1. Why have Houthis seized an India-bound ship, how this is linked to the Gaza war

Introduction

The Yemen rebel group of Houthis seized an Israel-linked ship bound for India on November 19, raising fears of another dimension being added to the ongoing Gaza conflict. Houthi fighters descended on the ship from helicopters and took all 25 crew members hostage. Israel has claimed the ship is British-owned and Japanese-operated.

Why was the ship hijacked?

The ship, Galaxy Leader, was heading from Turkey towards Pipavav in Gujarat, and had no cargo on board. Its crew members are from Bulgaria, Romania, Ukraine, Mexico, and the Philippines.

The hijacking is in line with the Houthis' earlier statement, where they had said they would attack Israel-linked ships in the Red Sea and the crucial Bab al-Mandeb, a narrow strait that connects the Red Sea to the Gulf of Aden, if Israel continued its bloodshed in Palestine.

How has Israel reacted, and why is Japan involved?
Israel has said it does not own or operate the ship, nor is any crew member from Israel. The Galaxy Leader was operated by the Japanese firm Nippon Yusen. Japanese officials have condemned the hijack, and said they are negotiating with the Houthis while also seeking help from Saudi Arabia, Oman and Iran for the release of the ship and the crew.

Who are the Houthis, and why are they involved at all?
The Houthis are a rebel group locked in a civil war with the Yemen government for almost a decade. They are in power in northern Yemen, including the official capital Sanaa. The official government now operates out of Aden.

The group is named after the Houthi tribe. The Houthis are Zaydi Shias backed by Iran, while the Yemen government has the support of Iran's biggest rival Saudi Arabia and the West.

Houthis' support for "brothers and sisters in Palestine" stems from a staunch opposition to Israel and the West. As a fighting force, they are significant, with tens of thousands of fighters and a huge arsenal of ballistic missiles and armed drones. While the Houthi stronghold in Yemen is too far from Israel for their rockets and fighters to pose a direct threat, they have been firing missiles towards the "enemy country".

The main danger from the Houthis' activity is that their involvement can widen the conflict, potentially drawing in Iran. Also, if Israel wants to attack Houthi territory in retaliation, its rockets will have to go over Saudi Arabia, possibly forcing the powerful Muslim country to wade into the conflict. Seizing of vessels in the sea can also involve many other countries with stakes in the maritime trade in the region.

Relevance: GS Prelims & Mains Paper II; International Relations
Source: The Indian Express

2. What is tantalum, the rare metal found in Sutlej?

Introduction
A team of researchers from the Indian Institute of Technology (IIT), Ropar has found the presence of tantalum, a rare metal, in the Sutlej River sand in Punjab. According to experts, the presence of tantalum is significant not only for Punjab but also India as the metal is widely used in electronics and semiconductors.

What is tantalum?

Tantalum is a rare metal with the atomic number 73 — the number of protons found in one atom of the element. It's grey, heavy, very hard, and one of the most corrosion-resistant metals in use today. It possesses high corrosion resistance because when exposed to air, it forms an oxide layer that is extremely difficult to remove, even when it interacts with strong and hot acid environments.

When pure, tantalum is ductile, meaning it can be stretched, pulled, or drawn into a thin wire or thread without breaking. Moreover, it "is almost completely immune to chemical attack at temperatures below 150°C, and is attacked only by hydrofluoric acid.

Notably, tantalum also has an extremely high melting point, exceeded only by tungsten and rhenium.

What are the uses of tantalum?

Tantalum is most prominently used in the electronic sector. The capacitors made from tantalum are capable of storing more electricity in smaller sizes without much leakage than any other type of capacitor. This makes them ideal for use in portable electronic devices such as smartphones, laptops, and digital cameras.

As tantalum has a high melting point, it is frequently used as a substitute for platinum, which is more expensive. The rare metal is also used to make components for chemical plants, nuclear power plants, aeroplanes and missiles. Tantalum does not react with bodily fluids and is used to make surgical equipment and implants, like artificial joints.

A composite consisting of tantalum carbide (TaC) and graphite is one of the hardest materials known and is used on the cutting edges of high-speed machine tools.

Relevance: GS Prelims; Science & Technology
Source: The Indian Express & The Hindu

3. How a NASA experiment will study 'air glow' to understand Space weather

Introduction

With an exponential rise in satellite-based services used for navigation and communications, obtaining forecasts and data on the health of Space weather is of supreme importance.

But what factors drive Space weather? National Aeronautics and Space Administration (NASA) is set to launch the Atmospheric Waves Experiment (AWE) to study one of the important drivers of Space weather – the Earth's weather.

First, what exactly is Space weather and why is it important?

Just like there is weather on the Earth, the environment around the Earth and the other planets remains constantly under the influence of the Sun and its behaviours – solar flares and emissions, along with the kinds of prevailing matter in the Space surroundings.

During certain days, when the weather over Earth turns rough or extreme, Space weather, too, can suffer extreme events. These have a direct impact on vital installations on Earth, like satellite-based communication, radio communication, and Space-based aircraft orbits or stations – affecting the smooth operations of the navigation and Global Positioning Systems (GPS) and power grids.

Apart from influences from the Sun-bound emissions, Space weather also comes under the impact of terrestrial weather.

What is a gravity wave?

The simplest way to explain a gravity wave is by considering the example of ripples formed when a pebble is thrown into the calm waters of a pond. Close to where the pebble touches the water surface, the waves are concentric and tightly packed whereas they become less defined at a far point from the pebble.

Similarly, in the atmosphere, there are a wide variety of waves, travelling both horizontally and vertically. Atmospheric Gravity Waves (AGW) are one such kind of vertical wave. They are mostly generated when there is an extreme weather event or a sudden disturbance leading to a vertical displacement of stable air.

There is limited data about these waves provided by satellites. But we need a better understanding of the vertical motion of waves, the altitude and causes for their

development – all of which are vital to better our understanding of these waves and their impacts on the overall weather, climate along with Space weather.

A stable atmosphere plays an important role in the generation of gravity waves, that is, when the atmosphere is stable, the temperature difference between the rising air and the atmosphere produces a force that pushes this air to its original position. The air will continuously rise and sink, thus creating a wave-like pattern.

AGW is a wave that moves through a stable layer of the atmosphere, wherein the upward-moving region is the most favourable for the formation of cloud patterns or streaks. AGWs continue all the way to Space, where they contribute to the Space weather.

Figure 1The cloud wave patterns formed due to atmospheric gravity waves.

What is the Atmospheric Waves Experiment (AWE)?

AWE is a first-of-its-kind NASA experimental attempt aimed at studying the interactions between terrestrial and Space weather.

Planned under NASA's Heliophysics Explorers Program, the $42 million mission will study the links between how waves in the lower layers of the atmosphere impact the upper atmosphere, and thus, Space weather.

AWE will be launched and mounted on the exterior of the Earth-orbiting International Space Station (ISS). From the vantage point, it will look down at the Earth and record the colourful light bands, commonly known as airglow.India's edible oil imports have risen almost 1.5 times and more than doubled in rupee value terms during the last 10 years. From a 10-year perspective, India's edible oil imports have increased from 11.6 mt (valued at Rs 60,750 crore) in 2013-14 to 16.5 mt (Rs 138,424 crore) in 2022-23.

During the previous 10 years between 2004-05 and 2013-14, imports had shot up even more, from 5 mt to 11.6 mt.

Figure 2 Airglow in the image from the International Space Station (ISS)

AWE will measure the airglow at mesopause (about 85 to 87 km above the Earth's surface), where the atmospheric temperatures dip to minus 100 degrees Celsius. At this altitude, it is possible to capture the faint airglow in the infrared bandwidth, which appears the brightest enabling easy detection.

AWE will be able to resolve waves at finer horizontal scales than what satellites can usually see at those altitudes, which is part of what makes the mission unique.

What will NASA's AWE do?

AWE will perform focused mapping of the colourful airglows in the Earth's atmosphere.

Onboard AWE is an Advanced Mesospheric Temperature Mapper (ATMT), an instrument that will scan or map the mesopause (a region between the mesosphere and thermosphere). Using the four identical telescopes comprising an imaging radiometer, scientists hope to obtain the brightness of light at specific wavelengths.

This information can then be converted into a temperature map, which could reveal the airglow movement and ultimately, give clues on their role in the upper atmosphere and Space weather.

Relevance: GS Prelims; S & T
Source: The Indian Express