Dr. MGR-ACS Space Technology Centre

SPACE EXPLORER

"An Ingress to Borderless world"

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SpaceX Dragon capsule splashes down with Crew-5 astronauts after 157 days in space

SpaceX's Crew-5 astronauts have returned to Earth. The four astronauts on the SpaceX Dragon capsule, named Endurance, splashed down late Saturday (March 11), wrapping up a five-month mission to the International Space Station. Returning on the capsule were NASA astronauts Josh Cassada and Nicole Mann, Japan's Koichi Wakata and cosmonaut Anna Kikina of Russia, who splashed down in darkness after streaking over the Gulf of Mexico off the coast of Tampa Bay, Florida at 9:02 p.m. EST (0202 GMT on March 12).

"Thank you SpaceX, that was one heck of a ride!" Mann radioed to SpaceX's mission control team after splashdown. "We're happy to be home."

The four astronauts spent 157 days in space during their mission to the space station on a mission that marked the first spaceflight ever for Mann, Cassada and Kikina. It was the fifth flight for Wakata, who now has 505 days in space under his belt. SpaceX recovery teams arrived on the scene quickly in fast boats from the company's recovery ship S.S. Shannon (named for astronaut Shannon Walker who flew on SpaceX's Crew-1 flight for NASA).

Endurance undocked from the station earlier on Saturday at 2:20 a.m. EST (0720 GMT), then performed a series of maneuvers to put itself on course for atmospheric reentry. The safe splashdown under parachutes wrapped up SpaceX's fifth operational mission for NASA's Commercial Crew Program, swapping personnel aboard the space station with the recently arrived members of Crew-6. NASA officials said the Crew-5 Dragon lit up the night sky as a brilliant streak of light as it reentered Earth's atmosphere. The Crew-5 mission achieved a pair of historic firsts, with Mann becoming the first Native American woman to reach space and Kikina the first Russian to fly on a private American spacecraft. Additionally, the mission marked Wakata's fifth return from space — a Japanese record — with Crew Dragon the third crew-rated craft he's flown on.

NASA wants new 'deorbit tug' to bring space station down in 2030

NASA aims to develop a spacecraft capable of steering the International Space Station (ISS) to a controlled destruction in Earth's atmosphere when its time in orbit is up.

We first learned about this plan on Thursday (March 9), when the White House released its 2024 federal budget request. NASA's $27.2 billion allocation included $180 million "to initiate development of a new space tug" that could safely deorbit the ISS over the open ocean after its operational life ends in 2030, as well as potentially perform other activities.

More details emerged on Monday (March 13) during a press conference NASA held to discuss the proposed budget, which must be approved by Congress to be enacted. For example, we've now got a ballpark price tag for the deorbit tug, preliminary though it may be.

"A cost estimate we had was a little short of about $1 billion," Kathy Lueders, NASA's human spaceflight chief, said during the press conference. "Our goal is to go out with an RFP [request for proposals], and then, obviously, when we get the proposals, then we're hoping to get a better price than that. But this gives us a healthy start in '24 to get that critical capability onboard."

The new tug will supplement existing deorbit capabilities of the International Space Station partners (the space agencies of the U.S., Russia, Europe, Canada and Japan). The current plan for bringing the station down safely relies upon engine burns by robotic Progress cargo vehicles, which are provided by Russia.

"But we're also developing this U.S. capability as a way to have redundancy and be able to better aid the targeting of the vehicle and the safe return of the vehicle, especially as we're adding more modules," Lueders said.

"As you've seen in the past and over this last year, us having these redundancies has been very, very important for both ourselves and our partners," she added. "And so, having a U.S. deorbit vehicle is another key linchpin in our space operations and deorbit strategy of the ISS." The recent examples to which Lueders was likely referring are coolant leaks that occurred on two separate Russian vehicles docked to the ISS: A Soyuz crew spacecraft lost all of its coolant to space on Dec. 14, 2022, and a Progress sprang a leak of its own on Feb. 11.

Russia has attributed the Soyuz leak to a likely micrometeoroid strike and linked the Progress issue to an "external influence," perhaps a problem incurred during launch. But the investigation into the two leaks continues.

In addition, Russia has voiced a desire to leave the ISS partnership early (at some point "after 2024") to focus on building its own outpost in low Earth orbit. This information likely factors into NASA's deorbit-tug plans, as does Russia's ongoing invasion of Ukraine, which has severed many of Russia's space partnerships.

ULA rolls 1st Vulcan Centaur rocket to launch pad for testing

The brand-new rocket is scheduled to fly for the first time less than two months from now.

United Launch Alliance (ULA) just took its brand-new rocket out to the pad for the first time ever.

On Thursday (March 9), ULA rolled its first Vulcan Centaur rocket from the Vertical Integration Facility (VIF) to Space Launch Complex-41 at Florida's Cape Canaveral Space Force Station. The move is part of the prep work for Vulcan Centaur's debut liftoff, which is targeted for no earlier than May 4. At the pad, ULA is conducting a series of "pathfinder tests" to assess the performance of the heavy-lift rocket's first and second stages, its huge launch platform and ground support systems, among other equipment.

Those tests include fueling trials, which have already begun.

Vulcan Centaur won't stay at the launch pad all the way through its May 4 liftoff attempt. After the current testing wraps up, ULA will roll the 202-foot-tall (62 meters) rocket back to the VIF, where additional work will be done, including integration of the payloads and their protective fairing.

There are a handful of payloads on the debut flight. The main one is Peregrine, a robotic moon lander built by Pittsburgh-based company Astrobotic.

Also going up are two demonstration satellites for Amazon's planned Project Kuiper internet constellation and a memorial capsule provided by space-burial company Celestis.

ULA has big plans for the Vulcan Centaur; the new rocket will replace both of the company's currently operational launchers, the Atlas V and the Delta IV Heavy.

In its burliest configuration, which features six attached solid rocket boosters, Vulcan Centaur will be able to deliver 60,000 pounds (27,200 kilograms) of payload to low Earth orbit (LEO), according to its ULA specifications page. (The vehicle flying the debut mission will have two solid rocket boosters.)

That's comparable to the lift capacity of the Delta IV Heavy but considerably greater than the most powerful variant of the Atlas V, which can loft 41,570 pounds (8,850 kg) to LEO.

The first Vulcan Centaur vehicle cuts quite a dashing figure on the pad, but it's unclear if its descendants will have the same look. The striking white, silver and red livery may or may not be a special design employed only on the debut launch, according to ULA CEO Tory Bruno.

Rocket Lab launches 2 satellites to orbit on 2nd Electron mission from US soil

The 'Stronger Together' flight was a success.

Rocket Lab's second launch from U.S. soil was a success.

A Rocket Lab Electron booster lifted off from NASA's Wallops Flight Facility in Virginia Thursday (March 16) at 6:38 p.m. EDT (2238 GMT), kicking off a mission the company called "Stronger Together."

Just under an hour later, the 59-foot-tall (18 meters) Electron's kick stage deployed two radar-imaging satellites for San Francisco-based company Capella Space into a circular orbit about 370 miles (600 kilometers) above Earth as planned.

"Mission success for @capellaspace with our second launch from Launch Complex 2, Virginia! We've now launched 34 Electron missions total, deploying 157 satellites to space," Rocket Lab tweeted just after the deployment.

The two new satellites are joining Capella Space's SAR (synthetic aperture radar) constellation, which provides customers with detailed imagery of Earth both day and night, in all weather conditions.

These spacecraft allow "Capella Space to deliver the highest quality, highest resolution SAR imagery commercially available with the fastest order-to-delivery time, empowering organizations across the public and private sector to make informed, accurate decisions," Rocket Lab representatives wrote in the mission's press kit.

Rocket Lab has now launched 34 orbital missions with the two-stage Electron to date, all but two of them from its Launch Complex 1 in New Zealand. The other Virginia flight, a mission named "Virginia Is for Launch Lovers," lifted off from Wallops on Jan. 24 of this year.

The Wallops site, Rocket Lab's Launch Complex 2 (LC-2), will get more and more action over the coming months, if all goes according to plan.

LC-2 "is designed to serve the responsive space needs of commercial, civil, defense and national security customers, supporting up to 12 missions per year," Rocket Lab wrote in a statement.

Rocket Lab has been working to make the expendable Electron's first stage reusable; the company has recovered boosters on several previous missions, even plucking a falling rocket out of the sky with a helicopter on one occasion. But there was no such recovery attempt on "Stronger Together."

Relativity Space scrubs debut launch attempt of world's 1st 3D-printed rocket after abort

The space startup Relativity Space called off the first-ever flight of its new 3D-printed rocket on Wednesday (March 8) after a last-minute abort and temperature issues during the countdown.

Relativity Space's Terran 1 launch vehicle, billed as the world's first 3D-printed rocket, experienced an automatic abort about 70 seconds before an initial launch try at 2:40 p.m. EST (1940 GMT) at its Florida launch pad at the Cape Canaveral Space Force Station.

While the company tried to reset for a second launch attempt on Wednesday, it ultimately had to stand down "due to exceeding launch commit criteria limits" for the fuel temperatures on the rocket's second stage, officials wrote in a Twitter update.

"We are scrubbing launch operations for the day, thanks for playing," the company's launch director said during the countdown.

"While we obviously had high hopes for sending our Terran 1 off today, we're going to continue to take a measured approach so we can ultimately see this rocket off to Max Q and beyond," Arwa Tizani Kelly, test and launch technical program manager for Relativity Space, said during live launch commentary. (Max Q refers to the period of maximum dynamic pressure on a rocket during launch.)

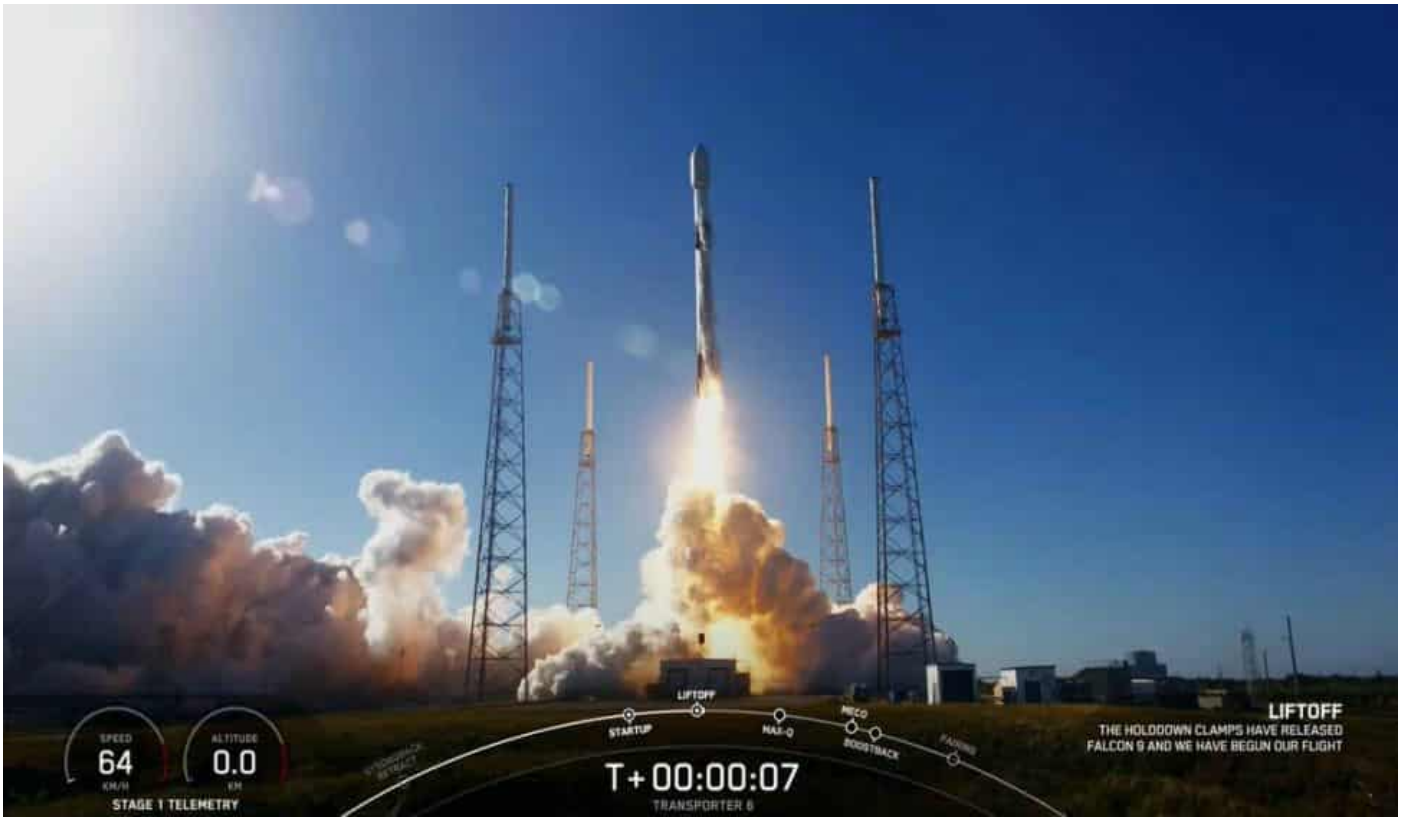
The company announced shortly after the scrub that it aims to try again this weekend.

"No matter the outcome tomorrow, we are still in the early innings of a 9-inning ballgame," Relativity Space CEO Tim Ellis wrote on Twitter before the Terran 1 launch attempt. "This launch won't singularly define our long-term success."

Ellis said he will be happy to see if Terran 1 can successfully pass through Max Q, since it will prove that the company's use of additive manufacturing technology to 3D-print rockets is viable.

"This launch will, however, provide us with useful data and insights that will make us better prepared for our next at-bat, and is a fantastic learning platform for developing technologies directly applicable to Terran R, giving us a lot of confidence we are ahead in the race to become the next great launch company," Ellis added. "Excited to show the world what we've got!"

SpaceX launches 40 OneWeb internet satellites to orbit, lands rocket



It was the 13th launch and landing for this particular booster.

A SpaceX Falcon 9 rocket launched 40 broadband satellites to orbit for the U.K. company OneWeb on Thursday (March 9) and came back to Earth for a pinpoint touchdown.

The two-stage Falcon 9 lifted off from Cape Canaveral Space Force Station in Florida Thursday at 2:13 p.m. EST (1913 GMT).

The rocket's first stage came back to Earth right on schedule, touching down on a landing pad at Cape Canaveral about 7 minutes and 50 seconds after launch.

It was the 13th launch and landing for this particular booster, according to a SpaceX mission description. Among those previous flights were SpaceX's two private astronaut missions, Inspiration4 and Ax-1, which launched in September 2021 and April 2022, respectively.

The rocket's upper stage, meanwhile, continued making its way to low Earth orbit (LEO). The OneWeb satellites were deployed in small batches beginning about 59 minutes after liftoff. All 40 had been successfully deployed by T+96 minutes.

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US Space Force grants 4 companies launch pads at Cape Canaveral

Four companies have been allocated the use of launch pads at the historic Cape Canaveral Space Force Base in Florida. The U.S. Space Force has granted the use of several launch pads at the historic Cape Canaveral launch facility in Florida to four additional private launch companies. The decision is part of Space Force's new Launch Pad Allocation Strategy (LPAS) and should promise to be a boon for the four companies selected by Space Launch Delta 45, which oversees all space launch operations from the U.S. East Coast on behalf of the Space Force.

The move was announced via a statement released on the Space Launch Delta 45 Twitter feed. In the statement, Space Launch Delta 45 said that offering launch facilities to the new companies fosters the development of new launch space systems and helps to "ensure a strong space launch industrial base" for the United States.

The four companies allocated launch pads are: ABL Space, based in El Segundo, California, focused on launch vehicle and launch systems technology development; Stoke Space based in Kent, Washington, and focused on the development of reusable rockets; Phantom Space which specializes in space transportation systems; and Vaya Space, based in Florida and known for its STAR-3D Engine Platform.

Space Launch Delta 45, which is headquartered nearby at Patrick Space Force Base in Florida, added that LPAS was developed to account for maximizing opportunities for the number of companies that can be hosted at Cape Canaveral Space Force Station.

In turn, this maximizes the launch capacity of the Eastern Range, which is managed by Space Launch Delta 45 and extends 10,000 miles (16,000 kilometers) eastward from the launch pads at Cape Canaveral over the Atlantic Ocean.

There are currently four active launch complexes on the Eastern Range: Launch Complex 37 for United Launch Alliance (ULA) Delta rockets; Launch Complex 39 which is owned by NASA and comprised of three launch pads; Launch Complex 40 reserved for SpaceX Falcon 9 rockets; and Launch Complex 41 for ULA Atlas rockets.

In addition to this, the Eastern Range is home to three currently inactive launch complexes that are reserved for future missions and mission partners. These include Launch Complex 36 for Blue Origin, Launch Complex 17, which is reserved for Moon Express and Launch Complex 39B, owned by NASA and undergoing refurbishment for future missions.

Space Launch Completed (SLC) 15 will be used by ABL Space. Stoke Space has been granted the use of SLC 14 and Phantom Space and Vaya Space will be sharing SLC 13. More allocations are expected to be alloteted under the LPAS program.

Chinese carmaker to launch 72 satellites to assist intelligent driving

Chinese automaker Geely plans to launch 72 satellites by 2025 to support a new range of cars.

Hangzhou-based Geely unveiled(opens in new tab) its Galaxy, or Yinhe, range of electrified and fully electric cars in late February — and the vehicles will be getting assistance from orbit.

Geely established a space-focused arm in 2018 named Geespace to provide autonomous driving solutions by building a satellite network.

Geespace has since set to work building a satellite factory in Taizhou, set up a headquarters in the southern city of Guangzhou close to other new space startups and, in 2022, launched nine test satellites into orbit.

Until now its satellite constellation plans had been vague, stating only that the network would be designed to provide centimeter-level accuracy positioning, high-precision maps and connectivity for its vehicles.

Now the firm states that it aims to put 72 satellites into orbit by 2025 as a first phase of its constellation to provide intelligent driving functionality for the Galaxy range of cars.

The constellation will provide global positioning services without blind spots, according to Geely. To do this it will augment the signals of China's Beidou navigation and positioning system, which is China's answer to GPS, while also using the services of China's Tiantong 1 mobile communications satellites in geostationary orbit.

Geely is focusing heavily on self developed chips, operating systems, intelligent cloud computing, and satellite networks to secure the future of the brand, according to a statement.

China's government opened up areas of its space sector to private capital in 2014, resulting in the emergence of a wide range of companies engaged in launch, satellite manufacturing and operating, ground stations, downstream applications and more. Geely received approval to begin manufacturing satellites in 2021.

The "deep integration of the aerospace industry, the automobile industry and the information and communication industry has become an inevitable trend," another Geely statement read, via machine translation.

The RS-25 Engine: A Marvel of Modern Rocketry

The RS-25 engine, also known as the Space Shuttle Main Engine, is one of the most powerful and efficient rocket engines ever developed. Developed by NASA and Pratt & Whitney Rocketdyne, the engine was originally designed to power the Space Shuttle. Today, it continues to play a critical role in space exploration, powering NASA's Space Launch System (SLS) rocket.

The RS-25 engine is a liquid-fueled engine that uses liquid hydrogen as fuel and liquid oxygen as an oxidizer. It is capable of producing a thrust of 512,000 pounds and can operate at a temperature of over 6,000 degrees Fahrenheit. This incredible power and efficiency make it one of the most capable rocket engines in the world.

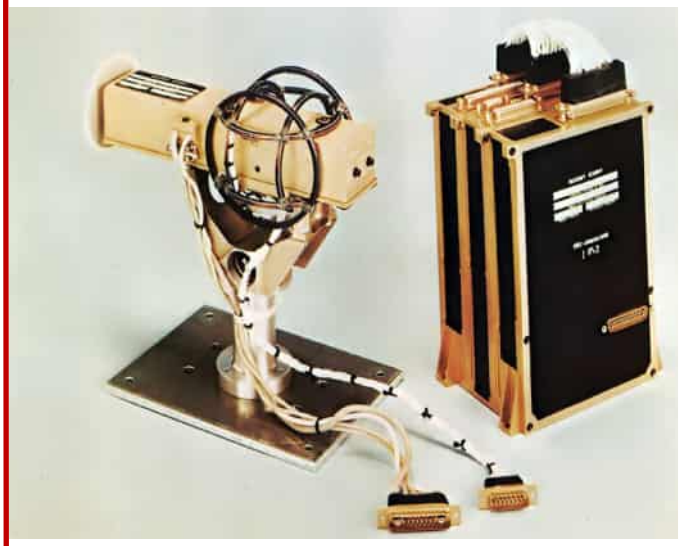
The engine's design is complex and includes a number of advanced features. One of the key features of the RS-25 is its ability to adjust its thrust level during flight. This allows it to be used for a wide range of missions, from lifting heavy payloads into orbit to propelling spacecraft beyond Earth's gravity well.

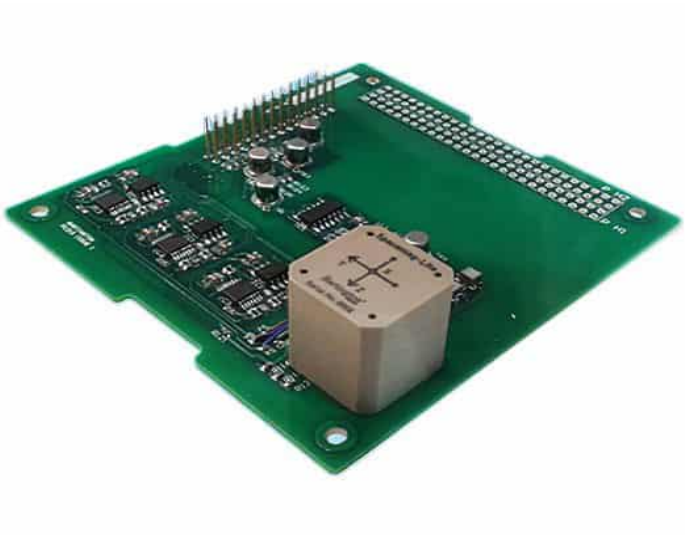
Another important aspect of the engine's design is its use of regenerative cooling. The engine's combustion chamber and nozzle are exposed to extreme temperatures during operation, but the use of regenerative cooling helps to keep them from overheating. In this system, fuel is passed through tubes that run along the walls of the combustion chamber and nozzle. This cools the walls and helps to maintain the structural integrity of the engine.

Despite its advanced design and incredible performance, the RS-25 engine is not without its challenges. One of the biggest challenges is its cost. Each engine costs over $60 million to produce, making it one of the most expensive rocket engines ever developed. However, NASA has continued to invest in the engine due to its reliability and performance.

Overall, the RS-25 engine is an incredible feat of engineering and a critical component of NASA's space exploration efforts. Its advanced design and performance capabilities make it one of the most powerful rocket engines in the world, and its continued use in the Space Launch System ensures that it will play a vital role in the future of space exploration.

SPACE SENSORS





Magnetometers are highly sensitive instruments used to detect and measure magnetic fields. These instruments have played an important role in space exploration since the early days of space flight. Today, they are used extensively in space exploration, from studying the magnetic fields of planets and moons to helping spacecraft navigate through space.

One of the most important uses of magnetometers in space is in studying the magnetic fields of Earth and other planets. These magnetic fields are generated by the movement of molten iron in the planet's core. By measuring the strength and direction of these fields, scientists can learn about the underlying geology and dynamics of a planet, including its core structure and its interactions with the solar wind.

Magnetometers have also been used to study the magnetic fields of moons, asteroids, and comets. In some cases, these bodies have magnetic fields that are surprisingly strong, despite their relatively small size. Understanding the origins and behavior of these magnetic fields can provide important clues about the formation and evolution of the solar system.

One common type of magnetometer used in space is the fluxgate magnetometer. This instrument uses a set of coils to detect changes in magnetic field strength. The coils are arranged in a way that allows them to detect changes in both the strength and direction of the magnetic field. The instrument is highly sensitive and can detect even very small changes in magnetic field strength.

Another type of magnetometer used in space is the proton precession magnetometer. This instrument measures the frequency of precessing protons in a magnetic field. It is highly accurate and can measure magnetic fields with a resolution of just a few nanoTeslas.

One of the challenges of using magnetometers in space is that they are highly sensitive to interference from other sources, such as the magnetic fields generated by the spacecraft itself. To overcome this problem, scientists use a technique called "magnetic cleanliness," which involves carefully shielding the magnetometer from other sources of magnetic interference.

In conclusion, magnetometers are essential tools for space exploration, providing valuable information about the magnetic fields of planets, moons, and other celestial bodies. With continued advancements in technology, these instruments will continue to play a critical role in our understanding of the cosmos.

Space Terms to know about

Event Horizon :

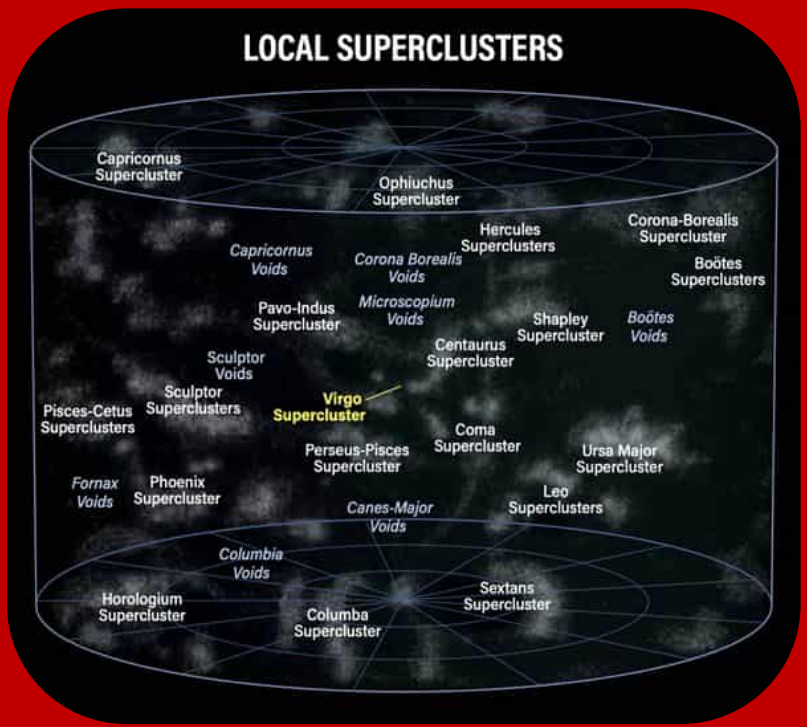
The boundary around a black hole beyond which nothing, including light, can escape due to the intense gravitational pull.

Galactic Center :

The center of a galaxy, typically a dense region of stars and other objects, including a supermassive black hole.

Stellar Evolution :

Galaxy Superclusters usually consist of chains of around a dozen galaxy clusters, each with a mass of about ~ 10^{13} - 10^{14} solar masses. The largest superclusters can be spread over several million light years of space. Ninety percent of galaxies are thought to be located in them!



Space-Tech Company

Blue Origin

Image Credit: *Blue Origin*

Blue Origin is a private American spaceflight company founded in 2000 by Amazon CEO Jeff Bezos. The company's primary goal is to make access to space more affordable and accessible. Blue Origin designs and manufactures reusable rockets and spacecraft that can be used for sub-orbital and orbital flights. The company has already completed several successful launches and is actively developing its New Shepard and New Glenn rockets for commercial and scientific missions. Blue Origin is also working on a lunar lander called Blue Moon that will help enable a sustainable human presence on the Moon. The company is committed to advancing space exploration and making it accessible to all.