

UPSC CURRENT AFFAIRS NOTES 11-01-2024

Einstein Probe (EP)

China recently sent a new astronomical satellite called the Einstein Probe into space to observe mysterious transient phenomena in the universe that flicker like fireworks.



About Einstein Probe (EP)

- The EP is a mission of the Chinese Academy of Sciences (CAS) dedicated to time-domain high-energy astrophysics.
- The primary scientific goal of the EP is to explore the transient and variable X-ray sky, capturing powerful bursts of high-energy light emanating from objects such as merging neutron stars and black holes.
- It was successfully launched on January 9, 2024, from the Xichang Satellite Launch Center in China with a "Long March-2C" rocket.
- It is equipped with state-of-the-art X-ray mirrors and detectors.
- Unlike conventional X-ray telescopes, Einstein Probe's unique design allows it to monitor almost a tenth of the sky simultaneously, discovering new sources as they light up in X-rays and enabling in-depth studies of known and new celestial phenomena over extended periods.



- It will also detect light from gamma-ray bursts, supernovae, flares from other stars, and events within the Solar System, such as emissions from comets.
- The satellite has a weight of ~ 1450 kg and an average power of ~ 1212 W

Neutron stars

Neutron stars are formed when a massive star runs out of fuel and collapses. The very central region of the star the core collapses, crushing together every proton and electron into a neutron.

Carbon Border Adjustment Mechanism (CBAM)

India recently flagged concerns relating to sensitive and confidential trade data of its exporters getting compromised while complying with the European Union's Carbon Border Adjustment Mechanism (CBAM).

About Carbon Border Adjustment Mechanism (CBAM)

What is it? It is a proposed European Union (EU) tariff on carbon-intensive products.

Purpose: To put a fair price on the carbon emitted during the production of carbon intensive goods that are entering the EU and to encourage cleaner industrial production in non-EU countries.

It was adopted on May 17, 2023, and the CBAM transitional period started October 1, 2023.

It is designed to counter the risk of carbon leakage and operates by imposing a charge on the embedded carbon content of certain imports that is equal to the carbon price of domestic production.

How does it Work?

If implemented as planned, EU importers will have to buy carbon certificates corresponding to the carbon price that would have been paid in the EU if the goods had been produced locally.



The price of the certificates would be calculated according to the auction prices in the EU carbon credit market.

The amount of certificates required would be defined yearly by the quantity of goods and the embedded emissions in those goods imported into the EU.

Companies in countries with a domestic carbon pricing regime equivalent to the EU's will be able to export to the EU without buying CBAM certificates.

The CBAM will initially affect goods imported from non-EU countries that are particularly carbon-intensive, namely specified goods within the cement, electricity, fertilisers, aluminium, iron, steel, and hydrogen sectors, as well as some upstream and downstream products (mainly iron, steel, and aluminium).

Transition Period:

In the transitional phase of the implementation of the CBAM, from October 1, 2023, to December 31, 2025, affected companies are subject to a reporting obligation without financial obligations.

During this period, importers must determine and document direct and indirect emissions that occur in the course of the production process of the imported goods.

In addition, affected EU importers are obliged to prepare a quarterly CBAM report that provides information on the imported quantity of CBAM goods, the direct and indirect embedded emissions contained therein (reporting on indirect embedded emissions is initially only for cement, electric power, and fertiliser), as well as any carbon taxes effectively paid in the country of production.

With the start of certificate trading from January 1, 2026, importers are obliged to purchase sufficient emission allowances for imported embedded emissions during the year.

Sea Dragon-24

Indian Navy's P8I aircraft landed at Guam, a US island territory in Western Pacific, to participate in Exercise Sea Dragon – 24.

About Exercise Sea Dragon-24

It is an elite multinational maritime exercise that encourages professional exchanges and teamwork among participating navies.

Participating countries: India, Japan, South Korea, Australia, and the US.

The exercise seeks to improve skills in a variety of maritime combat domains through a number of aerial and ground-based tasks, including:

Anti-submarine warfare (ASW): Locating and neutralising enemy submarines hiding beneath the seas.

Surface warfare: Coordinated attacks on hostile surface vessels using superior weaponry and tactics.



Air defence: Putting up an impenetrable air barrier to keep friendly forces safe from aerial threats.

Search and rescue (SAR): Tracking down and saving maritime personnel in need.

Communication and coordination: Synchronising activities across several platforms and exchanging information in a seamless manner.

Key facts about the P8I aircraft

It is a versatile aircraft with potent force multiplier in maritime operations. Some of its primary capabilities are:

Long-range surveillance: The P8I can scan wide sections of ocean, identifying hostile movements and activities from long distances.



Multi-sensor fusion: Its electronic intelligence systems, sonars, and onboard radars provide a thorough image of the maritime environment.

Anti-submarine warfare: With its depth charges and torpedoes, the P8I poses a serious threat to enemy submarines.

Communication relay: The aircraft can serve as an essential means of communication between various participating fleets' forces.

Henley Passport Index 2024

The average number of visa-free destinations has nearly doubled since 2006, according to the 2024 Henley Passport Index.

About Henley Passport Index

It is the original, authoritative ranking of all the world's passports according to the number of destinations their holders can access without a prior visa.

It started in 2006 as the Henley & Partners Visa Restrictions Index (HVRI).

The index is based on exclusive data from the International Air Transport Association (IATA), the largest, most accurate travel information database, and enhanced by Henley & Partners' research team. (Henley & Partners is a London-based advisory firm).

The index includes 199 different passports and 227 different travel destinations.

The number of countries that a specific passport can access becomes its visa-free 'score'.

Highlights of Henley Passport Index 2024:

France, Germany, Italy, Japan, Singapore, and Spain hold the top spot as the world's most powerful passports, allowing visa-free entry to 194 global destinations.

The top 10 is largely dominated by European countries.



The average number of destinations travellers are able to access visa-free has nearly doubled, from 58 in 2006 to 111 in 2024.

India's passport ranked 80th in the list, with citizens allowed to travel to 62 countries without a visa.

Afghanistan occupies the bottom spot on the list, with access to just 28 countries without a visa.

Syria, with visa-free access to only 29 destinations, holds the second-lowest position, followed by Iraq with 31 and Pakistan with 34.

The United Arab Emirates was the fastest climber over the past decade, jumping to 11th place and offering access to 183 destinations without a visa.

Momentum investing

Many academic studies have shown that momentum investing can generate high returns that comfortably beat the benchmark indices.

It refers to a style of investing wherein investors purchase assets such as stocks or bonds that are consistently rising in price while selling assets whose prices are falling.

Momentum investors buy assets with rising prices in the hope that the upward price momentum of these assets would continue, thus allowing them to sell these assets at higher prices in the future to make profits.

It is based on the philosophy that there can be discernible trends in asset prices and that these trends tend to persist over time.

The persistence of such trends gives investors an opportunity to recognise and participate in them early enough to make significant profits from their investments.

Similarly, they sell assets that are falling in price expecting the fall in prices to continue for some time.

Momentum investors generally do not conduct a deep analysis of the fundamental or intrinsic value of the assets in which they invest their money.

They invest purely based on whether the price of an asset is showing a strong trend, either upward or downward, that they can ride on.



The “buy high, sell higher” philosophy of momentum investing is in stark contrast to the traditional “buy low, sell high” advice given to investors.

UGRAM

DRDO recently unveiled a groundbreaking achievement the indigenous rifle named 'Ugram,' meaning ferocious.

Developed in less than 100 days, this rifle is a collaborative effort between the Armament Research and Development Establishment (ARDE), a unit of DRDO, and the Hyderabad-based private firm Dvipa Armour India Private Limited.

Caliber and Lethality:

The 'Ugram' rifle is designed to deploy rounds of 7.62 mm caliber, distinguishing it from rifles like the INSAS that use 5.56 mm caliber rounds.

This enhancement in caliber contributes to its ferocious nature, making it a formidable addition to the armory of the armed forces in India, including paramilitary forces.

Operational Requirements:

Developed with the operational requirements of the military, paramilitary, and police forces in mind, the 'Ugram' rifle aims to meet the diverse needs of India's defense apparatus.

Effective Range and Weight:

The rifle boasts an impressive effective range of 500 meters, equivalent to approximately five football fields.

Weighing four kilograms, it strikes a balance between portability and firepower.

Development Process

General Staff Qualitative Requirements (GSQR):

Developed as per the General Staff Qualitative Requirements (GSQR) of the army, ensuring it aligns with the specific needs and standards set by the military.

Development cum Production Partner (DcPP):



The project adopted the Development cum Production Partner model for expedited progress.

Private industry partner, Dvipa Armour India Private Limited, collaborated with ARDE during the design and production phases.

Trials and Acceptance:

The rifle, having been developed in 100 days, is now set to undergo trials to evaluate its operational capability under various conditions, including harsh winter, extreme heat, and underwater.

Following successful trials, it will proceed to acceptance trials to ensure its readiness for deployment.

Significance and Context

Fast Track Procurement:

The 'Ugram' rifle's development aligns with the Fast Track Procurement initiative, aiming to replace the ageing INSAS rifle, which debuted during the Kargil conflict in 1999.

International Collaborations:

India's collaboration with Russia for the AK-203 rifle, deploying 7.62 mm caliber rounds, provides context to the 'Ugram' development.

Challenges in the AK-203 project due to geopolitical conflicts, such as the Russia-Ukraine war, created an opportunity for the 'Ugram.'

Global Recognition:

G Ram Chaitanya Reddy, Director of Dvipa Armour India, highlighted the global significance of the 'Ugram,' emphasizing its rapid development as one of the fastest in the world.

2023-THE WARMEST CALENDAR YEAR

2023 was the warmest calendar year in global temperature data records going back to 1850, Copernicus Climate Change Service said.



In 2023, the global average temperature was 14.98 degree C, 0.17 degree C higher than the previous highest annual value in 2016. Last year was 0.60 degree C warmer than the 1991-2020 average and 1.48 degree C warmer than the 1850-1900 pre-industrial level.

A 12-month period ending in January or February, 2024 will likely exceed 1.5 degree C above the pre-industrial level.

Copernicus, which is the European Union's Earth Observation Programme, said: 2023 marks the first time on record that every day within a year has exceeded 1 degree C above the 1850-1900 pre-industrial level. Close to 50% of days were more than 1.5 degree C warmer than the 1850-1900 level, and two days in November were, for the first time, more than 2 degree C warmer.

Key Reasons behind rising temperature of the Earth

The rising temperature of the Earth and the phenomenon of the warmest years can be attributed to various natural and anthropogenic factors. Here are the key reasons behind these trends:

Greenhouse Gas Emissions:

Anthropogenic Influence: Human activities, primarily the burning of fossil fuels, deforestation, and industrial processes, release large amounts of greenhouse gases (GHGs) such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) into the atmosphere. These gases trap heat, leading to a warming effect known as the greenhouse effect.

Deforestation:

Reduced Carbon Sink: Deforestation and land-use changes diminish the Earth's capacity to absorb and sequester carbon dioxide. Trees act as carbon sinks, and their removal contributes to higher concentrations of greenhouse gases in the atmosphere.



Increased Industrialization:

Energy Production: The industrial revolution and increased reliance on fossil fuels for energy have significantly elevated carbon emissions. The combustion of coal, oil, and natural gas releases carbon dioxide, contributing to global warming.

Land Use Changes:

Urbanization and Agriculture: Changes in land use, including urbanization and large-scale agriculture, can alter the surface properties of the Earth, affecting energy balance and contributing to local and regional temperature increases.

Melting of Ice and Snow:

Albedo Effect: The melting of polar ice caps and glaciers reduces the Earth's albedo, or reflectivity. Darker surfaces absorb more sunlight, leading to further warming and accelerating the melting process.

Natural Climate Variability:

El Niño and La Niña: Periodic climate phenomena like El Niño, characterized by warmer-than-average sea surface temperatures, can lead to temporary spikes in global temperatures. Conversely, La Niña, with cooler-than-average sea surface temperatures, can have cooling effects.

Solar Radiation Variability:

Solar Cycles: Changes in solar radiation, associated with the sun's natural cycles, can influence Earth's climate. However, the impact of solar variability on recent warming is considered minimal compared to anthropogenic factors.

Ocean Heat Absorption:

Thermal Inertia: Oceans absorb a significant amount of heat from the atmosphere. As global temperatures rise, oceans store excess heat, contributing to the delayed manifestation of temperature increases.

Positive Feedback Loops:



Amplifying Mechanisms: Positive feedback loops, such as the release of methane from thawing permafrost, can amplify warming effects. As certain processes are triggered, they lead to further warming, creating a self-reinforcing cycle.

Extreme Weather Events:

Feedback into the Climate System: Increased temperatures contribute to more frequent and intense extreme weather events, including heatwaves, droughts, and storms, further influencing global temperature patterns.

FAST RADIO BURSTS

A fast radio burst that occurred when the universe was just 5 billion years old was detected in 2022.

About Fast Radio Bursts

Mysterious emissions of radio light, known as Fast Radio Bursts (FRBs), originate from distant corners of the universe.

These bursts, arriving from faraway galaxies, release an amount of energy in one millisecond equivalent to what the sun emits over several weeks.

FRBs represent the most intense natural radio bursts observed. Although astrophysicists have briefly detected FRBs using expansive radio telescopes, the exact origins and triggers of these phenomena remain unknown.

Some FRBs occur as singular, isolated events, while others exhibit a repetitive pattern, intermittently illuminating Earth.

More about the news

Scientists have traced the origin of the farthest and most powerful fast radio burst (FRB) to a group of at least seven galaxies that appear to be merging.

Such groups of galaxies are rare and possibly led to conditions that triggered the FRB.

Astronomers led by Northwestern University presented the findings at the 243rd meeting of the American Astronomical Society in New Orleans, Louisiana.



FRBs, emitted by extragalactic sources, are transient flashes of radio waves that typically last a few milliseconds.

The energy generated in a quick burst is more than what the sun emits in an entire year.

The most powerful and distant FRB was first detected in 2022 by the ASKAP radio telescope in Australia. The burst occurred when the universe was just 5 billion years old.

The sources of FRB are mysterious but researchers speculate that they could be coming from a compact object such as a black hole or neutron star.

The researchers relied on images from the Hubble Space Telescope to trace the origin of the 2022 FRB, officially known as FRB 20220610A.

Previously, scientists thought that FRB 20220610A originated near an amorphous blob. This, they speculated, could be coming from a single, irregular galaxy or a group of three distant galaxies.

But Hubble's images indicate that the blob might be as many as seven galaxies that are so close that they could all fit inside our own Milky Way galaxy.

This interaction could trigger bursts of star formation, Gordon explained. "That might indicate that the progenitor of FRB 20220610A is associated with a fairly recent population of stars, which matches what we've learned from other FRBs," the expert added.

Researchers are interested in distant FRBs as they are key to accurately measuring the missing matter of the universe.