

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.

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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)

PEOs	Statement
PEO1	To provide students with sound mathematical, engineering and multidisciplinary knowledge to solve Aero-
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 success-

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

A BRIEF IDEA ON STRING THEORY

S. RAVI TEJA

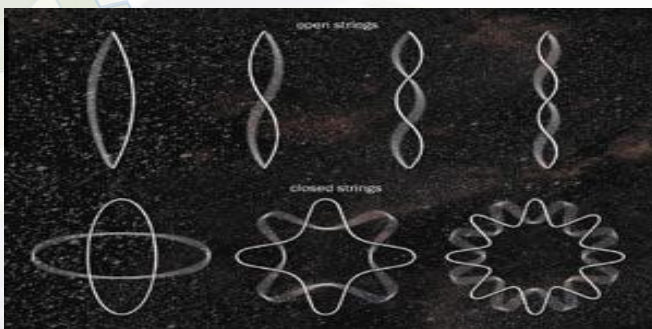
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ABSTRACT:

String theory is a framework of the theory that attempts to integrate the fundamental principles of quantum physics with general relativity. It proposes that the fundamental building elements of the cosmos are not point-like particles, but rather small one-dimensional strings. These threads vibrate at different frequencies, giving birth to the many particles and forces of existence.

The Beginnings of String Theory:

String theory has its origins in the study of the strong nuclear force, one of nature's four basic forces. In the 1960s, scientists realized that the strong force could be defined in terms of the characteristics of hypothetical particles known as mesons and baryons. These particles were eventually discovered to be made up of even smaller particles known as quarks. Nonetheless, the strong force was still unknown due to its unique behavior at extremely high energies. To describe the behavior of the strong force, physicists developed an



innovative theoretical framework called quantum chromodynamics (QCD), but QCD was highly complicated and difficult to work with. String theory was developed among physicists in the 1970s as an alternative way to explain the strong force. The strong force was characterized in this framework as the vibrations of small one-dimensional strings, rather than particle interactions

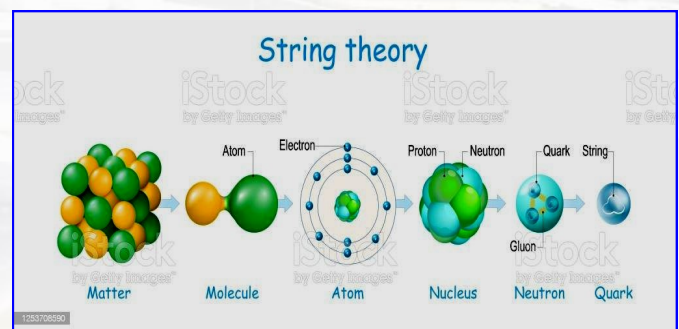
String theory has the potential to unify the four fundamental forces of nature: the strong nuclear

force, the weak nuclear force, electromagnetism, and gravity. One of the primary goals of theoretical physics is the convergence of these forces.

SOURCES OF STRING THEORY:

1. General features:

After all the efforts made by scientists since the late 1960s to the present, string theory is not yet fully formulated and we cannot yet give a detailed description of how the standard model of elementary particles should emerge at low energies, or how the Universe originated, there are some general features of the theory that have been well understood. These are features that seem to be quite generic irrespective of what the final formulation of string theory might be:



1. Gravity
2. Yang-Mills gauge theory
3. Supersymmetry
4. Extra dimensions of space
5. Size of Strings

2. Basic string theory and superstring theory:

Basial String Theory:

As a string evolves in time it sweeps out a two-dimensional surface in space-time, which is called the string world sheet of the string. This is the string counterpart of the world line for a point particle. In quantum field theory, analyzed in perturbation theory, contributions to amplitudes are associated with Feynman diagrams, which depict possible configurations of world lines. In particular, interactions correspond to junctions of world lines. Similarly, perturbation expansions in string theory involve string world sheets of various topologies. The existence of interactions in string theory can be understood as a consequence

of world-sheet topology rather than of a local singularity in the world sheet. This difference from point-particle theories has two important implications. First, in string theory, the structure of interactions is uniquely determined by the free theory. There are no arbitrary interactions to chosen. Second, since string interactions are not associated with short-distance singularities, string theory amplitudes have no ultraviolet divergences.

3. Superstring Theory:

Superstring theory is of two revolutions they are: First superstring revolution; Second superstring revolutions.

First Superstring Revolution:

Edward Witten discovered that most theories of quantum gravity could not accommodate chiral fermions like the neutrino. This led him, in collaboration with Luis Álvarez-Gaumé, to study violations of the conservation laws in gravity theories with anomalies, concluding that type I string theories were inconsistent. Green and Schwarz discovered a contribution to the anomaly that Witten and Alvarez-Gaumé had missed, which restricted the gauge group of the type I string theory to be $SO(32)$. In coming to understand this calculation, Edward Witten became convinced that string theory was truly a consistent theory of gravity, and he became a high-profile advocate. Following Witten's lead, between 1984 and 1986, hundreds of physicists started to work in this field, and this is sometimes called the first superstring revolution.

Second Superstring Revolution:

Edward Witten gave a speech on string theory that in essence united the five string theories that

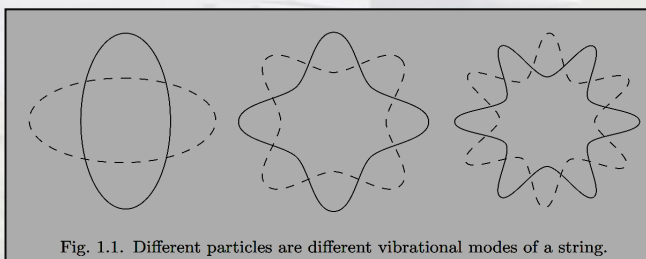


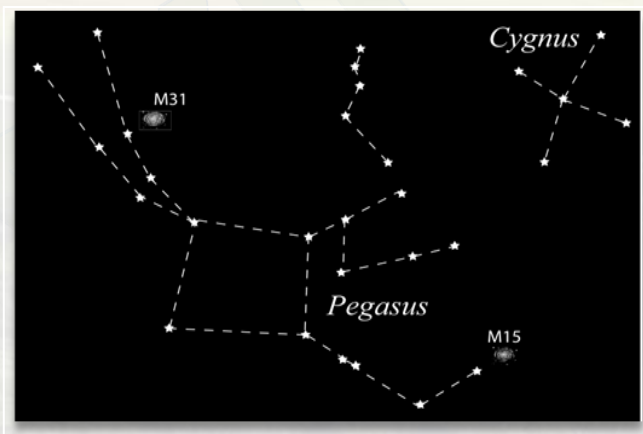
Fig. 1.1. Different particles are different vibrational modes of a string.

existed at the time, giving birth to a new 11-dimensional theory called M-theory. M-theory was also foreshadowed in the work of Paul Townsend at approximately the same time. The flurry of activity that began at this time is sometimes called

the second superstring revolution.

4. EXTRA DIMENSIONS OF SPACE AND SIZE OF STRINGS:

Extra dimensions of space are a theoretical concept in physics that suggest that our universe may have more than the three spatial dimensions (length, width, and height) that we observe in everyday life. The most widely accepted theory that incorporates extra dimensions is string theory. In string theory, it is proposed that the fundamental building blocks of the universe are not point-like particles, but rather tiny, one-dimensional objects called strings. String theory suggests that there may be as many as 10 or 11 dimensions, but the additional dimensions are "compactified," or curled up into tiny, almost imperceptible shapes. It is believed that the geometry of these extra dimensions plays a crucial role in determining the properties of particles and the forces that govern them. The idea of extra dimensions and tiny strings is still highly theoretical and has not yet been experimentally confirmed. According to string theory, the size of strings is incredibly small, on the order of 10^{-33} centimeters, which is known as the Planck length. This length scale is considered to be the smallest possible length scale that makes sense within our current understanding of physics. The size of strings is so small that they are not directly observable with current technology. Despite that, the effects of strings can potentially be observed indirectly through high-energy particle collisions or through astrophysical observations. However, it is an active area of research in theoretical physics and could potentially



lead to a deeper understanding of the nature of the universe

THE FUNDAMENTAL CONCEPTS OF STRING THEORY

Strings are tiny, one-dimensional objects that vibrate in a higher-dimensional space-time in string theory. The number of dimensions required by string theory is ten, with the extra six curled up and compactified. These extra dimensions are thought to be too tiny to be directly observed, but they are crucial to the theory's consistency. The frequency of vibration of a string involves determining its properties. A string can vibrate at different frequencies to produce different particles, just as a guitar string can vibrate at different frequencies to produce different sounds. All of nature's particles and forces are therefore able to be understood as different vibrational modes of the same underlying string.

APPLICATIONS OF STRING THEORY

String theory has a wide range of potential applications, both within and outside of fundamental physics. One of the most exciting applications is the potential unification of nature's four fundamental forces: the strong nuclear force, the weak nuclear force, electromagnetism, and gravity. This would be a significant advance in our understanding of the universe, potentially leading to new technologies and applications.

String theory could also be used in cosmology. Understanding the properties of the early universe may enable string theory to shed light on a few of physics' most fundamental questions, such as the nature of dark matter and dark energy. String theory has also been applied to the study of black holes, which are among the most mysterious and extreme objects that exist in the cosmos. Physicists may be able to gain new insights into the nature of space-time and the fundamental laws of physics by understanding the properties of black holes in the context of string theory.

STRING THEORY CONCERNING BLACK HOLES:

Black holes are objects in space that are so dense that their gravitational pull is strong enough to prevent anything, including light, from escaping. Classically, black holes are stable objects, whose mass can only increase as matter (or radiation) crosses the horizon and becomes trapped forever.

Quantum mechanically, black holes have thermodynamic properties, and they can decay by the emission of thermal radiation. The study of black holes is important for understanding the behavior of gravity and the nature of space and time.

String theory suggests that black holes are not simply objects with a singularity at their center, but are composed of tiny, one-dimensional strings. These strings vibrate in specific patterns, which determine the properties of the black hole, such as its mass, charge, and spin.

According to string theory, black holes have a temperature and entropy, just like any other object in the universe. This temperature and entropy are related to the behavior of the strings that make up the black hole. In fact, string theory predicts that black holes can emit radiation, known as Hawking radiation, which is a consequence of the quantum properties of the strings.

String theory has also been used to study the information paradox, which arises when an object falls into a black hole. According to classical physics, information is conserved, which means that if an object falls into a black hole, the information about that object should be preserved. However, if the black hole evaporates via Hawking radiation, it is unclear what happens to the information that was contained within it. String theory provides a possible resolution to this paradox by suggesting that information is encoded in the strings that make up the black hole and is not lost when the black hole evaporates.

CHALLENGES OF STRING THEORY

Despite its promise, string theory is not without difficulties. One of the most significant challenges is the theory's lack of experimental evidence. String theory cannot currently be tested experimentally because the energy scales required to observe the strings directly are so large. Some physicists have criticized string theory as unscientific because it cannot be tested in the same way that other scientific theories can. Another difficulty is the theory's complexity. Higher-dimensional spaces, Quantum mathematics, and advanced theoretical frameworks are required for string theory. Because of this complexity, many physicists find it difficult to work with the theory and predict outcomes that can be tested experimentally.

CONCLUSION

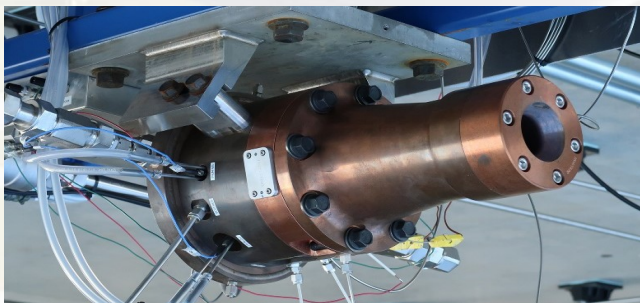
To summarize, string theory is a thrilling and promising theoretical framework that aims to resolve the principles of quantum mechanics and general relativity. Its fundamental concepts involve small one-dimensional strings vibrating at different frequencies to generate particles and forces of nature. Despite multiple difficulties, the theory remains one of the most range of applications for unifying nature's fundamental forces.

GROUNDBREAKING NEW ROCKET -PROPULSION SYSTEM

SK MOHAMMED ARSHAD
20761A5647

Researchers have developed an advanced new rocket-propulsion system once thought to be impossible. The system, known as a **rotating detonation rocket engine**, will allow upper stage rockets for space missions to become lighter, travel farther, and burn more cleanly.

The rotating detonations are continuous, Mach 5



explosions that rotate around the inside of a rocket engine, and the explosions are sustained by feeding hydrogen and oxygen propellant into the system at just the right amounts.

This system improves rocket-engine efficiency so that more power is generated while using less fuel than traditional rocket energies, thus lightening the rocket's load and reducing its costs and emissions.

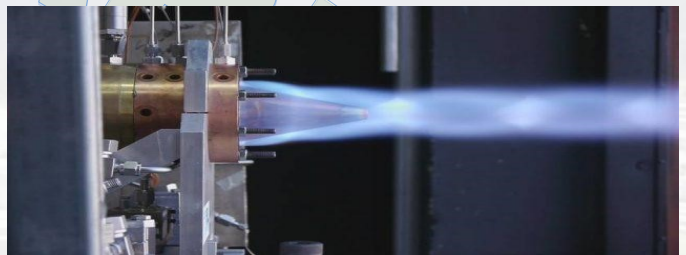
Mach 5 explosions create bursts of energy that travel 4,500 to 5,600 miles per hour, which is more than five times the speed of sound. They are contained within a durable engine body constructed of copper and brass.

The technology has been studied since the 1960s

but had not been successful due to the chemical propellants used or the ways they were mixed.

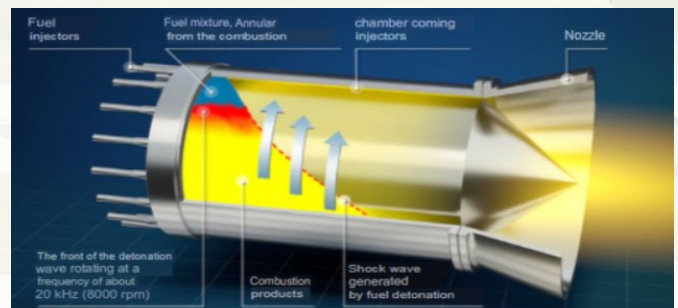
But researches made it work by carefully balancing the rate of the propellants, hydrogen and oxygen, released into the engine.

We have to tune the sizes of the jets releasing the propellants to enhance the mixing for a local hydrogen-oxygen mixture. So, when the rotating explosion comes by for this fresh mixture, it's still sustained. Because if we have your composition mixture slightly off, it will tend to deflagrate, or



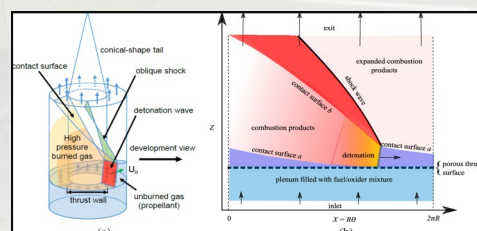
burn slowly instead of detonating.

Researches also had to capture evidence of their finding. They did this by injecting a tracer in the hydrogen fuel flow and quantifying the detonation waves using a high-speed camera. we need the



tracer to actually see that explosion that is happening inside and track its motion.

[A **rotating detonation engine (RDE)** is an engine



using a form of pressure gain combustion, where one or more detonations continuously travel around an annular channel.

Credits : University of Central Florida

TYPES OF PROPULSION ENGINES AND ROCKET ENGINES

MOHAMMED ZAMEERUDDIN

20761A5633

PROPULSION :

Propulsion is the process of providing force or energy to move an object in a particular direction. In the context of transportation, propulsion is typically used to refer to the means by which vehicles are moved forward, such as engines or motors. There are many different types of propulsion systems, including internal combustion engines, electric motors, jet engines, and rocket engines. The choice of propulsion system depends on the specific application and the desired speed, efficiency, and range of the vehicle.

CLASSIFICATION OF PROPULSIVE DEVICES :

Several propulsive devices based on various principles were designed and developed, which are used in modern aircraft and spacecraft. The propulsive devices can be broadly divided into two categories: air-breathing and non-air-breathing engines. In the case of air-breathing engines, ambient air is used as an oxidizer for burning fuel. Air-breathing engines can be broadly divided into two categories: constant-pressure combustion and constant-volume combustion. The first category is based on the Brayton cycle, which can be further divided into two categories: gas turbine and ramjet. There is another exotic jet engine known as the scramjet engine. The gas turbine engine can be classified broadly into three categories: turbojet, turbofan, and turboprop/turboshaft.

In non-air-breathing engines, the oxidizers are not taken from the atmosphere but are rather carried onboard the vehicle. Most non-air-breathing engines are generally termed as rocket engines/motors.

Note that the term rocket used in the literature is

more broad-based, and its definition can be conceived as “the device in which mass contained in the vehicle is ejected.

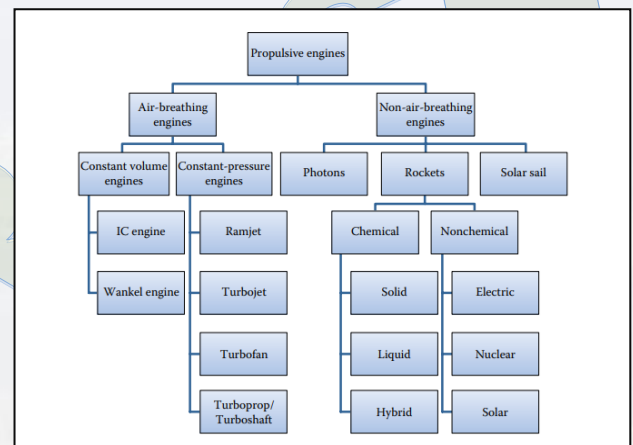


Fig : Classifications of Propulsive devices

We know that for propelling an aircraft, piston and gas turbine engines use air from the atmosphere as these vehicles are confined within the earth's atmosphere. Besides, ramjet engines, employed mostly for missile application, come under the category of air-breathing engines. We know that an air-breathing engine's propulsive efficiency drops down to low values when the flying altitude exceeds 25 km. Therefore, one must think of a non-airbreathing propulsive device that can carry both fuel and oxidizer along with it. Such a device is known as a rocket engine, as mentioned earlier. Thus, a rocket engine is a non-air-breathing jet propulsive device that produces the required thrust by ejecting high-pressure and high-temperature gas from a propellant burning through a CD nozzle.

TYPES OF ROCKET ENGINES :

The rocket engine can be broadly classified into two categories: chemical rockets and nonchemical rockets.

Based on the physical form of the chemical propellant, chemical rocket engines can be divided into three categories: (1) solid propellant, (2) liquid propellant, and (3) hybrid propellant. But the nonchemical engines based on type of energy are

further classified into three categories: (1) nuclear rockets, (2) electrical rockets, and (3) solar rockets.

CHEMICAL ROCKET ENGINES :

In case of chemical rocket engines, chemical energy released during the burning of fuel and oxidizer is used to raise the temperature and pressure of the gas which is expanded in a CD nozzle to produce thrust. Generally, the hot gases at high pressure are accelerated to high supersonic velocities in the range of 1500–4000 m/s for producing thrust. It may be noted that both fuel and oxidizer are being carried along with the engine unlike in air-breathing engines. Based on the physical state of the propellant (fuel and oxidizer), as discussed earlier, chemical rocket engines can be broadly divided into three categories: (1) solid propellant, (2) liquid propellant, and (3) hybrid propellant.

SOLID PROPELLANT ROCKET ENGINES :

We know that solid-propellant rocket engine (SPRE) is one of the oldest non-air-breathing engines as it is believed to have been used in China as early as the thirteenth century onward for war purposes. The solid propellant composition, which was initially black powder, underwent a series of changes with time. Currently, solid propellants have found a wider application in various propulsion and gas-generating systems. It has a wide range of thrust levels ranging from a few N (Newton) to several hundred N. Besides having a solid form, this propellant can be stored in the combustion chamber ready for use for a longer period of time, on the order of 10–20 years, provided they are hermitically sealed. Compared to other types of chemical rocket engines, these are economical, reliable, and simple. Hence, these engines find a wider range of both civilian and military applications.

LIQUID PROPELLANT ROCKET ENGINES :

Recall that around 1927, an American professor, Robert Goddard, had designed and developed an

LPRE, which had flown only 46 m. Subsequently, the Germans took this technology to a mature level that culminated in the famous V2 rocket engine. Currently, the LPRE has found a wider application in various propulsion and gas-generating systems. It has a wide range of thrust levels ranging from a few N (Newton) to several hundred N. In addition to having a liquid form, this propellant can be stored in a separate tank and can be controlled easily, and hence thrust can be varied easily unlike in an SPRE. As LPREs are stored in separate tanks unlike SPRE, one can achieve a higher level of thrust and is thus considered to be more powerful than an SPRE. Therefore, it is preferred for large spacecraft and ballistic missiles. However, the design of an LPRE is quite complex and requires specialized nozzles. Compared to other types of chemical rocket engines, LPREs are compact, light, economical, and highly reliable. Hence, they have a wider range of both civilian and military applications.

HYBRID PROPELLANT ROCKET ENGINES :

In order to achieve better performance, elements from SPREs and LPREs are combined to devise a new engine known as the HPRE. Note that this engine can use both solid and liquid types of propellants. All permutation and combination of propellants can be used for this kind of engine. But the most widely used propellant combination is a liquid oxidizer along with a solid propellant

Three types of chemical rocket engines:

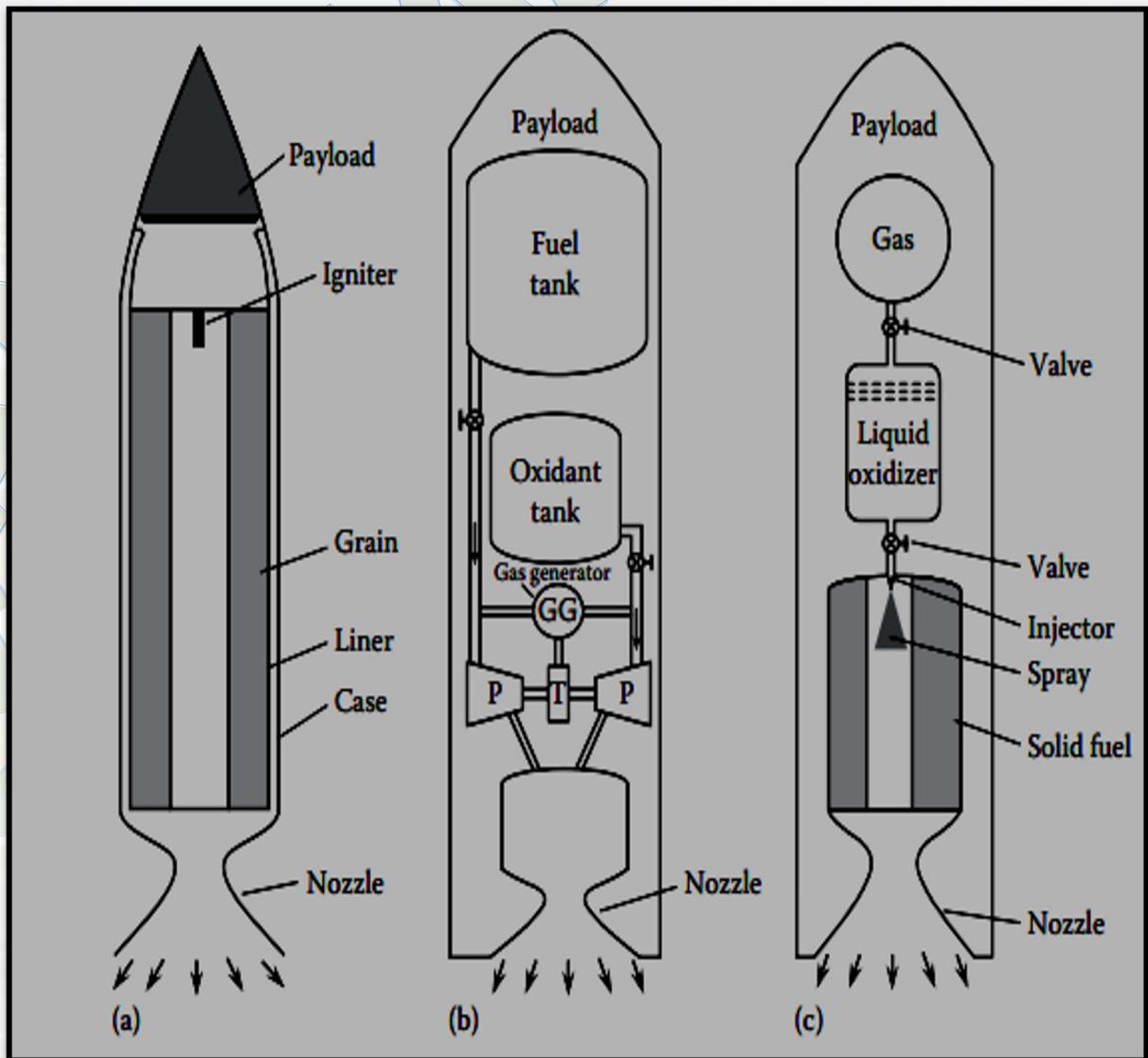
- (a) solid propellant
- (b) liquid propellant
- (c) hybrid propellant.

NON CHEMICAL ROCKET ENGINES :

We use chemical rocket engines liberally for most applications, but nonchemical rocket engines are being designed and developed for quite some time now as for certain missions it is undesirable to use

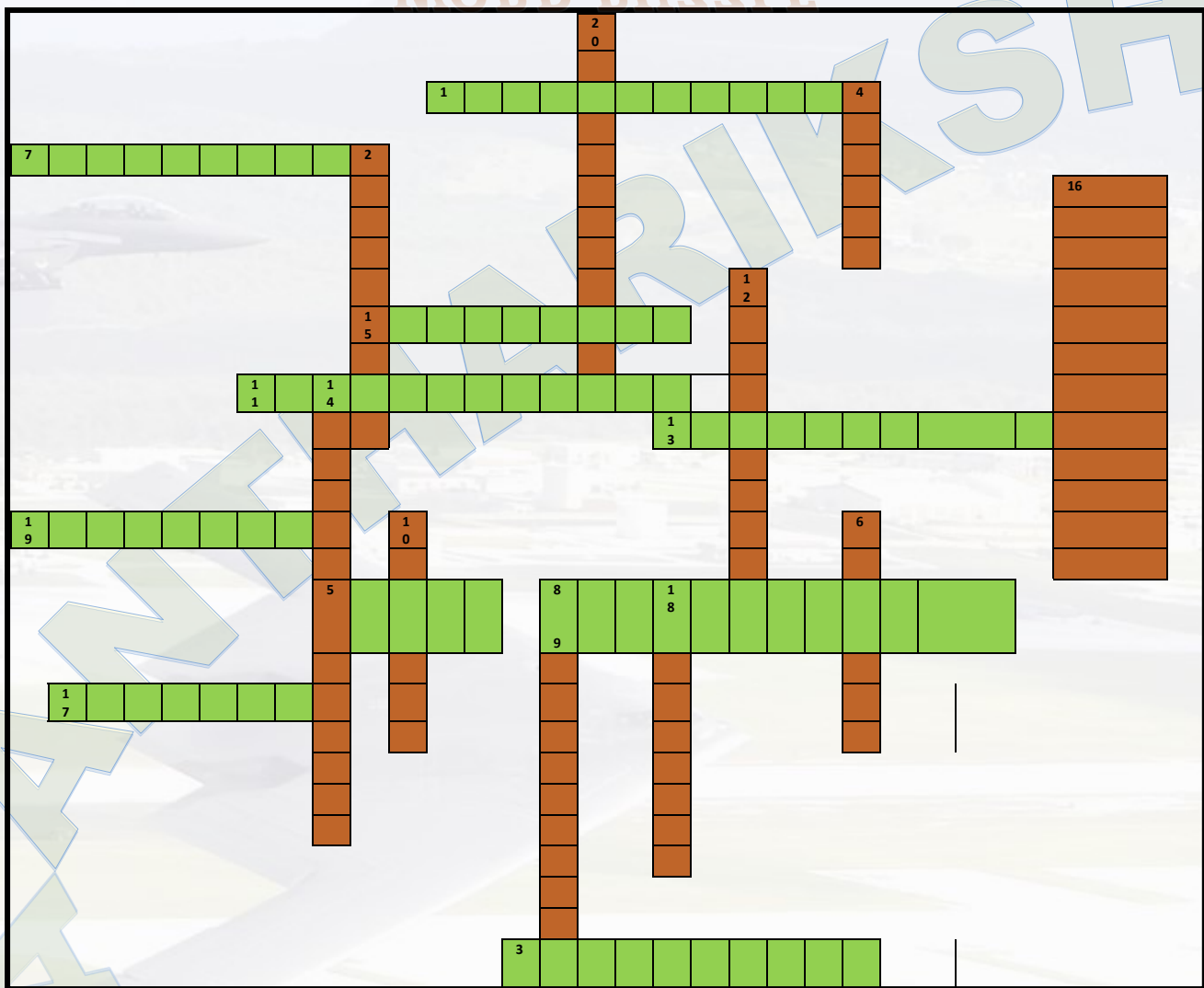
chemical rocket engines due to their higher propellant mass per unit impulse. In some deep space applications, nonchemical rocket engines are much sought after. Based on the source of energy, these engines can be broadly divided into three categories:

- (1) electrical rocket engines,
- (2) nuclear rocket engines, and
- (3) solar rocket engines.



WORD PUZZLE

WORD PUZZLE



HOW TO ANSWER ?

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.

<https://forms.gle/mktFrTfEVVBSz9Cs5>

Across

1. _____ is the way objects move through air.
3. Reversible Adiabatic flow is called _____ process.
5. The second law of motion give us a measure of which physical quantities _____.
7. who was the first to state the principle of floatation _____.
9. Weather and clouds exist in the _____.
11. When the fluid is in motion the actual pressure exerted by the fluid is known as _____.
13. Which device measures the fluid pressure by height of a liquid column _____.
15. What was added to a purely monocoque structure to support larger more and powerful aircraft _____.
17. Mach number is generally used to define the speed of _____.
19. _____ is a device consisting of a wheel having much of its mass concentrated around the rim, mounted on a spinning axis.

Down:

2. In PSLV, S is abbreviated as _____.
4. The phenomena 'Great White Spot' is associated with which planet? _____.
6. What is the ratio of change in configuration to the original configuration called as _____.
8. Missile Women of India is _____.
10. _____ is the forward force that moves an aircraft through the air.
12. Which engine provides the greatest amount of thrust for their weight? _____.
14. What is the angle called which is connected between the chord line and the relative air-flow _____.
16. Which scale is extremely accurate for measurement? _____.
18. Compressive stress in liquids is called _____.
20. Which control surfaces are present in V-tail configuration? _____.



INDUSTRIAL VISIT

DETAILS REGARDING VISIT

DATE : 13-02-2023

ORGANIZATION : VIJAYAWADA THERMAL POWER STATION (V.T.P.S)

PLACE : IBRAHIMPATNAM, N.T.R dist.



SODIUM-ION BATTERIES

K. Roshini

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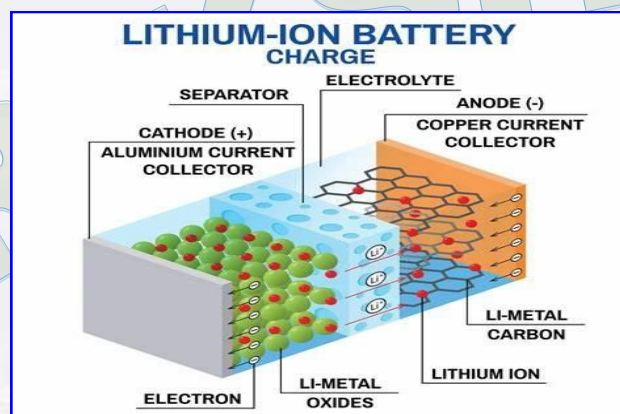
The sodium-ion battery (NIB or SIB) is a type of rechargeable battery that uses sodium ions (Na^+) as its charge carriers. Its working principle and cell construction are almost identical with those of lithium-ion battery (LIB) types, but replace lithium with sodium. The largest advantage of sodium-ion batteries is the natural abundance of sodium. Challenges to adoption of SIBs include low energy density and insufficient charge-discharge cycles. Now let us know about the difference between **Sodium-Ion Batteries and Lithium-Ion Batteries**.

Sodium-ion batteries have a similar origin as lithium-ion batteries, however lithium-ion batteries rely on lithium ions moving between the electrodes, whereas sodium ion batteries use sodium ions. On the periodic table, sodium has the same number of outermost electrons and chemical properties as lithium. Elements in the same group also have similar properties. This is an important reason why sodium ions can be as competent as lithium ions as charge carriers.

Sodium is a mineral resource that is found in crustal abundance at 2.74%, more than 400 times the lithium element, has rich reserves, and is widely distributed since, after all, seawater contains sodium chloride. Moreover, sodium ion battery cathode does not need to use cobalt, nickel, these rare precious metals, the resource is limited by the trouble of a lot less.

With the rapid growth in demand for lithium in electric vehicles, energy storage and other fields, lithium resources are becoming increasingly tight. Sodium salt is much cheaper than lithium salt, and sodium ion batteries can be used without

cobalt, nickel and other rare and precious metals, and can also use aluminum foil, which is cheaper than copper foil, as a collector fluid, and the material cost is expected to be 30-40% lower than



that of lithium-ion batteries.

Since sodium ion batteries work similarly to lithium-ion batteries in terms of principle and cell structure, the production line design of lithium can be used to produce sodium ion batteries with minor adjustments.

Sodium ion battery with better stability of aluminum foil as the negative collector, do not have to worry about low voltage resulting in battery performance decay, failure, so you can completely



empty the power before transport, to ensure transport safety, but also does not affect the subsequent performance of the battery. The potential of sodium is higher than lithium, sodium ions are larger and heavier than lithium ions, when embedded in the positive and negative electrode is

easy to make a large volume change in the pole piece material, which makes the sodium ion battery in comparison with lithium-ion batteries, there is a low energy density, multiplier performance is poor, short cycle life and other relative disadvantages.

LATEST APPLICATIONS OF SODIUM-ION BATTERIES:

The BYD Seagull with sodium-ion batteries will have a range of 300 kilometers, while the lithium-ion version will have a range of 400 kilometers, according to the report.

BYD will begin testing the materials for the sodium-ion batteries in December and will conduct A and B samples in the first quarter of 2023, with preliminary results expected in June, the report said.

If the test results are satisfactory, the battery will be launched in the second quarter of 2023, otherwise, it will be launched in the third quarter, the report said.

In addition to the Seagull, BYD will also put sodium-ion batteries in lower-range versions of models priced above RMB 200,000, according to the report.

Sodium-ion batteries currently cost about the same as lithium batteries, which are RMB 650 per kWh. BYD aims to bring the cost per kWh down to RMB 500 by the time the battery is installed in high volume.

If lithium battery prices remain high through 2026, there is a window of opportunity for sodium-ion batteries to grow, the report said.

Tesla Could Soon Replace Lithium with Sodium-ion Batteries:

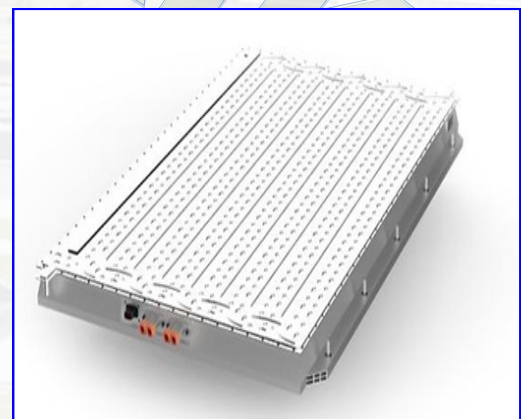
Researchers from the United States have made a critical discovery that has the potential to make sodium-ion batteries significantly safer and cheaper compared to lithium-ion batteries.

We already know EVs' big dent in the transportation industry worldwide. However, these vehicles still need lower-cost batteries to power cars for

higher ranges. At the same time, the world also anticipates low-cost batteries that can store the intermittent clean energy from wind and solar technologies to power hundreds of thousands of households.

And to meet these requirements, researchers worldwide are trying to create batteries beyond the current norm of lithium-ion materials. One of the most encouraging contenders is sodium-ion batteries.

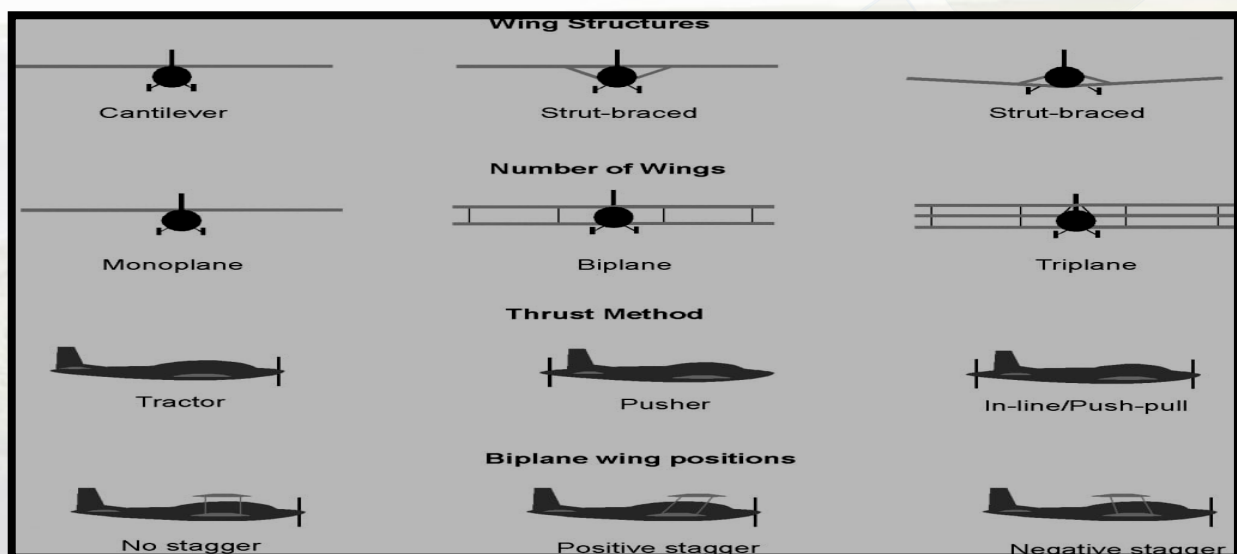
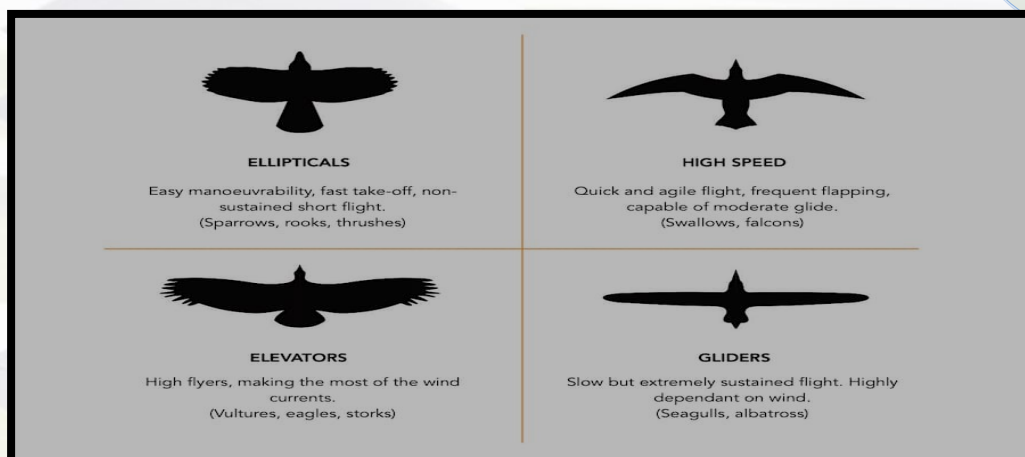
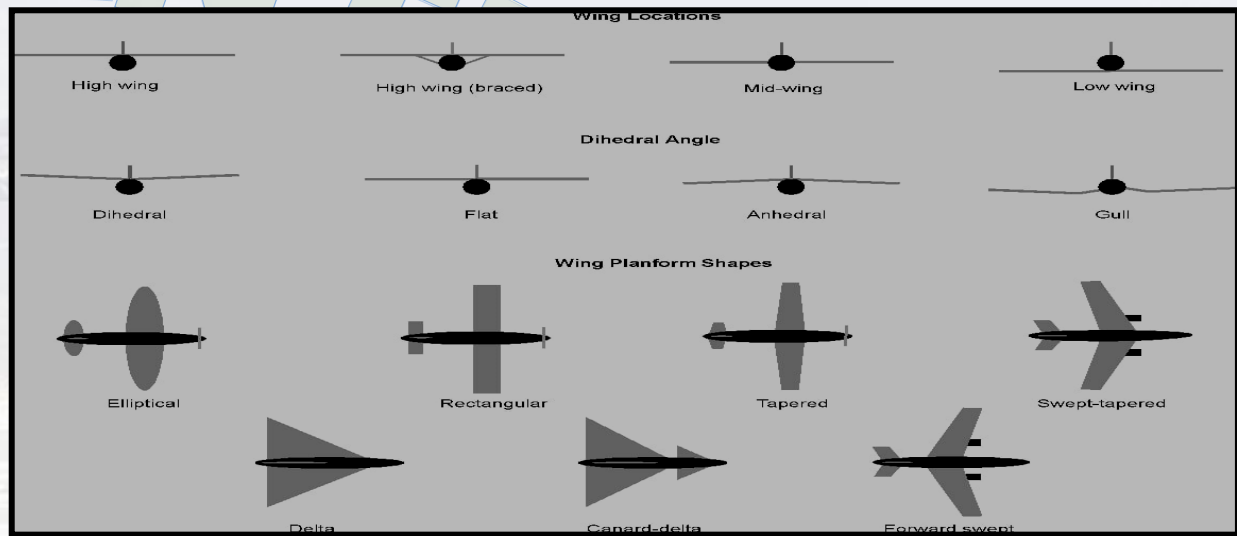
Sodium-ion batteries are particularly appealing because of:



- Its greater abundance and lower cost (than lithium).
- An increased amount of stored energy when cycled at high voltage.

But, its performance also declined at a rapid pace with charge-discharged cycling, which hampered its commercialization.

PHOTO GALLERY



STUDENT

ACHIEVEMENTS

I'm happy to share that I've secured a GATE score of 669 with AIR 70. Special thanks to my Parents, who stood by my side in every moment of my life. Undoubtedly, no words can ever be strong enough to express my gratitude to my Parents and my Sister for their unconditional love and support.

My heartfelt gratitude to the HoD Lovaraju Pinnam sir, my Professors and Staff of Aerospace Engineering Department of Lakireddy Bali Reddy College of Engineering(Autonomous) for the strong foundation they have laid, without which this achievement wouldn't have been easier.

I truly believe, the standards of teaching in the Aerospace Dept of Lakireddy Bali Reddy College of Engineering(Autonomous) remain unmatched and will surely propel in inspiring many.

I truly appreciate the team of IITians GATE CLASSES: GATE Coaching Institute and special thanks to Dinesh sir for helping me on many occasions and motivating me in this journey.

Special thanks to my Friends who supported me throughout this journey.

My heartfelt gratitude to my friend Srihari Kuchika who dealt with utmost patience, reminded me of what I truly am, built confidence and made the path easier.

Hearty congratulations to all the candidates for clearing GATE 2023 and I wish everyone good luck in your future endeavours.



SHAIK VANHAR ALI

17761A2132

AIR - 70

I am delighted to share that I have secured a GATE score of 642 with AIR 93.

I sincerely applaud to my mentor and guide Dr.P. Lovaraju sir, HOD and Professor of Department of Aerospace Engineering, Lakireddy Bali Reddy college of Engineering (Autonomous) for his relentless efforts and faith in me. He never left me down in this journey. The faculty of department helped a lot and guide me at every step. They all made this pivotal journey much easier.

I truly believe that the standards of teaching and way of step back in inspiring others.

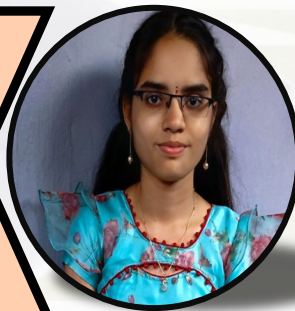
Undoubtedly, without family blessings and support, a child can't achieve their dreams. I am so grateful for their continuous encouragement.

Special thanks to my senior Mr. Suresh Ragireddy, who helped me on many occasions

JONNADULA SARIKA

19761A2114

AIR - 93



I take immense pleasure to express my gratitude towards the dept. of Aerospace Engg., LBRCE for all the guidance, kindness and help, the faculty of the department rendered unto me.

My special thanks to Dr.P.Lovaraju sir, the head of the department, for constantly being my supreme supporter, mentor and for patiently dealing with me in all the prolonged discussions on every conceptual lapse of mine.

As for me, the teaching-learning process in the department is the chief element that helped me qualify GATE being a third year student.



KURAPATI RUBY

20761A5629

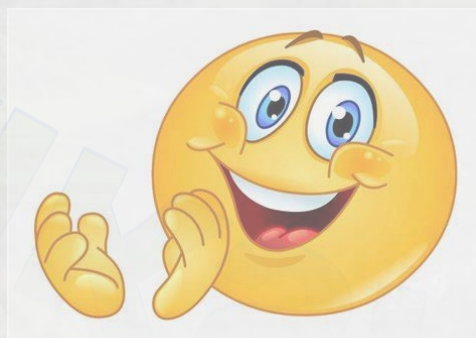
AIR-652

Winners of various competitions which were held by 'Literary Club' on the occasion of 25th Annual Day Celebrations:

S.No	Event	Name of the Winner	Regd.No	Prize
1	Creative Writing	P.Dharani	20761A5644	I
2	Word Wizardry	D.Siri Chandana	20761A5610	II
3	Essay writing	P.Jaya Kishore Reddy	20761A5641	II

Academic Toppers of the year 2021-2022:

S.No	Student Name	Regd.No	CGPA	Rank
1	Ragireddy Suresh	19765A2106	9.46	I
2	Duggempudi Venkata Sunil Kumar	19765A2103	9012	II
3	Jonnadhula Sarika	19761A2114	90.7	I
4	Patibandla Supraja	19761A2135	5.12	II
5	Kurapati Ruby	20761A5644	9.47	I
6	Bezawada Kusuma	20761A5606	9.05	II
7	Banavathu Krishna Mohan	21761A5606	8.76	I
8	Baluguri Praveen Kumar	21761A5604	8.64	II



We are so glad that our idea is selected for ideation fest 5.0 and it's going to be funded as per our proposal . Dr.C Sreenadh sir , Associate Professor , Department Of Aerospace , supported us a lot and he's the key person who motivated us in presenting our idea successfully and Dr.P Lovaraju sir , Head of the Department , Department of Aerospace , greeted us to make this idea successful . We are so grateful to them.

We also thankful to the Aerospace Department faculty for supporting us . We hope this idea will be implemented successfully under the guidance of Dr. C Sreenadh sir . We request all the students to be active and thrive for their future . Everyone should try to think out of box .

20761A5646 - Shaik Chasheeda

20761A5647 - Shaik Mohammad Arshad

20761A5637 - Koushik Nela

21761A5637 - Shaik Sahiti Safiya

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)

DEPARTMENT OF AEROSPACE ENGINEERING

GATE RANKER 2023

CONGRATULATIONS

Current students



19761A2114
JONNADULA SARIKA
AIR - 98



20761A5629
KURAPATI RUBY
AIR- 652



20761A5631
MARAM MAHENDRA REDDY
AIR- 1051

Alumni students



17761A2132
SHAIK VANHAR ALI
AIR - 70



17761A2120
MALLAVARAPU
CHERISHMA
AIR - 161



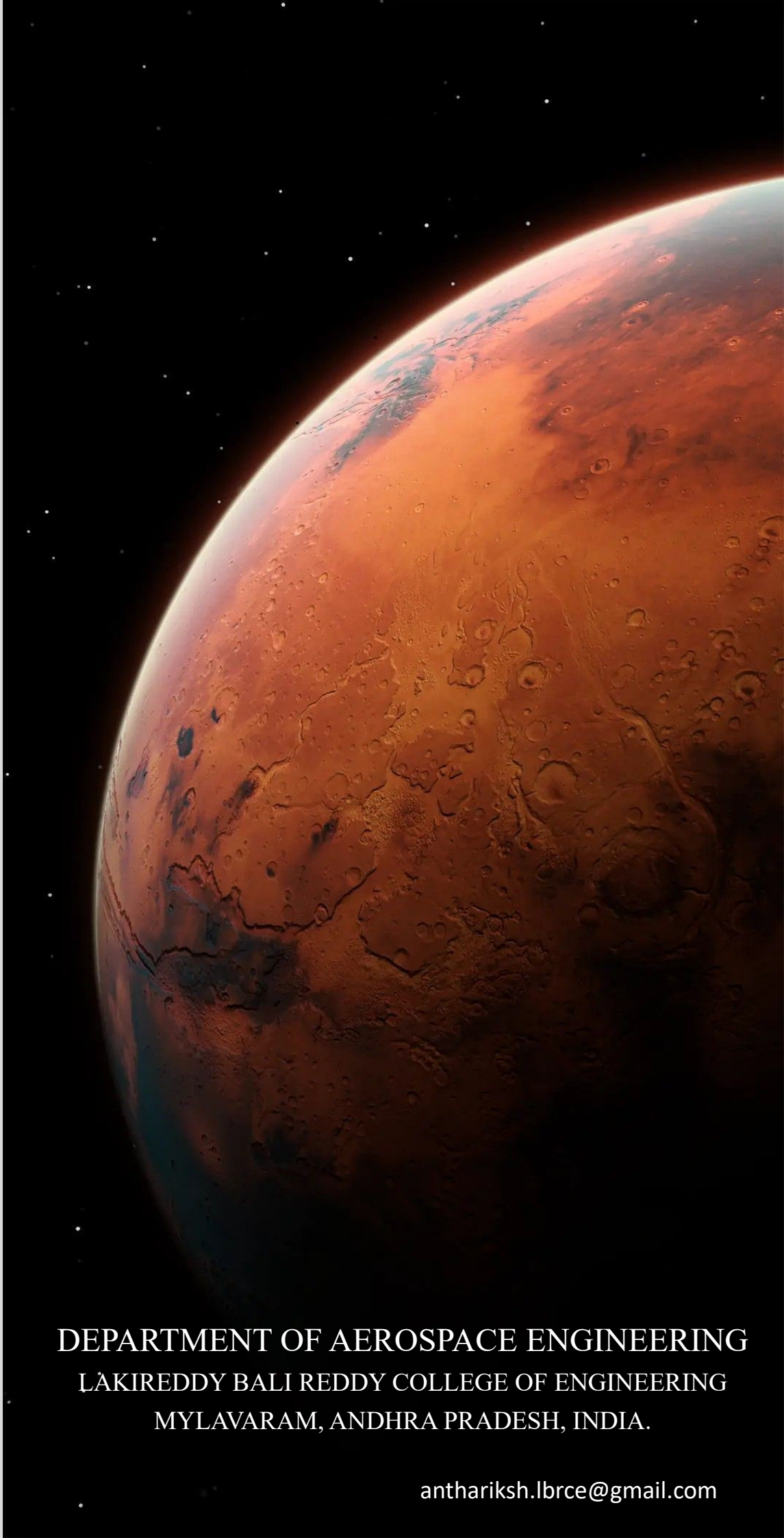
19765A2106
RAGIREDDY SURESH
AIR - 307



18761A2127
KOWLURI ISHMAEL
AIR - 330

ANTHARIKSH

THE SPACE...



DEPARTMENT OF AEROSPACE ENGINEERING
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