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Chinese Rocket crashes and risk of uncontrolled entry

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What's in News?

The debris from a large Chinese rocket – the Long March 5B — crashed to earth over the Pacific and the Indian oceans

Background:

The Long March 5B blasted off on July 24, 2022 to deliver a laboratory module to the new Chinese space station under construction in orbit, marking the third flight of China's most powerful rocket since its maiden launch in 2020.

Uncontrolled Re -Entry:

Generally, the core or first stage of a rocket is made up of heavy pieces that usually don't reach orbit after liftoff, and fall back safely along a near-precise projected trajectory.

If they do enter an orbit, then a costly de-orbit manoeuvre is required for a steered, controlled return using engine burn.

Without a de-orbit manoeuvre, the orbital core stage makes an uncontrolled fall.

Gigantic remnants from China's Long March 5B rockets' core stage are known to make such fiery, out-of-control descents back to earth.

The reason is a difference in the mission sequence where the core stage reaches orbit, and then crashes back.

Most nations' rockets, separate the launcher from the payload before leaving the atmosphere.

An extra engine then gives the payload a final boost. But China's 5B series does not use a second engine and pushes right into orbit

Difficulties in Tracking Uncontrolled Re-entry:

The variables involved make it difficult to precisely track the re-entry time and drop zone of rocket debris in uncontrolled descents.

The factors that make this prediction extremely challenging include atmospheric drag, variations in solar activity, angle and rotational variation of the object among others.

A miscalculation of even a minute in re-entry time could result in the final resting place of the debris changing by hundreds of kilometres.

Convention related:

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The Space Liability Convention of 1972 defines responsibility in case a space object causes harm. The treaty says that “a launching State shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the earth or to aircraft, and liable for damage due to its faults in space. The Convention also provides for procedures for the settlement of claims for damages.”

However, there is no law against space junk crashing back to earth.

Criticism:

The uncontrolled return of rocket's core stage has raised questions about responsibility for space junk.

There have previously been calls by NASA for the Chinese space agency to design rockets to disintegrate into smaller pieces upon re-entry, as is the international norm.

China also faced criticism after using a missile to destroy one of its defunct weather satellites in 2007, creating a field of debris that other governments said might jeopardise other satellites.

The current incident also raised questions regarding the safety and security of human population on the earth

Kessler syndrome:

This is an idea proposed by NASA scientist Donald Kessler in 1978. He said that if there was too much space junk in orbit, it could result in a chain reaction where more and more objects collide and create new space junk in the process, to the point where Earth's orbit became unusable.

Early Instances:

In May 2020, Long March 5B debris had apparently fallen in Ivory Coast; and a year later in May 2021, remains of a Chinese rocket had dived uncontrolled into the Indian Ocean near Maldives.

Chinese Space Station:

The Tiangong space station or "Heavenly Palace" is a Chinese space station being built in low Earth orbit between 340 and 450 kilometers above the earth. (Low Earth Orbit refers to an altitude of up to 2000 kilometres.)

It is part of China Manned Space Program and is the country's first long-term space station.

China is only the third country in history to have put both astronauts into space and to build a space station, after the Russia and the US.

China hopes Tiangong will replace the International Space Station (ISS), which is due to be decommissioned in 2031

India's initiative for space debris:

In 2019, India performed **Mission Shakti**, an anti-satellite missile test, from the Dr. A P J Abdul Kalam Island launch complex, making space debris a major topic of discussion. India conducted the test by destroying a defunct Indian satellite orbiting at 300 kilometres. The incident made headlines since India became only the fourth country in the world to possess such technology, after the United States, China, and Russia.

The Indian Space Research Organisation (ISRO) is building up its space debris tracking radar with a range of 1,500 km and an optical telescope will be inducted as part of establishing an effective surveillance and tracking network under the **Network for Space Objects Tracking and Analysis (NETRA) project**.