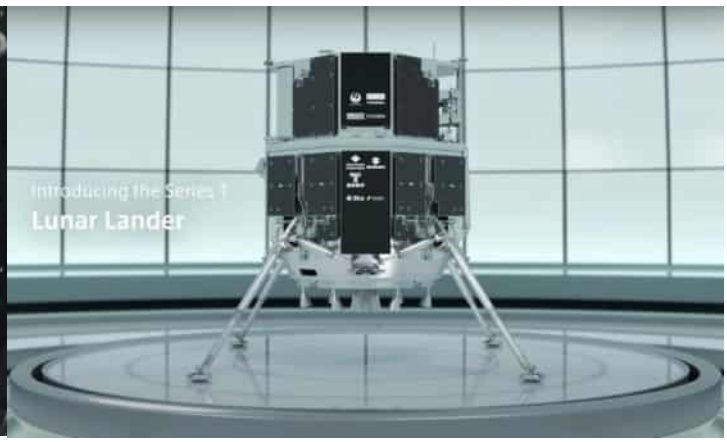
"This innovative research by Rolls-Royce could lay the groundwork for powering continuous human presence on the moon," Paul Bate, chief executive of the U.K. Space Agency, said in the press release.

There is also the matter of outfitting the micro-reactor to operate in the lunar environment. Currently, a majority of space travel is powered by solar energy. A nuclear power source allows for more versatility in missions, and less reliance on the sun.

To help Rolls-Royce scientists and engineers, the company has partnered with the University of Oxford, University of Bangor, University of Brighton, the University of Sheffield's Advanced Manufacturing Research Centre (AMRC) and Nuclear AMRC.

"Partnerships like this, between British industry, the U.K. Space Agency and government, are helping to create jobs across our £16 billion space tech sector and help ensure the U.K. continues to be a major force in frontier science," George Freeman, Minister of State at the Department of Science, Innovation and Technology, said in the March 17 press release.

Private Japanese moon lander reaches lunar orbit



The Hakuto-R spacecraft has made it to the moon. A private Japanese lander has made it to the moon. The Hakuto-R space-craft entered lunar orbit late Monday night (March 20), notching a huge milestone for the Japanese company ispace, which has big plans in Earth-moon space. "The successful insertion of the lander into lunar orbit is an important step toward the establishment of a payload transportation service, as it demon-strates that ispace is capable of transporting customer payloads to orbit around the moon," representatives of Tokyo-based ispace wrote in an update on Tuesday (March 21). "Future ispace missions will involve deployment of satellites into lunar orbit," they added. Hakuto-R launched atop a SpaceX Falcon 9 rocket on Dec. 11, 2022, kicking off a test flight that ispace calls Mission 1. The lander then took a long, looping and highly energy-efficient path to the moon, finally arriving there after an engine burn that started at 9:24 p.m. EDT on Monday (0124 GMT and 10:24 a.m. Japan Standard Time).

"After a controlled burn from the lander's main propulsion system lasting several minutes, the maneuver was successfully completed," ispace wrote in Tuesday's update.

Hakuto-R's work is far from done, however: The lander will attempt to touch down on the moon late next month, if all goes according to plan. ispace has not yet announced a target date for that landmark try.

And it will indeed be a landmark: No privately operated spacecraft has ever landed softly on the moon. To date, the only probes to achieve the feat have been operated by the national space agencies of the U.S., the Soviet Union and China. If Hakuto-R does ace the landing, it will deploy a tiny rover named Rashid for the United Arab Emirates' space agency.

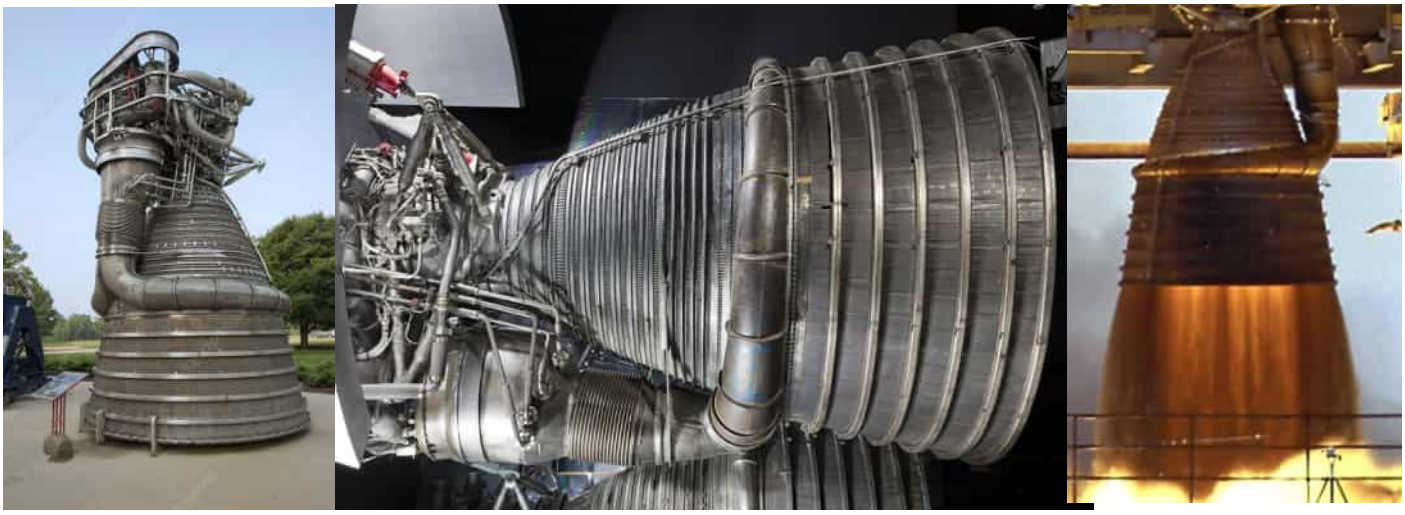
If all goes according to plan, Mission 1 will be followed in relatively quick succession by two other robotic flights to the surface of the moon, as ispace works to help lay the foundation for a cislunar economy.

Mission 2 and Mission 3 are targeted to launch in 2024 and 2025, respectively. Mission 3's lander will carry payloads to the surface and also deploy two communications satellites in lunar orbit, ispace representatives have said.

With Hakuto-R's success, there are now two privately operated spacecraft orbiting the moon. The other is CAPSTONE, a tiny cubesat operated for NASA by Colorado-based company Advanced Space.

CAPSTONE arrived in a near-rectilinear halo orbit (NRHO) around the moon last November. The probe's main task is testing the stability of the lunar NRHO, the same path that will be taken by NASA's moon-orbiting Gateway space station, a key component of the agency's Artemis program.

The F-1 Engine: A Technological Marvel of the Space Race



The F-1 engine was a marvel of engineering and a critical component of the Saturn V rocket that took astronauts to the moon. Developed by Rocketdyne in the 1960s, the F-1 engine was the most powerful single-chamber liquid-fueled rocket engine ever built, producing a staggering 1.5 million pounds of thrust at liftoff.

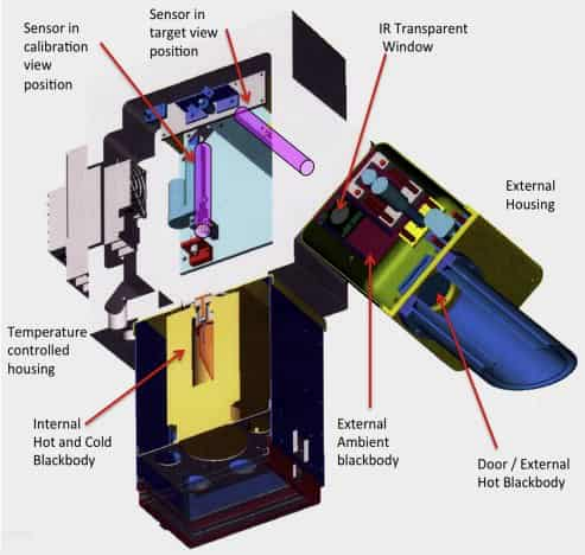
The F-1 engine was an essential part of the Saturn V rocket, which was developed by NASA to support the Apollo program's goal of landing humans on the moon. The rocket was a towering 363 feet tall and consisted of three stages, with the F-1 engine powering the first stage. Each Saturn V rocket used five F-1 engines, arranged in a cross pattern, and the combined thrust of all five engines was equivalent to the power output of 85 Hoover Dams.

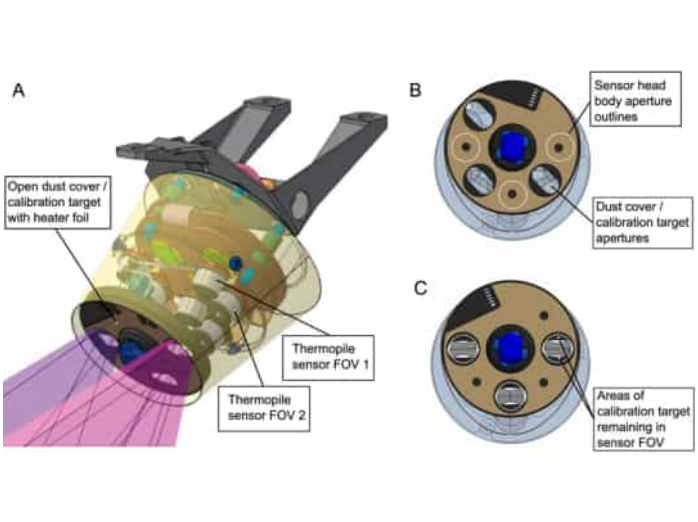
The F-1 engine was a liquid-fueled rocket engine, which means that it used liquid fuel and oxidizer to generate thrust. The fuel used was RP-1, a type of kerosene, and the oxidizer was liquid oxygen. The fuel and oxidizer were pumped into the engine's combustion chamber, where they were ignited to create an intense flame. The combustion created a high-pressure gas that was expelled through the engine's nozzle, generating the thrust that propelled the rocket. The F-1 engine was a technological marvel, with a number of innovative features that allowed it to generate so much power. One of the key features was its turbopump, which pumped fuel and oxidizer into the engine at an incredible rate of 15,000 gallons per minute. The engine also used a regenerative cooling system, where the fuel was circulated around the engine's combustion chamber to absorb the intense heat generated by the combustion.

Despite its impressive power, the F-1 engine was not without its challenges. During development and testing, engineers struggled to control the engine's combustion, which caused the engine to vibrate and even explode on occasion. But through diligent testing and refinement, Rocketdyne was able to overcome these challenges and develop a reliable engine that powered the Saturn V rocket to the moon and back.

Today, the F-1 engine stands as a testament to human ingenuity and the power of collaboration between government, industry, and academia. It is a reminder of the incredible achievements of the Apollo program and the determination of the men and women who worked to make it a reality. And while the F-1 engine may no longer be in use, its legacy lives on as a symbol of the power of human curiosity and the quest for knowledge that drives us to explore the unknown.

SPACE SENSORS





Radiometers have played a crucial role in our understanding of the Earth's climate and the composition of the universe. These instruments are used to measure the intensity and spectrum of electromagnetic radiation emitted or absorbed by objects in space. Radiometers used in space are equipped with specialized detectors that can measure radiation across a wide range of wavelengths, from visible light to microwave and radio frequencies.

One of the most important applications of radiometers in space is in climate studies. Radiometers placed on satellites can measure the amount of energy that the Earth is receiving from the sun and the amount of energy that is being reflected back into space. This data is used to track changes in the Earth's energy balance over time, which is crucial for understanding the mechanisms driving climate change.

Radiometers are also used to study the composition of the universe. By measuring the radiation emitted by celestial objects at different wavelengths, astronomers can infer the chemical composition and physical properties of these objects. For example, radiometers can be used to study the temperature and density of interstellar gas clouds, which are thought to be the birthplaces of stars.

One of the key challenges of using radiometers in space is dealing with interference from other sources of radiation. For example, the Earth's atmosphere emits radiation that can interfere with measurements of radiation from space. To overcome this challenge, radiometers used in space are often equipped with filters that can block out unwanted radiation. In addition, radiometers can be calibrated using known sources of radiation to ensure that they are measuring radiation accurately.

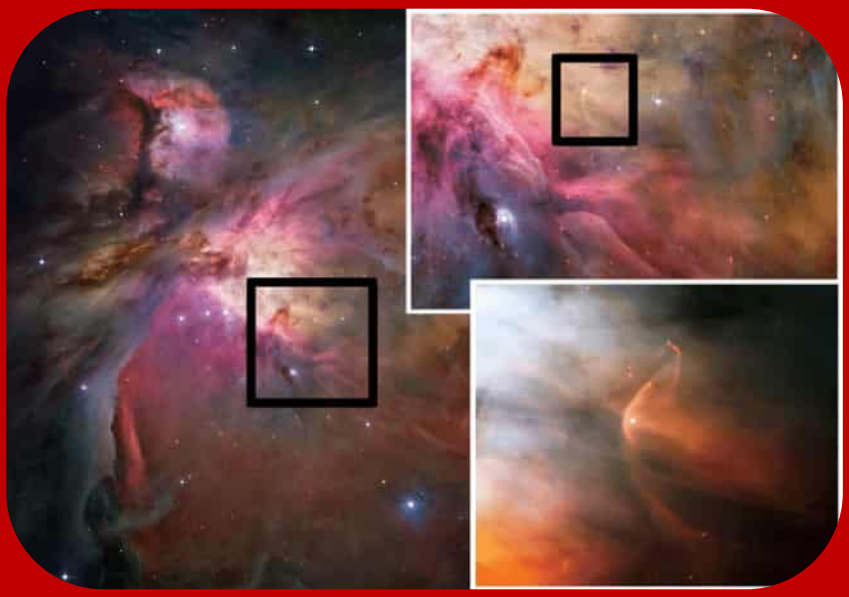
In recent years, there has been growing interest in using radiometers to study the potential for using space-based solar power. Space-based solar power involves placing solar power satellites in orbit around the Earth to collect solar energy and beam it back to Earth using microwave radiation. Radiometers can be used to measure the amount of energy that would be available for collection in different parts of space, which is crucial for determining the feasibility of space-based solar power.

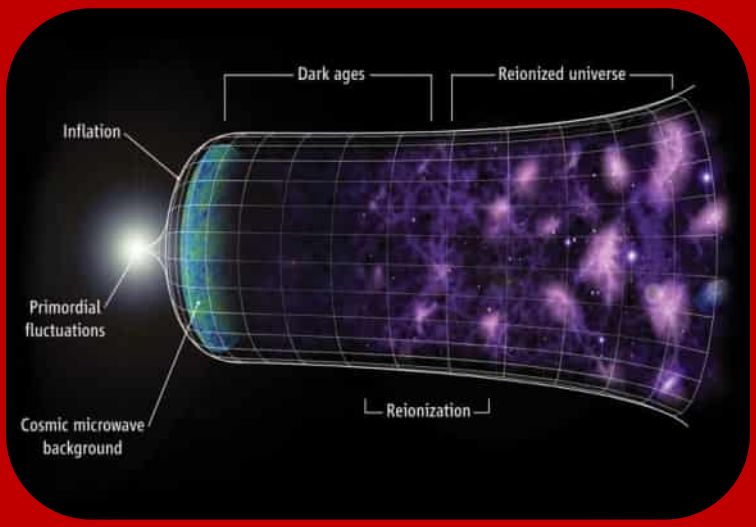
Overall, radiometers are an essential tool for studying the universe and the Earth's climate. They have enabled us to make significant advances in our understanding of these complex systems and will continue to play an important role in scientific research in the years to come.

Space Terms to know about

Stellar Nursery :

An area of outer space within a dense nebula in which gas and dust are contracting, resulting in the formation of new stars.



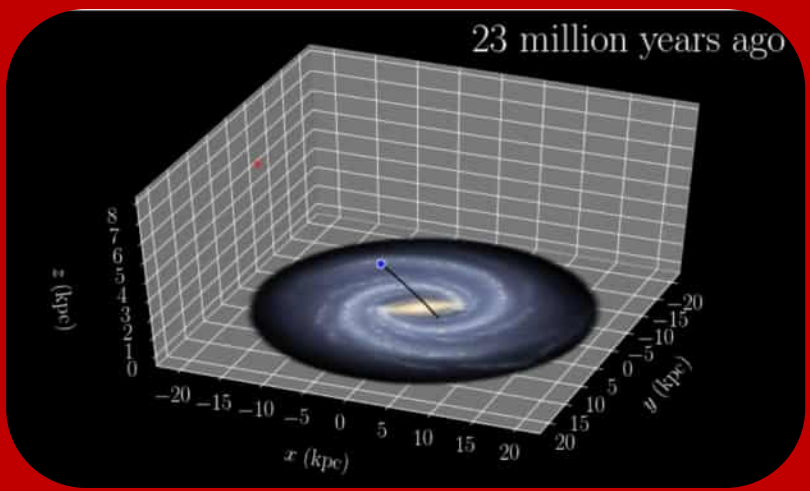


Cosmic Inflation :

A theory of exponential expansion of space in the early universe. The inflationary epoch is believed to have lasted from 10−36 seconds to between 10−33 and 10−32 seconds after the Big Bang.

Hypervelocity Star :

Hypervelocity stars (HVSs) are remarkable objects. HVSs are ejected by the Galaxy's central massive black hole (MBH) at speeds that exceed Galactic escape velocity. HVSs are now observed in the halo of the Milky Way.



Space-Tech Company

Relativity Space

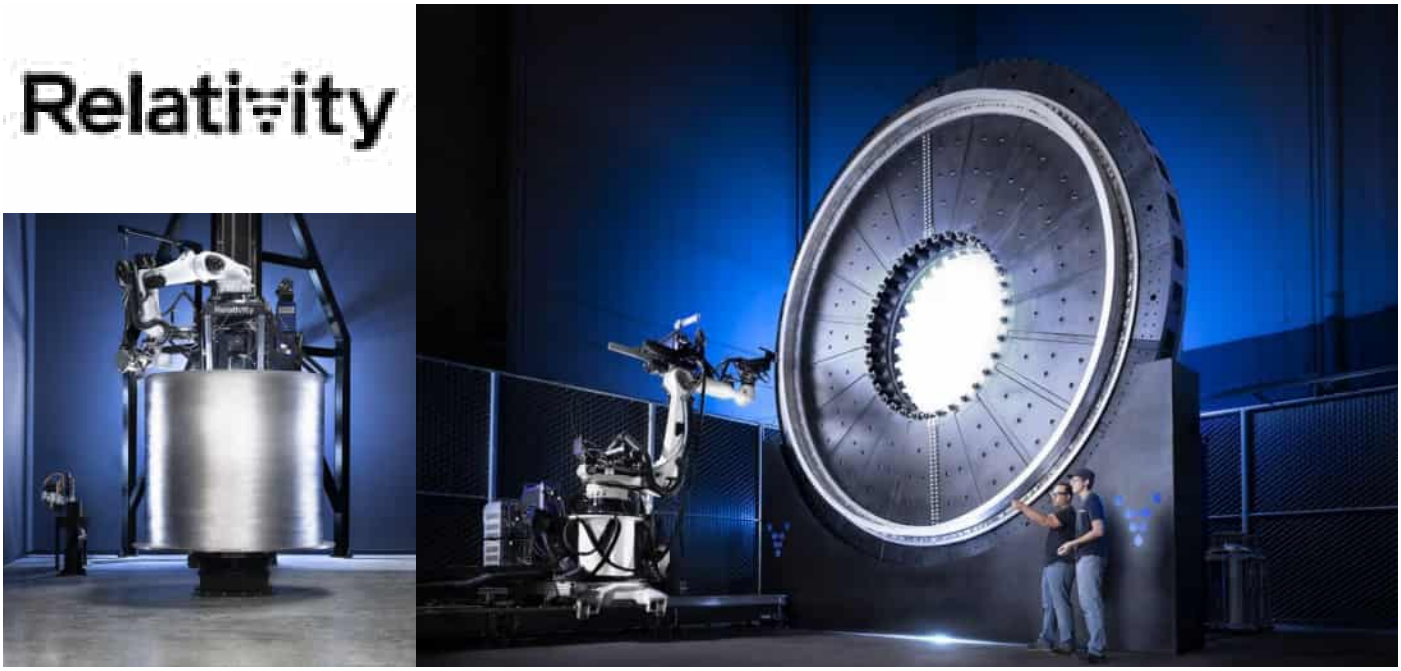


Image Credit: *Relativity Space*

Relativity Space is a private American aerospace manufacturer and launch service provider. The company was founded in 2015 by two aerospace engineers, Tim Ellis and Jordan Noone. Relativity Space is best known for its proprietary 3D printing technology, which allows it to manufacture rockets quickly and at a much lower cost than traditional methods. The company's first rocket, the Terran 1, is designed to launch payloads of up to 1,250 kg to low Earth orbit. Relativity Space has already secured contracts with several commercial and government customers, including NASA.

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