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

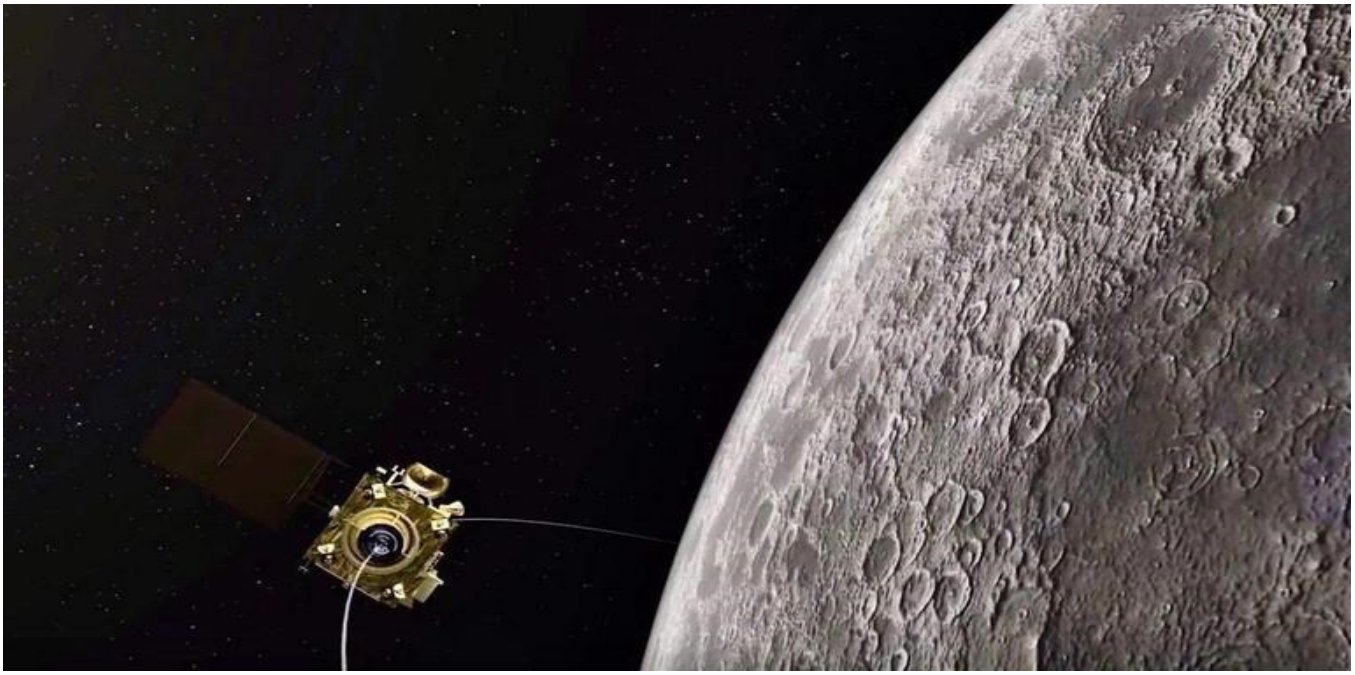
Some of the contents published in this magazine are from open sources. The contents of this magazine are for information purposes only, enabling the faculty and students to have easy and quick access to information and do not have any legal sanctity. This magazine is intended for circulation among students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

FROM HOD's DESK

A person who will not undergo the difficulty of understanding must undergo the danger of trusting. We should prefer to surround ourself with the people who reveal their imperfection, rather than people who fake their perfection. There is no such thing as helplessness. Its just another word of giving up. So, never give up. You never know what someone is going through. Be kind always.. Sprinkle the kindness everywhere.

Dr. P. Lovaraju

CHANDRAYAAN-2 BRINGS CHEER



Chandrayaan-2 found that there is a plasma density in the moon's ionosphere. Let's understand the latest discovery made by Chandrayaan-2: What has Chandrayaan-2 found? ISRO's indigenous spacecraft was launched into a lunar orbit in July 2019, carrying several payloads including Dual Frequency Radio Science (DFRS), which is designed to study the lunar ionosphere.

The DFRS has played a significant role in the latest discovery. Using the technology, Chandrayaan-2 has discovered that the moon's ionosphere has a plasma density in the wake region, which is at least one order of magnitude more than what is present on the day side. The discovery opens new possibilities in understanding the lunar dark side plasma environment. The measurements made using DFRS have shown that the moon's ionosphere has a plasma density of 104 per cubic centimetre in the wake region, which is at least one order of magnitude more than that present on the day side. "In the wake region, neither the solar radiation nor the solar wind interacts directly with the available neutral particles, but still, the plasma is getting generated",. The DFRS uses two coherent signals in S-band (2240 MHz) and X-band (8496 MHz) of radio frequencies. These are transmitted from Chandrayaan-2 orbiter and received by the ground station at Byalalu, Bengaluru, to explore lunar plasma ambiance using the radio occultation (RO) technique. ISRO said that simultaneous measurements by two coherent radio signals helps mitigate the effect of Earth's atmosphere and any uncertainties due to various sources during the experiments. A total of 12 such radio occultation experiments were conducted in campaign mode on four different occasions. The experts also noted that argon and neon are the dominant ions in the wake region. These have a comparatively longer lifetime than the molecular ions of carbon dioxide and water dominant in other regions. "Numerical simulations of the dark side of plasma environment using a 3-dimensional Lunar Ionospheric Model (3D-LIM) developed at SPL that the production of ions by charge exchange reactions may play a pivotal role in producing a significantly large plasma density in the Lunar wake region, which can sustain for a longer period,".

AIRCRAFT VALUE REFERENCE

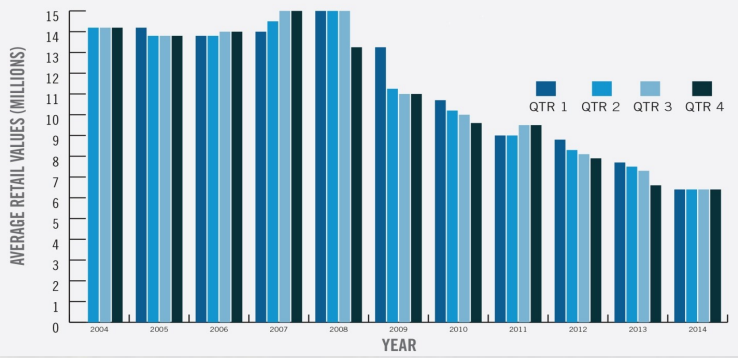
SHAIK MOHAMMAD ARSHAD
20761A5647

Aircraft Value Reference (VREF), established in 1991, is published twice a year by the Aircraft Value Analysis Company. It is used by both aircraft brokers and a number of financial institutions to estimate the future value of aircraft. However, the true value of an aircraft can only be ascertained on a case-by-case basis resulting from a mutual agreement among the buyer, seller, and lender. VREF optionally provides additional services that allow pilots to receive a more accurate appraisal and VREF Verified values. For over 27 years, VREF has stood as a pillar in the aviation community, regularly working with high-profile and smaller-scale clients. With offices located globally, VREF offers vital aircraft and engine valuation services through an online subscription platform.

AOPA - Aircraft Owners and Pilots Association

The AOPA Aircraft Valuation Service can be used as a good starting point when attempting to determine the general retail value of an airplane. However, the true value of an aircraft can only be ascertained on a case-by-case basis resulting from a mutual agreement among the buyer, seller, and lender.
The Official Valuation Partner and Appraisal Company for AOPAs

VREF Aircraft Value Reference, Appraisal & Litigation Consulting Services was founded in 1994 and is headquartered in Buffalo Grove, IL, with offices in 40 locations across the globe. VREF provides aircraft and engine valuation through software subscription services (*VREF Online*) and published quarterly print digests, delivering valuation data on over 565 models. VREF is the largest aircraft-specific appraisal firm in the world, conducting over 2000 USPAP compliant appraisals annually and averaging 18,000 valuations a month. VREF provides valuations, appraisals, and litigation consulting services to a worldwide clientele of aviation professionals, including law firms, banks, financial institutions, leasing companies, and manufacturers. Aircraft owners, aircraft operators and suppliers depend on VREF for accurate, unbiased data. VREF plays a crucial role in advising decision-makers within the aviation industry. VREF is the Official Valuation Guide and Appraisal partner for the AOPA.



PATH FOR MS IN AUSTRALIA

A Master's is a post-graduation degree that is pursued after completing graduation to enhance one's skills in a specific scientific genre. This degree provides comprehensive research and study on a particular subject of choice. Australia, USA, UK, Germany are the best places to some well-reputed universities that are recognized worldwide for the quality of education and their advanced infrastructure. So, let us know the requirements, eligibility, tests to be taken, details about universities ,scholarships offered in AUSTRALIA if we prefer to do our Master's.

MS IN AUSTRALIA:

The Group of Eight (Go8) encompasses Australia's leading research-intensive universities and includes the following universities:

- The University of Melbourne
- Australian National University
- The University of Sydney
- The University of Queensland
- The University of Western Australia
- The University of Adelaide
- Monash University
- The University of New South Wales, Sydney

Eligibility criteria for pursuing a master's in Australia:

One must know the entry requirements before applying to any university. The most common requirements include:

1) Undergraduate degree
2) English proficiency tests
3) GMAT/GRE

Cost of Studying Master's in Australia from India

The average program fee to study for a full-time Master's degree in Australia is AUD $50,000 to AUD $65,760. Some of the programs in top universities in Australia do not offer part-time study or credit transfers. International students doing MS in Australia are also allowed to work up to 20 hours every week during a particular semester.

Requirements to Study in Australia:

The admission cycle in Australia commences in the month of February and July. The requirements to study master's in Australia include English languages proficiency tests like IELTS and TOEFL, a Statement of purpose along with a bank statement reflecting financial capacity, and an Overseas Health Cover.

Exams needed to Study master's in Australia:

Following are the exams you need to clear in order to study master's in Australia:

Exam	Score
English Proficiency Exam	TOEFL- 90 or above PTE- 72 or above IELTS- 6.0 to 6.5 CAE- C1 certificate (65 and above) or C2 certificate
GMAT	680 or above
Law School Admissions Test or LSAT	150 or above

Scholarships to Study in Australia:

Sponsored by the DFAT (Department of Foreign Affairs) and ACIAR (Australian Centre for International Agricultural Research) along with the Department of Education, it offers UG/PG scholarships. Students applying for Australian partner universities and TAFE (Technical and Further Education) institutions are eligible. Coverage is provided for the entire tuition costs, living costs, airfare, health insurance, along with miscellaneous costs. The total coverage period is two years. Scholars should return to India after finishing their education.

Name of the Scholarship	Award	Eligibility
The University of New South Wales Business School	$10,000 annually	Academic performance, leadership attributes, co-curricular activities, and more.
University of Melbourne Graduate Research Scholarship	$110,000 (100% coverage for fees)	Students are considered automatically, without having to provide dedicated applications
International Scientia Coursework Scholarship at the University of New South Wales	The scholarship comes in two parts, one which offers coverage for the total tuition costs and another component which is $20,000 per year for tuition charges	A scholarship program for international students taking up postgraduate or graduate courses at the institution
Monash MBA International Excellence in Leadership	Two awards of amount $16,000 each	Exceptional leadership skills and stellar academic record and an interview that needs to be cleared by the aspirant.
University of Sydney's Dr Abdul Kalam International Postgraduate Scholarship	50% of tuition costs for a year	Those with distinctions in their undergraduate courses can apply
University of Melbourne International Undergraduate Scholarship	100% or 50% waivers on tuition fees for three-year UG courses. It may also be a remission of $10,000 on tuition costs for the first year.	Stellar academic record
Swinburne University	$38,000	Stellar academic record and remarkable leadership skills
Sydney Scholars India Equity Scholarship	$50,000 per year (throughout four years) and ten UG/PG students will receive $20,000 for the first year.15 UG/PG students will also be getting $10,000 as their scholarship amounts under this scholarship	Only Indian students with a good academic record are eligible.
Vice-Chancellor International Scholarships Scheme	–	Open to international students interested in UG/PG courses with CRICOS registration
Griffith University	50% of overall tuition costs for the entire length of the course	Stellar academic record and remarkable leadership skills

Student Visa and Study Permit in Australia:

If you want to enrol in the Master's Program in Australia, you will require a Study Permit or Student Visa. Below mentioned are the required document to apply for a student visa:

1. A Valid passport:

⇒ Valid beyond six months of your intended stay.

⇒ Non-immigrant visa application

2. Application Fee Payment Receipt
3. COE (Confirmation of Enrolment) Form which means Confirmation that you have been enrolled in an Australian institute.

4. Letter of Acceptance
5. Overseas Health Insurance proof
6. Passport-sized photographs.

The visa official can also ask for documents other than these as your academic and financial proof. These may include your transcripts, degree, scores in IELTS/PTE/TOEFL, etc.

- You must prove your intent to leave Australia after the completion of your program.
- You must prove that you have funds to provide for academic, living and travel costs.

The Student Visa Process for MS in Australia usually takes 8 to 12 weeks depending upon an individual to an individual.

Post-study work visa in Australia :

There are two types of post-study work visas offered in Australia.

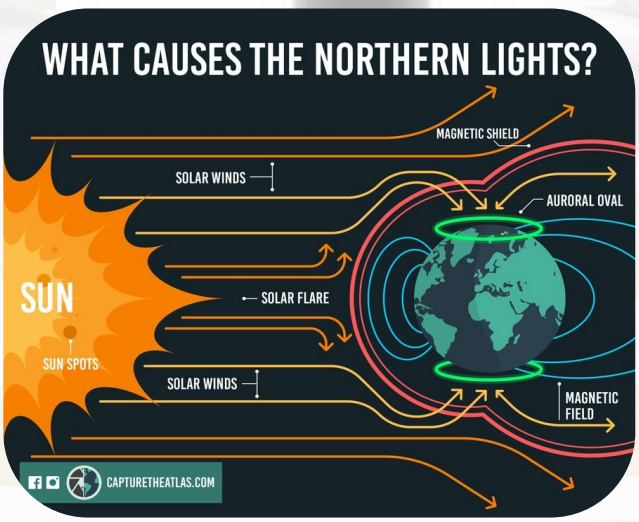
Post-study work stream

This visa is for bachelor's, master's, or doctoral students from any recognised Australian university. Students who applied for the student visa after November 2011 are eligible for this visa. Your post-study work visa tenure will depend on the degree you have gained.

Graduate work stream

This visa will be given to students who meet all the Australian study requirements and hold eligible qualifications and skills for occupations listed on the SOL (Skilled Occupation List). The Graduate work stream visa is generally for students applying for vocational education or training qualifications. The duration of this visa is 18 months. Please note that students graduating with a master's by research degree will get a post-study work visa with three years of validity.

*The procedure to do masters in other countries and details about the language proficiency tests will be published in the upcoming magazines.



Did you know !!!

The corrosion resistant 321 stainless steel is a prominently used material for rocket pipes . This steel is rich in chromium and nickel and stabilized by 0.3-0.7% of titanium

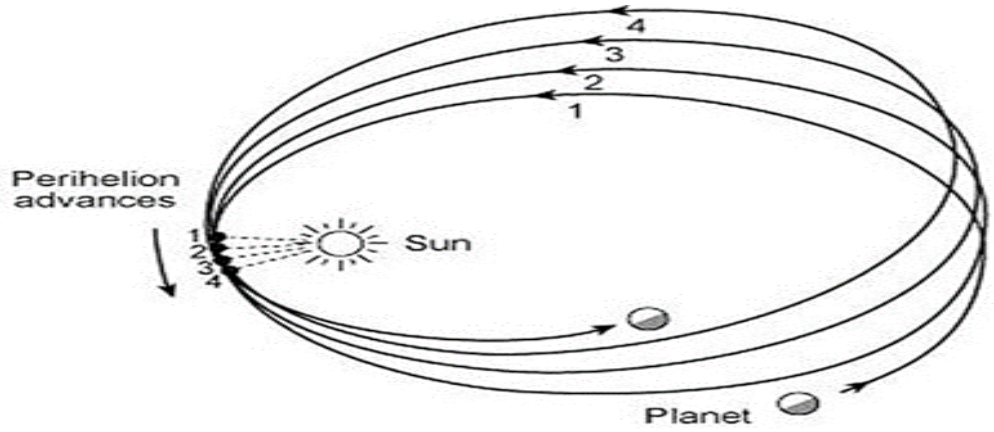
WHAT IS MERCURY PRECESSION?

BALAJI KIREETI

20761A5642

Mercury's orbit had been a mystery for decades because it was unusual. All planets orbited the sun in ellipse. The planets closest to the sun, Mercury also orbited in ellipse but it did something weird. It is

called a precession. The smaller gravitational forces due to the other planets cause the major axis to

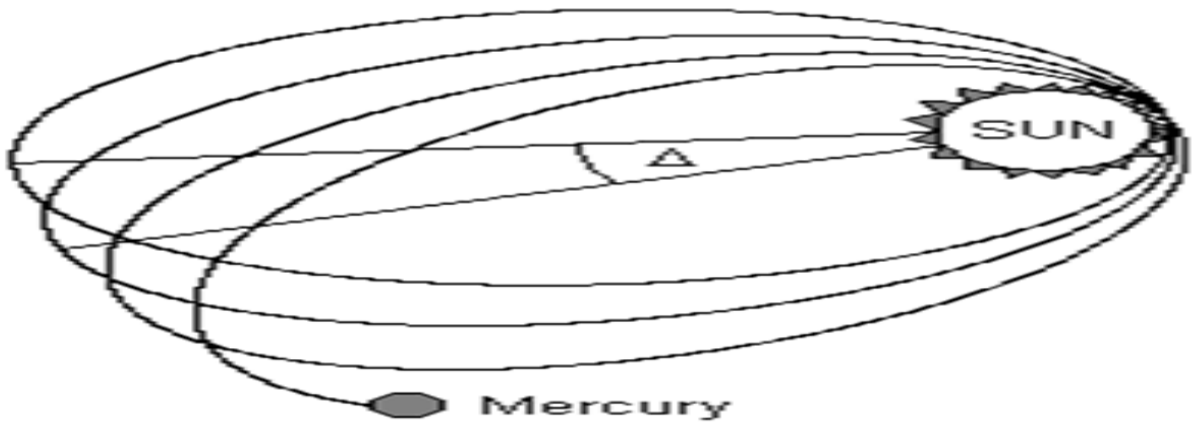


slowly rotate about the Sun, shifting the line from the Sun to the perihelion through an angle each orbit. This shift is referred to as the precession of the perihelion. What this means is that its ellipse never closes. The point of the orbit that was farthest from the sun advances a little bit every time Mercury goes around the Sun. It's as if the ellipse itself is orbiting the sun.

The orbits of the planets around the sun can be found, to a good approximation, by only considering a two-body system (a planet and the sun) interacting through a central force. However, all the other planets cause slight variations in the predicted path of an individual planet. Astronomers have been able to calculate the expected precession of Mercury's apsides (due to the forces of other planets) to be 531 arcseconds per century, and they have observed that the actual precession is 574 arcseconds per century. This leaves a difference of 43" that could not be explained by uncertainties in calculation or measurement and which was noticed as early as 1845.

Before Einstein's theory of relativity, there were three unsatisfactory theories to explain this phenomenon: a retarding force due to a dust cloud around the sun, a new planet between Mercury and the sun, and an exponent slightly different from -2 in the gravitational force law. Then Einstein modified the force law by introducing a component that varies as 1/r4.

We will use this correction to calculate the angle Δ through which the apsides of Mercury shift with each revolution, ignoring the effects of other planets, as shown here in the exaggerated figure.



HYPERSONIC MISSILE

PRAVEEN KUMAR BALUGURI 21761A5604

A Hypersonic missile is a weapon system which flies at least at the speed of Mach 5 i.e. five times the speed of sound and is manoeuvrable. The manoeuvrability of the hypersonic missile is what sets it apart from a ballistic missile as the latter follows a set course or a ballistic trajectory. Thus, unlike ballistic missiles, hypersonic missiles do not follow a ballistic trajectory and can be manoeuvred to the intended target.The two types of hypersonic weapons systems are Hypersonic Glide Vehicles (HGV) and Hypersonic Cruise Missiles.The HGV are launched from a rocket before gliding to the intended target while the hypersonic cruise missile is powered by air breathing high speed engines or 'scramjets' after acquiring their target.India is also developing an indigenous, dual capable (conventional as well as nuclear) hypersonic cruise missile as part of its Hypersonic Technology Demonstrator Vehicle programme and has successfully tested a Mach 6 scramjet in June 2019 and September 2020. Cruise missiles can be launched from land, sea or air for land attacks and anti-shipping purposes, and can travel at subsonic, supersonic and hypersonic speeds.Since they stay relatively close to the surface of the earth, they cannot be detected easily by anti-missile systems, and are designed to carry large payloads with high precision. DARPA said the ground-launched test was carried out at the Sands Missile Range in the US state of New Mexico. In a separate test on Tuesday off the coast of California, the Air Force launched a hypersonic weapon, dubbed the Air-Launched Rapid Response Weapon (ARRW). The announcement of successful tests comes after failed attempts and increased concerns over costs and the US slipping behind in what is a race among great powers to develop the best hypersonic weapons. On June 29, the Common Hypersonic Glide Body failed in a test flight at the Pacific Missile Range Facility in Hawaii.

END OF STAR

K. Dinesh Babu
20761A5621

You know that everything has an end. Like that star also have lifetime.
We are going to know what happens when star or planet is going to end its life.

SUPERNOVA:

What is a supernova?

A supernova is what happens when a star has reached the end of its life and explodes in a brilliant burst of light. Supernovae can briefly outshine entire galaxies and radiate more energy than our sun will in its entire lifetime. They're also the primary source of heavy elements in the universe. According to NASA, supernovae are the largest explosion that takes place in space.
The term "*supernova" was first used by Walter Baade and Fritz Zwicky at Mount Wilson Observatory,*

who used it in relation to an explosive event they observed, called S Andromeda (also known as SN 1885A), located in the Andromeda Galaxy. The scientists suggested that supernovas happen when ordinary stars collapse into neutron stars.
Various civilizations recorded supernovae long before the telescope was invented in the 17th century. The oldest recorded supernova is RCW 86, which Chinese astronomers spotted in A.D. 185. Their records show that this "guest star" stayed in the sky for eight months, according to NASA.

What Causes a Supernova?

A supernova happens where there is a change in the core, or center, of a star. A change can occur in two different ways, with both resulting in a supernova.
The first type of supernova happens in binary star systems. Binary stars are two stars that orbit the same point. One of the stars, a carbon-oxygen **white dwarf**, steals matter from its companion star. Eventually, the white dwarf accumulates too much matter. Having too much matter causes the star to explode, resulting in a supernova.

The second type of supernova occurs at the end of a single star's lifetime. As the star runs out of nuclear fuel, some of its mass flows into its core. Eventually, the core is so heavy that it cannot withstand its own gravitational force. The core collapses, which results in the giant explosion of a supernova. The sun is a single star, but it does not have enough mass to become a supernova.

Where Do Supernovas Take Place?

Supernovas are often seen in other galaxies. But supernovas are difficult to see in our own Milky Way galaxy because dust blocks our view. In 1604, Johannes Kepler discovered the last observed supernova in the Milky Way. NASA's Chandra telescope discovered the remains of a more recent supernova. It exploded in the Milky Way more than a hundred years ago.

Why do supernovas take place?

When the pressure drops low enough in a massive star, gravity suddenly takes over and the star collapses in just seconds. This collapse produces the explosion we call a supernova. Supernovae are so powerful they create new atomic nuclei.

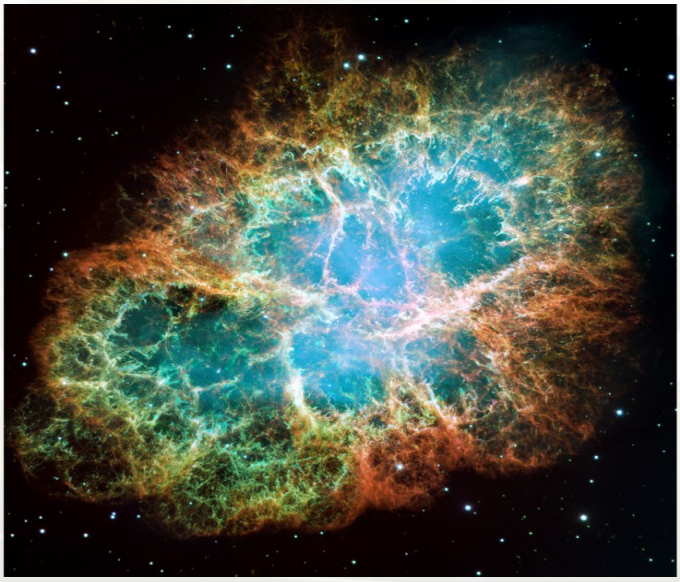
Example:

In 1054, Chinese astronomers took notice of a "guest star" that was, for nearly a month, visible in the daytime sky. The "guest star" they observed was a supernova explosion, which gave rise to the Crab Nebula, a six-light-year-wide remnant of the violent event.
With an apparent magnitude of 8.4 and located 6,500 light-years from Earth in the constellation Taurus, the Crab Nebula can be spotted with a small telescope and is best observed in January. The nebula was discovered by English astronomer

John Bevis in 1731, and later observed by Charles Messier who mistook it for Halley's Comet. Messier's observation of the nebula inspired him to create a catalog of celestial objects that might be mistaken for comets.

This large mosaic of the Crab Nebula was assembled from 24 individual exposures captured by Hubble over three months. The colors in this image do not match exactly what we would see with our eyes but yield insight into the composition of this spectacular stellar corpse. The orange filaments are the tattered remains of the star and consist mostly of hydrogen. The blue in the filaments in the outer part of the nebula represents neutral oxygen. Green is singly ionized sulfur, and red indicates doubly ionized oxygen. These elements were expelled during the supernova explosion.

A rapidly spinning neutron star (the ultra-dense core of the exploded star) is embedded in the center of the Crab Nebula. Electrons whirling at nearly the speed of light around the star's magnetic field lines produce the eerie blue light in the interior of the nebula. The neutron star, like a lighthouse, ejects twin beams of radiation that make it appear to pulse 30 times per second as it rotates.

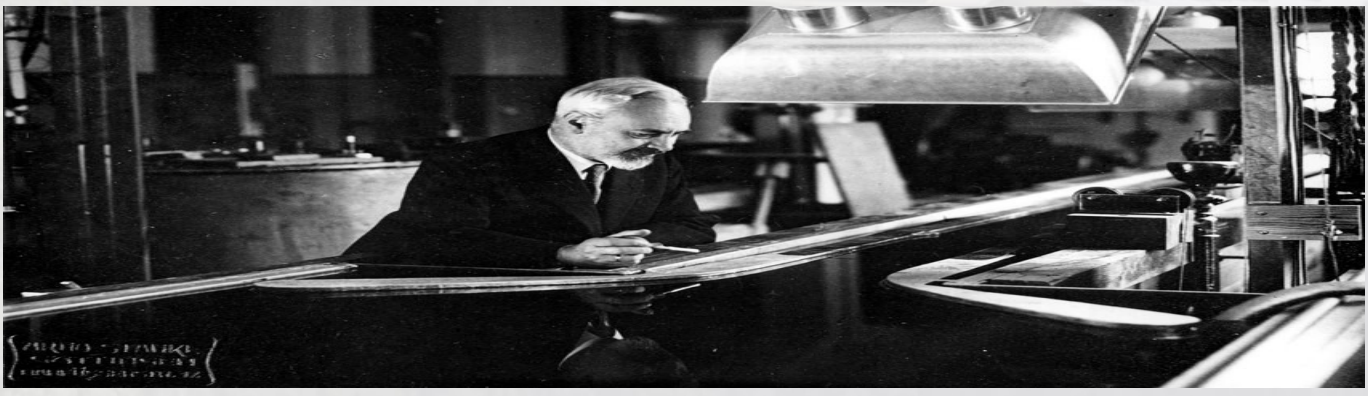


An inspirational bond between teacher and his students:

PRANDTL and his student **THEODOR MEYER** developed the first theories of supersonic shock waves and flow in 1908. The Prandtl–Meyer expansion fans allowed for the construction of supersonic wind tunnels. He had little time to work on the problem further until the 1920s, when he worked with Adolf Busemann and created a method for designing a supersonic nozzle in 1929. Today, all supersonic wind tunnels and rocket nozzles are designed using the same method. A full development of supersonics would have to wait for the work of Theodore von Kármán, a student of Prandtl at Göttingen.

In 1922 Prandtl, together with Richard von Mises, founded the GAMM (the International Association of Applied Mathematics and Mechanics)and was its chairman from 1922 until 1933. Until 1945 he also worked closely with the RLM.

Other work examined the problem of compressibility at high subsonic speeds, known as the Prandtl–Glauert correction. This became very useful during World War II as aircraft began approaching supersonic speeds for the first time. He also worked on meteorology, plasticity and structural mechanics. He also made significant contributions to the field of tribology. Prandtl is very successful as a scientist along with becoming one of the world's best teacher.



SPACE ELEVATOR

Manoj Kumar Pasagadugula
18761A2139

Our future in space depends upon many factors: our continued ability to pay for research, development, and missions; discovering new and innovative ways to reach orbit that are more efficient; and ensuring educational opportunities in STEM subjects to foster the upcoming generations of space and rocket scientists to name just a few. Being able to take mass from the surface of Earth, out of our gravity well and into zero-G orbit has always been one of the most expensive pieces of the puzzle. It takes enormous sums of energy, and therefore fuel and money, to get even a few pounds of something into space. What we've been doing so far is firing large rockets, already heavily-laden with tons of fuel, up through the atmosphere, each one carrying a payload that is tiny in comparison to the mass of the fuel and rocket. It's been inefficient, to say the least.

One of the ways that many engineers believe is a viable alternative is for us to build space elevators. These aren't elevators in the conventional sense of course. While SEs will indeed move objects up and down, it is more useful to think of them as railroads.

An SE would be a gigantic tether cable that reaches from the ground to a point at least 22,000 miles above Earth (with some plans stretching as far out as 62,000 miles) to a space station that acts as a counterweight in geostationary orbit. The power of the Earth's spin will be what keeps the SE straight, pointing out at the stars, via centrifugal force. Elevator "cars", what we'll call climbers, would move up and down the tether via electrical power to carry cargo and people to and from orbit.

The advantages to using SEs as opposed to traditional rocketry would be many. SEs could reduce the cost of sending mass into space from roughly $10,000 per pound to only $100 per pound. SEs, once proven, would likely be much safer than rocket travel for humans: The journey skyward would be slower, but there wouldn't be high-G forces to wreak havoc on organic or inorganic cargo. And cargo capacity would be far greater than any rocket could ever manage.

The origins of the SE idea might be traced back to Soviet Russian rocket scientist Konstantin Tsiolkovsky, who first wrote about the concept as early as 1895. Alongside Goddard and Oberth, Tsiolkovsky is one of the godfathers of rocket science. Tsiolkovsky's proposal was basically a tower built so high it reached outer space. Our modern idea of a space elevator really comes from Yuri Artsutanov, another Russian scientist, who in 1959 conceived of a "tensile structure" that would be held in place via centrifugal force. Aside from the sheer cost of building an SE structure in its totality, the primary hurdle is for our modern R&D to settle on the strongest and lightest material possible with which to construct the tether. Carbon nanotubes are commonly viewed as a best option, but there are other possibilities: silicon carbide, silicon nitride, and silica nanowires.

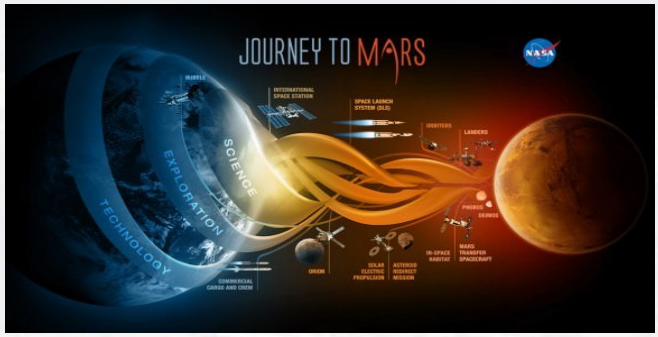
Space elevators will be comprised of 6 major sections: the ground station, the tether, the counterweight, the space station, climbers, and climber power sources. The counterweight must be positioned at the furthest end of the tether, while the station itself would be located at a point where there is an equal amount of mass above it as below. The power sources driving the climbers on their high-altitude treks will likely be a combination of lasers and solar cells. It is also probable that by the time the carbon nanotube construction technology becomes feasible we would also be able to use fusion reactors to power SEs.

Multiple trips up and down an SE can be made in a single day. In addition, an SE would require far fewer personnel overall to staff on a regular basis than a rocket launch base. One journey by a climber can also result in multiple opportunities for various parties, since the climbers will take cargo and people to four major points of egress. As a climber rises through the upper atmosphere and past low Earth orbit, objects such as weather stations and satellites can be jettisoned at points where they can enter stable orbits. These objects might not have enough velocity to maintain an orbit, however, and would therefore need some added acceleration capability, such as a small liquid-fuel cryogenic rocket engine. At the space station, more cargo and personnel can exit and utilize shuttle transport to other space stations. In addition, the tether can continue well beyond the space station and toward the counterweight, accelerating objects to greater speeds and then sending them on to much farther destinations such as the Moon, Mars, asteroid belt, and beyond.

TERAFORMING OF MARS

Krishna Likhil Ch
21761A5608

The **Terraforming** of **Mars** is a hypothetical procedure that would consist of a planetary engineering project or concurrent projects, with the goal of transforming Mars from a planet hostile to terrestrial life to one that can sustainably host humans and other lifeforms free of protection or mediation. The process would presumably involve the rehabilitation of the planet's extant climate, atmosphere, and surface through a variety of resource-intensive initiatives, and the installation of a novel ecological system or systems



CHALLENGES AND LIMIATIONS

- Reduced light levels (about 60% of Earth)
- Low surface gravity (38% of Earth's)
- Unbreathable atmosphere
- Atmospheric pressure (about 1% of Earth's; well below the Armstrong limit)
- Ionizing solar and cosmic radiation at the surface
- Average temperature −63 °C (210 K; −81 °F) compared to Earth average of 14 °C (287 K; 57 °F))
- Molecular instability - bonds between atoms break down in critical molecules such as organic compounds
- Global dust storms
- No natural food sources
- Toxic soil
- No global magnetic field to shield against th solar wind

LOW GRAVITY AND PRESSURE

The surface gravity on Mars is 38% of that on Earth. It is not known if this is enough to prevent the health problems associated with weightlessness. Mars's CO2 atmosphere has about 1% the pressure of the Earth's at sea level. It is estimated that there is sufficient CO2 ice in the regolith and the south polar cap to form a 30 to 60 kilopascals [kPa] (4.4 to 8.7 psi) atmosphere if it is released by planetary warming. The reappearance of liquid water on the Martian surface would add to the warming effects and atmospheric density, but the lower gravity of mars requires 2.6 times Earth's column airmass to obtain the optimum 100 kPa (15 psi) pressure at the surface.Additional volatiles to increase the atmosphere's density must be supplied from an external source, such as redirecting several massive asteroids (40-400 billion tones total) containing ammonia (NH_3) as a source of nitrogen.

ADVANTAGES

According to scientists, Mars exists on the outer edge of the habitable zone, a region of the Solar System where liquid water on the surface may be supported if concentrated greenhouse gases could increase the atmospheric pressure. The lack of both a magnetic field and geologic activity on Mars may be a result of its relatively small size, which allowed the interior to cool more quickly than Earth's, although the details of such a process are still not well understood.

There are strong indications that Mars once had an atmosphere as thick as Earth's during an earlier stage in its development, and that its pressure supported abundant liquid water at the Surface. Although water appears to have once been present on the Martian surface, ground ice currently exists from mid-latitudes to the poles. The soil and atmosphere of mars contain many of the main elements crucial to life, including sulfur, nitrogen, hydrogen, oxygen, phosphorus and carbon.

Any climate change induced in the near term is likely to be driven by greenhouse warming produced by an increase in atmospheric carbon dioxide (CO_2) and a consequent increase in atmospheric water vapor. These two gases are the only likely sources of greenhouse warming that are available in large quantities in Mars' environment. Large amounts of water ice exist below the Martian surface, as well as on the surface at the poles, where it is mixed with dry ice, frozen CO_2. Significant amounts of water are located at the south pole of Mars, which, if melted, would correspond to a planetwide ocean 5–11 meters deep. Frozen carbon dioxide (CO_2) at the pole's sublines into the atmosphere during the Martian summers, and small amounts of water residue are left behind, which fast winds sweep off the poles at speeds approaching 400 km/h (250 mph). This seasonal occurrence transports large amounts of dust and water ice into the atmosphere, forming Earth-like ice clouds.

GOOGLE MAPS STREET VIEW

POLIBOINA DHARANI
20761A5644

Google Maps recently launched its "street view service" in 10 cities in India in association with two local companies Genesys International and Tech Mahindra. Earlier, government had not allowed to show the panoramic images of roads and other sited, highlighting the security reasons.

Highlights of the Google Maps Street View:

The Street View Services will be available on Google Maps.

For this service, fresh imagery has been licensed from local partners covering more than 1,50,000 km in ten cities in India.

The 10 cities in which this service has been launched include; Bengaluru, Delhi, Mumbai, Chennai, Pune, Nasik, Hyderabad, Vadodara, Amritsar and Ahmednagar.

Google has planned to expand the services to over 50 cities by end of 2022.

The Street view is being brought to life in India, by local partners making it first such instance in the world.

Street View APIs will also be provided to local developers. It will enable them to deliver rich mapping experiences in their services.

Important features of the Google Map Street View in India include;

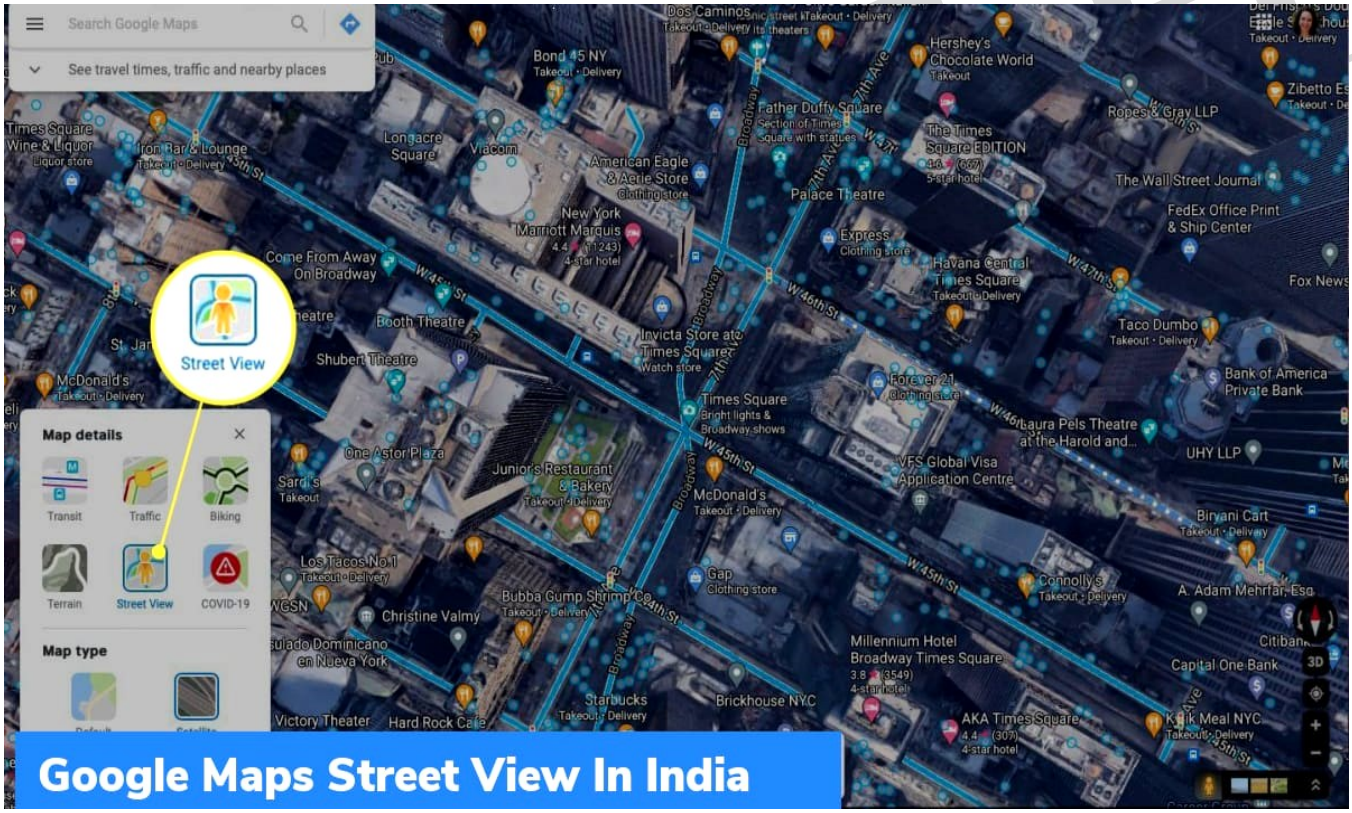
As a part of the Street View Services, Google Maps will showcase speed limits data, that will be shared by traffic authorities. This facility will start from Bengaluru.

In Bengaluru, Google will also partnership with traffic police in a bid to deliver models that optimises traffic light timings in a better manner.

It will help the local traffic authority to manage road congestion at important intersections.

Google-CPCB collaboration:

Google also announced to collaborate with Central Pollution Control Board (CPCB), in a bid to provide air quality information. Information regarding the air quality can be accessed through 'Layers' button at top right in Maps app and clicking the 'Air Quality' option.



PARKER...! THE SOLAR PROBE

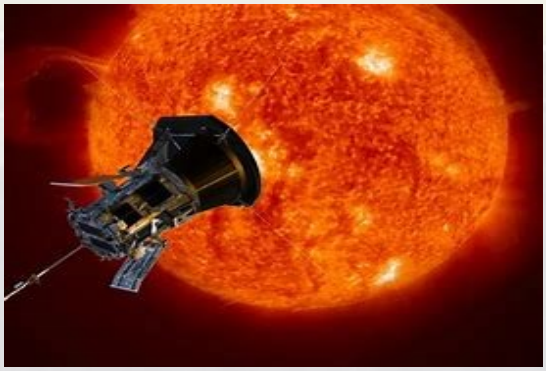
N Meena Mahitha

20761A5638

Sun, the giant star with no solid surface but filled entirely with hot plasma and strong magnetic field is hard to be reached by anyone and anything. But the Parker solar probe has been part of this miracle and a giant leap in solar science. “Parker solar probe touching the sun is a monumental moment for solar science and a truly a remarkable feat “, Said Thomas Zurbuchen, the associate administrator for the Science Mission Directorate at NASA Headquarters in Washington.

Parker solar probe was launched in 2018 by NASA to explore the sun by traveling closer to it, after three years from the launch and decades from conception it has now reached the first mile stone on 14th December,2021. As the sun has the superheated atmosphere made of solar material bound to it by its gravity and magnetic field as rising heat and pressure push the material from the sun it crosses the point where the magnetic fields are weak. The very point is the end of solar atmosphere and beginning of the solar wind. This point is known as Alfvèn critical surface. Until now, the researchers are unsure about the exact distance of Alfvèn critical surface from sun. Based on remote images of corona, they estimated it to be somewhere around 10 to 20 solar radii from the solar surface. On April 28, 2021, during its eighth flyby of the Sun, Parker Solar Probe encountered the specific magnetic and particle conditions at 18.8 solar radii (around 8.1 million miles) above the solar surface that told scientists it had crossed the Alfvén critical surface for the first time and finally entered the solar atmosphere. Corona, the sun’s atmosphere is 300 times hotter than the photosphere, which is one of the mysteries of the sun. During the flyby, Parker Solar Probe passed into and out of the corona several times. This is proved what some had predicted – that the Alfvén critical surface isn’t shaped like a smooth ball. Rather, it has spikes and valleys that wrinkle the surface. Discovering where these protrusions line up with solar activity coming from the surface can help scientists learn how events on the Sun affect the atmosphere and solar wind. Once, when is beneath 15 solar radii, probe transited a pseudostreamer. These are the massive structures that rise above the sun’s atmosphere. It felt like flying into the eye of a storm. There was a dramatic change inside, like the particles quieted, number of switchbacks dropped. This was the first time, the spacecraft experienced the strong magnetic field enough to dominate the movement of the particles in there.

Parker solar probe encountered and collected data pinpointing the origin of zigzag shaped strictures in solar wind, known as switchbacks. From the mid 1990s when the scientists first discovered the s-shaped kinks, thought these are rare, until 2019, at 34 solar radii from sun, parker confirmed that switchbacks are not occasional but are common in solar winds. The new findings confirmed that the origin is the photosphere and they contain high percentage of helium. As it goes deeper and closer to the giant ball of heat, we get know more and better. There are many more yet to be studied and confirmed from the process of formation of switchbacks to the reason behind the temperature of corona being higher than the photosphere. “It’s really exciting to see our advanced technologies succeed in taking Parker Solar Probe closer to the Sun than we’ve ever been, and to be able to return such amazing science,” said Joseph Smith, Parker program executive at NASA Headquarters. "We look forward to seeing what else the mission discovers as it ventures even closer in the coming years."



Acknowledgements:

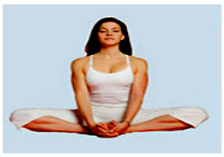
https://www.nasa.gov/feature/goddard/2021/nasa-enters-the-solar-atmosphere-for-the-first-time-bringing-new-discoveries

https://youtu.be/LkaLfbuB_6E

HEALTH WITH YOGA

BEGINNER YOGA POSES

Beginners have a lot of reservations for yoga such as flexibility, age, physical appearance, and even gender etc. However, Yoga class welcomes all with open arms. Below are the best beginner yoga poses and asanas which you can do at home. Each pose comes with its own set of modifications to level up or ease your routine either with props or other household objects.

YOGA POSES *(ASANAS)* WITH BENEFITS	POSE IMAGE
Bound Angle / Cobbler's / Butterfly Pose *(Baddha Konasana)* ◦ Level: Beginner ◦ Great hip opener and posture corrector ◦ Stretches and relaxes shoulders and lower back ◦ Relieves from neck pain and anxiety	
Cat Pose *(Bidalasana / Marjaryasana)* ◦ Level: Beginner ◦ Relaxes back and tones abdomen ◦ Aids in weight loss ◦ Rejuvenates body and mind	
Chair Pose *(Utkatasana)* ◦ Level: Beginner ◦ Improves posture and balance ◦ Tones abdomen and thighs ◦ Great for athletes and runners	
Child Pose *(Balasana)* ◦ Level: Beginner ◦ Great for stress, depression, and anxiety ◦ Relaxes upper back, neck and arms ◦ Helps sleep better at night	
Corpse Pose *(Savasana)* ◦ Level: Beginner ◦ Ideal pose for *Yoga Nidra* and abdominal breathing ◦ Helps rejuvenate mentally and physically ◦ Best restorative/follow up pose	
Cow Pose *(Bitilasana / Goasana)* ◦ Level: Beginner ◦ Great restorative pose for lower back stiffness ◦ Strengthens arms and knees ◦ Good for students looking to enhance focus	
Crocodile Pose *(Makarasana)* ◦ Level: Beginner ◦ Greatly centers anxious and depressed mind ◦ Restores energy and rejuvenates physically ◦ Good for flat feet	
Downward Facing Dog Pose *(Adho Mukha Svanasana)* ◦ Level: Beginner ◦ Enhances hamstring flexibility and hip flexion ◦ Stretches Achilles' tendons ◦ Strengthens wrists, ankles, toes and back	

INSPIRATIONAL LIFE LESSONS THAT WILL CHANGE YOUR LIFE

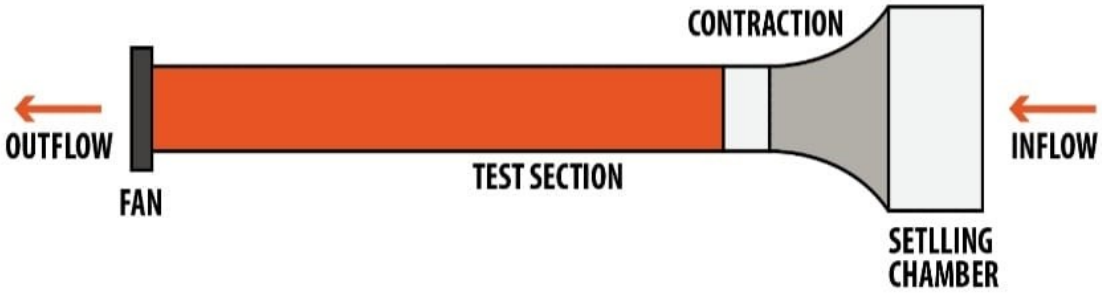
1. I don't regret the things I've done, I regret the things I didn't do when I had the chance.
2. When the past calls, let it go to voicemail, believe me, it has nothing new to say.
3. Death isn't sad. The sad thing is: most people don't live at all.
4. I am always doing things I can't do. That is how I get to do them.
5. Your time is limited, so don't waste it living someone else's life.
6. It doesn't matter where you are, you are nowhere compared to where you can go.
7. The more you take responsibility for your past and present, the more you are able to create the future you seek.
8. Success is 99% attitude and 1% aptitude.
9. Your life does not get better by chance, it gets better by change.

WIND TUNNEL STRUCTURE – HOW DOES IT WORK?

M. Mahindra Reddy
20761A5631

Three main criteria that are commonly used to define wind tunnels are maximum achievable speed, flow uniformity, and turbulence level. Therefore, the design aim of a wind tunnel, in general, is to get a controlled flow in the test chamber, achieving the necessary flow performance and quality parameters.

There are five basic parts of the wind tunnel: The Settling Chamber, the Contraction Cone, the Test Section, the Diffuser, and the Drive Section. During a test, the test object is placed in the test section of the tunnel, and the air is made to flow past it. Various types of instrumentation are used to determine the forces on the model.



Schematic of an open-circuit wind tunnel: a fan is usually located at the exit of the test section, not to generate undesired turbulence in the flow.

In some wind tunnel tests, the aerodynamic forces and moments on the model are measured directly. The model is mounted in the tunnel on a special machine called a force balance. The output from the balance is a signal that is related to the forces and moments on the model. Balances can be used to measure both the lift and drag forces.

The balance must be calibrated against a known value of the force before, and sometimes during, the test. Force measurements usually require some data reduction or post-test processing to account for Reynolds number or Mach number effects on the model during testing.

Four air properties affect the way it flows by an object: viscosity, density, compressibility, and temperature. With the model mounted on a force balance, lift, drag, lateral forces, yaw, roll, and pitching moments over a range of angles of attack can be measured.

LATEST HAPPENINGS

ISRO gears for the PSLV-C53 launch mission with three satellite passengers from Singapore

Indian Space Research Organisation is all set to launch three satellites from Singapore onboard ISRO's flagship rocket, the Polar Satellite Launch vehicle (PSLV) on the 30th of June, 2022. The mission – PSLV-C53 will be conducted from the Second Launch Pad at Satish Dhawan Space Centre, Sriharikota at 18:00 hours IST. The countdown of 25 hours leading to the launch will begin at 1700 hours IST on 29th June 2022.
Understanding the Mission
The mission proposes to demonstrate the utilization of the spent upper stage of the launch vehicle as a stabilized platform for scientific payloads subsequent to the separation of the satellites.

PSLV-C53 carries three satellites – DS-EO, a 365 kg and NeuSAR, a 155 kg satellite both belonging to Singapore. The third satellite is a 2.8 kg Scoob-1 of Nanyang Technological University (NTU), Singapore.

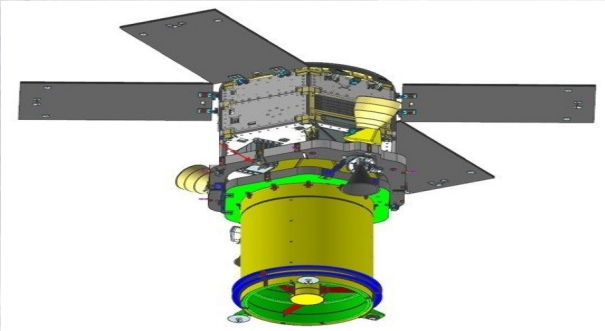
NeuSAR – Singapore's first small commercial satellite carrying a SAR payload, which is capable of providing images day and night and under all weather conditions.

SCOOB-I satellite – First satellite in the Student Satellite Series (S3-I), a hands-on student training program from the Satellite Research Centre (SaRC) at Singapore's NTU School of Electrical and Electronic engineering.

ISRO revealed that the DS-EO carries an Electro-Optic, multi-spectral payload that will provide colour images that will further aid in land classification, and serve "Humanitarian Assistance and Disaster Relief needs."
PSLV-C53
PSLV-C53 is the second dedicated commercial mission of the NewSpace Indian Limited (NSIL) and it is designed to orbit the DS-EO satellite along with two other co-passenger satellites from Singapore.

PSLV-C53 – a four-stage 44.4 m tall vehicle has a lift-off mass of 228.433 t. It would inject the DS-EO satellite into an orbit with a semi-major axis of 6948.137 + 20 km, at an altitude of 570 km measured from the equator, with a low inclination of 100 + 0.20.

ISRO is gearing to put up a new experiment with the four-stage rocket and use the fourth stage (PS4) to perform PSLV Orbital Experimental Module



(POEM) activity. Under this, the team will perform in-orbit scientific experiments using the spent PS4 stage as an orbital platform.
It is the first time that PS4 stage would orbit the earth as a stabilized platform." POEM derives the power from the solar panels mounted around the PS4 tank and a Lithium-Ion battery and navigates using four sun sensors, a magnetometer, gyros & NavIC. It also carries dedicated control thrusters using Helium gas storage and is enabled with a telecommand feature.

POEM carries six payloads including two from Indian Space Start-ups – Digantara and Dhruva Aerospace enabled through IN-SPACE and NSIL.

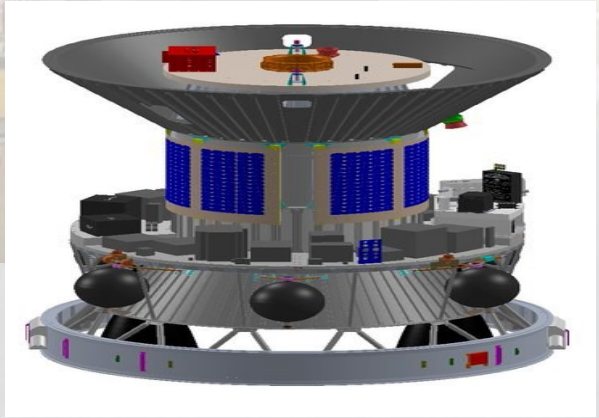
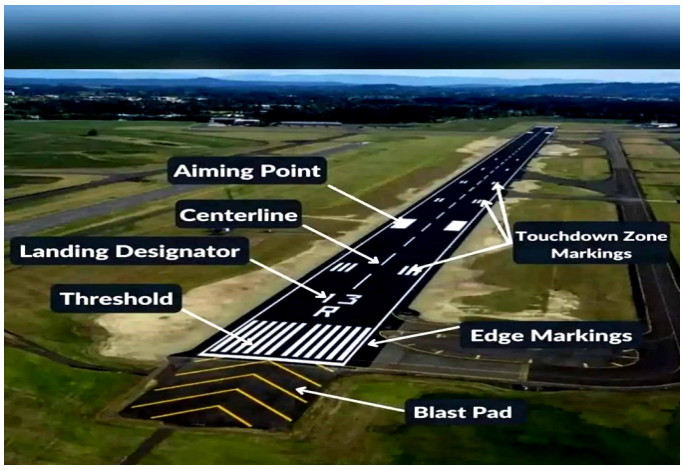


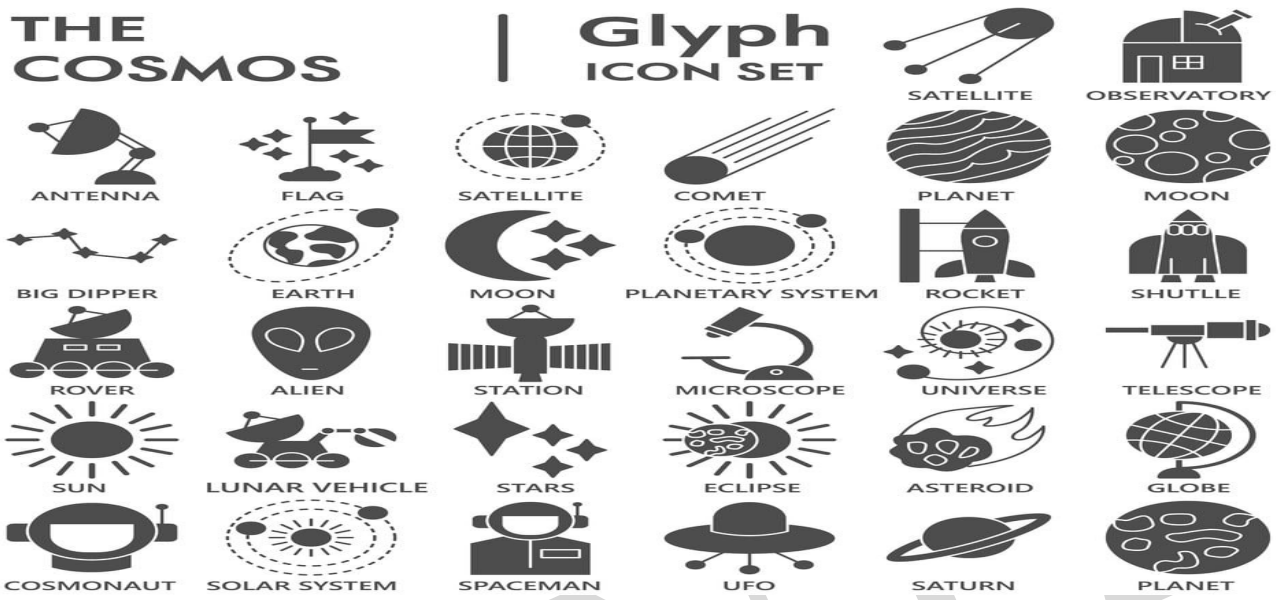
IMAGE GALLERY

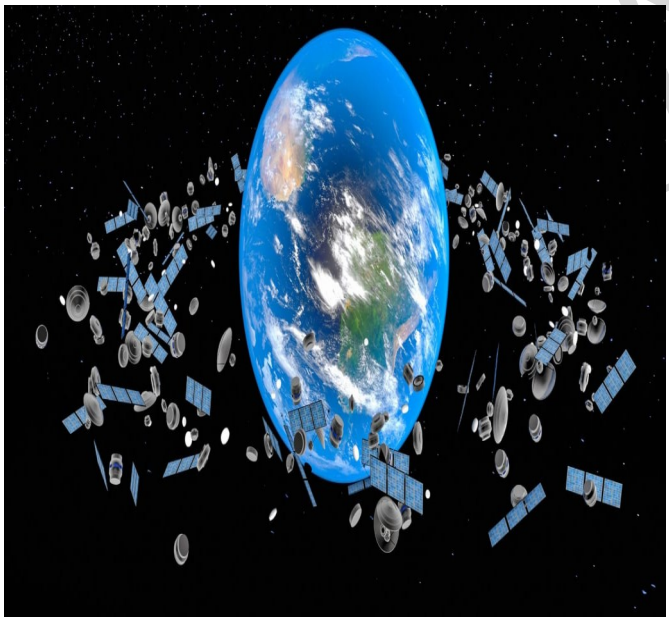


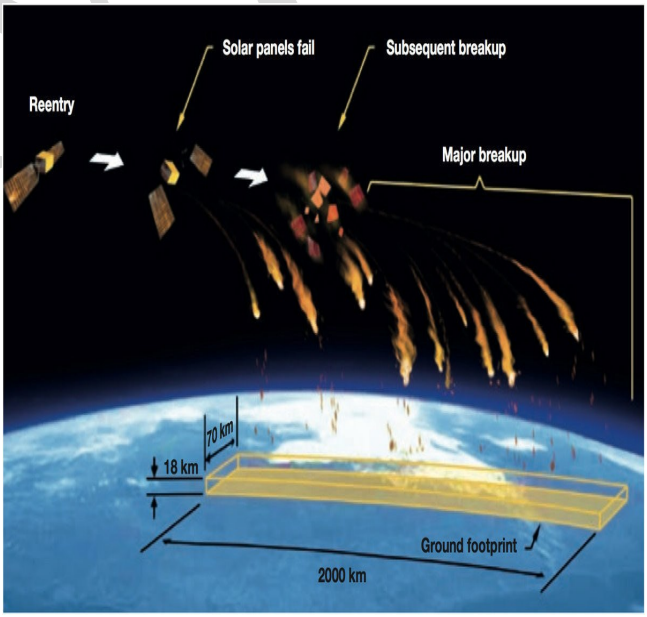
69 Celsius

69 Kelvin

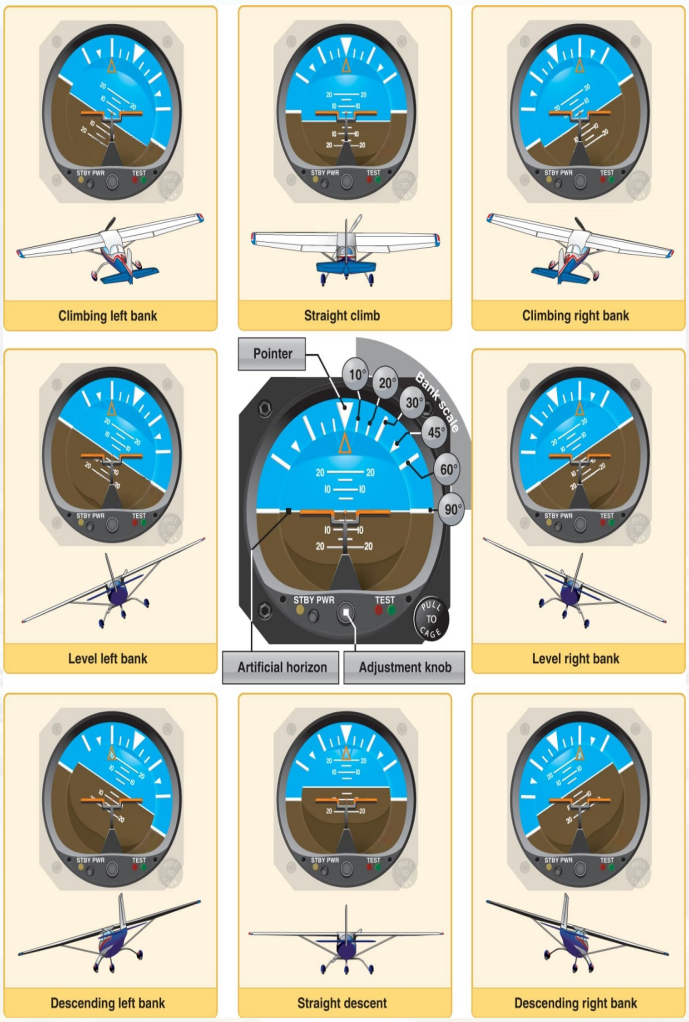
69 Fahrenheit

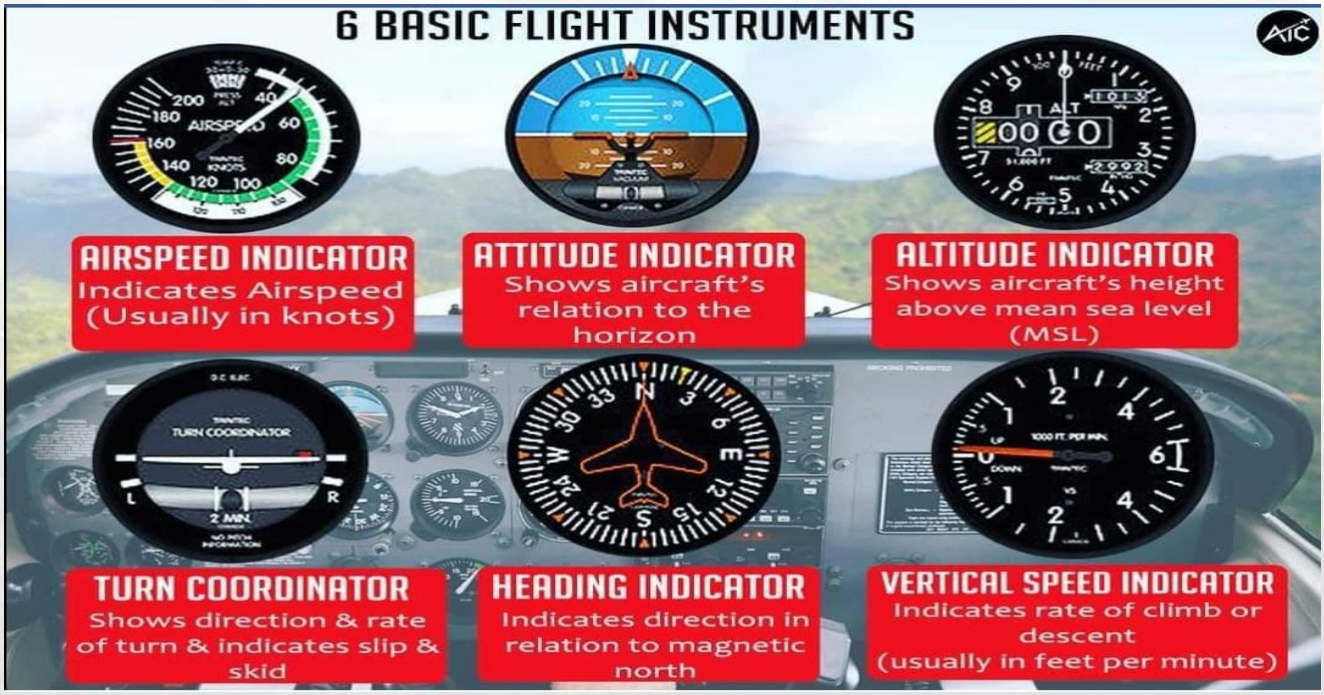







UNITED NATIONS
Office for Outer Space Affairs
esa
#SpaceCare
SATELLITES VS DEBRIS
2700 working satellites share their orbits with 8800 tonnes of space debris
Debris objects travel many kilometres per second. In case of impact, they may destroy working satellites
2700
26 000 tracked objects
≈ 1950
discarded rocket stages
≈ 128 million
debris fragments
1 mm–1 cm in size
≈ 2850
defunct satellites
≈ 900 000
fragments
1–10 cm in size
≈ 21 000
unidentified debris objects and fragments
≈ 34 000
fragments larger than 10 cm
About 26 000 debris objects are monitored from Earth
Smaller objects that cannot be monitored estimated by statistical models
Up-to-date as of December 2020
#SpaceSustainability


Climbing left bank
Straight climb
Climbing right bank
Level left bank
Pointer
Bank scale
10°
20°
30°
45°
60°
90°
STBY PWR
TEST
PULL TO CAGE
Artificial horizon
Adjustment knob
Level right bank
Descending left bank
Straight descent
Descending right bank


6 BASIC FLIGHT INSTRUMENTS
AIC
AIRSPEED INDICATOR
Indicates Airspeed (Usually in knots)
ATTITUDE INDICATOR
Shows aircraft's relation to the horizon
ALTITUDE INDICATOR
Shows aircraft's height above mean sea level (MSL)
TURN COORDINATOR
Shows direction & rate of turn & indicates slip & skid
HEADING INDICATOR
Indicates direction in relation to magnetic north
VERTICAL SPEED INDICATOR
Indicates rate of climb or descent (usually in feet per minute)

ANTHARIKSH

THE SPACE...

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