ANTHARIKSH

The Space...

DEPARTMENT OF AEROSPACE ENGINEERING

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

MYLAVARAM, ANDHRA PRADESH, INDIA.

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)

PEOs	Statement
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 Investigation 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 predictions 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 engineering 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

FOCUS AND SCOPE

A department magazine bridges the gap between students and faculty. Typically, a department magazine consists of Technical articles, ideas, project outcomes, language skills, literary articles, technical updates, success stories, career tips, academic advice, the latest events and happenings related to campus. Cover-stories have to be written in an engaging format. We can also include interviews of former students who have achieved success through dedication and hard work.

PUBLICATION FREQUENCY:

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Send your articles to the following mail ID.

E-Mail: anthariksh.lbrce@gmail.com

Disclaimer

Some of the contents published in this magazine are from open sources. The contents of this magazine are for information purposes only, enabling the faculty and students to have easy and quick access to information and do not have any legal sanctity. This magazine is intended for circulation among students of the department of Aerospace Engineering of LBRCE only.

FROM HOD's DESK

Engineering is not just a degree. It is a skill. A skill that can be developed by self-learning and practice

Don't wait for Opportunity. Create it

What hurts you today, makes you stronger

One of the best feelings in the world is knowing that someone is happy because of you

Sometimes letting things go is an act of far greater power than defending or hanging on

We don't grow when things are easy. We grow when we face challenges

Wrong is Wrong even if everyone is doing it. Right is Right even if no one is doing it

Good or Bad, what you put out comes back to you

Dr. P. Lovaraju

EUROCOPTER MOVES ONE STEP CLOSER TO 'WHISPER MODE'

GV Surya Narayana
Asst. Professor

Just about every helicopter operator is quite familiar with noise complaints. Whether it be the local news helicopter or even a medical helicopter, many people on the ground don't like the sound created by rotary-wing aircraft. The Eurocopter unveiled its most recent effort to reduce helicopter noise with the radical-looking **Blue Edge Rotor Blade**. The new blade has been tested on one of the companies EC155 helicopters to reduce noise 3 to 4 decibels, according to the company.

In addition to the Blue Edge rotor blade, the company also introduced something called **Blue Pulse Technology**. Also designed to reduce helicopter noise, the Blue Pulse system uses three flap modules in the trailing edge of each rotor blade. Piezoelectric mo-

tors move actuate the flaps 15 to 40 times per second in reduce the "slap noise" often heard when a helicopter is descending. Both of these technologies are able to reduce noise by minimizing the blade-vortex interaction of the main rotor on a helicopter. Blade-vortex interaction is the source of the pulsating sound most of us are familiar with when helicopters fly overhead. The noise is created when a rotor blade hits the wake vortex left behind from the blade in-front of it. Normally, the entire length of the rotor blade interacts with the vortex of the preceding blade. With the Blue Edge rotors, the double-swept tips of the rotor blade reduce the length of the blade-vortex interaction, and it does it at the tip where the blades are moving the fastest relative to the air. The result is a decrease in the sound produced due of the wake interaction at the tip. Both the new rotor blade and trailing edge flaps are part of what Eurocopter is

calling its **"Blue Copter"** technology. The company says the goal is to create more environmentally friendly helicopters from both a noise and emissions standpoint.

ION TRANSPORT MEMBRANE TECHNOLOGY (ITM)

Manoj Kumar Pasagadugula
18761A2139

Ion transport membrane (ITM) technology is a key perspective for efficient oxygen separation. At the present time, semi-industrial modules based on ceramic ITMs produce oxygen of 98.9%–99.9% purity. In order to improve the oxygen purity, using newly developed liquid-oxide ITMs along with the highest oxygen selectivity, these membranes exhibit competitive oxygen permeability and could be successfully used for ultra-high purity oxygen separation. Oxygen is the second -largest volume industrial gas that has numerous applications in Aerospace, Metallurgy, Power engineering, Environmental, Medicine, etc.

Ultrahigh purity oxygen (> 99.999% purity) is in demand in the solar, semiconductor, chemical, and pharmaceutical industries. Recently, renewable sources of energy (sun, wind, biomass, etc.) are rapidly gaining in popularity. Clean energy, especially photovoltaics (PV), is a field of major growth and investments. Oxygen is one of the ultrahigh-purity process gases needed by the PV cell manufacturing. At the present time, ultrahigh purity oxygen is produced by water electrolysis or distillation method. However, these method-based oxygen production technologies are energy-intensive. In recent decades, energy-efficient ion transport membrane (ITM) technology is developing to produce pure oxygen. Conventional ITMs are the ceramic membranes with high oxygen ion conduction at elevated temperatures. There are two ITM processes. In the first, a mixed ionic electronic conducting (MIEC) membrane operates with a difference of the oxygen partial pressures, as illustrated in Fig. 1a. Under the oxygen electrochemical potential gradient, ambipolar conductivity of ions and electrons provides a sufficient oxygen permeation flux through the MIEC membrane. The MIEC membrane-based separation process is referred to as ITM oxygen. In the second process, an ion-conducting membrane (or an electrolyte) operates with a voltage. In contrast to the first process, electron transfer occurs in the outer circuit, as illustrated in Fig. 1b. Devices utilizing electrolytes are referred to as oxygen generators. The envisioned ITM applications vary from the generation of pure oxygen and partial oxidation of methane (membrane reactors for syngas production) to the capture of CO2 in oxy-fuel power plants. Oxygen permeation flux through MIEC membrane is limited by diffusion. Therefore, the minimization of membrane thickness is necessary to achieve a high oxygen permeation flux. However, the brittle thin-film ceramic membrane material has a very low mechanical strength. As a rule, a thin membrane film is deposited on a porous support (it is so-called asymmetric membrane). To provide the thermochemical compatibility between membrane and support, they are usually made of the same material. The surface exchange reaction rates can limit the oxygen permeation flux through a thin MIEC membrane. An appropriate catalyst is deposited on the membrane to increase the rate of surface exchange reactions. Gas transport in a porous support can also control the oxygen permeation flux through asymmetric membranes. In order to ensure the sustainable production of oxygen, numerous asymmetric membranes with high oxygen permeability have been developed. Currently, asymmetric membrane-based semi-industrial modules produce oxygen of 98.9%–99.9% purity. Three types of liquid-oxide ITM materials have been developed: (i) mixed ionic electronic conducting (MIEC), (ii) bilayer mixed ionic electronic conducting—redox (MIEC-Redox) and (iii) ionic conducting (electrolytes). In contrast to the MIEC and ionic conducting membrane materials (Figs. 1a and 1b),

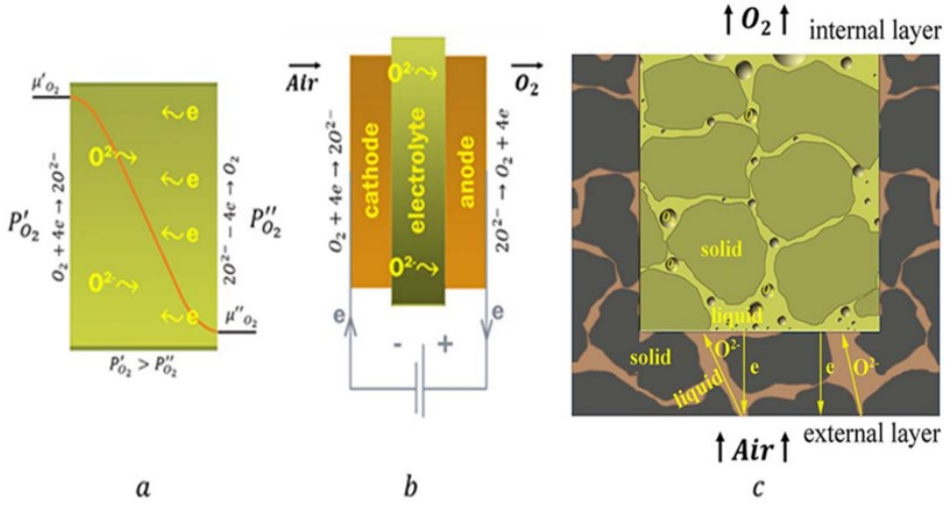


Figure 1. Schematic of (a) mixed ionic electronic conducting (MIEC) membrane, (b) ion conducting membrane (or electrolyte), and (c) mixed ionic electronic conducting—redox (MIEC-Redox) membrane.

the bilayer MIEC-Redox membrane materials have a combined diffusion bubbling oxygen mass transfer. The chemical diffusion of oxygen takes place in the external layer of the membrane material, while in the internal layer, the redox reactions and nucleation, growth and transport of oxygen gas bubbles occur, as illustrated in Fig. 1c. The concept of highly selective liquid-oxide ITMs opens up ample opportunities for oxygen separation technology. However, in order to realize the potential of these membranes and successfully commercialize them, many scientific and technical challenges remain to be solved. The rare earth stabilized bismuth oxide and rare-earth doped ceria are usually used as the oxygen generator electrolytes. To achieve a sufficient ionic conductivity of these electrolytes, oxygen generators operate in the temperature range of 700 °C–800 °C. The purity of oxygen produced by the ceramic electrolyte depends on the electrolyte density. At the present time, the product grades of 98%–99.99% oxygen are available.

DID YOU KNOW?

Light has the properties like Reflection, Refraction, Diffraction, Interfernce, Polarization, Dispersion, Scattering.

INDIGENOUS CRYOGENIC ENGINE AND STAGE

K.Bharath Ganesh
18761A2120

A Cryogenic rocket stage is more efficient and provides more thrust for every kilogram of propellant it burns compared to solid and earth-storable liquid propellant rocket stages. Specific impulse with cryogenic propellants (liquid Hydrogen and liquid Oxygen) is much higher compared to earth storable liquid and solid propellants, giving it a good payload advantage. However, cryogenic stage is technically a very complex system compared to solid or earth-storable liquid propellant stages due to its use of propellants at extremely low temperatures and the associated thermal and structural problems. Oxygen liquifies at -183°C and Hydrogen at -253°C. The propellants, at these low temperatures are to be pumped using turbo pumps operating at 40,000 rpm. It also requires complex ground support systems like propellant storage and filling systems, cryo-engine and stage test facilities, transportation and handling of cryo-fluids and related safety aspects. ISRO's Cryogenic Upper Stage Project (CUSP) developed the design and development of the indigenous Cryogenic Upper Stage to replace the stage obtained from Russia and used in GSLV flights. The main engine and two smaller steering engines of CUS together develop a nominal thrust of 73.55 kN in vacuum. During the flight, CUS fires for a specified duration of 720 seconds.

Liquid Oxygen (LOX) and Liquid Hydrogen (LH2) from the respective tanks are fed by individual booster pumps to the main turbopump to ensure a high flow rate of propellants into the combustion chamber. Thrust control and mixture ratio control are achieved by two independent regulators. Two gimballed steering engines provide for control of the stage during its thrusting phase.

Long-Term Storage

Indigenous Cryogenic Upper Stage of GSLV-D5

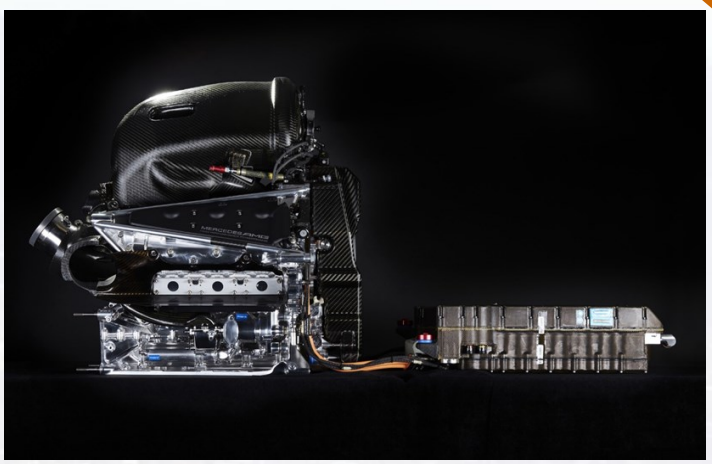
Long-duration missions in space to protect the Cryogenic fluid system (CFS) from excessive temperature fluctuations while in orbit.

- Passive thermal control includes the combination of insulation, low-conductivity structure, mixing, and thermodynamic venting.

A protective blanket must be thick (>50 radiation shield layers resulting in 2 to 3 inches) for long duration missions in space.
This effort characterized the impact on blanket performance of various approaches to optimize the interface between the multi layer insulation (MLI) blanket and elements that must penetrate it such as structure and plumbing.

- Active thermal control requires refrigeration by the integration of a cryocooler with the tank system.
- Cryogenic Propellant Storage and Transfer (CPST) integrated a cryocooler with a propellant tank using a cooled gas distribution loop to demonstrate the thermal and structural feasibility of hydrogen reduced boil-off.

The tubing containing the circulating cold gas is thermally linked to the tank structure, plumbing, and wires to intercept conductive heat loads. In addition, Broad Area Cooling (a distributed cooling scheme) was inserted in the middle layers of the MLI to intercept radiative heat loads. This reduces the heat that reaches the propellant .



MERCEDES AMG F1 ENGINE ACHIEVES OVER 50% THERMAL EFFICIENCY

E. Bhanu Prasad
19761A2110

Thermal efficiency in internal combustion engines is, when oversimplified, how much of the energy that enters the engine is converted into work and not wasted as heat. Many road car engines are approximately 20 percent efficient.Mercedes' recent dyno tests showed the 1.6-liter turbocharged V-6 scored in excess of 50 percent thermal efficiency; more than half of the available energy in the fuel is now doing useful work, not simply being wasted as heat and noise. Owen Jones, head of performance and controls at Mercedes AMG High Performance Powertrains, the unit responsible for Mercedes' F1 engines, Says, Mercedes spent a lot of time on the fundamental thermal dynamic principles such as gas exchange processes and combustion. From there, the team needed to reduce waste and losses through low friction. Oils were developed to reduce waste and friction, and exhaust waste heat is converted into electric power-the complete F1 power unit is also paired with two motor-generators. One of these aids the engine in driving the rear wheels while the other is used to spool up the turbocharger.

SPACEX BOUGHT TWO OIL RIGS

P. Haneesh babu
19761A2133

SpaceX bought two oil rigs, which they are now converting into floating spaceports….

Why they are doing that? and What they are off to?

Here we go SpaceX's Starship, the next generation spacecraft its currently in the process of developing, includes not only trip to Mars, but also regular point-to-point flights right here on earth. They achieve the target, they are going to use the super heavy booster. The super heavy booster produces an incredible amount of noise during building their floating spaceport…… launch. Infact, it's so loud that the sound levels 8km away would still be around 112 decibels! That's comparable to somebody using a chainsaw while standing right next to you. Another reason could be a Starship/Super Heavy requires 4600 metric tones of propellant per launch. Instead of using many tanker trucks, a single tanker ship could be used, making fuel delivery easier and cheaper. Or they could produce the propellant on-site. To make liquid Oxygen and liquid Methane, you only need water and carbon-di-oxide…… Additionally, having a mobile sea launch platform allow you to launch efficiently into every orbit imaginable. Let me explain, Let's say that you want to launch from cap Canaveral, which has a latitude of 28° N. Due to orbital mechanics, your orbit ends with a minimal inclination of 28° unless you do corrections, but those corrections require extra fuel. A mobile sea launch platform can be placed at almost any latitude. According to your orbital inclination you can move your launch platform to a desired latitude and launch from there. But obviously, there are some downside… A fully fuelled Starship/Super heavy exploding on the launch pad would shred the entire platform into pieces. The crew working on the platform has to be evacuated before every launch. Operating and maintaining a mobile sea launch platform is expensive.

VERTICAL TAKE-OF AND LANDING

K. Roshini
20761A5620

USING THRUST TO OVERCOME WEIGHT

Rockets use thrust to reach orbit, but they are not the only type of vehicles the direct thrust down to create vertical flight. However, relying on the brute force to thrust to counteract weight requires far more fuel and energy than using the force of lift. An aircraft that can take-off and land vertically can hover, flying slowly, and land in tight spaces-things conventional aircraft cannot do. The powerful exhaust streams from the jet engine of the Harrier fighter can be directed downward as well as backward, and their direction can be changed in mid-flight. This allows the Harrier to take-off vertically, Fly forward, stop in mid-air, backup, and land vertically. It can also take-off and land like a normal airplane. (VTOL): Vertical Take off and Landing Aircraft include fixed wing aircraft that can hover, take-off and land vertically, as well as helicopters and other aircraft with powered rotors, Such as tiltrotors. some VTOL aircraft can operate in other modes as well, such as CTOL (Conventional take-off and landing), STOL (Short take-off and landing), and/ STOVL(Short take-off and vertical landing). Others, such as some helicopters, can only operate by VTOL, due to the aircraft lacking landing gear. That can handle horizontal motion. A helicopter's spinning blades create trust like a large propeller, but the trust is directed vertically this allows the vehicle to take off and landing vertically and to hover. To move forward, the helicopter tilts slightly to direct some of its trust forward.

A tiltrotor is an aircraft that uses a pair tiltrotors mounted on rotating engines at the end of a fixed wing to generate vertical and horizontal trust. it combines the vertical capability of a helicopter with the speed and range of a fixed wing aircraft. For vertical flight, the rotors are angled so the plane of rotation is horizontal, like a helicopter. as the aircraft gains speed, the rotors are tilted forward with the plane off rotation eventually becoming vertical. The wing then provides lift, and the rotor provides trust like a propeller.

SELF-CONFIDENCE

Mohammed Zameeruddin
20761A5633

DID YOU KNOW?

Earth is the only place in the Universe known to harbour life. ... On 4 November 2013, astronomers reported, based on Kepler space mission data, that there could be as many as 40 billion Earth-sized planets orbiting in the habitable zones of Sun-like stars and red dwarfs within the Milky Way.

We all know that self-confidence means having a belief in yourself and your abilities. It is freedom from doubt. It is something that needs to be developed internally. It cannot be taught but it is very important for a healthy and positive lifestyle.

One cannot achieve his/her goals without self-confidence. Self-confidence makes a person independent, eager, optimistic, loving and positive by nature. And all these characteristics are important to achieve goals in life.

It is not so that a confident person will always win and achieve success in life. But a self-confident person will always come over a difficult situation. He/she understands that it's not always about winning but about learning from your mistakes. One can improve his/her self-confidence in many ways. The first step is to say what you feel. People shy away when it comes to express one's opinion. They also find it very difficult to say no to something they don't like. Saying no to something you don't like or are not comfortable with is very important. You don't need to feel guilty about it.

People also face the problem of presumption. This also shakes self- confidence. For example, you are going to a debate competition and you know that the opponent is very strong, you may feel nervous and preassume that you will lose. This can bring negativity and can affect your debate. Another way to boost your self-confidence is to set realistic goals. If we set our goals too high, it can affect our self-confidence. For example, if you

plan to finish a whole coursebook in a day. It is unrealistic. You may not be able to achieve this goal. A whole book cannot be learned in a day.

You may feel low when unable to achieve this goal. Similarly, if you set your goals too low, it also won't work for your self-confidence. For example, you plan to learn only one question-answer per day, this is very less work to be done to score good marks or to complete your course on time. Hence, you should always set realistic goals. Remember, self-confidence cannot be built or boost in a day. It takes time. So keep working on your self-confidence and achieve your goals slowly and steadily.

VSS UNITY

NEERAJ VAMSI MADDU
18761A2130

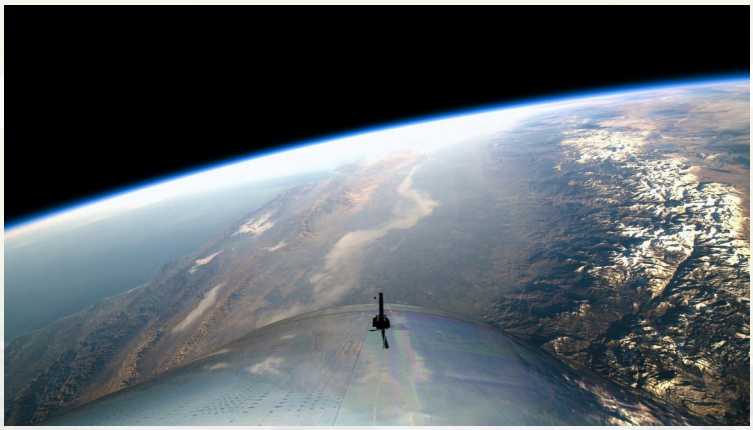
Have you ever thought of going into space with just a plane which is half the size of Airbus A320? seems unrealistic! but it is real that we can go into the space with a plane which is half the size of Airbus A320. For this we must know about the spaceflight, which is developed by Virgin Galactic, a British spaceflight company owned by Richard Branson. Virgin Galactic's SPACESHIPTWO, VSS Unity is the spaceflight which is developed by Virgin Galactic to develop space tourism and to open space for all. As we see it is 60 feet long and having a span of 42 feet and it is equipped with Hybrid Rocket Motor which can propel VSS Unity with a speed of 3 times the speed of sound to the space, weights about 3000 pounds, with 320 kN of thrust and 60 second burn duration.

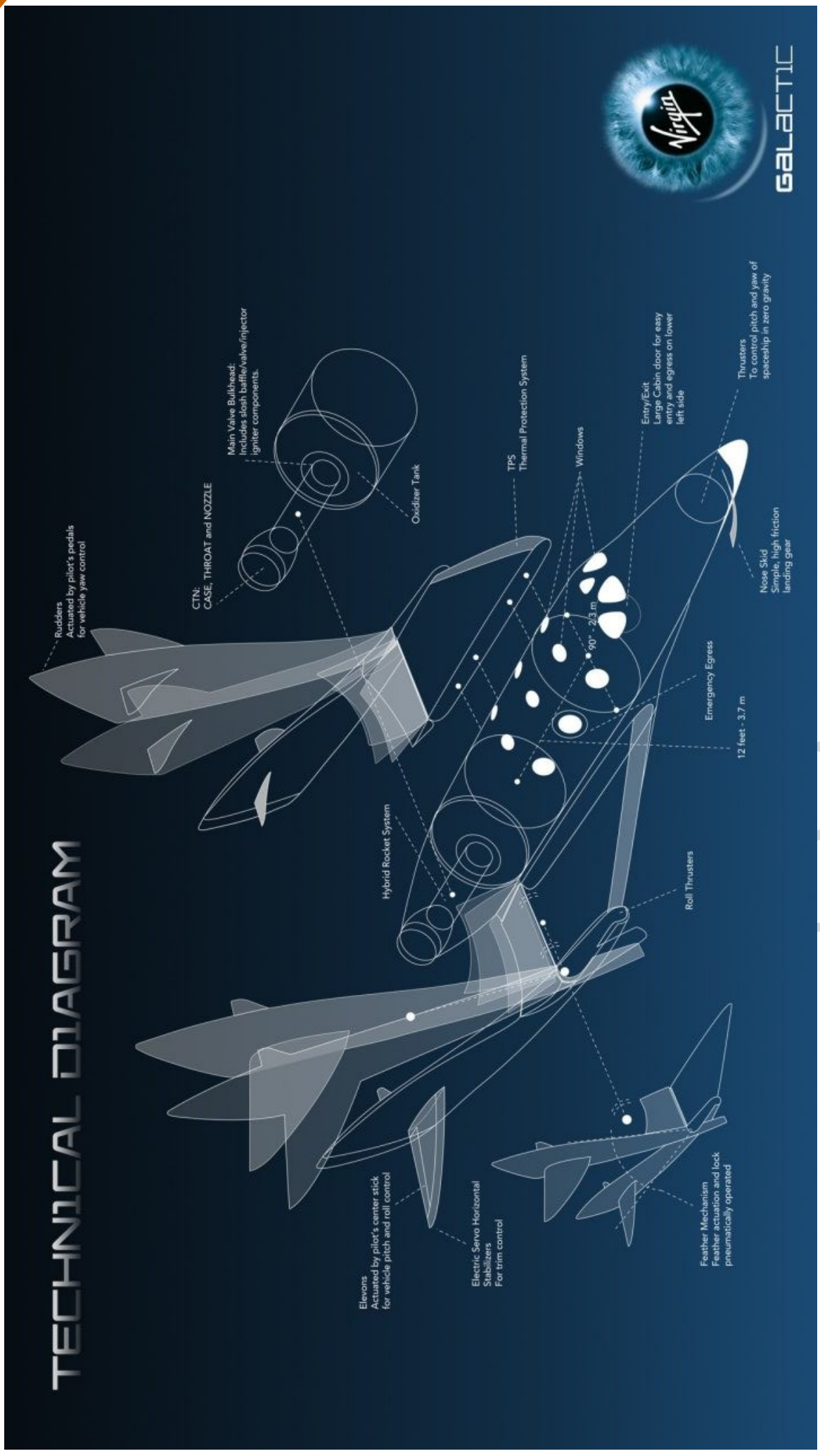
On July 11th, 2021, Virgin Galactic conducted its 22nd flight test which is its first test flight with a full crew in the cabin, to the space including the Company's founder, Richard Branson. The entire mission is carried out at Spaceport America. After the crew entered the VSS Unity it is carried by another plane called Mothership, VMS Eve to a release point of 14 km from the ground and has released at a speed of Mach 0.5. After separation, Unity ignited its hybrid rocket motor, which uses a mixture of solid and liquid propellant, to begin the boost phase. This carried Unity to its target altitude of 53 miles (86 km), where the pilots and crew experienced 4 minutes of weightlessness. They exited their seats and enjoy sweeping views of the Earth below through the many round windows that dot the space plane's fuselage.

After that short encounter with weightlessness, the crew will climb back into their seats as Unity prepares to return to Earth. Pilots Mackay and Masucci "feathered" the spacecraft's twin tail booms to provide stability during atmospheric reentry. The feathered tail was then locked back into place for the glide back to Earth, which will end with a runway landing at Spaceport America. The entire flight, from takeoff to landing, should last about 90 minutes.

WhiteKnightTwo is a custom-built, four-engine, dual-fuselage jet aircraft, designed to carry SpaceShipTwo up to an altitude of 50,000 feet. The WhiteKnightTwo, VMS Eve, is the largest all composite aviation vehicle in service and has a unique heavy payload, high altitude capability. The catamaran design provides a large and easily accessible payload area and facilitates clean separation when the spaceship is released. The twin cabins come from the same mould as the spaceship. This enables efficient manufacture but also provides a potential training platform for both spaceship pilots and passengers.

SpaceShipTwo is a reusable, winged spacecraft designed to carry eight people (including two pilots) into space safely and with high frequency. SpaceShipTwo is powered by a hybrid rocket motor– combining elements of solid rockets and liquid rocket engines. Both types of rocket engine have important advantages; the hybrid aims to combine the simplicity of a solid motor with the controllability of a liquid. SpaceShipTwo's rocket motor can be shut down quickly and safely at any point during the flight. SpaceShipTwo's most innovative feature is its unique capability to change its shape in space to ensure a repeatable safe re-entry. By rotating its wings and tail booms upwards while in space, the vehicle's stability and rate of deceleration in descent is controlled by aerodynamic forces. This "feathering" design takes the best from both the traditional capsule and winged space vehicle designs, and adds a little magic of its own. The "feathering" concept is often compared to a badminton shuttlecock or birdie – and proves that sometimes the most disruptive designs can emerge from the most humble of origins.SpaceShipTwo's cabin has been designed to maximize safety, comfort and astronaut experience. For this reason, SpaceshipTwo has more windows than any other spacecraft in history, allowing each astronaut to look out into the cosmos and back to our beautiful planet below – with a new perspective in each direction. With the exception of the rocket motor's fuel and oxidizer, which must be replenished after each flight. SpaceShipTwo is a fully reusable spacecraft. Virgin Galactic's current operational SpaceShipTwo, was the first to be manufactured by The Spaceship Company and named VSS Unity by Professor Stephen Hawking during an unveiling ceremony in 2016.




TECHNICAL DIAGRAM
GALACTIC
Virgin
Rudders
Actuated by pilot's pedals
for vehicle yaw control
CTN:
CASE, THROAT and NOZZLE
Main Valve Bulkhead:
Includes slosh baffle/valve/injector
igniter components.
Oxidizer Tank
TPS
Thermal Protection System
Windows
Entry/Exit
Large Cabin door for easy
entry and egress on lower
left side
Thrusters
To control pitch and yaw of
spaceship in zero gravity
Nose Skid
Simple, high friction
landing gear
90" - 2/3 m
Emergency Egress
12 feet - 3.7 m
Hybrid Rocket System
Roll Thrusters
Elevons
Actuated by pilot's center stick
for vehicle pitch and roll control
Electric Servo Horizontal
Stabilizers
For trim control
Feather Mechanism
Feather actuation and lock
pneumatically operated


FLIGHT PATH
SpaceShipTwo reaches maximum altitude and passengers experience micro-gravity
SpaceShipTwo's booms move into the 'feather' position ready for re-entry
The journey home begins as SpaceShipTwo re-enters the earth's atmosphere
Rocket Motor ignites and the vertical ascent commences
The booms lower and SpaceShipTwo glides home
SpaceShipTwo and WhiteKnightTwo separate
Virgin
GALACTIC

DID YOU KNOW?

The footprints on the moon will be there for 100 million years, because there is no such airflow and heavy atmosphere like us on earth

CABIN CATASTROPHE IN THE SOUTHWEST 1380

Ruby
20761A5629

This happened very recently on 17th of April, 2018, when the southwest 1380 (Boeing 737-7H4) aircraft, operated by the southwest airlines, carrying 5 crew and 144 passengers, had a devastating experience due to the failure of its left engine. After 10 minutes of it's departure from LaGuardia Airport, New York City, over Pennsylvania, the plane underwent a massive jerk and the cabin was with fumes all over. The Captain of the flight, Tammie Jo Shults and her co-pilot, the first officer, Darren Ellisor, weren't able to see any of the readings on the machine but did notice a couple of alarms of the left engine sounding. Everyone therein then suddenly started feeling as if the air in their lungs were being sucked out and were thrust into chaos not knowing what was happening.

All of them pulled down their oxygen masks and Rachel Fernheimer, the flight attendant walked to every seat asking all the passengers if they were alright. But when she came to seat 14, she was horrified seeing a window broken and Jennifer Riordan, the passenger by that window side being sucked out partially. She tried to pull Jennifer back inside with the help of other passengers but in vain. In the meanwhile, the pilots in the cockpit try contacting the flight attendants to acknowledge what was happening in the cabin behind. After a good number of attempts, Rachel's co-attendant answered their call and told them of the terrific incident that was then happening. The pilots get stunned on hearing that and wished that they could somehow save the passenger in trouble. They then contacted the Air Traffic Controllers and requested them for an emergency landing on a runway nearby, explaining them their worsening condition. The ATC then directed the southwest 1380's crew to the Philadelphia's international airport and the pilots follow their instructions with utmost struggle. But with concern for the partially sucked out passenger, the pilots reduced the speed of the plane. It was at that low speed, the passengers and the crew were able to pull Jennifer back into the plane. But to her misfortune, Jennifer did not survive the day. The southwest 1380 crew, with great struggle made it to the Philadelphia's international airport safely with just single engine running. The NTSB at Philadelphia's international airport, after examining the shattered left engine of the Southwest 1380, soon identified what went wrong with it. It was the distorted 13th fan blade of the turbofan engine that literally caused the disaster. The investigators had to examine why the fan blade no. 13 broke. After examining the broken fan blade, the investigators discovered that it was due to a crack generated in the fan blade due to metal fatigue. On keen examination, they found thousands of striations on the blade saying that the crack started almost 6 years back. They then go through the records of inspection of the fan blades. The fan blades were supposed to undergo ultrasonic inspections and if any crack were found, they were to be replaced. But the previous inspections surprised the investigators which certified that all the fan blades were examined including the blade 13. The investigators concluded that the fan blade 13, when distorted, hit one of the latches that hold the engine cowl, which led to the disintegration of the engine cowling from off the engine. As a result, the fragments of the cowl hit the passenger window 14 and shattered it. This eventually led to the rapid depressurization inside the cabin and ultimately to the fatality of a passenger. The heroic crew of the southwest 1380 were praised for their brave act all around the world.

LEARNING FROM THE FEYNMAN TECHNIQUE

U. Kavya
(Assistant Professor)

They called Feynman the "Great Explainer." Richard Feynman (1918–1988), an author, graphic novel hero, intellectual, philosopher, physicist, and *No Ordinary Genius* is considered to be one of the most important physicists of all time.

- He pioneered an entire field: quantum electrodynamics (QED).
- His work has directly influenced the fields of nanotechnology, quantum computing, and particle physics.
- In 1986, his research and explanations were critical in helping to understand the cause of the space shuttle Challenger disaster.

The Feynman technique for teaching and communication is a mental model to convey information using concise thoughts and simple language. This technique is derived from Feynman's studying methods when he was a student at Princeton. You can use this model to quickly learn new concepts, shore up knowledge gaps you have (known as targeted learning), recall ideas you don't want to forget, or to study more efficiently. Taking that concept further, you can use this technique to grapple with tough subject matter, which is one of the great barriers to learning.

The steps in the Feynman learning technique can be summarized as follows:

1. Identify the Topic:

The first step in the Feynman learning process is to think of a subject you'd like to learn or a topic you think you'd like to test yourself for understanding.

2. Teach It to a Child:

If you wanted to simply test your understanding, you could just explain the topic to yourself or a child, perhaps by writing it down, in a way that a child would easily be able to get what you're saying.

3. Review Your Explanation:

The third step in the Richard Feynman Technique is to go over the explanation you just gave. Here, you want to ask yourself a few questions, such as:

- Is my explanation of this topic easy enough for a 6^{th} grader to understand?
- How solid might my own grasp on this topic seem to this person?
- Are there any gaps in my knowledge or in my explanation of my knowledge?
- Did I use any complicated language or domain-specific vocabulary?
- Is there anything you've forgotten?
- How difficult was it for you to provide a simple explanation on the topic?
- How happy are you with your explanation and the topical knowledge behind it?

4. Simplify:

If you've found that your explanation or your own grasp on the topic need work, re-learn the subject or brush up on weak areas. Re-read any source material to fill any gaps in knowledge, and perhaps study additional literature for the possibility of learning the topic from a new perspective.

Once you feel you have a better comprehension of the subject matter and related material and think you'll be able to impart this knowledge more plainly, return to Step 2. Practice reading your story out loud. Pretend to tell the story to a classroom of students. That way, you'll hear where language stops being simple. Stumbles could indicate incomplete thoughts. Use analogies and simple sentences to strengthen your understanding of the story.

20-YEAR-LONG EXPERIMENT

From the collections of Chief Editor and Editors…

The experiment aims to look into the workings of some of the complex phenomena such as how objects melt, waves form in fluids and currents change at the atomic level. The International Space Station (ISS), a flying laboratory nearly 250 miles above Earth, has seen astronauts come and go, new technologies being added, removed and survive dangerous radiations. However, in the last two decades of its three-decade-long service, one experiment has remained on board working silently in weightlessness — the Plasma Kristall investigations.

The experiment is to get a sneak peek of a world, which lives and breathes among us, but beyond the visibility of our eyes. The Plasma Kristall (PK) investigations focus on understanding how materials form on an atomic scale.

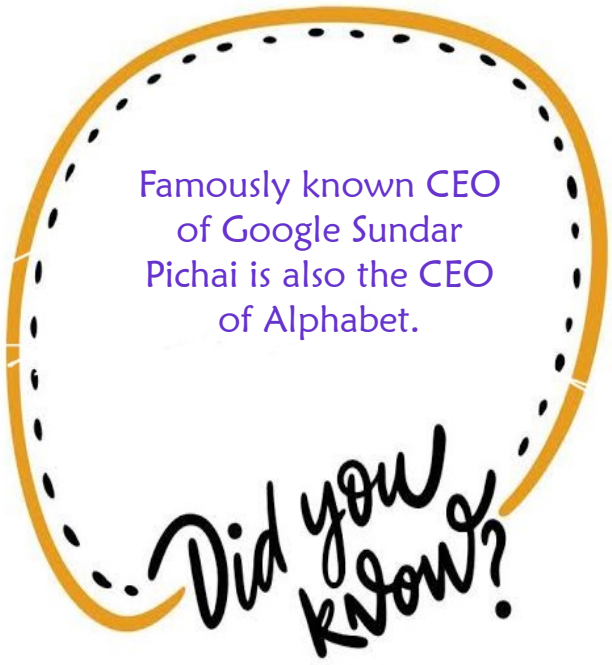
The experiment looks beyond the visual range to understand some of the most unique phenomena on Earth, like how an object melts, waves form in fluids and currents change at the atomic level.

WHAT IS THE PLASMA KRISTALL INVESTIGATION?

The Plasma Kristall suite of investigations into fundamental science is a Russian-European experiment running on the ISS since March 3, 2001. The research tries to understand the workings of our world on the atomic scale by injecting fine dust particles in a plasma, which turns the dust into highly charged particles. These charged particles bounce off each other and, under the right conditions, the dust particles can arrange themselves to form organized structures or plasma crystals.

According to the European Space Agency (ESA), these particles are way too small for even an electron microscope to observe, therefore a laser beam is added to make the charged particles visible and recordable. By changing the parameters in PK experiments, such as adjusting voltage or using larger dust particles, different situations can be simulated.

Complex phenomena such as phase transitions, for instance from gas to liquid, microscopic motions, the onset of turbulence and shear forces are well known in physics, but not fully understood at the atomic level. The PK-4 research has helped to understand some of these processes, including how planets form.



"At its origin, our planet Earth was probably two dust particles that met in space and grew and grew into our world. PK-4 can model these origin moments as they are during the conception of planets," ESA said in a statement.

WHY ON SPACE STATION?

The question that may arise on one's mind is why the research has not been conducted on Earth? The answer is gravity. According to ESA, the experiment cannot be run on Earth because gravity makes only sagging, flattened recreations possible; if you want to see how a crystal is constituted, you need to remove the force pulling downwards. However, conducting a big experiment over such a long duration has its own set of problems: the data transfer from the experiment. The data generated from the research is so big that space agencies had to send physical hard drives to bring back the findings.

“The knowledge from the PK experiments can be directly applied to research on fusion physics where dust needs to be removed and the processing of electronic chips, for example in plasma processes in the semiconductor and solar cell industry," ESA said.

WHAT IS A SUBORBITAL FLIGHT?

From the collections of Chief Editor and Editors…

What exactly is “suborbital”?

Simply put, it means that while space vehicles will cross the ill-defined boundary of space, they will not be going fast enough to stay in space once they get there. If a spacecraft or anything else, for that matter reaches a speed of 17,500 mph (28,000 km/h) or more, instead of falling back to the ground, it will continuously fall around the Earth. That continuous falling is what it means to be in orbit and is how satellites and the Moon stay above Earth. Anything that launches to space but does not have sufficient horizontal velocity to stay in space – like these rockets – comes back to Earth and therefore flies a suborbital trajectory.

Why these suborbital flights matter?

Although the two spacecraft launched in July 2021 will not reach orbit, the accomplishment of reaching space in private spacecraft is a major milestone in the history of humanity. Those aboard these and all future private-sector, suborbital flights will for a few minutes be in space, experience a few minutes of exhilarating weightlessness and absolutely earn their astronaut wings.

A well-thrown baseball

Conceptually, the flights that Branson and Bezos will be on are not terribly different from a baseball thrown into the air. The faster you can throw the baseball upward, the higher it will go and the longer it will stay in the air. If you throw the ball with a bit of sideways velocity as well, it will go farther down-range. Imagine throwing your baseball in an open field. As the ball rises, it slows down, as the kinetic energy inherent in its velocity is exchanged for potential energy in the form of increased altitude. Eventually the ball will reach its maximum height and then fall back to the ground. Now imagine that you could throw the baseball fast enough to reach a height of perhaps 60 miles (97 km). Presto! The baseball has reached space. But when the ball reaches its maximum height, it will have zero vertical velocity and start to fall back to Earth. The flight may take several minutes, and during most of that time the ball would experience near weightlessness – as will the newly minted astronauts aboard these spacecraft. Just like the hypothetical baseball, the astronauts will reach space but won’t enter orbit, so their flights will be suborbital.

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THE GAGANYAAN MISSION

From the collections of Chief Editor and Editors…

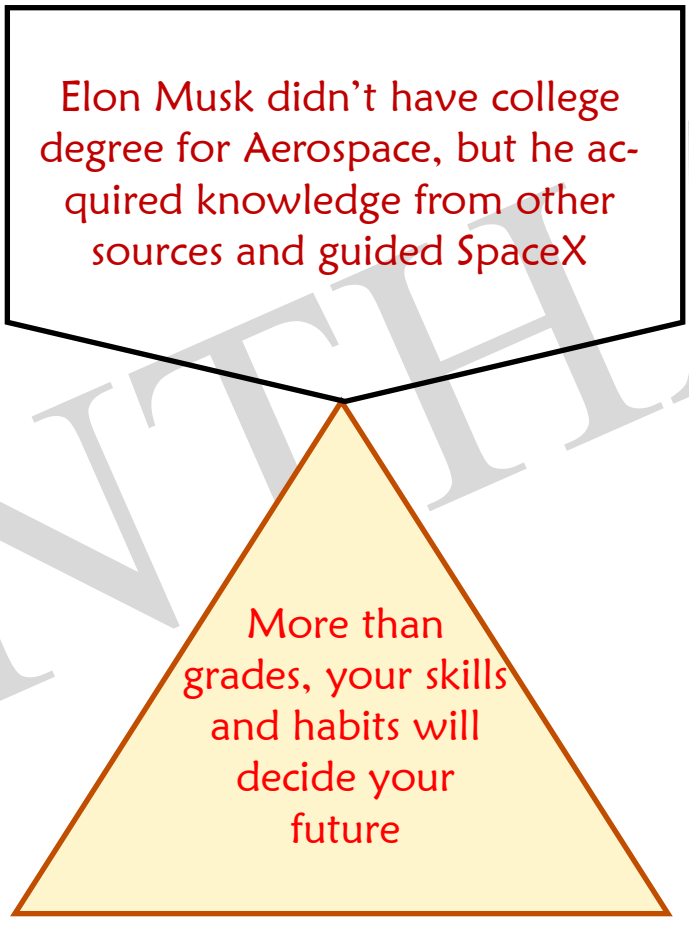
The Gaganyaan mission could propel India to the centre of human space exploration, which is dominated by the US and Russia. The manned mission is the biggest ISRO venture in the new decade. The Gaganyaan Mission, India's foray into independent human space exploration, is moving ahead with plans to send an uncrewed mission into orbit. The mission is part of the three-stage Gaganyaan project. While the first unmanned flight is likely to be launched this year, the second demonstration launch could happen in 2022-23 before the astronauts finally take to the skies in a full-scale, crewed mission. Despite the coronavirus pandemic impacting the pace of the mission, the Defense Research and Development (DRDO) organization and the Indian Space Research Organization (ISRO) are now conducting impact studies on the crew module. Being developed by the Hindustan Aeronautics Limited, the Gaganyaan crew module will be the first indigenous spacecraft to take Indian astronauts into space and return them safely to Earth.

What is Gaganyaan Mission?

The Rs 10,000-crore mission aims to send a three-member Indian crew to space for a period of five to seven days and safely return them to Earth. The Gaganyaan mission was initially scheduled for 2022, when India completes 75 years of independence. However, several delays have led to the deferment of the final crew mission. The initial timeline was set for 40 months since the date of before which two uncrewed launches are to take place to demonstrate and test key technologies and capabilities. "The human spaceflight programme will provide a unique micro-gravity platform in space for conducting experiments and test-bed for future technologies,"

Why do we need Gaganyaan mission?

After land, sea and air, the next frontier of global dominance is space as countries rush to explore the vastness of the cosmos, discover new resources on the Moon, and look for signs of microbial life beyond our orbit. With the US and Russia dominating space exploration, China is slowly cruising ahead with plans to build its own space station, return samples from asteroids, and trundle on the surface of shaping the already changing geopolitics. India sofar has reached the Moon and Mars with extremely cost-efficient missions apart from its Polar Satellite Launch Vehicle (PSLV) catering to the global demand of putting satellites into Low Earth Orbit (LEO).



Even before the Gaganyaan mission was announced, ISRO had been busy with developing technologies to support a human spaceflight mission and had tested several key technologies critical for such a mission.

These include a re-entry and recovery technology for the module, a cryogenic engine to carry the payload, and critical life support systems. The airdrop test of the Space-capsule Recovery Experiment (SRE) was successfully conducted way back in 2004. ISRO will also launch a data relay satellite that will help maintain contact with the Gagangyaan mission ahead of the final manned flight.

Boosting global collaboration, India has managed to bring together countries for its ambitious plans to send humans to space. Russia and France are providing key training and equipment needed to carry out the mission. Four Indian Air Force pilots underwent training in Russia with the Russian space agency. While the names of the selected pilots are yet to be released, the Russian space agency ROSCOSMOS had in August said that the astronauts were doing well and determined to continue with their training. Apart from imparting training at the Gagarin Cosmonaut Training Center, Zvezda, a Russian company is also manufacturing space suits for Indian astronauts. The astronauts had in September visited the facility, where their anthropometric parameters were measured to begin designing the customized spacesuits. The company will also be providing individual seats for the astronauts and custom-made couch liners. India recently signed an agreement with the French space agency National Centre for Space Studies (CNES) to provide equipment it has developed for the International Space Station.

The agency will supply fireproof carry bags made in France to shield equipment from shocks and radiation. "Under the terms of the agreement, CNES will train India's flight physicians and CAPCOM mission control teams in France at the CADMOS centre for the development of microgravity applications and space operations at CNES in Toulouse and at the European Astronaut Centre (EAC) in Cologne, Germany," . India is also in talks with Australia to set-up a ground station at Cocos Island for smooth monitoring of the mission. The manned missions will push India further in exploration beyond Earth's orbit as countries vie to control the next space race, which has the potential to trigger major changes in the global order.

DID YOU KNOW?

The spacecraft is an integral part of Aerospace engineering.
The launch of the first artificial satellite can be considered as the launch of the first spacecraft. The first satellite was Sputnik 1 launched by the Soviet Union. It was launched on 4th October 1957.

NEW SHEPARD

D. Jobin
18761A2115

Named after Mercury astronaut Alan Shepard, the first American to go to space, New Shepard is reusable suborbital rocket system designed to take astronauts and research payloads past the Kármán line – the internationally recognized boundary of space. Whether you are an astronaut flying with Blue Origin or sending a payload to space, your 11-minute flight on New Shepard will be the experience of a lifetime.

Crew Capsule: With room for six astronauts, the spacious and pressurized crew capsule is environmentally-controlled for comfort and every passenger gets their own window seat. The vehicle is fully autonomous. Every person onboard is a passenger—there are no pilots.

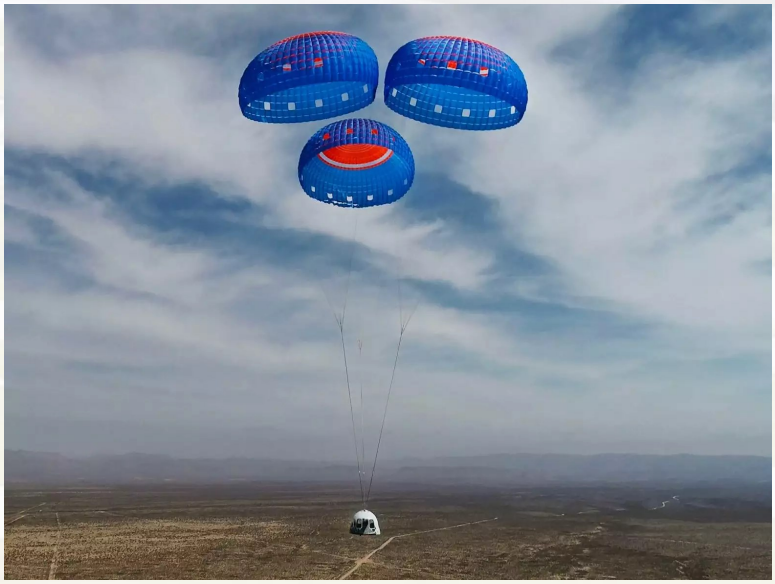
Ring & Wedge: Fins Aerodynamically designed to stabilize the booster and reduce fuel use on its flight back to Earth.
Drag Brakes: Deploy from the ring fin to reduce the booster's speed by half on its descent from space.
Engine: The BE-3 (Blue Engine 3) propels the rocket to space and restarts for a controlled pinpoint landing on the pad. The uniquely throttleable engine slows the booster down to just 8 km/h (5 V E H mph) for landing.
Aft Fins: Stabilize the vehicle during ascent, steer it back to the landing pad on descent, and guide the rocket through airspeeds of up to Mach 4.
Landing Gear: All rockets take-off, not all rockets land. As a fully reusable rocket, the New Shepard booster uses landing gear that deploys for touchdown.

Blue Origin founder Jeff Bezos flew to the edge of space on Tuesday July 20, 2021, in Blue Origin's New Shepard rocket from Launch Site One in West Texas that had a bulbous passenger capsule sitting atop a tall, narrow booster shaft. New Shepard's characteristic shape was designed to optimize cabin space for up to six passengers and maximize the rocket's stability when coming back to Earth. The main reason the design looks like this is because Jeff's first goal is to send people to space, so everything revolves around having four to six people in the cabin and so maximizing cabin volume. Jeff also wanted to have the biggest windows in space so people could have an awesome experience, which further increased the size of the capsule. While most spacecraft resemble, in part, male genitalia, New Shepard's wide mushroom-like capsule - and the skinny girth of the booster underneath - are the driving source of recent innuendo. Blue Origin engineers tested more than 100 configurations for the capsule shape before settling on one that starts wide at the base and tapers - a bit like a muffin top. The capsule shape helps reduce drag on the rocket and keep passengers safe. But experts say this suborbital sausage fest was anything but accidental.

Given that the capsule is the first thing to cut through the air as New Shepard ascends skyward (scientists call this forward-most part the nose cone), it's rounded to reduce drag.

Drag is the force that slows an object down as it moves through the air. The shape of a rocket affects how much drag it experiences. "Most round surfaces have less drag than flat ones." The capsule needed to stay stable on descent, too - it detached from the New Shepard booster in the atmosphere and fell for four minutes before deploying parachutes and delivering Bezos and three others safely to the ground. That's why, The more base it has, the better it's going to land. A capsule shape with a narrower base would have been less stable during reentry. Engineers had to make the bottom so wide. Like most rockets, New Shepard has a propellant-filled booster that helps blast its capsule toward space. The higher in space a rocket's objective is, the more propellant it needs to hold in order to power its journey.

So a booster carrying a spacecraft bound for the orbiting International Space Station, like SpaceX's Falcon 9 rocket, is going to be taller and larger than a booster for a rocket like New Shepard that's designed to go only to the very edge of space. "You don't need as much fuel to go suborbital; everything on Jeff's rocket is optimized to go suborbital". If it had gone orbital the design would've been much different."
Since Bezos' rocket was only aiming for the Kármán line - an imaginary boundary 62 miles above sea level, where many experts say space begins - its engineers cut down the height and girth of New Shepard's booster.



DID YOU KNOW?

Venus spins clockwise. It's the only planet in our solar system that does!

STEPHEN HAWKING'S BLACK HOLE THEOREM PROVED RIGHT AFTER 50 YEARS

From the collections of Chief Editor and Editors…

In 1971, Hawking proposed the area theorem, which set off a series of fundamental insights about black hole mechanics. The theorem predicts that the total area of a black hole's event horizon -- and all black holes in the universe, for that matter -- should never decrease. The statement was a curious parallel of the second law of thermodynamics, which states that the entropy, or degree of disorder within an object, should also never decrease.

Fifty years after physicist Stephen Hawking derived the black hole theorem, physicists at Massachusetts Institute of Technology have confirmed it for the first time, using observations of gravitational waves.

In the study, which appears in the Physical Review Letters, the researchers took a closer look at GW150914, the first gravitational wave signal detected by the Laser Interferometer Gravitational-wave Observatory (LIGO), in 2015. The signal was a product of two in-spiralling black holes that generated a new black hole, along with a huge amount of energy that rippled across space-time as gravitational waves. If Hawking's area theorem holds, then the horizon area of the new black hole should not be smaller than the total horizon area of its parent black holes. The MIT physicists team reanalysed the signal from GW150914 before and after the cosmic collision and found that indeed, the total event horizon area did not decrease after the merger -- a result that they report with 95 per cent confidence.

Their findings mark the first direct observational confirmation of Hawking's area theorem, which has been proven mathematically but never observed in nature until now. The team plans to test future gravitational-wave signals to see if they might further confirm Hawking's theorem or be a sign of new, law-bending physics.

"It is possible that there's a zoo of different compact objects, and while some of them are the black holes that follow Einstein and Hawking's laws, others may be slightly different beasts," said lead author Maximiliano Isi, from MIT's Kavli Institute for Astrophysics and Space Research.

The similarity between the two theories suggested that black holes could behave as thermal, heat-emitting objects -- a confounding proposition, as black holes by their very nature were thought to never let energy escape, or radiate. Hawking and others have since shown that the area theorem works out mathematically, but there had been no way to check it against nature until LIGO's first detection of gravitational waves.

The team plans to further test Hawking's area theorem, and other longstanding theories of black hole mechanics, using data from LIGO and Virgo, its counterpart in Italy.

DID YOU KNOW?

The thermosphere starts just above the mesosphere and extends to 600 km (372 miles) high. (Temperatures 1,500^{O} C). The thermosphere is considered part of Earth's atmosphere, but air density is so low that most of this layer is what is normally thought of as outer space. In fact, this is where the satellites, space shuttles flew and where the International Space Station orbits Earth (400 km).

CHAOS IN TURBULENT SYSTEMS AND BOSE-EINSTEIN CONDENSATION

From the collections of Chief Editor and Editors…

An important phenomenon studied in Aerospace Engineering is the emergence of order from chaos in turbulent systems that leads to detrimental large amplitude fluctuations. Examples of this include Aeroelastic Flutter as observed in the wings of aircraft and thermoacoustic instabilities in rocket combustors, both of which can lead to the breaking down of the system. For this reason, it is important to be able to predict and understand such happenings and avoid them. At R.I. Sujith's lab in the Department of Aerospace Engineering of IIT Madras, this phenomenon has been studied for years. As he succinctly explains: Thermoacoustic instability, which comprises self-sustained large amplitude periodic oscillations, can overwhelm the thermal protection system in combustion chambers, cause damage to structural parts such as turbine blades, or even affect the guidance and control system of rockets and lead to mission failures.

Apollo rocket failure: An oft-quoted example of this is the failure during testing of the F-1 engine in the Apollo rocket. Initially, every time they tested the rocket, the engine would get into this instability and explode. They later introduced baffles that disrupted the interactions between the flames and that between the flames and the combustion chamber giving the engine the desired stability. In a combination of theory and experiment, Prof. Sujith and his student Shruti Tandon have come up with an understanding of the emergence of order in chaotic systems by drawing an analogy with a phenomenon widely studied in quantum statistical physics – Bose-Einstein condensation (BEC). In BEC, Bosons, which are elementary particles having spins that take integer values, such as 0, 1 or 2, condense to the lowest energy level when temperature is taken to very low values. The group has shown an analogous condensation taking place in the case of order emerging from chaos in turbulent systems. To understand this, take the concept of phase space – an dynamic imaginary space where a particle is represented by its position and momentum at every instant of time. The acoustic dynamics of the combustor is represented as a trajectory moving in this imaginary space.

Orbit condensation: During chaotic movement, there are several possible orbits, and so even as the trajectory moves towards one orbit, it is attracted to a different orbit, and therefore does not stick to any one orbit. However, as the parameter is tuned and the system makes a transition towards order, the number of orbits is reduced and therefore, the trajectory gets caught in a few stable orbits. The researchers label this process a type of "condensation.""In the current work we have provided a novel perspective to study the transformation of the phase space structure with transition from chaos to order using analogy with Bose-Einstein Condensation," says Ms Tandon, a dual degree student in the department. "The next step would be to use statistics of Bosons, namely, tools from statistical mechanics that are used to study Boson particles and Bose-Einstein condensation, to quantify the transformations in the topology of the phase space," she adds.

DID YOU KNOW?

Talking about busy… the busiest day recorded in aviation is 24 July 2019, with more than 225,000 flights on that day.

The paper that draws out the analogy is published in the journal *Chaos*. "Using measures from cycle networks and using analogy with BEC we were able to develop 'early warning indicators' that identify the onset of intermittency and hence forewarn the occurrence of thermoacoustic instability in the combustor," says Prof Sujith, who is the D. Srinivasan Chair Professor in the department. Strategies to mitigate "In future, we would like to also analyze the spatio-temporal data from the perspective of BEC transition; thus, develop strategies to prevent the condensation transition and thus mitigate such instabilities," he adds.

ORBITAL DEBRIS REENTRY PREDICTION

From the collections of Chief Editor and Editors…

Wondering if you're in a debris path? Here's what all those blue and yellow lines mean.

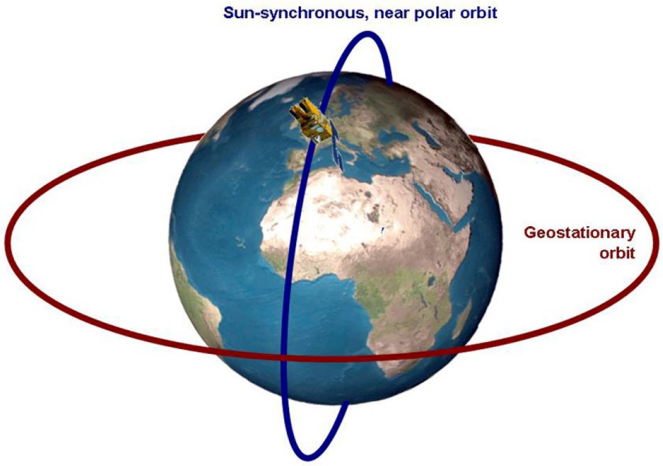
The Aerospace Corporation's Center for Orbital Reentry and Debris Studies (CORDS) is tracking the reentry path of the rocket body from the Chinese Long March 5B (CZ-5B) launch of April 29. The CORDS' graphic has generated a lot of questions such as, "what exactly am I looking at?" and "am I in the path of debris?" For context, the previous "normal" rocket body descent, Long March 3B (CZ-3B) that reentered on May 3, is shown below:

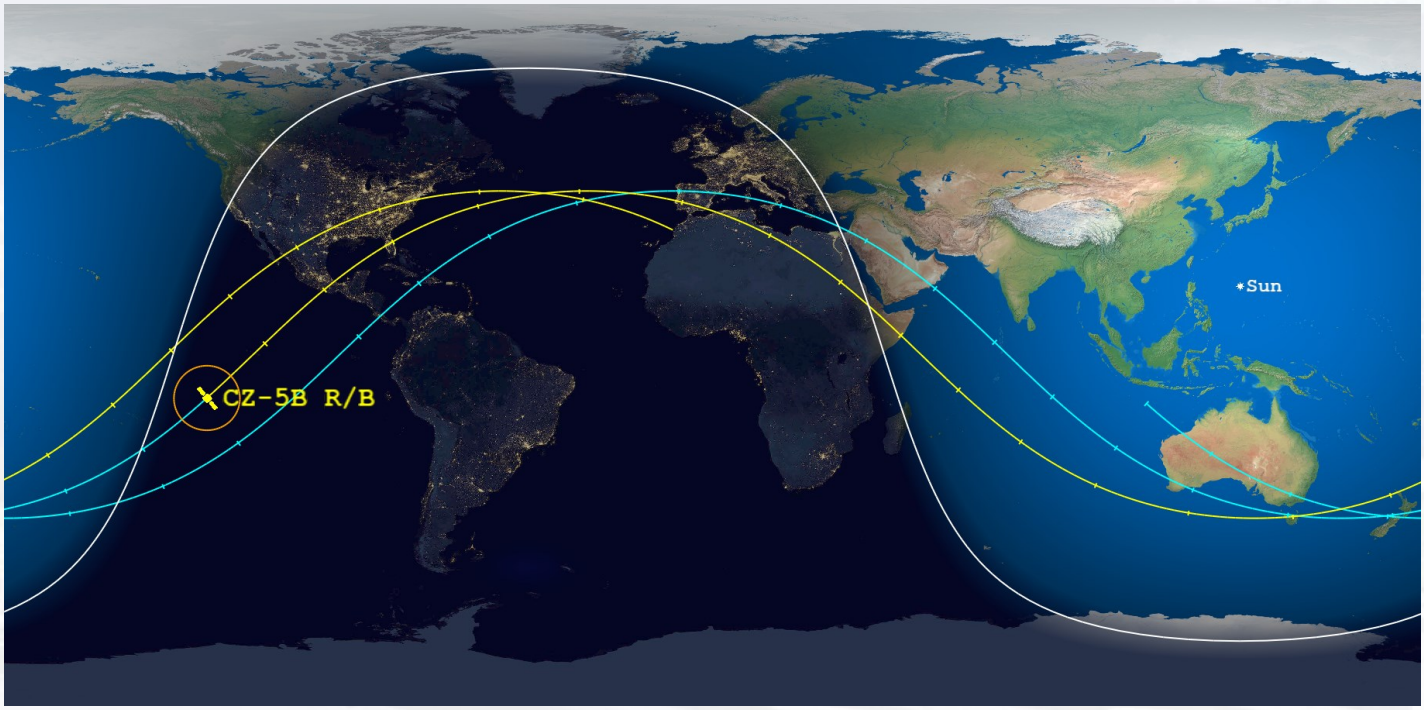
- The white line and shaded area show day and night around the globe
- The blue line shows the orbital path prior to reentry, and each tick mark is a five-minute interval
- The yellow line is the predicted future path with tick marks at five-minute intervals
- The text label and satellite icon indicate where the rocket body ultimately reentered
- The circle around the reentry point is the vicinity in which the reentry could be seen

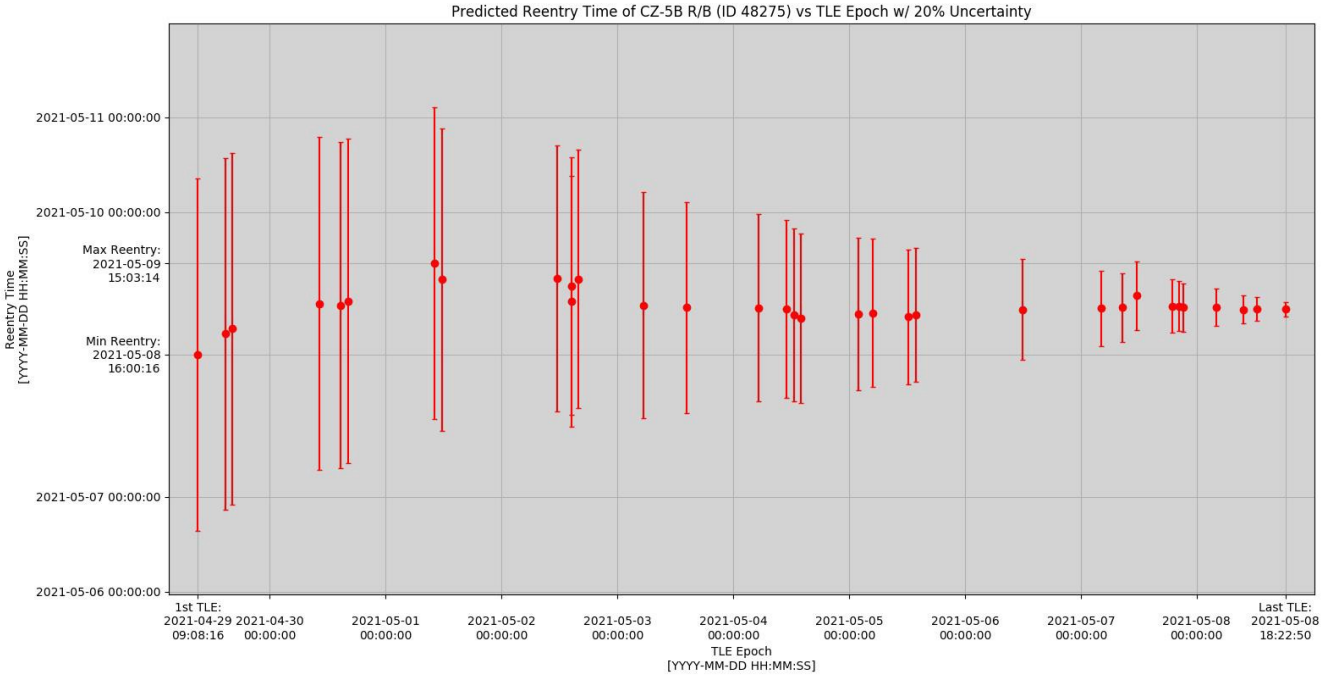
The Long March 5B reentry is unusual because during launch, the first stage of the rocket reached orbital velocity instead of falling downrange as is common practice. The empty rocket body is now in an elliptical orbit around Earth where it is being dragged toward an uncontrolled reentry.

Currently, the rocket body could reenter anywhere along the blue or yellow paths, with the satellite icon indicating the latest informed prediction: The spread of debris, referred to as the "debris footprint," is not something experts can speculate on at this time, given the degree of uncertainty remaining for the reentry point. However, any spot away from the lines are very unlikely to be at risk from debris. The predictions for time and location will become more specific as reentry time draws closer, as shown below:

DID YOU KNOW?




CZ-5B R/B
Sun


Predicted Reentry Time of CZ-5B R/B (ID 48275) vs TLE Epoch w/ 20% Uncertainty
Reentry Time
[YYYY-MM-DD HH:MM:SS]
2021-05-11 00:00:00
2021-05-10 00:00:00
Max Reentry:
2021-05-09
15:03:14
Min Reentry:
2021-05-08
16:00:16
2021-05-07 00:00:00
2021-05-06 00:00:00
1st TLE:
2021-04-29
09:08:16
2021-04-30
00:00:00
2021-05-01
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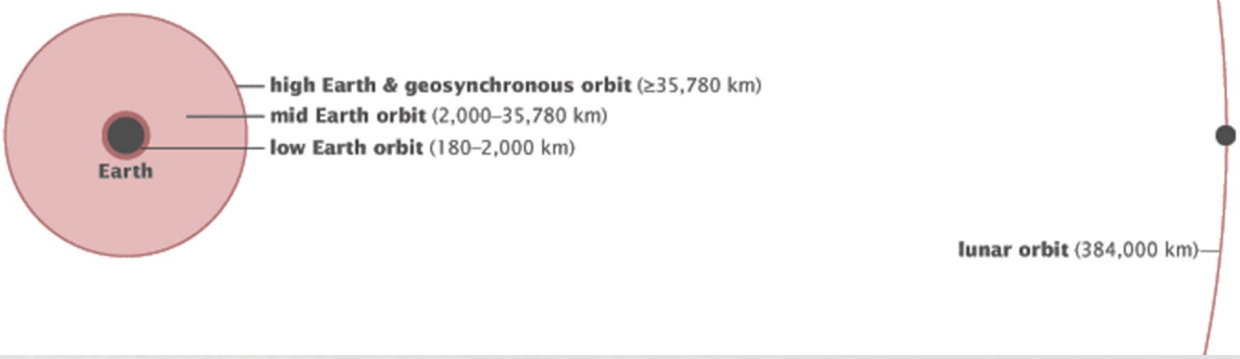
DID YOU KNOW?


high Earth & geosynchronous orbit (≥35,780 km)
mid Earth orbit (2,000–35,780 km)
low Earth orbit (180–2,000 km)
Earth
lunar orbit (384,000 km)

DID YOU KNOW ?

Planes are designed to be struck by lightning and they regularly are hit. It's estimated lightning strikes each aircraft once a year or once per every 1,000 hours of flight time. Yet, lighting hasn't brought down a plane since 1963, due to careful engineering that lets the electric charge of a lightning bolt run through the plane and out of it, typically without causing damage to the plane.

KUNTAMUKKALA BHUVANA SRI
18761A2128

FLYING CAR

From the collections of Chief Editor and Editors…

The flying car comes with a 160 hp BMW engine and it also has a fixed propeller and a ballistic parachute. The flying car, called AirCar, is capable of racing at a speed of 170 kmph and can perform several manoeuvres mid-air. The flying car is capable of flying a distance of 1,000 km at an altitude of 8,200 ft. Flying cars have been a fantasy for many for decades. A car that is equally capable of running on roads and flying in the sky, sounds interesting but technically challenging. However, in the last couple of

years, several companies tried their hands on this technology and came up with innovative prototypes. One such is made by AirCar and it has completed an inter-city test flight for the first time. This was also the first time any flying car completed an inter-city flight. The car flew between two international airports in Nitra and Bratislava in Slovakia on June 28. The flying car took 35 minutes to cover the distance. AirCar in a press release has said that after landing, at a click of a button the aircraft transformed into a sportscar in less than three minutes. The flying car has already clocked 40 hours of flying till now. Also, during its test flights, the flying car has performed steep 45 degree turns and stability and maneuverability testing. It takes around two minutes and 15 seconds to take-off and convert from a car to an aircraft, claims the company. Flying cars have been in discussion for quite some time. These vehicles are being considered as the future medium of city commuting and inter-city transport as the roads are becoming increasingly congested. Flying cars can help in decongesting roads and reduce travel time as well.

Flying cars are not fantasy anymore, but reality. Ride-hailing services like Uber have already announced that they are working on flying cars that would be used in future commuting and inter-city transportation. This flying car based ride-hailing system is expected to bring a major change in the mobility industry in near future. Among the established automakers, some OEMs like Hyundai too are working on flying car technology.

DID YOU KNOW ?

1986 marked a big milestone in aviation history. A homebuilt light-weight aircraft with 17 fuel tanks in total made it around the world without stopping or being refueled once on the way.
The Rutan Model 76 Voyager took off in California on 14 December and landed nine days later, just a day before Christmas Eve. The two pilots, the designer, and the crew chief were subsequently awarded the Collier Trophy, the most prestigious prize in aviation.

RECEPTION OF INDIAN TEXTS BY THE MODERN ERA

Meena Mahitha
20761A5638

Will this modern era accept the fact that ancient Indian texts had mastered the Aeronautics? This is the second episode of review on the impact of the ancient Indian texts on the modern world.

Everything in this world is an opinion! Similarly many scientists, engineers and professors worldwide possess different opinions on the **Vaimānika Shāstra**. As we know, **Vaimānika Shāstra** has originated in India. Ironically, The Indian Institute of science, Bangalore, after a critical study concluded that the techniques specified are unclear to us at the moment. In contrary to which Travis Taylor, a professor in Aerospace Department at university of California, Irvine had tested the 3D model of the Tripura vimana from **Vaimānika Shāstra** thus showed the results of the "created lift " with help of Kavya Vaddadi. Kavya Vaddadi is an Aeronautical Engineer from Hyderabad started decoding the shlokas in **Vaimānika Shāstra** since few years now. Kavya has been decoding the Sanskrit terms with appropriate meanings for recreating the models and techniques specified in the **Vaimānika Shāstra** that would help the scientific studies to solve the mysteries in space and to be useful for the mankind in the form of **Aeronautics**. She says that every term in Sanskrit has various meanings in different contexts. Hence it is referred to as a divine language. With her academic knowledge and knowledge in this divine language, she reverse engineered the Aeronautics and had found many new results. She has also encrypted her Knowledge taken from Shastras in a book called 'Reverse Engineering Vedic Vimanas'. Besides this, Kavya has also fact checked about the information regarding use of vimanas by Gods especially during wars. Another book by her 'vimanas and the wars of the gods ' mentions about this.

While, the renowned institutions like IISc had shown the thumbs down, some of the impeccable scientists like A S Kiran Kumar, former chairman of ISRO said, " Our ancient texts should not be disregarded!". The positive and negative reception of these powerful texts have been acting as the two sides of the coin. In a nutshell, it can be said that Indian texts are yet to be studied by the world to taste the flavor of the evergreen ancient Indian Aeronautics!

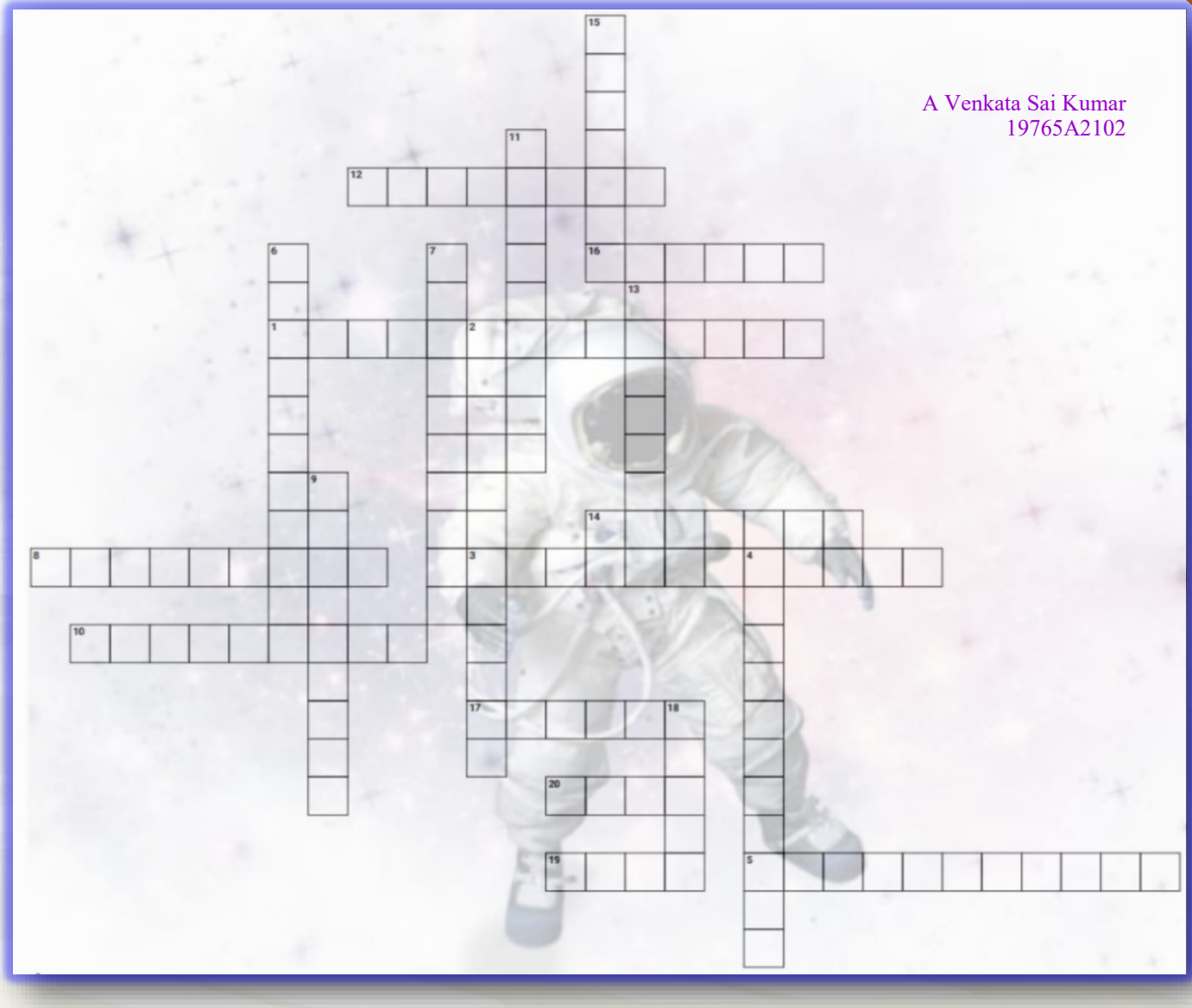
Acknowledgments:
https://m.economictimes.com/articleshow_comments/49873747.cms
https://youtube.com/user/kavyavaddadi

RETURNING FROM SPACE (RE-ENTRY)

Dr. P. Lovaraju

When the wind is calm, on the mirror-like surface of the water we strike a stone at a precise angle and speed that will allow its wide, flat bottom to take the full force of impact, causing it to skip. If we have great skill, it may skip three or four times before finally losing its momentum and plunging beneath the water. If the rock is not flat enough or its angle of impact is too steep, it'll make only a noisy splash rather than a quiet and graceful skip. Returning from space, Astronauts face a similar challenge. Earth's atmosphere presents to them a dense, fluid medium, which, at orbital velocities, is not all that different from a lake's surface. They must plan to hit the atmosphere at the precise angle and speed for a safe landing. If they hit too steeply or too fast, they risk making a big "splash," which would mean a fiery end. If their impact is too shallow, they may literally skip off the atmosphere and back into the cold of space. This subtle dance between fire and ice is the science of atmospheric re-entry.

Crossword Puzzle



Across

1. Within the sphere of influence of target planet,the trajectory is considered as _____ hyperbola
3. Which layer of atmosphere contains the ozone layer
5. Which layer of the atmosphere has the highest density of gas molecules
8. The waste heat in the spacecraft is disposed of by _____
10. The distance travelled by light in vaccum during one year is equal to _____
12. Control surface that controls the pitching of aircraft
14. Rolling moment due to rate of roll is called as _____ in roll
16. Which planets mean density is less than that of water
17. Yaw motion of an aircraft can be controlled by which control surface
19. The purpose of wings is to generate _____
20. Aircrafts are streamlined from nose to tail to reduce

Down

2. In which layer of atmosphere does auroras occur
4. The equipmet used to measure the atmospheric humidity
6. The spacecraft which was given excess speed for interplanetory transfer follows a _____ trajectory
7. Reversible adiabatic flow is called _____ process
9. The altitude as measured from the mean sea level is _____ altitude
11. The space probe which was given exact escape speed follows a _____ trajectory
13. Satellites used for intercontinental communications are known as
15. The solar sails mostly work from the _____ released from sun
18. Positive side slip will lead the aircraft to roll _____ side

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You people can send your responses through the given link. First 10 Students with correct responses will be featured in next volume of our Magazine

1.Just answer the puzzle on a white paper, take a picture of it.
2.Click on the google form link.

WORD SEARCH

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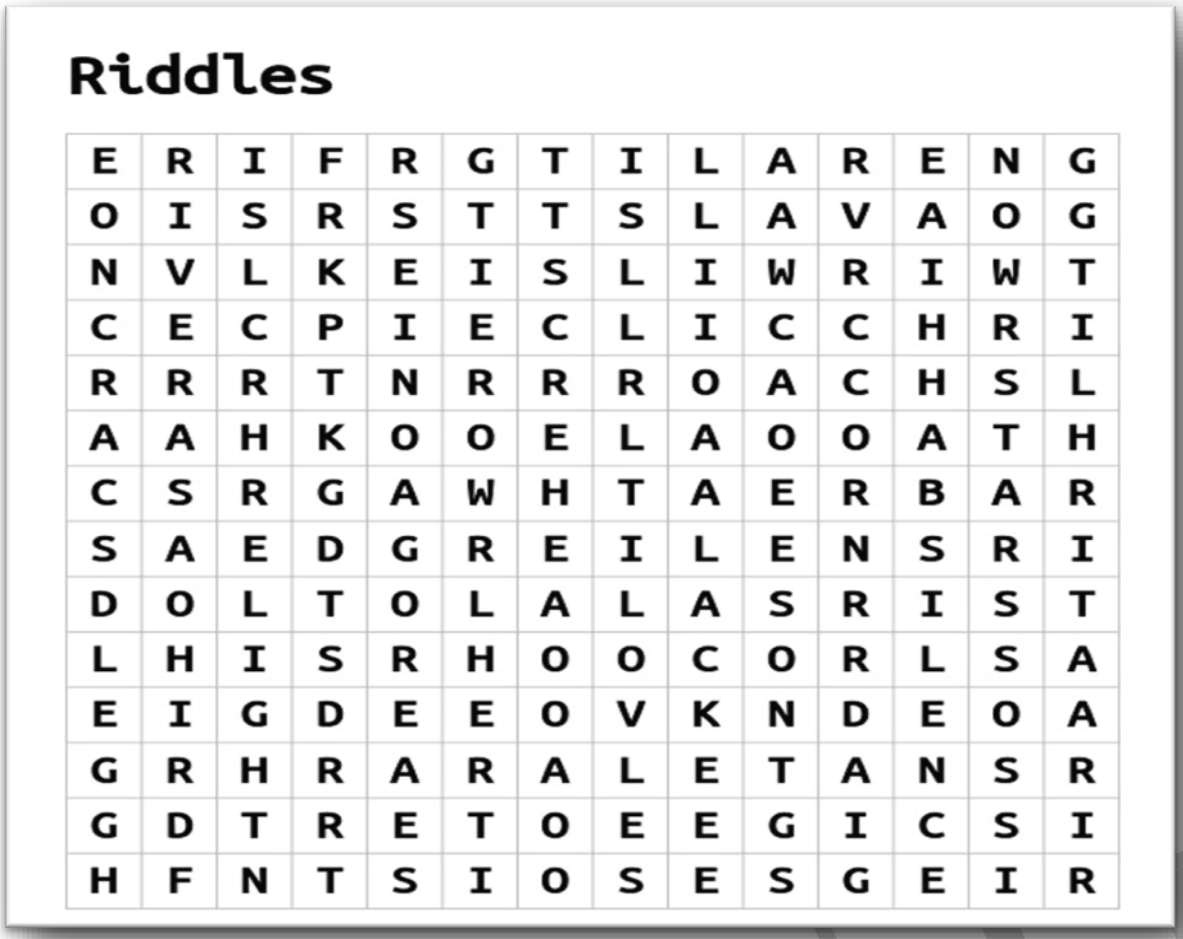
19765A2103

Find out the words in search box for the riddles illustrated below …!



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Questions:

1. What goes up and down stairs without moving? (Starts with C_____)
2. Give it food and it will live; give it water and it will die. (Starts with F___)
3. The more there is, the less you see. (Starts with D_____)
4. They come at night without being called and are lost in the day without being stolen. (Starts with S____)
5. What can fill a room but takes up no space? (Starts with L____)
6. Remove the outside, cook the inside, eat the outside, throw away the inside. (Starts with C___)
7. No sooner spoken than broken. What is it? (Starts with S_____)
8. I run, yet I have no legs. What am I? (Starts with N___)
9. Light as a feather, there is nothing in it; the strongest man can't hold it for much more than a minute. (Starts with B_____)
10. What gets wetter the more it dries? (Starts with T____)
11. A barrel of water weighs 20 pounds. What must you add to it to make it weigh 12 pounds? (Starts with H____)
12. Only two backbones and thousands of ribs. (Starts with R___R___)
13. As I walked along the path, I saw something with four fingers and one thumb, but it was not flesh, fish, bone, or fowl. (Starts with G____)
14. What has to be broken before it can be used? (Starts with E__)
15. What can run but never walks, has a mouth but never talks, has a head but never weeps, has a bed but never sleeps? (Starts with R____)

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THE SPACE...

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