ANTHARIKSH

The Space...

DEPARTMENT OF AEROSPACE ENGINEERING

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

MYLAVARAM, ANDHRA PRADESH,INDIA.

FOCUS AND SCOPE

Our departmental magazine bridges the gap between the students and the faculty. Typically, it consists of technical articles, ideas, project outcomes, language skills, literary articles, technical updates, success stories, career tips, academic advice and the latest events and happenings in the institution. Cover-stories are published in an engaging format. We also include interviews of former students who have achieved success through dedication and hard work.

PUBLICATION FREQUENCY:

Magazine is published quarterly, appearing in the months of January, April, July and October.

send your articles to the following mail ID.

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Vision of the Department:

To achieve academic excellence and produce highly competent professionals in the field of Aerospace Engineering

Mission of the Department:

DM1: To impart high quality education in Aerospace Technology through class room teaching and laboratory practice.

DM2: To develop indigenous Aerospace Technology by carrying out research in collaboration with industry and research organizations.

DM3: To train and inspire the student community to possess effective communication and leadership skills with ethical values.

DM4: To harness the technological development by being consistently aware of societal needs and challenges.

Program Educational Objectives (PEOs)

PEO1: To provide students with sound mathematical, engineering and multidisciplinary knowledge to solve Aerospace and Allied Engineering problems.

PEO2: To prepare students to excel in higher education programs and to succeed in industry/academia profession.

PEO3: To inculcate ethical attitude, leadership qualities, problem solving abilities and life-long learning for a successful professional career.

PROGRAM OUTCOMES (POs)

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design / Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the ring and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: To apply the knowledge of Aerodynamics, Propulsion, Aircraft structures and Flight Dynamics in the Aerospace vehicle design.

PSO2: To prepare the students to work effectively in Aerospace and Allied Engineering organizations.

The Fascinating Change in Earth's Poles

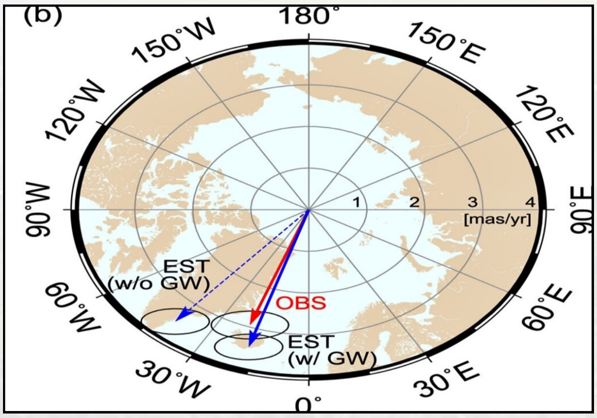
The Editorial board, Anthariksh

The Earth is a dynamic and ever-changing planet, undergoing various geological and environmental transformations throughout its history. One of the most captivating phenomena occurring on our planet is the change in Earth's poles. While the idea of the Earth's poles shifting might evoke images of a catastrophic event, it is crucial to understand that this natural occurrence happens gradually over extended periods. In

this article, we will explore the concept of Earth's pole shift, its causes, and its implications for our planet. Excess groundwater exploitation in India and the US has led to Earth being tilted nearly 80 centimeters eastward, scientists have estimated based on new climate models.

Humans have pumped so much water out of the ground that it has effectively affected Earth's spin, and the pole has drifted at a speed of 4.36 centimeters per year between 1993 and 2010.

This has led to Earth being tilted nearly 80 centimeters eastward, scientists have estimated based on new climate models.



The study published in the Geophysical Research Letters states that an important anthropogenic contribution is sea level rise due to groundwater depletion resulting from irrigation. "Earth's pole has drifted toward 64.16 degrees E at a speed of 4.36 centimeters per year during 1993–2010 due to groundwater depletion and resulting sea level rise,".

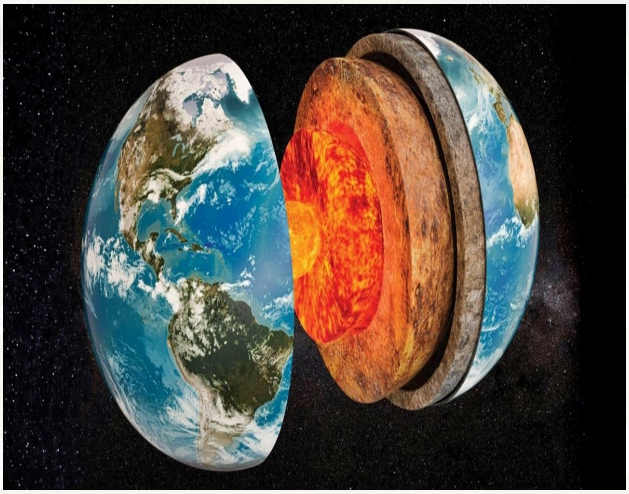
The international team of researchers estimated that humans have pumped out 2,150 gigatons of groundwater, equivalent to more than 0.24 inches of sea level rise, though they acknowledged that estimating the exact figure is difficult. One way to understand this is by looking at the Earth's rotational pole. This is the point around which the Earth spins. It actually moves slightly over time in a process called polar motion.

This means that the position of the Earth's rotational pole changes relative to the Earth's outer layer (crust). The way water is distributed on our planet affects how mass is spread out. It's similar to what happens when you add a small weight to a spinning top – it starts to spin a bit differently because of the added weight.

Similarly, as water moves around on Earth, it can cause slight changes in how our planet spins.

"We show that the model estimate of water redistribution from aquifers to the oceans would result in a drift of Earth's rotational pole, about 78.48 cm toward 64.16°E," the paper read.

"Earth's rotational pole actually changes a lot. Our study shows that among climate-related causes, the



redistribution of groundwater actually has the largest impact on the drift of the rotational pole," Ki-Weon Seo, a geophysicist at Seoul National University who led the study, said in a statement released by the American Geophysical Union.

Researchers maintained that the location of the aquifers (groundwater) also matters for Earth's spin to change. The team estimated that during the period of the study, most water was redistributed in western North America and northwestern India.

While the slight drifting of the pole will not have an impact on the seasons, researchers cautioned that over a longer geologic time period, it could have an impact on the climate.

THE VOICE OF 'SPACE'

An ANTHARIKSH special…

The Editorial board, Anthariksh

VOLUME-3

THE AGE OF ROCKETS

Hello folks! Last week, we all enjoyed the birth anniversary of the little Taru-Way galaxy, the daughter of the Raju-way galaxy. They welcomed us with their pleasant fragrance and were very hospitable unto us. The birthday girl happened to ask me to narrate the story of my sister, the Sky. Then did I start by saying, "After finding the rocket technology as the basic tool for space exploration, the nations of the Earth, slowly started racing with the rockets they made? The elementary aspects they looked for in a rocket included thrust, direction, pressure and temperature of the exhaust gases.

Then came the one named Issac Newton, who manifested mankind, his revolutionary laws of motion. He remained to be that scientific figure, who established the theoretical and scientific foundations of space exploration.

The intervention of the United States through Goddard:

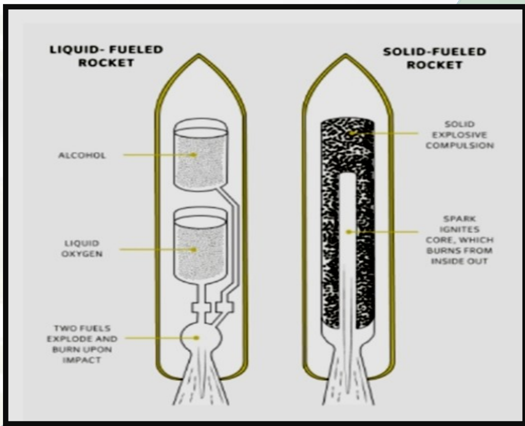
Robert Hutchings Goddard was the son of a machine-shop owner and was fascinated by flight from a young age. After excelling at school, he went on to pursue an academic career in science, working principally at Clark University in Worcester, Massachusetts, where he taught and continued to pursue his research in rocketry. To support his experiments with gunpowder-based solid-fueled rockets, Goddard applied for a scholarship from the Smithsonian Institution in 1916 and received a $5,000 grant from its 'Hodgkins Fund'. This aided him facilitate the publication of his classic 1919 study, 'A Method of Reaching Extreme Altitudes', in which he detailed his 'escape velocity' equation, stating that a flight speed of 6.95 miles per second is necessary to overcome the Earth's gravity. He also argued publicly that humans can reach the Moon using his techniques. His ideas were also derided in the 'New York Times opinion column, and it was not until humans finally landed on the Moon in 1969, 24 years after Goddard's death, that Timex finally issued a correction, effectively acknowledging that Goddard had been right all along.

Although the negative publicity prompted Goddard to become more secretive and reclusive, it did not stop his work. In September 1921, he began experimenting with liquid oxidisers that would eventually lead to his pioneering first liquid-fuel-powered rocket flight in 1926. Goddard was subsequently awarded $50,000 from the 'Daniel Guggenheim Fund' to continue his work. It enabled him to move to Roswell, New Mexica, where he could more easily build and test even larger rockets. It wasn't long after writing up the results of his 1936 study on the "Liquid-Propellant Rocket Development", the United States Navy began to express an interest in Goddard's research. It then seemed that the American military was into developing its rockets.

He was given the credit for building the first liquid-fueled rocket, launched in the year 1926. Although it was not perfectly successful, it was the rocketry equivalent of the Wright Brothers' plane.

Fig: Goddard with his rocket

Fig: Difference between liquid, solid-fueled rockets



German Rocket Saplings :

Hermann Julius Oberth (25 June 1894 – 28 December 1989) was a Transylvanian Saxon physicist and an Engineer. He was considered one of the founding fathers of rocketry and astronautics, along with Robert Esnault-Pelterie, Konstantin Tsiolkovsky, Robert Goddard and Herman Potočnik. During WWII, he supported Nazi Germany's Aggregate rocket program.

In 1922, Oberth's proposed doctoral dissertation on rocket science was rejected as "utopian". However, Professor Augustin Maior of the University of Cluj in

Romania offered Oberth the opportunity to defend his original dissertation there to receive a doctorate. He did so successfully on 23 May 1923. He next had his 92-page work published privately in June 1923 as a somewhat controversial book, "The Rocket into Planetary Space". By 1929, Oberth had expanded this work to a 429-page book titled "Ways to Spaceflight".

In 1923, Oberth first described his space mirrors with a diameter of 100 to 300 km in his book "The Rocket to the Planetary Spaces", which consisted of a grid network of individually adjustable facets.

Space mirrors in orbit around the Earth, as designed by Hermann Oberth, were intended to focus sunlight on individual regions of the Earth's surface or deflect it into space so that the solar radiation weakens in a specifically controlled manner for individual regions on the Earth's surface.

It was therefore not a question of the weakening of the solar radiation on the entire exposed surface of the Earth, as would be the case when considering the establishment of shading areas at Lagrange point between the sun and the earth.

"These giant mirrors in orbit could be used to illuminate individual cities, as a means of protection against natural disasters, to control weather and climate, to create additional living space for tens of billions of people", Hermann Oberth writes. The fact that one could influence the trajectories of the barometric high and low-pressure areas with these spatial mirrors seemed most important to Oberth.

Later Oberth's student, Max Valier joined forces with Fritz von Opel to create the world's first large-scale experimental rocket program Opel-RAK, leading to speed records for ground and rail vehicles and the world's first rocket plane. Opel RAK.1, a purpose-built design by Julius Hatry, was demonstrated to the public and world media on September 30, 1929, piloted by von Opel. Valier's and von Opel's demonstrations had a strong and long-lasting impact on later spaceflight pioneers, in particular on another of Oberth's students, Wernher von Braun.

Shortly after the Opel RAK team's successful liquid-fuel rocket launches of April 10 and 1929, Oberth conducted in the autumn of 1929, a static firing of his first liquid-fuelled rocket motor. He was helped in this experiment by an 18-year-old student Wernher von Braun, who later become a giant in both German and American rocket engineering from the 1940s, culminating with the gigantic Saturn V rockets that made it possible for a man to land on the Moon in 1969 and several following years.

Fig: World's first public rocket plane

Oberth moved to Germany in 1941 to work on the Aggregate rocket program. Later he worked on solid-propellant anti-aircraft rockets at the German WASAG military organization near Wittenberg. In 1953, Oberth returned from Germany and published his book, "Mankind into Space", in which he described his ideas for space-based reflecting telescopes, space stations, electric-powered spaceships, and space suits.

During the 1950s and 1960s, Oberth gave his opinions regarding unidentified flying objects (UFOs). He was also a supporter of the extra-terrestrial hypothesis. Later on, France, Russia, Japan, Italy and all the major nations of Earth, made rockets and used them as weapons in World War – 2. Many Rocket societies were also established all over the Earth.

'World War-2'- The Pavement for Space Exploration:

The war changed the usage of rocket technology from space exploration to human destruction. My sister, the Sky, was thrust into a great tragedy, where all her children, the atmospheric layers, suffered the smoke and blasts caused majorly by these rockets I now mention.

Fig: Multi rocket launcher

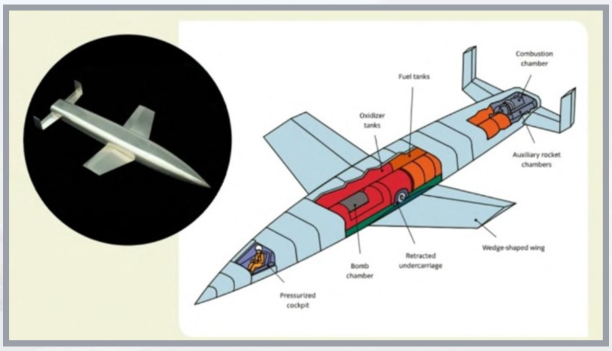
Fig: Multi rocket barreled launchers

Fig: Rocket launch through aircraft

Fig: Shoulder-Mounted Rocket Launchers

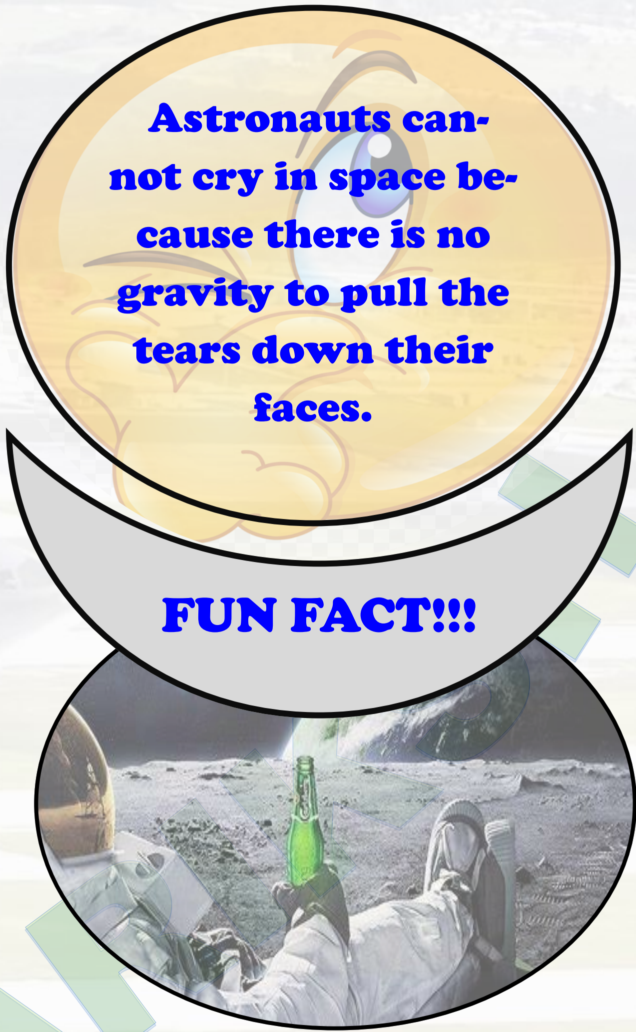
The Silverbird:

Silbervogel (German for "silver bird"), also known as 'the rocket bomber', was a design for a liquid-



propellant rocket-powered sub-orbital bomber produced by Eugen Sänger and Irene Bredt in the late 1930s. The design incorporated new rocket technology and the principle of the lifting body, foreshadowing the future development of winged spacecraft. It was considered to be too complex and expensive to produce. The design never went beyond the mock-up stage.
The Silbervogel was intended to fly long distances in a series of short hops. The aircraft was to begin its mission propelled along a 3 km (2 mi) long rail track by a large rocket-powered sledge to about 1,930 km/h (1,200 mph). Once airborne, it was to fire its rocket engine and continue to climb to an altitude of 145 km (90 mi), at which point it would be travelling at about 21,800 km/h (13,500 mph). It should then gradually descend into the stratosphere, where the increasing air density would generate lift against the flat underside of the aircraft, eventually causing it to "bounce" and gain altitude again, where this pattern would be repeated. Because of aerodynamic drag, each bounce would be shallower than the preceding one, but it was still calculated that the Silbervogel would be able to cross the Atlantic, deliver a 4,000 kg (8,800 lb) bomb to the continental United States, and then continue its flight to a landing site somewhere in the Empire of Japan–held Pacific, a total journey of 19,000 to 24,000 km (12,000 to 15,000 mi).
Post-war analysis of the Silbervogel design involving a mathematical control analysis unearthed a computational error. It turned out that the heat flow during the initial atmospheric re-entry would have been much greater than the original one calculated by Sänger and Bredt. Hence, if the design had been constructed, it would have been destroyed by the heat, exceeding its design limits. The problem could have been solved by augmenting the heat shield, but this would have reduced the craft's payload capacity significantly, reducing its use for the intended mission of bombing distant areas."

I feel emotional whenever I think of the pathetic condition of my sister. I broke down when I narrated all this to Taru-way Galaxy. She consoled me and everyone waved us goodbye. Well, today I just want to peep into the making of pressure suits. I promise to get back to you.



LATEST HAPPENINGS

Chandrayaan-3: India's Leap Towards Lunar Exploration

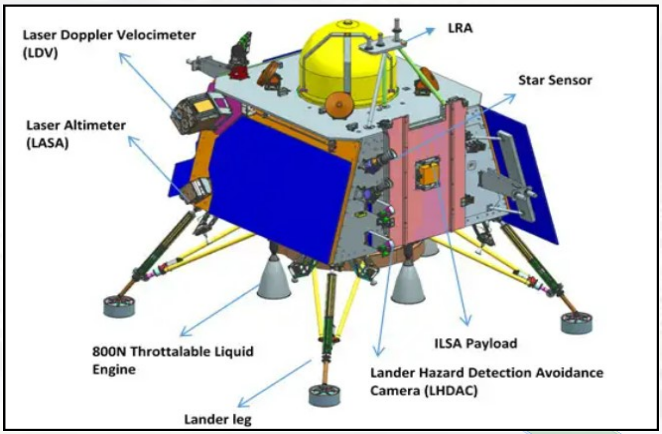
Chandrayaan-3 is an India's third lunar mission, is set to take the country's space exploration program to new heights and to demonstrate end-to-end capability in safe landing and roving on the lunar surface. It consists of Lander and Rover configuration. It will be launched by LVM3 from SDSC SHAR, Sriharikota. The propulsion module will carry the lander and rover configuration till 100 km lunar orbit. The propulsion module has Spectro-polarimetry of Habitable Planet Earth (SHAPE) payload to study the spectral and Polari metric measurements of Earth from the lunar orbit. Building upon the successes and lessons learned from Chandrayaan-1 and Chandrayaan-2, this mission represents a significant milestone in India's journey to unravel the mysteries of the Moon.

Lander Payloads: The lander is equipped with a set of scientific instruments to facilitate various measurements and experiments. Lander Payloads include:

- Chandra's Surface Thermophysical Experiment (ChaSTE) is an instrument measures the thermal conductivity and temperature of the lunar surface, providing valuable insights into the Moon's thermal properties.
- Instrument for Lunar Seismic Activity (ILSA) is designed to measure seismic activity around the landing site, helping scientists understand the Moon's geological activity and internal structure.
- Additionally, a passive Laser Retroreflector Array from NASA is included for lunar laser ranging studies, enabling precise measurements of the Moon's distance from Earth.

Rover Payloads: The rover is equipped with advanced instruments to analyze the elemental composition near the landing site. These payloads include:

- Alpha Particle X-ray Spectrometer (APXS): APXS is used to analyze the elemental composition of rocks and soil by measuring the alpha particles and X-rays emitted when the samples are bombarded with alpha particles.
- Laser Induced Breakdown Spectroscope (LIBS): LIBS utilizes laser-induced plasma to identify and quantify elements present in the vicinity of the landing site. It enables detailed chemical analysis of the lunar surface.
- These payloads play a crucial role in conducting comprehensive scientific investigations, gathering data, and expanding our knowledge of the Moon's composition and geological characteristics.



Chandrayaan-3 aims to accomplish several scientific and technological objectives:

- Lunar Surface Exploration: The primary objective is to conduct detailed exploration of the lunar surface, studying its topography, mineralogy, and elemental composition. This data will provide crucial insights into the Moon's formation and evolution.

Lunar South Pole Investigation: Chandrayaan-3 will focus on the lunar south pole region, aiming to confirm the presence of water ice and assess its distribution and quantity. This knowledge is vital for future human missions and lunar resource utilization.

Technological Advancements: The mission will showcase technological advancements in landing techniques, navigation systems, and payload instruments. These advancements will contribute to the development of more efficient and capable spacecraft for future lunar and interplanetary missions.

The mission objectives of Chandrayaan-3 are:

⇒ To demonstrate Safe and Soft Landing on Lunar Surface

⇒ To demonstrate Rover roving on the moon and

⇒ To conduct in-situ scientific experiments.

⇒ To achieve the mission objectives, several advanced technologies are present in Lander such as,

Altimeters: Laser & RF based Altimeters
Velocimeters: Laser Doppler Velocimeter & Lander Horizontal Velocity Camera

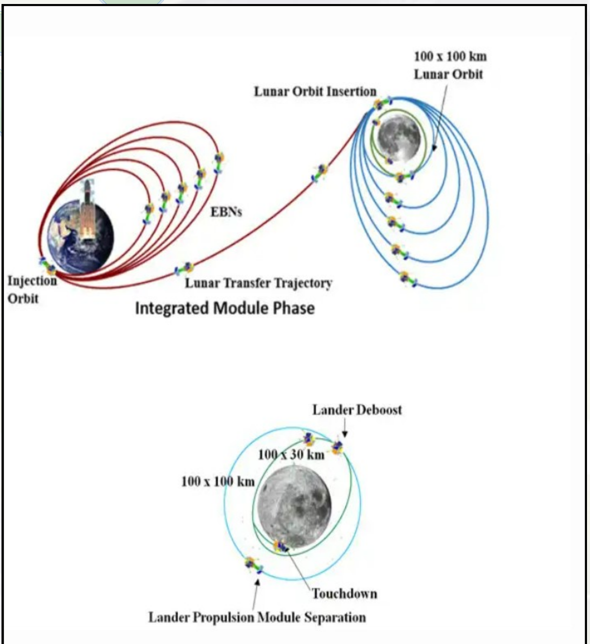
Inertial Measurement: Laser Gyro based Inertial referencing and Accelerometer package.

Propulsion System: 800N Throttleable Liquid Engines, 58N attitude thrusters & Throttleable Engine Control Electronics

Navigation, Guidance & Control (NGC): Powered Descent Trajectory design and associate software elements

Hazard Detection and Avoidance: Lander Hazard Detection & Avoidance Camera and Processing Algorithm Landing Leg Mechanism.

The chandrayaan mission's primary objectives of conducting detailed surface exploration, investigating the lunar south pole region for water ice, and showcasing advanced landing and navigation techniques hold the promise of enriching our understanding of the Moon's history and its potential as a valuable resource for future space missions.



Chandrayaan-3 – Mission Profile

The Chandrayaan program stands as a testament to India's determination and commitment to exploring the wonders of the cosmos. From its humble beginnings to its significant achievements, Chandrayaan has propelled India into the league of nations at the forefront of space exploration. With future missions on the horizon, the program holds the promise of even greater scientific discoveries and technological advancements. As Chandrayaan-3 embarks on its journey, the world eagerly awaits the discoveries and achievements that will undoubtedly expand humanity's cosmic horizons.

The overall specifications for Chandrayaan-3 are provided below:

Sl No.	Parameter	Specifications
1.	Mission Life (Lander & Rover)	One lunar day (~14 Earth days)
2.	Landing Site (Prime)	4 km x 2.4 km 69.367621 S, 32.348126 E
3.	Science Payloads	Lander: 1. Radio Anatomy of Moon Bound Hypersensitive ionosphere and Atmosphere (RAMBHA) 2. Chandra's Surface Thermo physical Experiment (ChaSTE) 3. Instrument for Lunar Seismic Activity (ILSA) 4. Laser Retroreflector Array (LRA) Rover: 5. Alpha Particle X-Ray Spectrometer (APXS) 6. Laser Induced Breakdown Spectroscope (LIBS) Propulsion Module: 7. Spectro-polarimetry of HAbitable Planet Earth (SHAPE)
4.	Two Module Configuration	1. Propulsion Module (Carries Lander from launch injection to Lunar orbit) 2. Lander Module (Rover is accommodated inside the Lander)
5.	Mass	1. Propulsion Module: 2148 kg 2. Lander Module: 1752 kg including Rover of 26 kg 3. Total: 3900 kg
6.	Power generation	1. Propulsion Module: 758 W 2. Lander Module: 738W, WS with Bias 3. Rover: 50W
7.	Communication	1. Propulsion Module: Communicates with IDSN 2. Lander Module: Communicates with IDSN and Rover. Chandrayaan-2 Orbiter is also planned for contingency link. 3. Rover: Communicates only with Lander.
8.	Lander Sensors	1. Laser Inertial Referencing and Accelerometer Package (LIRAP) 2. Ka-Band Altimeter (KaRA) 3. Lander Position Detection Camera (LPDC) 4. LHDAC (Lander Hazard Detection & Avoidance Camera) 5. Laser Altimeter (LASA) 6. Laser Doppler Velocimeter (LDV) 7. Lander Horizontal Velocity Camera (LHVC) 8. Micro Star sensor 9. Inclinometer & Touchdown sensors
9.	Lander Actuators	Reaction wheels – 4 nos (10 Nms & 0.1 Nm)
10.	Lander Propulsion System	Bi-Propellant Propulsion System (MMH + MON3), 4 nos. of 800 N Throttleable engines & 8 nos. of 58 N; Throttleable Engine Control Electronics
11.	Lander Mechanisms	1. Lander leg 2. Rover Ramp (Primary & Secondary) 3. Rover 4. ILSA, Rambha & Chaste Payloads 5. Umbilical connector Protection Mechanism, 6. X- Band Antenna
12.	Lander Touchdown specifications	1. Vertical velocity: ≤ 2 m / sec 2. Horizontal velocity: ≤ 0.5 m / sec 3. Slope: ≤ 120

ANIMALS TEACH YOU…

CH. VENKATA NARASIMHA

20761A5608

To Be Different

Animals don't care if they are a blonde penguin or a white lion. Being different is not a bad thing. It only makes us unique.

To Trust Your Instinct

Animals rely solely on their instincts, trusting their senses and reacting to their environment accordingly. Instead of analyzing a situation from different angles, listen to what your instincts tell you, and harness those deep-seated survival skills.

To Respect Your Elders

Wisdom and knowledge are oftentimes passed down from older people to the younger generation. Elephants know this to be true and their matriarchs remain the leaders of elephant tribes till they pass away. Spend some time with an elder. Pay close attention to the conversation, and take some advice from the interaction.

To Be Patient

Nothing prompts an animal to do anything unless it is ready. Remember when you stood in the rain for hours waiting for your dog to poop?

To Show Compassion

Whether it is an interspecies friendship or foster care, animal compassion knows no bounds. If animals can see the big difference between themselves and others, so can we.

To Be Goofy

Never underestimate animals when it comes to having fun. From rolling in muddy pools to chasing humans, they know exactly how to make the most of their free time.

To Stick Together and Be Loyal

Animals are not without enemies, but after all, having each other's backs helps them survive. That's why elephants move in herds and birds flock together. Sticking together and loyalty go hand in hand. One cannot exist without the other. Your pet may drive you up a wall, but the loyalty it shows, proves that it will do anything for you.

To Take Risks

Survival is the major driving force for animals. If they aren't driven by it, they will lose all purpose. This is why every risk they take translates into them being alive and healthy.

The Dawn of a New Era: SpaceX Launches World's First Space Factory

P. Dharani
20761A5644

In a groundbreaking achievement that will forever shape the course of space exploration, SpaceX has etched its name in history by successfully launching the world's first "space factory" into orbit on June 12th. A SpaceX Falcon 9 rocket deployed 72 small satellites for customers. Particles behave differently when freed from the force of gravity.

What Is a Space Factory?

A space factory is a facility that can produce goods in space, taking advantage of the unique conditions of microgravity. Microgravity is the state of near weightlessness that occurs when an object is in free fall, such as when orbiting the Earth. Microgravity affects the behaviour of matter in various ways, such as changing the shape and size of crystals, altering the viscosity and density of fluids, and enhancing the growth and differentiation of cells. These effects could enable the creation of new or improved materials and drugs that are not possible or feasible on Earth.

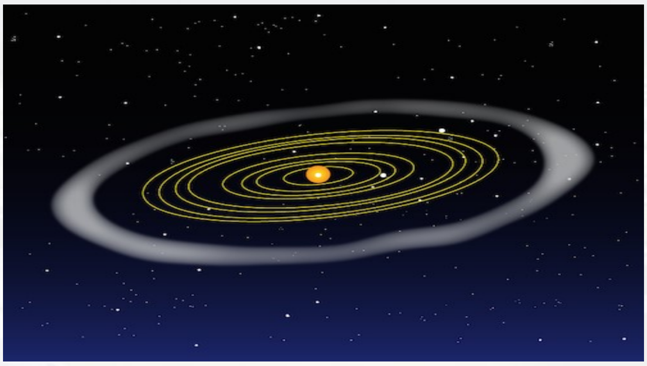
Fig: The 'world's first space factory' has successfully been deployed

Who Is Behind the Space Factory?

The space factory was developed by Varda Space Industries, a California-based startup founded in 2021 by former SpaceX engineers. The company's mission is to "unlock the next frontier of manufacturing" by building factories in space that can produce high-performance products for Earth. The space factory is comprised of

two distinct modules: a manufacturing module and a re-entry module. The manufacturing module is equipped with autonomous machinery designed to produce various products in the microgravity environment. On the other hand, the reentry module houses a secure capsule that ensures the safe return of the finished products back to Earth.

Space factories can serve a variety of purposes and industries. They could produce advanced materials for aerospace applications, such as lightweight and high-strength materials for spacecraft construction. They could also manufacture pharmaceuticals, including drugs that are difficult to produce on Earth because of



gravity or other environmental factors.

Another potential application for space factories is the production of large structures or components for space infrastructure. For example, building and assembling satellites, space stations, or even spacecraft in space itself could eliminate the challenges and costs associated with launching fully assembled structures from Earth.

Space factories could also support long-duration space missions by producing consumables and spare parts for astronauts, reducing the need for resupply missions from Earth. This self-sufficiency could be crucial for extended missions to the Moon, Mars, or other destinations in the solar system.

While the concept of space factories is still in its early stages, several space agencies, and private companies, including SpaceX, Blue Origin, and NASA, have expressed interest in developing and exploring this idea. These organizations are actively researching and investing in technologies and infrastructure that could

Fig: Rocket engine designed for reusable flight tested

enable the establishment of space factories and drive innovation in space manufacturing.

The space factory's impact spans across multiple industries, from aerospace to pharmaceuticals, and its applications are far-reaching. By manufacturing high-strength and lightweight materials in space, companies can construct more efficient spacecraft and satel-

WORD SEARCH

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O	U	F	F	A	Z	D	R	A	G	E	R	I	R	S	F	P	F	N	N	Q	G	K
P	R	H	D	S	C	S	A	Q	M	W	O	A	S	D	F	K	F	H	A	J	D	H
L	A	K	D	T	X	A	F	L	U	I	D	D	Y	N	A	M	I	C	S	H	S	J
D	L	Y	S	R	A	Y	Q	W	X	H	Y	Q	E	W	R	Y	H	H	A	N	M	L
S	A	H	B	O	S	U	E	A	R	J	N	A	S	F	H	J	H	G	G	H	Q	E
D	N	G	M	N	W	I	R	S	F	K	A	R	C	H	I	M	E	D	E	S	U	Y
C	A	F	A	O	E	O	D	H	V	L	M	A	R	D	W	Y	T	G	Q	U	I	O
F	L	R	W	M	R	P	F	F	S	O	I	E	T	E	R	O	L	O	G	Y	W	P
G	Y	E	S	Y	T	K	H	S	Q	I	C	G	U	K	L	R	K	Q	T	Y	U	I
H	S	W	R	L	F	L	J	H	J	J	S	H	J	D	H	J	U	A	W	Q	Q	O
Y	I	W	G	K	H	H	M	G	J	K	F	D	E	R	Y	T	Y	S	A	E	Q	W
T	S	S	N	J	L	U	N	A	R	E	X	P	L	O	R	A	T	I	O	N	G	S

1. The process of joining two or more pieces of metal together to form a strong bond is called ___________.
2. Who is the father of mathematics?
3. The study of the behaviour of structures under applied loads is known as ___________.
4. This term refers to the study of the behaviour of air and the interaction between the air and solid bodies moving through it.
5. The minimum speed required for an aircraft to achieve lift and take off is called ___________.
6. This famous space agency is known for its missions to explore the universe and conduct research in space.
7. The branch of aerospace engineering that deals with the design and construction of aircraft is called ___________.
8. Name the part of the rocket engine that expels the high-speed gases.
9. Which planet is called Red planet?
10. The force that opposes the motion of an aircraft through the air is called ___________.
11. Name the vehicle used to transport astronauts to and from the International Space Station (ISS).
12. What is the primary objective of Chandrayaan-3?
13. What is the biggest planet in our solar system?
14. What is the engine that uses a combination of jet and rocket propulsion called?
15. What term is used to describe the set of equations that represent the conservation of mass, momentum, and energy in CFD?
16. What is the study of celestial bodies and the universe called?
17. The first artificial satellite launched into space was named ___________.
18. What is the study of the Earth's atmosphere and weather called?
19. What is the engine that uses the combustion of fuel and air to generate thrust called?
20. What is the part of the engine where the fuel and air are mixed and burned?

Trinitite Is Atomic Rock Forged By The Fireballs Of Nuclear Bombs

The Editorial board,

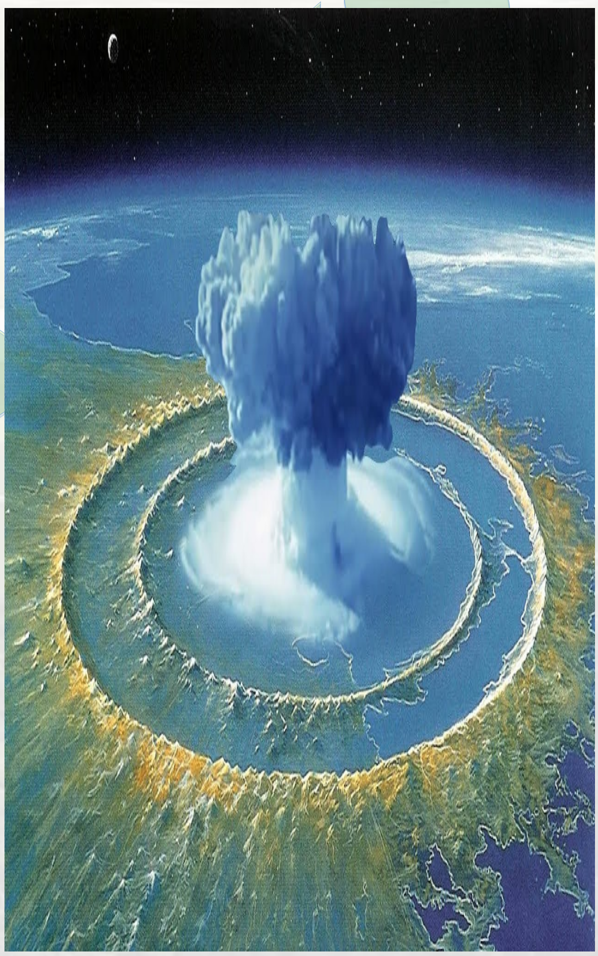
Anthariksh

If you want to make trinitite, all you need is a few things: a bucket of sand and the intense heat of a thermonuclear weapon. Scientists first noticed this strange green-red glass after dropping some of the very first atomic bombs in the dying days of War World Two. As it turned out, this material was even stranger than they first realised. In the early morning of July 16, 1945, the

world's first atomic bomb was detonated near Alamogordo in the dusty desert of New Mexico, shooting an 11,500-meter (~38,000-foot) mushroom cloud into the air. When the blast site was investigated, people noticed that a never-before-seen glassy material had been left behind like residue.

They called it trinitite after the code name for the first atomic bomb blast, Trinity, although it also goes by the name Alamogordo Glass. It's largely made of silicate dioxide embedded with melted quartz grain and feldspar and a sprinkling of other minerals like calcite, hornblende, and augite. Trinitite was formed by sand that had been melted by the unbelievable amount of heat energy kicked out by the bomb. By one estimate, it rose the air temperature at its core to approximately 4,982 degrees Celsius (9,000 degrees Fahrenheit). The blast would have sprayed heaps of sand into the sky, cooking it in an atomic fireball, before letting rain down as a liquid. Once it reached the ground, it cooled and formed this crystal-like glass. Trinitite can feature an array of colours – namely grey, green, and red – and it's been speculated that each hue is caused by the different materials in the bomb itself, as well as the various radionuclides formed during the detonation. Green trinitite may have been formed by material from the bomb's shell, while red trinitite may stem from copper electrical wiring. As such, scientists have floated the idea of using trinitite as forensic evidence to understand the composition and origin of nuclear bombs. Similar melted glass materials can be naturally made with other displays of fierce energy, such as meteorites and lightning strikes, but trinitite is characterized as its district material that's only created by atomic bomb blasts. It's considered mildly radioactive, although not enough to cause too much concern. Trinitite could even be found at the Trinity site as late as 2018, despite the clean-up efforts of the US Atomic Energy Commission that bulldozed the area in the 1950s.

In yet another strange twist to the tale of trinitite, scientists have recently discovered that it has an extremely unusual atomic structure containing "forbidden" quasicrystals. A typical crystal refers to a material that has atoms that are symmetrically ordered in a periodic, repeating pattern. However, quasicrystals have atoms that are still ordered but the pattern is not repeated. This results in a bizarre asymmetric and non-repeating atomic structure not seen in typical crystals and is known as "forbidden symmetry".Quasicrystals are known to be formed by meteorites and in labs, but it appears that atomic blasts also pack enough punch. When quasicrystals were first identified in the 1980s by Daniel Shechtman, an Israeli materials scientist, he was showered with criticism and mockery, but his discovery eventually landed him the 2011 Nobel Prize in Chemistry.



Can we throw satellites into space?

SHAIK MOHAMMAD ARSHAD

20761A5647

***Yes*, it's possible by spin launch.**

Spin Launch is a spaceflight technology development company working on mass accelerator technology to move payloads to space.

SpinLaunch is an innovative new space technology company that has created an alternative method for putting 200-kilogram class satellites into low earth orbit. Unlike traditional fuel-based rockets, SpinLaunch uses a ground-based, electric-powered kinetic launch system that delivers a substantially less expensive and environmentally sustainable approach to space access.

Orbital Accelerator

(The world's first kinetic space launch system)

The Future Of Space is Electric

The SpinLaunch Orbital Launch System is a fundamentally new way to reach space. The velocity boost provided by the accelerator's electric drive results in a 4x reduction in the fuel required to reach orbit, a 10x reduction in cost, and the ability to launch multiple times per day. The first customer launches are planned for 2025.

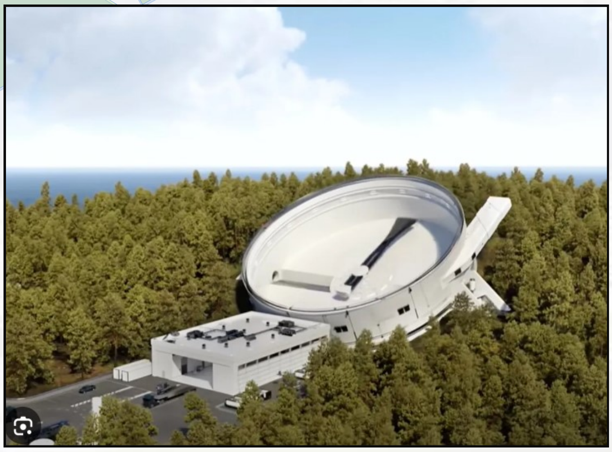
Making Space Sustainable

With industry plans to launch ten times the number of satellites over the next decade, it is more urgent than ever to develop environmentally sustainable space access technology. Because kinetically launched satellites exit the stratosphere without a rocket, SpinLaunch enables a future in which constellations of satellites and space payloads can be launched with zero emissions in the most critical layers of the atmosphere.

In a future where large numbers of people are travelling to space — structures, equipment, and supplies required to support in-space civilization must also be launched. For tens of thousands of people to someday work and live in space, millions of tons of infrastructure and supplies must be launched. SpinLaunch ensures that can be done with the least environmental impact possible.

The Path to Orbit

SpinLaunch started development in early 2015. Less than two years later, SpinLaunch surpassed the record for the fastest rotational tip speeds and subsequently conducted hundreds of launches in its headquarters-based laboratory. In October 2021, the first launch of the Suborbital System validated the technology and marked a key milestone. Check out recent developments in our Suborbital Flight Program and Space Systems.



Suborbital Accelerator

(Largest span vaccum chamber ever built)

Suborbital Testing & Facility Operations

The Suborbital Accelerator is designed to operate from 800 to 5,000 mph and acts primarily as a testbed for the Orbital Launch System. On October 22nd, 2021, its first launch successfully propelled a test vehicle at supersonic speeds and ended with the recovery of the reusable flight vehicle. Throughout 2022 the system will conduct regular test flights with a variety of vehicles and launch velocities. The Suborbital System offers testing capabilities to customers and provides long-term value as a satellite qualification facility.

Space systems

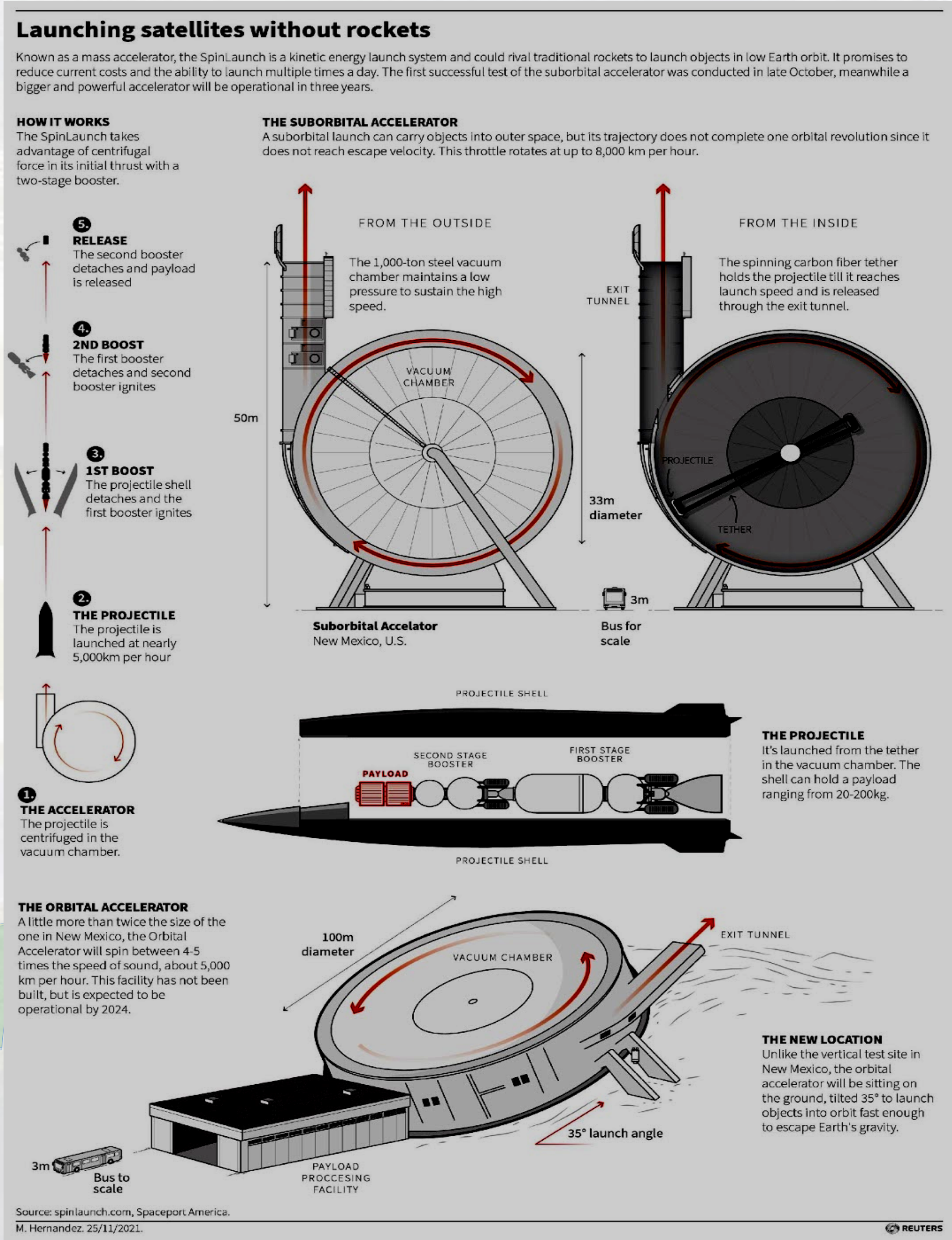
Spin Launch has developed a new class of ultra-low-cost satellites. By utilizing mass manufacturing design principles, and reducing supply chain complexities, we lower satellite costs, without any impact on performance.

Spin launch satellites are uniquely designed for their mass accelerator environment while remaining qualified for traditional launch systems.

This consists :

- S-20 (12U MICRO SATELLITE BUS)
- S-200 (200KG SATELLITE BUS)
- RW-20(REACTION WHEEL)

- HT-200(HALL EFFECT THRUSTER)
- ST-20 (STAR TRACKER)
- MT-20 (MAGNETORQUER)
- EPS-20 (POWER SYSTEM)
- BP-20 (BATTERY PACK)
- SP-125 (SOLAR PANEL)



Department achievement

CERTIFICATE

OF ACHIEVEMENT

FOR SECURING 108TH RANK IN
HASHTAG KALAKAR ART'S COMPETITON

PROUDLY PRESENTED TO

Bhanu Prakash Kalisetty

This certificate is awarded for outstanding performance in Hashtag Kalakar Arts & Painting competition. It serves as proof of his/her competence and excellent artistic skills. This certificate was awarded in the year 2023.

BEST AWARD

Kalakar

LANANG BAGASKARA
CREATIVE DIRECTOR

K. Bhanu Prakash from 4th year(2020-2024 batch) has secured 108th position in HASHTAG KALAKAR arts competition for his outstanding performance.

NCC c grade certified students:

B. Kusuma(20761A5606)
Sk. Shaniya (20762A5648)

ANTHARIKSH

THE SPACE...

DEPARTMENT OF AEROSPACE ENGINEERING
LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
MYLAVARAM, ANDHRA PRADESH, INDIA.

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sh.lbrce@gmail.com