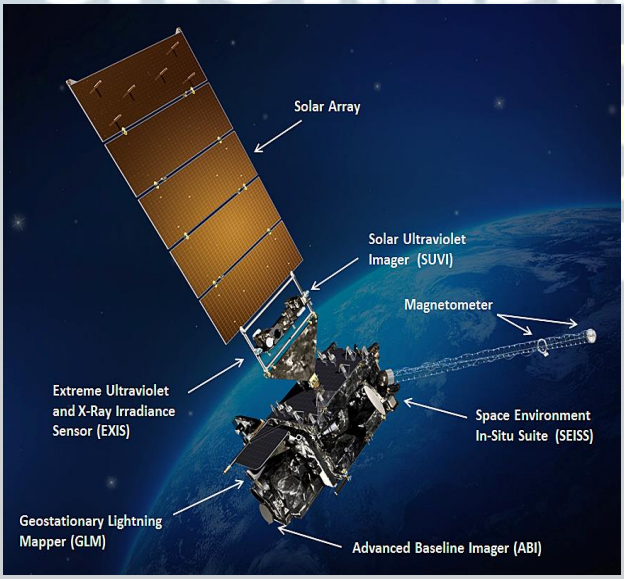
Current Affairs 19th January 2024 by Saurabh Pandey

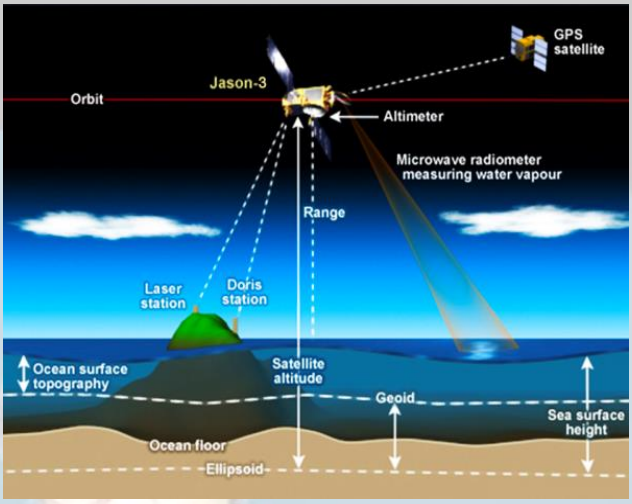
How does satellite track weather?

- The IMD has accompanied weather alerts with maps from the INSAT 3D satellite, and sometimes from the INSAT 3DR satellite.

How does one read the maps? What do the colors represent?

- At the bottom right of a map from 2021 (map 1) is a clue 'Night Microphysics'.
- According to a paper published by IMD scientists in February 2019, the INSAT 3D satellite has a red-green-blue, or RGB, imager whose images' colors are determined by two factors: solar reflectance and brightness temperature.





- Solar reflectance is a ratio of the amount of solar energy reflected by a surface and the amount of solar energy incident on it.
- Brightness temperature has to do with the relationship between the temperature of an object and the corresponding brightness of its surface.
- The INSAT 3D's 'day microphysics' data component studies solar reflectance at three wavelengths: 0.5 micrometers (visible radiation), 1.6 micrometers (shortwave infrared radiation) and 10.8 micrometers (thermal infrared radiation).
- The strength of the 0.5-micrometer visible signal determines the amount of green color; the strength of the 1.6-micrometer shortwave infrared signal, the amount of red color; and the strength of the 10.8-micrometer thermal infrared signal, the amount of blue color.

- This way, the INSAT 3D computer determines the color of each point of the image.

How does the satellite track snow?

- According to the paper, "the major applications of this color scheme are an analysis of different cloud types, initial stages of convection, maturing stages of a thunderstorm, identification of snow area, and the detection of fires."
- While the solar reflectance of snow and that of clouds is similar in the visible part of the spectrum, snow strongly absorbs radiation of wavelength 1.6 micrometer, that is the shortwave infrared.
- As a result, when the satellite tracks snow, the red component of the colour scheme becomes very weak.

How are the colours determined?

- The satellite's 'night microphysics' component is a little more involved.
- Here, two colours are determined not by a single signal but by the strength of the difference between two signals.
- The computer determines the amount of red colour according to the difference between two thermal infrared signals 12 micrometer and 10 micrometer.
- The amount of green colour varies according to the difference between a thermal infrared and a middle infrared signal 10.8 micrometer and 3.9 micrometers.
- The amount of blue color is not a difference but is determined by the strength of a thermal infrared.
- By combining day and night microphysics data, atmospheric scientists can elucidate the presence of moisture droplets of different shapes and temperature differences over time, and in turn track the formation, evolution, and depletion of cyclones and other weather events.
- For example, taking advantage of the fact that INSAT 3D can produce images based on signals of multiple wavelengths,

How do the satellites collect weather data?

- Both INSAT 3D and INSAT 3DR use radiometers to make their spectral measurements.
- A radiometer is a device that measures various useful properties of radiation, typically by taking advantage of radiation's interaction with matter, for example in the form of temperature or electrical activity.

- Both satellites also carry atmospheric sounders.
- These are devices that measure temperature and humidity and study water vapor as a function of their heights from the ground.

What weather satellites does India have?

- According to the INSAT 3DR brochure, its radiometer is an upgraded version of the very high-resolution radiometer (VHRR) that the Kalpana 1 and INSAT 3A satellites used (launched in 2002 and 2003, respectively.
- For meteorological observation, INSAT 3A carries a three channel Very High Resolution Radiometer (VHRR) with 2 km resolution in the visible band and 8 km resolution in thermal infrared and water vapour bands."
- The Kalpana 1 and INSATs 3A, 3D, and 3DR satellites aided India's weather monitoring and warning services with the best technology available in the country at the time, and with each new satellite being a better equipped version of the previous one.
- The INSAT 3D and 3DR satellites are currently active in geostationary orbits around the earth, at inclinations of 82 degrees and 74 degrees' east longitudes respectively.

The Hindu

HPV

- Human papillomavirus infection (HPV infection) is caused by a DNA virus from the *Papillomaviridae* family.
- Many HPV infections cause no symptoms and 90% resolve spontaneously within two years.Depending on the site affected, increase the risk of cancer of the cervix, vulva, vagina, penis, anus, mouth, tonsils, or throat.
- Nearly all cervical cancer is due to HPV, and two strains HPV16 and HPV18 account for 70% of all cases.
- HPV vaccines can prevent the most common types of infection.
- To be most effective, inoculation should occur before the onset of sexual activity, and are therefore recommended between the ages of 9–13 years.

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Electric propulsion system

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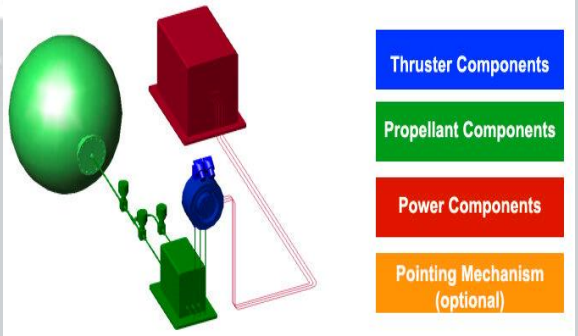
- Electric Propulsion, when compared with chemical propulsion, is not limited in energy, but is only limited by the available electrical power onboard the spacecraft.
- Therefore, EP is suitable for low-thrust (micro and milli-newton levels) long-duration applications on board spacecraft.
- The propellant used in EP systems varies with the type of thruster and can be a rare gas (i.e. xenon or argon), a liquid metal or, in some cases, a conventional propellant.

Electric Propulsion System components

An Electric Propulsion System is composed by four different building blocks:

- The thruster components,
- The propellant components or fluidic management system,
- The power components, which includes the PPU,
- The pointing mechanisms (optional)



Electric Propulsion applications and type of thrusters

The different applications which currently make or may make use of Electric Propulsion Systems in the future, are:

- LEO (e.g. Earth Observation, Earth Science, constellations)
- MEO (e.g. Navigation)
- GEO (e.g. Telecommunications)
- Space Transportation (e.g. launcher kick stages, space tugs)
- Space Science, Interplanetary, and Space exploration.

The Hindu

Steadfast Defender 2024

- The Steadfast Defender 2024 exercise, which will be held from next week to May, will involve about 90,000 troops from NATO-member states and Sweden.
- *"Steadfast Defender 2024 will demonstrate NATO's ability to rapidly deploy forces from North America,"*
- The last exercises of a similar scale were the Reforger drills during the Cold War in 1988 with 125,000 participants and the Trident Juncture ones in 2018 with 50,000 participants.

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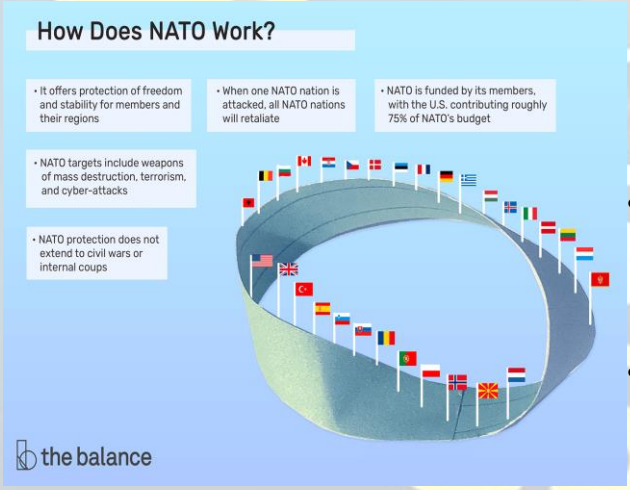

The Hindu

Chancay port and china

- Once-sleepy fishing town of Chancay, 80km north of Lima
- The town is about to become host to one of the largest Deepwater ports in Latin America. Construction and operation will be carried out entirely by private companies
- The project is so huge it has the potential to upend maritime traffic all along the Pacific coast of South America, displacing it from Chile, Ecuador and Colombia
- Cosco Shipping, a Chinese state-backed shipping and logistics company, has a 60 per cent stake in the port, with the remainder in the hands of Volcano, a Peruvian mining company
- "The intention of the port is to pull South American countries towards Peru as a focal point [for trade to Asia], taking advantage of our strategic location
- Cargo will be able to reach China from Peru in 10 days, rather than 45 at present.
- And Brazil is also expected to be a beneficiary of the port, which will provide quicker access to Asian markets for the country's exports.
- The $3.5 billion deep water port, set to start operations late this year, will provide China with a direct gateway to the resource rich region.
- Over the last ten years, Beijing has unseated the U.S. as the largest trade partner for South America, devouring its soy, corn and copper.

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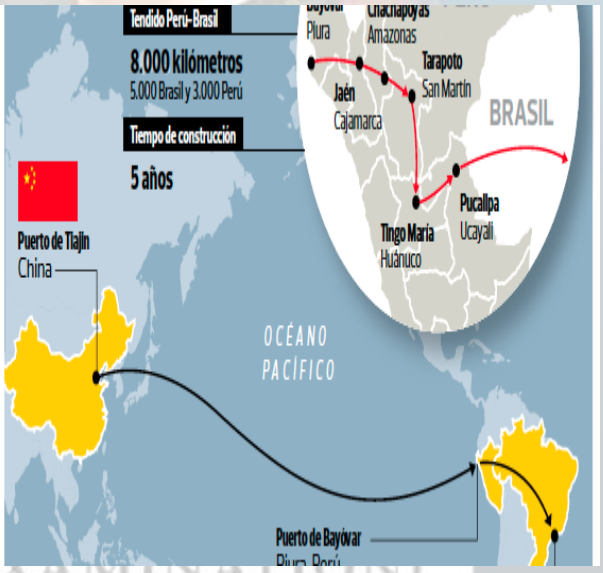

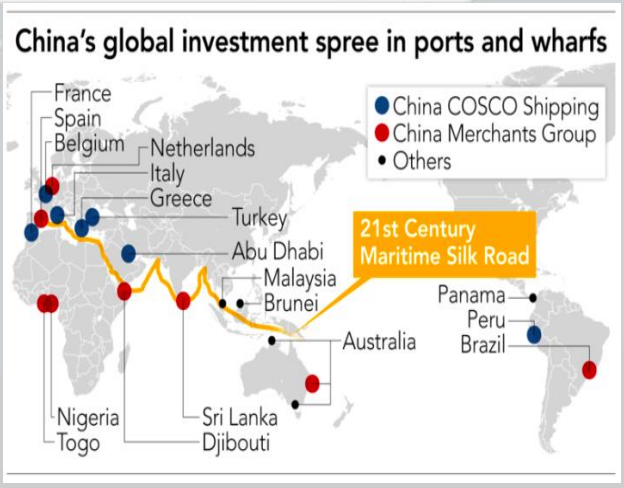

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Yanomami and gold mining

- The Yanomami are the largest relatively isolated tribe in South America.
- They live in the rainforests and mountains of northern Brazil and southern Venezuela.
- The Yanomami Indigenous group are again facing a severe humanitarian crisis blamed on illegal gold miners,
- Like most tribes on the continent, they probably migrated across the Bering Straits between Asia and America some 15,000 years ago, making their way slowly down to South America. Today their total population stands at around 38,000.
- At over 9.6 million hectares, the Yanomami territory in Brazil is twice the size of Switzerland. In Venezuela, the Yanomami live in the 8.2-million-hectare Alto Orinoco Casiquiare Biosphere Reserve. Together, these areas form the largest forested Indigenous territory in the world.
- The Hindu