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 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

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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FROM HOD's DESK

Do It Now!

Too often people delay making decisions when there is no advantage to be found in that delay. Usually delaying a decision will only have negative consequences, so even if you're faced with ambiguity, just bite the bullet and make a decision. If it turns out to be the wrong one, you'll know it soon enough. Many people probably spend more than 60 seconds just deciding what they'll eat for dinner. If I can't decide what to eat, I just grab an apple or a couple bananas and start eating, and sometimes I'm full of fruit before I figure out what I really would like to eat. So my brain knows that if it wants something other than fruit, it had better decide quickly. If you can speed up the pace of making decisions, you can spend the rest of your time on action.

Dr. P. Lovaraju

THE VOICE OF 'SPACE'

An ANTHARIKSH special…

The Editorial board, Anthariksh

VOLUME-3

THE AGE OF ROCKETS

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

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

The intervention of the United States through Goddard:

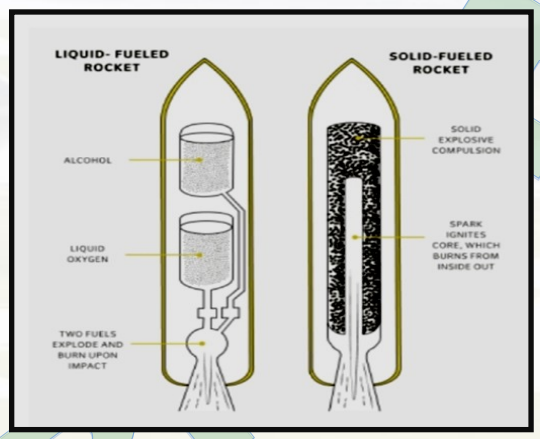
Robert Hutchings Goddard was the son of a machine-shop owner and was fascinated by flight from a young age. After excelling at school, he went on to pursue an academic career in science, working principally at Clark University in Worcester, Massachusetts, where he taught and continued to pursue his research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

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

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

Fig: Goddard with his rocket

Fig: Difference between liquid, solid-fueled rockets



German Rocket Saplings :

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

In 1922, Oberth's proposed doctoral dissertation on rocket science was rejected as "utopian". However, Professor Augustin Maior of the University of Cluj in Romania offered Oberth the opportunity to defend his original dissertation there to receive a doctorate. He did so successfully on 23 May 1923. He next had his 92-page work published privately in June 1923 as a somewhat controversial book, "The Rocket into Planetary Space". By 1929, Oberth had expanded this work to a 429-page book titled "Ways to Spaceflight".

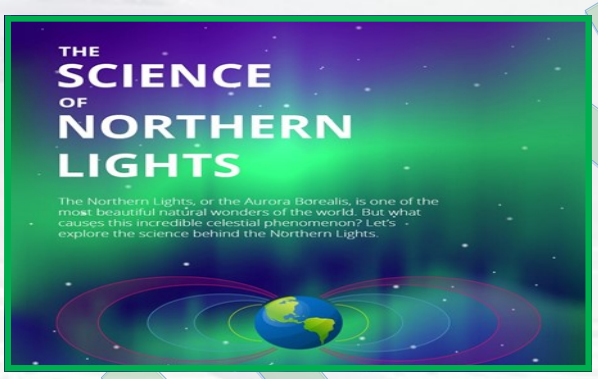
In 1923, Oberth first described his space mirrors with a

The Phenomenon of Lights on the Northern and Southern Poles

K DINESH BABU
20761A5621

Introduction

The Northern and Southern Poles, also known as



the Arctic and Antarctic regions, are characterized by extreme cold temperatures and vast icy landscapes. These remote and captivating regions are not only home to unique ecosystems but also witness one of nature's most awe-inspiring displays—the Northern and Southern Lights, also known as Aurora Borealis and Aurora Australis, respectively. This article delves into the fascinating science behind these mesmerizing light shows, exploring the causes and significance of these celestial phenomena.

Understanding the Aurora

The Aurora is a stunning natural light display that occurs in the high-latitude regions near the Earth's magnetic poles. It is caused by the interaction between charged particles from the solar wind and the Earth's magnetic field. The solar wind, which consists of charged particles ejected from the sun, constantly streams towards the Earth. When this solar wind interacts with the Earth's magnetic field, it creates a stunning display of lights in the sky, known as the Aurora.

Northern Lights (Aurora Borealis)

The Northern Lights, or Aurora Borealis, grace the night skies near the Arctic Circle. The phenomenon primarily occurs during the winter months, from September to April, when the nights are longest and the sky is darkest. The most active areas for witnessing the Northern Lights include Norway, Iceland, Sweden, Canada, and Alaska.

Causes of Aurora Borealis

1. Solar Wind Interaction: The Sun continuously emits charged particles, mostly electrons and protons, which form the solar wind. When these particles enter the Earth's magnetosphere, they are channeled towards the polar regions by the magnetic field lines.
2. Collision with Atmosphere: As the solar wind particles enter the Earth's atmosphere, they collide with gases, particularly oxygen and nitrogen. These collisions excite the atoms and molecules, temporarily boosting their energy levels.
3. Light Emission: The excited atoms and molecules release this excess energy in the form of photons. When these photons combine, they create the dazzling colors of the Northern Lights. Oxygen emits green and red light, while nitrogen emits purples, pinks, and blues.
4. Altitude Dependence: The specific colors observed in the Northern Lights depend on the altitude at which the collision occurs. Higher altitudes result in red and purple hues, while green lights are more prevalent at lower altitudes.

Southern Lights (Aurora Australis)

The Southern Lights, or Aurora Australis, mirror the Northern Lights but occur around the Antarctic Circle in the Southern Hemisphere. Like the Aurora Borealis, the Aurora Australis is most visible during the winter months in the southern hemisphere.

Causes of Aurora Australis

The causes of the Aurora Australis are fundamentally the same as those of the Northern Lights. Solar wind particles interact with the Earth's magnetic field and collide with the atmosphere, leading to the emission of

light in the form of breathtaking colors.

Significance and Cultural Importance

Throughout history, these celestial displays have captivated human imagination, inspiring numerous myths, legends, and cultural beliefs. Indigenous communities in the Arctic and Antarctic regions have often associated the Northern and Southern Lights with spirits, ancestors, and celestial beings. Their dancing lights in the sky have been interpreted as messages from the divine. Today, these phenomena continue to be major attractions for tourists, scientists, and photographers, drawing people from around the world to experience the otherworldly beauty of the polar regions.

Conclusion

The Northern and Southern Lights are incredible celestial spectacles resulting from the interplay between the solar wind and the Earth's magnetic field. Their mesmerizing colors and hypnotic dance in the polar skies have been a source of wonder and fascination for humanity for generations. As we delve deeper into the secrets of these phenomena, they remain a testament to the intricate and interconnected forces that shape our planet and the universe beyond.

Stealth Technology

BHANU PRAKASH KALISETTY
20761A5619

The term stealth is defined as a covert or concealed movement. When used to refer to warships, fighter aircraft, and submarines, stealth is similarly characterized as reduced visibility of modern aircraft in visual, audio, infrared, and radio frequency spectrum. Presently, stealth technology continues to be extensively researched and progressed by scientists and engineers. The most powerful nations of the world including the USA and Russia have spent billions of dollars to develop and promote stealth technology.

During World War II, radar was a revolutionary technology. Luftwaffe air crafts were detected through radar technology by the British army, which helped the British to launch defense mechanisms. Since WWII, radar technology has played a significant role in modern warfare.

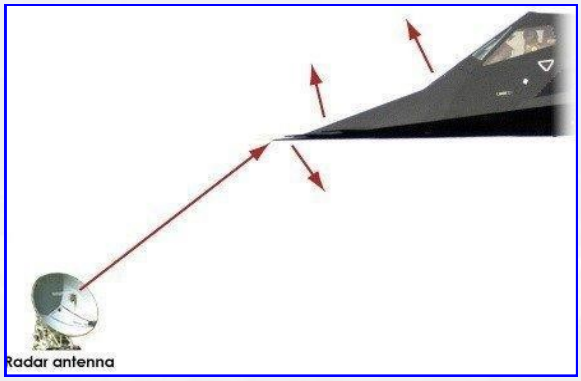
Radar functions as an object identification system. The word radar is an acronym for Radio Detection and Ranging. Radar transmits electromagnetic (radio) waves via an antenna through the air until the waves collide with an object. Once the waves collide with an object, the wave is reflected back to the antenna. The reflected signals are processed to estimate the size, geometry, and exact position of the object from the radar source. Radar technology can detect the moving velocity of any object. An example of this detection and signal process is the use of radar guns by police to apprehend speeding motorists. Radar is also used in space, synthetic aperture radar (SAR) is installed in space shuttles and satellites to generate comprehensive topographic maps of the Earth and other planets.

Stealth technology

Stealth technology combines the ability of radar to detect and analyze with the concealment unique to stealth technology. Stealth technology is used in air crafts to evade radar signals, by absorbing or deflecting electromagnetic waves. Stealth aircraft manage to stay invisible (undetected) to radar signals in two ways:

1. The surface of the Aircraft

Aircraft with round surfaces reflect signals back to the radar (source). Stealth air crafts are engineered with flat surfaces and sharp angles that can deflect the radar signals away from the source, making themselves invisible.



2. Absorbing Materials

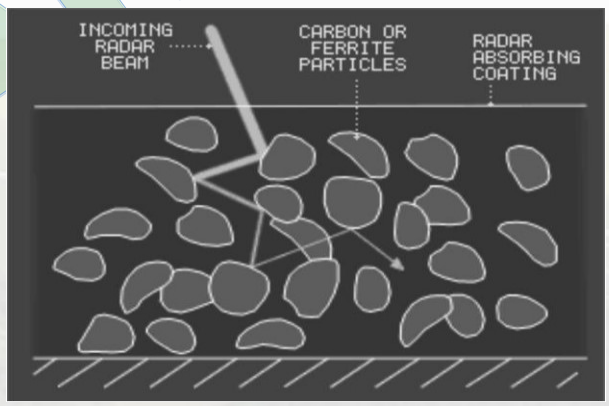
Radar Absorbing Materials (RAM) is used to coat the aircraft structures, which block the radar signals by absorbing the electromagnetic radar waves.

Iron ball paints:

Iron ball paints are among the primary class of stealth materials.

These paints are composed of iron microparticles coated with ferrous carbonyl.

1. **Superficial wave absorbers:** Elastomers loaded with magnetic particles are applied to the metallic surface to absorb the maximum waves without reflecting them back.
2. **Foam absorbers:** Foam absorbers are composed of conductive carbon-loaded gradient coatings. These coatings result in broadband of radar absorbing films which absorb the radar signals efficiently.
3. **Tuned frequency absorbers:** These are resonant frequency absorbers, which have prominent reflection loss at particular frequencies.
4. **Low-frequency absorbers:** These absorbers contain magnetic particles with high permeability. Low-frequency absorbers show high wave loss at low (microwave) frequencies.



Advantages of Stealth technology:

- Efficiency can be increased while in a war zone when stealth vehicles are used in place of conventional vehicles, providing long-term fiscal savings.
- Strikes from a stealth fighter aircraft prevent enemies from initiating attacks and as enemies are

unable to locate them stealth weapons are utilized as intimidation fleets

- The declaine in casualty rates is achievable using stealth technology in warfare.

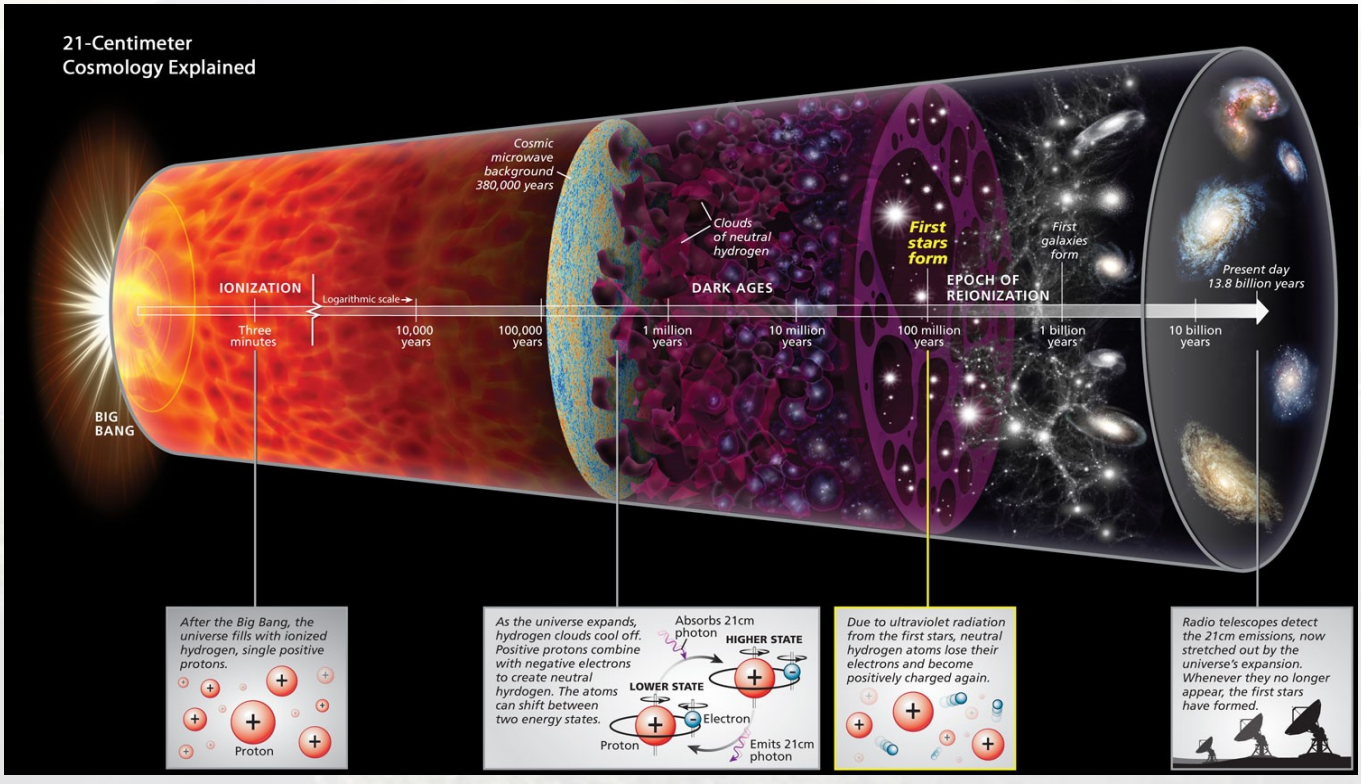
Disadvantages of Stealth technology:

- Compared to conventional aircrafts, stealth aircrafts are less agile and lack efficient maneuverability.
- Stealth aircraft have lower payload or carrying capacity than the conventional aircraft
- The biggest disadvantage of a stealth aircraft is its high cost.
- Fighter aircraft such as B-2 ($2 billion) and F-22 ($100 million) are the most expensive aircraft in the world.

ANTHARIKSH

Did you know?

HONEY NEVER SPOILS. ARCHAEOLOGISTS HAVE FOUND POTS OF HONEY IN ANCIENT EGYPTIAN TOMBS THAT ARE OVER 3,000 YEARS OLD AND STILL PERFECTLY EDIBLE.



EVOLUTION OF UNIVERSE

The Science Behind Cloud Seeding: How Experts Manipulate the Weather

The Editorial board,

Anthariksh

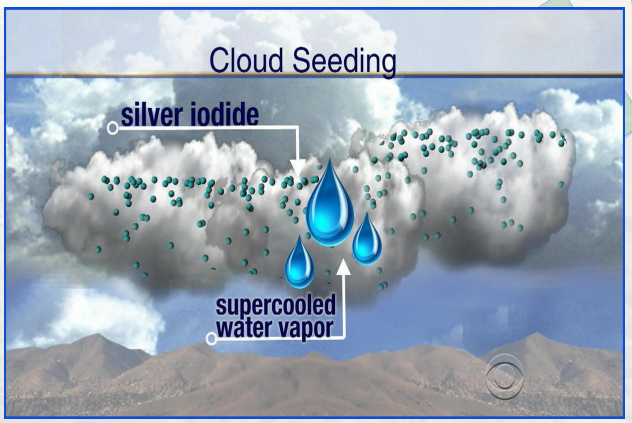
Introduction

In this article, we will be discussing the science behind cloud seeding, and how experts manipulate the weather. A lot of people are familiar with the idea of cloud seeding, but may not be aware of all the science that goes into it. Cloud seeding is the process of adding water or other particles to clouds in order to improve their weather conditions. It is used by experts to modify weather patterns, and has been shown to work in a variety of different circumstances. In this article, we will be discussing the various ways that cloud seeding can be used to improve weather conditions, and the science behind it.

Understanding Cloud Seeding

When it comes to manipulating the weather, there are a few different ways that experts can do it. One of these is cloud seeding. Cloud seeding is when a person or organization uses airplanes, helicopters, or even weather balloons to release particles or droplets from the atmosphere in order to affect the weather. There are a few different reasons why cloud seeding might be used. One reason is to help improve precipitation. When these particles are released into the atmosphere, they can help to create clouds and precipitation. Another reason is to help improve air quality. When these particles are released, they can help to clean the air.

And finally, cloud seeding can be used to help improve the weather in certain areas. For example, if the weather in a certain area is unpredictable, cloud seeding can be used to help create a more stable atmosphere. All of these reasons are why cloud seeding is a popular tool for weather manipulation. If you're interested in learning more about the science behind cloud seeding, I would recommend checking out some of the resources listed below. They'll give you a better understanding of how cloud seeding works and the reasons why it's sometimes used.



How Does Cloud Seeding Work?

Cloud seeding is a technique used to manipulate the weather. It is based on the premise that tiny particles (called "seeds") can be added to clouds to make them produce rain or snow.

So how does cloud seeding work? Experts believe that seeding can make the clouds more reflective, which in turn makes them able to hold more water. This extra water then falls as rain or snow. Cloud seeding is controversial, and there are a number of concerns about how it is performed and what potential consequences it may have. But overall, it remains a popular technique for making the weather change.

The Science Behind Cloud Seeding

Now, if you're like most people, you probably think of clouds as fluffy white things in the sky. But what you may not know is that clouds are actually made up of tiny water droplets and ice crystals. The way that these tiny droplets and crystals are arranged determines the shape of the cloud, and this is where cloud seeding comes in. Cloud seeding is the practice of intentionally adding tiny particles, or "seeds", to clouds in order to make them produce rain or snow.

There are a few different ways that cloud seeding can work. One way is to add metal seeding particles that act as an ice nuclei. When these seeds fall to the ground, they cause the water droplets and crystals within the cloud to form. Another way is to add particles that cause the cloud to become "super-cooled". This means that the cloud droplets freeze before they reach the ground, which then causes them to fall as snow or rain. Both of these methods have been used for centuries to manipulate the weather. But, as you can imagine, there are a lot of different factors that go into cloud seeding.

So, if you're interested in learning more about how cloud seeding works, I would recommend checking out some of the scientific papers that have been written on the topic.

The Impact of Cloud Seeding on Water Supply:

When it comes to manipulating the weather, there are a number of experts out there that believe cloud seeding can be a powerful tool.

What is cloud seeding? Simply put, it's the practice of adding particles, such as silver iodide, to the atmosphere in an attempt to change the weather. Cloud seeding has been around for over 100 years, and it's believed to be a way to provide supplemental water to areas that are experiencing a water shortage.

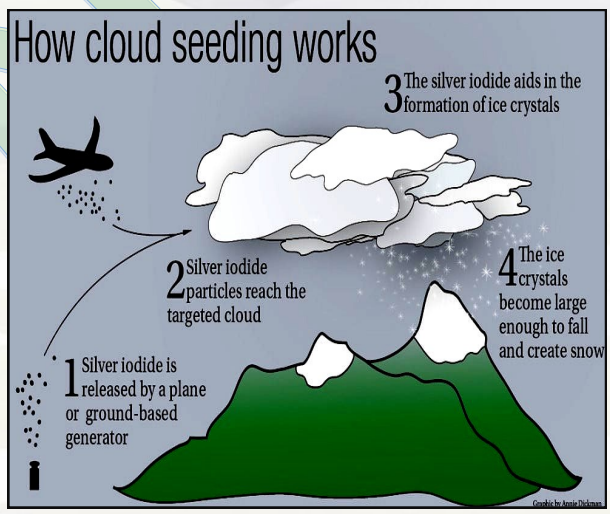
Experts believe that cloud seeding can help to increase precipitation, and it's often used to supplement rainfall during drought conditions. It's also been used to help improve air quality, and to cool the Earth's atmosphere. Cloud seeding is a controversial practice, and it's often met with skepticism from the general public.

However, the evidence suggests that cloud seeding can be a powerful tool when it comes to manipulating the weather.

Cloud Seeding Programs and Initiatives

There are a number of cloud seeding programs and initiatives in place around the world, each with their own objectives and goals. Some programs are designed to increase rainfall, others to improve the quality of snow, and still others to control pests. Whatever the objective, successful cloud seeding relies on careful science and understanding of how weather works.

In this article, we're going to take a look at some of the science behind cloud seeding, and discuss some of the methods that experts use to manipulate the weather. First, we'll discuss how weather is created on a global scale.



Then, we'll look at how cloud seeding works and how it can be used to improve weather conditions.
Last, we'll discuss some of the potential risks and concerns associated with cloud seeding, and how you can minimize them.
So read on to learn more about the science behind cloud seeding, and how it can be used to improve the weather in your area.

Recent Studies and Research on Cloud Seeding

There has been a lot of recent studies and research on cloud seeding. In this article, we will go over the basics of what cloud seeding is, what studies have been done, and what experts believe about the practice. We will also provide a list of resources to explore further.
What is Cloud Seeding?
Cloud seeding is a manipulation of the weather that experts believe can help improve weather conditions. By spreading small particles into the air, experts can help to create rain, snow, or other types of weather.
Studies and Research on Cloud Seeding
There have been a number of recent studies and research on cloud seeding. Some of these studies have looked at how cloud seeding can help improve weather conditions. Other studies have looked at how cloud seeding can be used to manipulate the weather for other purposes, such as climate change mitigation.
What Experts Believe About Cloud Seeding
Although the practice of cloud seeding is still relatively new, a majority of experts believe that it can be used to improve weather conditions. Some experts believe that cloud seeding can help to increase rainfall. Others believe that cloud seeding can help to create snow or other types of weather.

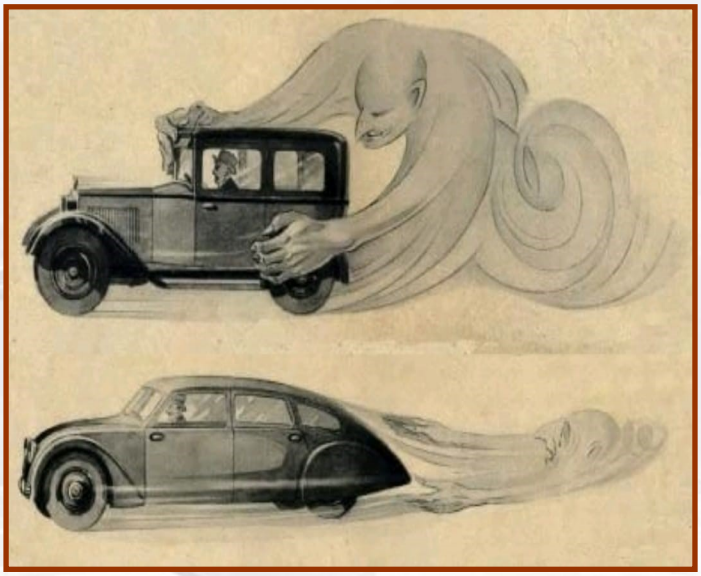
Conclusion

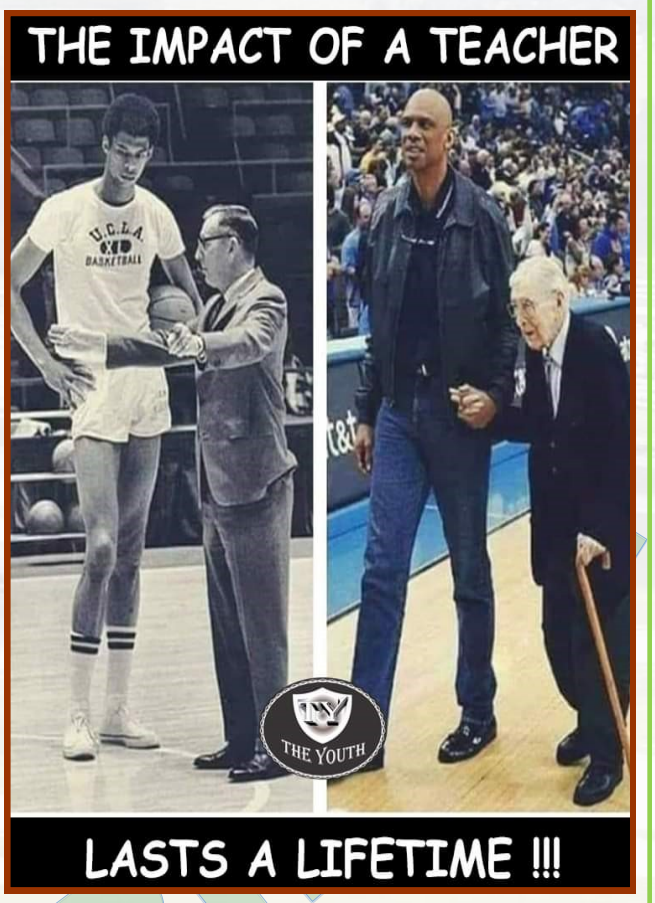
In this article, we have discussed the science behind cloud seeding and how experts manipulate the weather.
We have seen that cloud seeding is a relatively new technique that has recently gained a lot of attention.
It is a process where experts inject particles into the atmosphere to make it rain or snow.
This can be done for a variety of reasons, including reducing drought, raising water levels, or preventing flooding.
In conclusion, the science of cloud seeding opens up a world of possibilities when it comes to weather manipulation. By understanding the cloud dynamics and implementing techniques like introducing silver iodide into clouds, experts can enhance precipitation and ultimately create a positive impact on various industries such as agriculture and water resource management. Cloud seeding has shown promising results in regions experiencing droughts and water scarcity. With the ability to potentially increase rainfall and minimize the risk of wildfires, it offers a glimmer of hope for areas struggling with the effects of climate change. The ongoing research and advancements in technology continue to provide new insights and refine the cloud seeding process. So, if you've been wondering about the possibilities of weather manipulation and the potential benefits it can bring, keep an eye on the advancements.

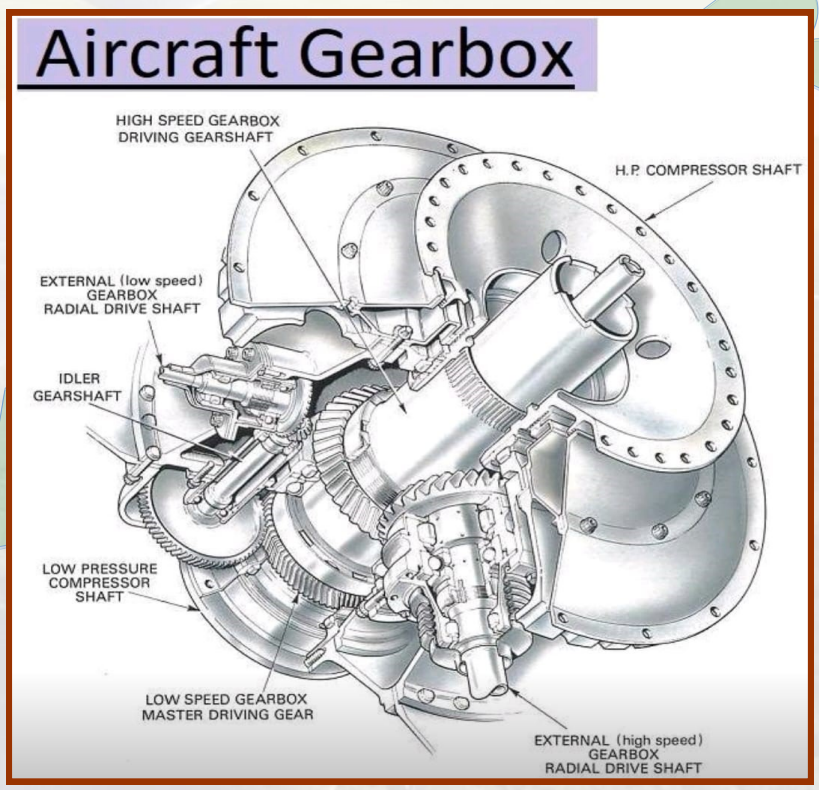
DID YOU KNOW...?

A GROUP OF OWLS IS CALLED A "PARLIAMENT."

IMAGE GALLERY







ANIMALS TEACH YOU...

CH. VENKATA NARASIMHA

20761A5608

To Be Different

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

To Trust Your Instinct

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

To Respect Your Elders

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

To Be Patient

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

To Show Compassion

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

To Be Goofy

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

To Stick Together and Be Loyal

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

To Take Risks

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

ANTHARIKSH

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

P. Dharani
20761A5644

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

What Is a Space Factory?

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

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

Who Is Behind the Space Factory?

The space factory was developed by Varda Space Industries, a California-based startup founded in 2021 by former SpaceX engineers. The company's mission is to "unlock the next frontier of manufacturing" by building factories in space that can produce high-performance products for Earth. The space factory is comprised of two distinct modules: a manufacturing module and a re-entry module. The manufacturing module is equipped with autonomous machinery designed to produce various products in the microgravity environment. On the other hand, the reentry module houses a secure capsule that ensures the safe return of the finished products back to Earth.

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

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

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

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

Fig: Rocket engine designed for reusable flight tested

The space factory's impact spans across multiple in-

dustries, from aerospace to pharmaceuticals, and its applications are far-reaching. By manufacturing high-strength and lightweight materials in space, companies can construct more efficient spacecraft and satellites, enabling a new generation of space exploration missions. Additionally, the pharmaceutical industry can leverage the space factory to produce medications that are challenging or impossible to manufacture on Earth, thanks to the absence of gravitational effects. One of the most significant advantages of the space factory is its potential to reduce reliance on Earth for resupply missions. By manufacturing essential supplies and spare parts in orbit, astronauts and space missions can become more self-sufficient and extend their reach into deep space. This capability is essential for future long-duration missions, including the establishment of permanent human settlements on other celestial bodies.

Conclusion:

The launch of the world's first space factory by SpaceX heralds a new chapter in human exploration and innovation. By harnessing the unique environment of space, this facility unlocks unprecedented opportunities for manufacturing, research, and development. As we venture further into the cosmos, the space factory will play a pivotal role in enabling humanity to thrive and establish a sustainable presence beyond Earth's boundaries. With each successful mission, we edge closer to a future where space manufacturing becomes an integral part of our quest for knowledge, progress, and the exploration of the unknown.

KUIPER BELT

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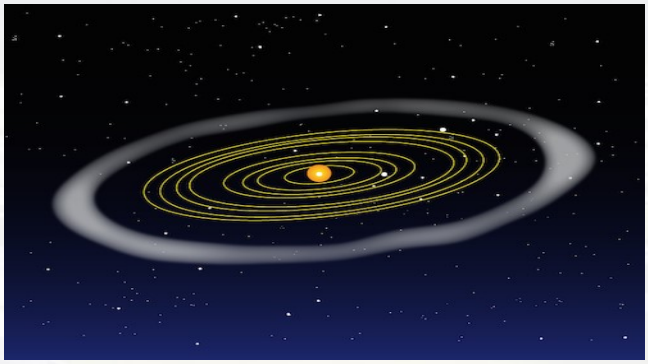
20761A5620

The Kuiper Belt is a large region in the cold, outer reaches of our solar system beyond the orbit of 0 Neptune. It's sometimes called the "third zone" of the solar system. Astronomers think there are millions of small, icy objects in this region – including hundreds of thousands that are larger than 60 miles (100 kilometres) wide. The Sun is at the centre of our solar system. It is orbited by eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. **But what's past Neptune?**

Just outside of Neptune's orbit is a ring of icy bodies.



We call it the **Kuiper Belt**. It's pronounced *ky-purr*. This is where you'll find dwarf planet Pluto. It is the largest and most massive member of the Kuiper belt and the largest and the second-most-massive known TNO (Trans-Neptunian Objects), surpassed only by Eris in the scattered disc. It's the most famous of the objects floating in the Kuiper Belt, which are also called **Kuiper Belt Objects**, or KBOs. Kuiper belt objects are composed largely of frozen volatiles (termed "ices"), such as methane, ammonia, and water.

Being distant from the Sun and major planets, Kuiper belt objects are thought to be relatively unaffected by the processes that have shaped and altered other Solar System objects; thus, determining their composition would provide substantial information on the makeup of the earliest Solar System. Due to their small size and extreme distance from Earth, the chemical makeup of KBOs is very difficult to determine. The principal method by which astronomers determine the composition of a celestial object is Spectroscopy. When an object's light is broken into its component colours, an image akin to a rainbow is formed. This image is called a spectrum.

The Kuiper Belt is named after a scientist named Gerard Kuiper. In 1951 he had the idea that a belt of icy bodies might have existed beyond Neptune when the solar system formed. He was trying to explain where comets with small orbits came from. No one had seen anything out there yet because it's hard to see small comets past Neptune even with the best telescopes. **What**'s out there?

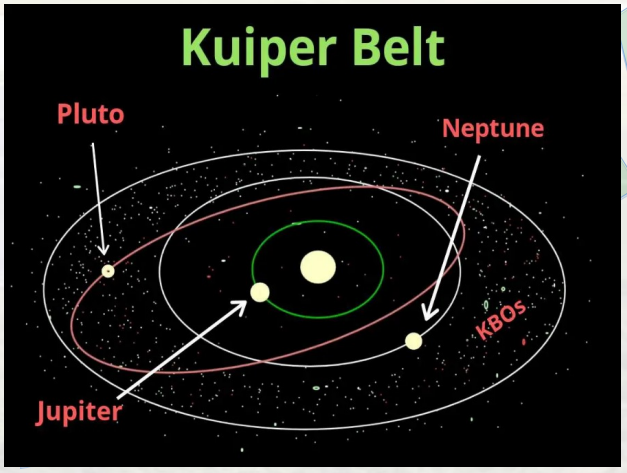
There are bits of rock and ice, comets, and dwarf planets. Besides Pluto, two other interesting Kuiper

planets. Besides Pluto, two other interesting Kuiper Belt Objects are Eris and Haumea. Similar to the asteroid belt, the Kuiper Belt is a region of leftovers from the solar system's early history. Like the asteroid belt, it has also been shaped by a giant planet, although it's more of a thick disk (like a doughnut) than a thin belt.

The Kuiper Belt shouldn't be confused with the Oort Cloud, which is a much more distant region of icy, comet-like bodies that surrounds the solar system, including the Kuiper Belt. Both the Oort Cloud and the Kuiper Belt are thought to be sources of comets. It is truly a frontier in space – it's a place we're still just beginning to explore and our understanding is still evolving.

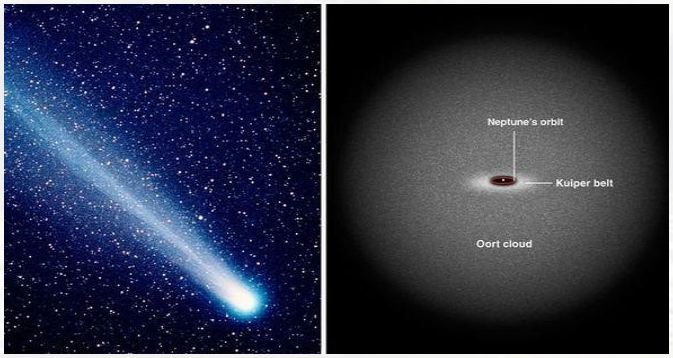
Its overall shape is like a puffed-up disk or doughnut. Its inner edge begins at the orbit of Neptune, at about 30 AU (Astronomical Unit) from the Sun. (1 AU is the distance from Earth to the Sun.)

The inner, main region of the Kuiper Belt ends around 50 AU from the Sun. Overlapping the outer edge of the main part of the Kuiper Belt is a second region called the scattered disk, which continues outward to nearly 1,000 AU, with some bodies on orbits that go even farther beyond.



Researchers have found that some near-Earth asteroids are burned-out comets, and most of them would have started in the Kuiper Belt. Many comets crash into the Sun or the planets. Those that have close encounters with Jupiter tend to be ripped apart or tossed out of the solar system entirely. Astronomers think the icy objects of the Kuiper Belt are remnants from the formation of the solar system. Similar to the relationship between the main asteroid belt and Jupiter, it's a region of objects that might have come together to form a planet had Neptune not been there. Instead, Neptune's gravity stirred up this region of space so much that the small, icy objects there weren't able to coalesce into a large planet.

The other source of comets is the Oort Cloud, where most long-period comets on highly tilted orbits come from.



Exploration and Future Missions: Scientists continue to study the Kuiper Belt through ground-based observations and telescopes. Additionally, there are plans for future missions to explore this region further, such as the proposed New Horizons 2 mission, which aims to visit another Kuiper Belt object.

The Kuiper Belt plays a significant role in our understanding of the early solar system and provides valuable insights into the formation and dynamics of icy bodies in the outer regions of our cosmic neighbourhood.

DID YOU KNOW..?

The world's first novel, "The Tale of Genji," was written by a Japanese noblewoman named Murasaki Shikibu in the 11th century.

Department achievement

Industrial Visit- Prakash Spectro Cast

ANTHARIKSH

THE SPACE...

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