Space Debris

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Why is in news? ISRO rocket debris and rules governing space junk

A large object found on the shores of western Australia a couple of weeks ago has been confirmed to be the debris of an Indian Space Research Organisation (ISRO) rocket, the Australian Space Agency said. ISRO has agreed with the assessment, saying the debris could be from one of its Polar Satellite Launch Vehicle (PSLV) rockets.

What is Space Debris?

Space debris refers to **man-made objects in Earth's orbit** that **no longer serve a useful purpose**. This includes defunct satellites, spent rocket stages, and fragments of debris from collisions or other events.

Threats due to space debris:

The **threat to life and property** from falling space junk is not negligible.

Even when **falling into the oceans**, which is more likely since 70 per cent of the earth’s surface is ocean, large objects can be a threat to marine life, and a source of pollution.

However, there are **no recorded incidents of these falling objects causing any appreciable damage** anywhere on the earth.

When they have dropped over land, so far, it has been over uninhabited areas.

However, what is **worrying is the fact** that **these junks did not by design have a system to ensure it fell in a designated place** on Earth.

Regulatory framework:

Convention on International Liability for Damage Caused by Space Objects:

Most space-faring countries are signatories to the Convention on International Liability for Damage Caused by Space Objects.

The **Liability Convention** deals mainly with damage caused by space objects to other space assets, but it also applies to damage caused by falling objects on earth.

The Convention **makes the launching country absolutely liable to pay compensation** for any damage caused by its space object on the earth or to a flight in air.

The Outer Space Treaty:

It was adopted by the United Nations in **1967.**

It primarily addresses the **peaceful use of outer space** and prohibits the placement of nuclear weapons in space.

It also contains **provisions related to space debris** and the return of space objects to Earth.

Space Debris Mitigation Guidelines of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS):

While the Outer Space Treaty establishes important principles, it lacks specific regulations and mechanisms for dealing with space debris directly.

Since the treaty was adopted in 1967, other international agreements and guidelines have been developed to address space debris mitigation and the safe disposal of space objects.

This includes the **non-binding Debris Mitigation Guidelines** (drafted in 2007).

Challenges in Space Debris Removal:

Unfortunately, there is an **explosion risk** in removing more dangerous objects.

The **issue of property rights**; one can't grab a satellite or rocket that belongs to another country without their permission.

It is **hard to eliminate space debris** as there are **huge chances of creating more junk** while doing it.

Most satellite operators require hours or days to plan and execute a collision-avoidance manoeuvre.

ISRO's Efforts to Mitigate Space Debris:

Unique Scientific Experiment: ISRO successfully conducted a dedicated commercial mission, placing seven Singaporean satellites into intended orbits on board a PSLV rocket.

Orbit-lowering Experiment: During this mission, ISRO performed a unique experiment, lowering the fourth stage of the rocket into a 300 km high orbit after placing customer satellites at an altitude of 536 km to mitigate space debris concerns.

Reducing Debris Duration: Thanks to the orbit-lowering experiment, the duration of the stage in space has been significantly reduced to "two months."

Objectives of the Experiment: The experiment aims to address space debris mitigation problems and preserve valuable orbits for future satellite deployments.

Way Forward:

Spacefaring nations must minimize the risks to people and property on Earth of re-entries of space objects and maximize transparency regarding those operations.

It is critical that all spacefaring nations and commercial entities act responsibly and transparently in space to ensure the safety, stability, security and long-term sustainability of outer space activities.

The high-accuracy assessment and prediction tools are essential for reducing risk to current systems and future launches.