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What Is XPoSat, India's First Polarimetry Mission

Why In The News?

- The Indian Space Research Organisation Is Collaborating With The Raman Research Institute (RRI), Bengaluru, An Autonomous Research Institute, To Build The **X-Ray Polarimeter Satellite (XPoSat)** That Is Scheduled To Be Launched Later This Year.
- Recently, **ISRO Chairman S Somanath** Urged Indian Scientific Institutions To Identify Talented Students And Take Steps To Motivate Them In Effectively Using The Data Emerging From Science-Based Space Missions. He Mentioned The **XPoSat** In This Regard.

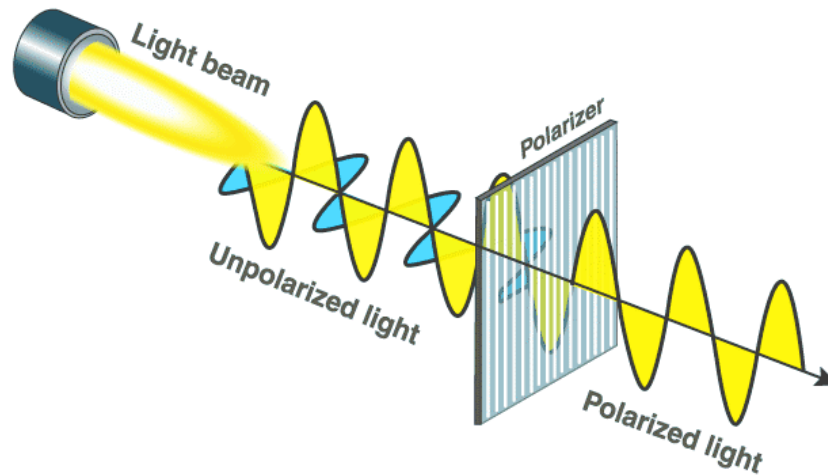


Polarimetry Studies:

- The Field Of Polarimetry Studies The **Measurement Of The Angle Of Rotation Of The Plane Of Polarized Light** (That Is, A Beam Of Light In Which The Vibrations Of The Electromagnetic Waves Are Confined To One Plane) That Results Upon Its **Passage Through Certain Transparent Materials**.
- The Emission Mechanism From **Various Astronomical Sources** Such As **Black Holes, Neutron Stars, Active Galactic Nuclei, Pulsar Wind Nebulae** Etc.

Originates From Complex Physical Processes And Are **Challenging To Understand.**

- Space-Based Observatories Are Also Unable To Give Information About The **Exact Nature Of The Emission From Such Sources.** Therefore, Newer Devices Can Measure Specific Properties.



How Are X-Rays Witnessed In Space?

- **X-Rays Have Much Higher Energy And Much Shorter Wavelengths,** Between 0.03 And 3 Nanometers, So Small That Some X-rays Are No Bigger Than A Single Atom Of Many Elements. The Physical Temperature Of An Object Determines The Wavelength Of The Radiation It Emits.
- The Hotter The Object, The Shorter The Wavelength Of Peak Emission. X-rays Come From Objects That Are Millions Of Degrees Celsius - Such As Pulsars, **Galactic Supernova Remnants, And Black Holes.**

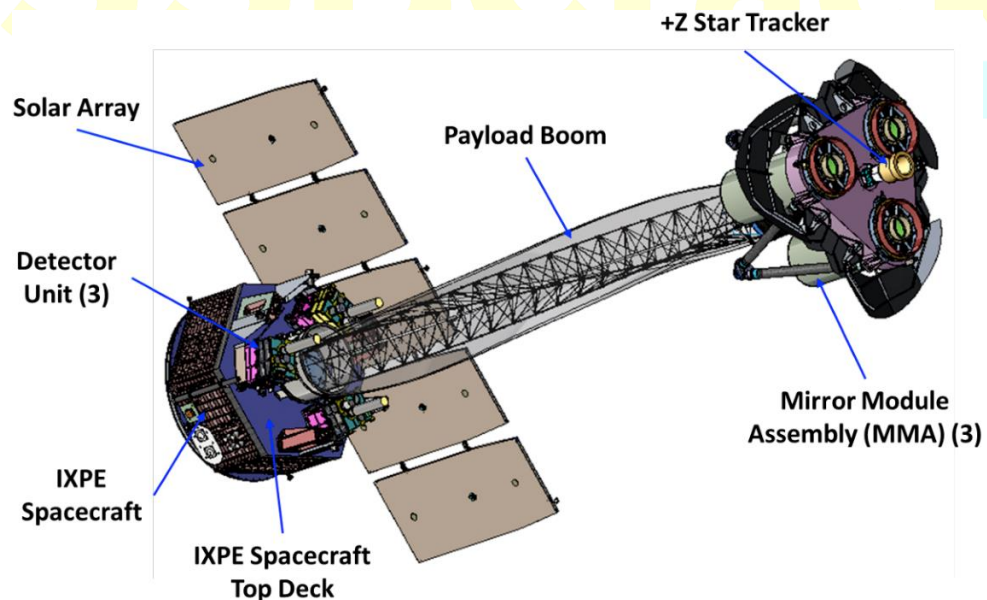


What Is The XPoSat Mission?

- XPoSat Will Study Various Dynamics Of Bright Astronomical X-ray Sources In Extreme Conditions.
- It Has Been Billed As **India's First, And Only The World's Second Polarimetry Mission** That Is Meant To Study Various Dynamics Of Bright Astronomical X-Ray Sources In Extreme Conditions.
- The Other Such Major Mission Is **NASA's Imaging X-Ray Polarimetry Explorer (IXPE)** Which Was Launched In 2021.

NASA's Imaging X-Ray Polarimetry Explorer (IXPE):

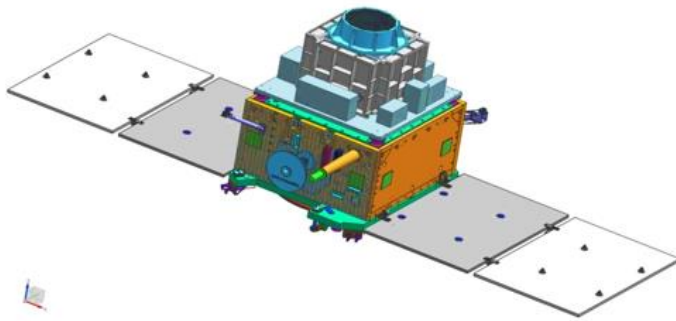
- IXPE Carries 3 State-of-the-art Space Telescopes.
- Each Of The Three Identical Telescopes Hosts One Light-weight X-ray Mirror And One Detector Unit.
- These Will Help Observe Polarized X-rays From Neutron Stars And Supermassive Black Holes.
- By Measuring The Polarization Of These X-rays, We Can Study Where The Light Came From And Understand The Geometry And Inner Workings Of The Light Source.



What Are XPoSat's Payloads?

- The Spacecraft Will Carry **Two Scientific Payloads In A Low Earth Orbit**. The **Primary Payload POLIX** (Polarimeter Instrument In X-rays) Will Measure The Polarimetry Parameters (Degree And Angle Of Polarization).

- POLIX Is Expected To Observe About **40 Bright Astronomical Sources Of Different Categories** During The Planned Lifetime Of The XPoSat Mission Of **About 5 Years**. This Is The First Payload In The Medium X-ray Energy Band Dedicated For Polarimetry Measurements.
- The **XSPECT (X-ray Spectroscopy And Timing) Payload** Will Give Spectroscopic Information (On How Light Is Absorbed And Emitted By Objects). It Would Observe Several Types Of Sources, Such As X-ray Pulsars, Blackhole Binaries, Low-magnetic Field Neutron Star, Etc.



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