IN-SPACe Re-entry Guidelines

Mains: *GS III – Science and Technology*

Why in News?

Recently, the Indian National Space Promotion and Authorisation Centre (IN-SPACe) released the 'Authorisation for Undertaking Planned Re-entry of Space Objects' guidelines.

What is the background?

- **Issue of debris –** Objects in orbit or the upper atmosphere, such as **spent rocket stages, dead satellites, and orbital debris**, naturally fall back to Earth due to gravity.
- Most of these re-entries are **uncontrolled**, with smaller objects burning up in the atmosphere, while larger or heat-resistant components may survive and reach the Earth's surface.
- **Need for the guidelines** – Rapid growth of India's commercial space ecosystem.
- Increasing number of satellite launches.
- Rising risks from uncontrolled space debris.
- Need to safeguard public safety, aviation and maritime operations.
- India's obligations under international space law.
- Hence the guidelines specifically deal with **planned re-entry**.

What is Planned Re-entry?

- **Planned Re-entry** – It refers to the controlled return of a space object into Earth's atmosphere by managing its landing location, trajectory, or timing using suitable technical measures.
- The guidelines distinguish it from:
- **Unplanned Re-entry –** Natural orbital decay without active control.
- **Post-Mission Disposal (PMD) –** End-of-life disposal measures to minimize space debris and ensure long-term sustainability of outer space.

IN-SPACe

• **IN-SPACE** – The **Indian National Space Promotion and Authorisation Centre.**
• It is a single-window, autonomous government agency under the **Department of Space (DOS).**
• It promotes, permits, and oversees space activities by private companies and non-governmental entities in India.
• Headquartered in Bopal, Ahmedabad, it acts as a bridge between **ISRO and the private sector.**
• **Core Functions:**
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- **Promote and Enable –** Supports startups and private space firms in building rockets, satellites, and offering space services.
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- **Authorise and supervise –** Grants official clearance for private space launches, operations, and spacecraft re-entry guidelines.
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- **Share Infrastructure –** Allows private entities to use testing facilities, launch infrastructure, and premises belonging to DOS and ISRO

What are the major features of the guidelines?

- **Mandatory IN-SPACe Authorisation –** Every **planned re-entry** undertaken by an Indian entity, whether inside or outside Indian territory, requires prior authorisation from IN-SPACe.
- Foreign operators can undertake re-entry over Indian territory only through an incorporated Indian entity responsible for regulatory compliance.
- **Exception for Natural Burn-up –** Separate re-entry authorisation is **not required** when:
    - The spacecraft naturally decays from orbit.
    - It completely burns up during atmospheric entry.
    - The post-mission disposal plan already addresses debris mitigation.
- Such plans, however, must be disclosed in the Space Debris Mitigation Plan during authorisation.
- **Advance Planning –** Applicants must, declare re-entry plans during satellite authorisation itself, submit detailed technical information, provide survivability studies, submit casualty risk assessments, furnish trajectory analysis.
- Separate approval is revalidated approximately **three months before** the planned re-entry.
- Where re-entry is planned after launch, applications must be submitted at least **six months in advance**.
- **Public Safety Threshold –** The guidelines prescribe a strict quantitative safety benchmark.
- The **Expected Casualty (Ec)** due to re-entry must remain below **1 in 10,000**
- Applicants must demonstrate compliance through scientific risk assessments.
- **Comprehensive Risk Assessment –** Applicants are required to submit mission objectives, re-entry trajectory, event timeline, failure scenarios, fragmentation pattern, ballistic coefficients, reliability analysis, de-orbit strategy, impact zones and danger zones.
- IN-SPACe may require changes in mission planning if safety standards are not

satisfied.

- **NOTAM and Danger Zone Notification –** Before every re-entry mission, Applicants must obtain an **Advisory Note** from IN-SPACe.
- Relevant aviation and maritime authorities must issue **NOTAM/NAVAREA warnings**.
- Notifications should generally begin around **45 days before** the scheduled re-entry.
- Revised notifications are mandatory if schedules or danger zones change.
- **Liability and Insurance –** Applicants must bear full responsibility for third-party damages.
- Protect the Government of India from liabilities arising under the **Liability Convention (1972)**.
- Obtain adequate insurance, including mandatory third-party liability insurance where prescribed.
- Authorisation is contingent upon satisfying insurance and notification requirements.
- **International Coordination –** Where the planned re-entry affects another country's territory or Exclusive Economic Zone (EEZ), applicants must secure prior clearance from the concerned nation before authorisation.

What is the significance of the guidelines?

- **Strengthens India's Space Governance –** Establishes a predictable regulatory framework, Enhances investor confidence and Supports private-sector participation.
- **Improves Public Safety –** Minimises risks to life and property.
- Protects aviation and maritime navigation and Enables scientifically managed re-entry operations.
- **Promotes Sustainable Space Activities –** Encourages responsible end-of-life disposal.
- Supports mitigation of space debris and Contributes to long-term sustainability of outer space.
- **Enhances International Credibility –** Aligns domestic practices with international obligations.

- Demonstrates India's commitment to responsible space operations.
- **Supports Commercial Space Ecosystem –** Provides procedural certainty for startups and private operators.
- Facilitates growth under the Indian Space Policy and regulatory reforms.

What lies ahead?

- The **IN-SPACe 'Authorisation for Undertaking Planned Re-entry of Space Objects'** guidelines establish a comprehensive framework governing the planned re-entry of space objects.
- The guidelines strengthen India's regulatory framework for space activities while supporting emerging capabilities such as **Gaganyaan**, reusable launch vehicles, and commercial space missions.

Reference

The Hindu| IN-Space Re-Entry Guidelines

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