

India's Dhvani Hypersonic Missile

India is on the verge of a historic defence breakthrough with the upcoming test of **Dhvani**, a next-generation **hypersonic missile**. This will place India among a select group of nations with hypersonic strike capability, significantly boosting its deterrence and strategic posture.

1. Background & Context

- **Hypersonic weapons** = Missiles that can travel at speeds **greater than Mach 5** (five times the speed of sound).
- Countries with developed hypersonic tech: **USA, Russia, China** (India preparing to join).
- India has already tested **HSTDV (Hypersonic Technology Demonstrator Vehicle)**, laying the foundation for Dhvani.
- Dhvani is expected to undergo testing **by end of 2025** and possible **deployment by 2029-30**.

2. Technical Features of Dhvani

- **Type:** Hypersonic Glide Vehicle (HGV).
- **Design:**
 - Length: ~9 metres | Width: ~2.5 metres.
 - **Blended wing-body design** for aerodynamic efficiency.
- **Heat Protection:**
 - Uses **ultra-high-temperature ceramic composites**.
 - Survives **2,000°C-3,000°C** during atmospheric re-entry.
- **Stealth:** Angled surfaces reduce radar visibility → **harder to detect/intercept**.

3. Strategic Advantages

- **Speed:** Travels faster than **Mach 5**.
- **Manoeuvrability:**
 - Can perform sharp, unpredictable turns.

- Avoids interception by missile defence systems.
- **Range:** Estimated **6,000 - 10,000 km** (double the Agni-5's reach).
- **Versatility:** Can carry conventional as well as **nuclear warheads**.

4. Impact on Regional Security

- **Pakistan:**
 - Relies mainly on **conventional ballistic missiles**.
 - Dhvani creates a major technological gap in India's favour.
- **China:**
 - Already fields hypersonic systems like **DF-ZF**.
 - India's entry reduces the asymmetry with Beijing.
- **South Asia Security:**
 - Strengthens **deterrence**.
 - Enhances **regional stability** by discouraging aggression.

5. Global Context

- **Russia:** Avangard Hypersonic Glide Vehicle.
- **China:** DF-ZF (operational).
- **USA:** Developing **Dark Eagle** & **HACM**.
- **India:** Achieving hypersonic tech **indigenously**, boosting **Atmanirbhar Bharat (self-reliance)** in defence.

6. Strategic Significance for India

- **Defence Posture:** Counters advanced missile defence systems.
- **Power Projection:** Extends India's strike capability far beyond South Asia.
- **Geopolitics:** Enhances India's credibility in global security forums.
- **Technology Leadership:** Indigenous R&D makes India a leader among

emerging powers.

7. Future Prospects

- **Operationalisation:** By 2029-30.
- **Expansion:** Development of hypersonic variants for:
 - **Anti-ship warfare.**
 - **Precision strikes.**
 - **Nuclear deterrence.**
- **Strategic Messaging:** Sends a signal of India's technological progress and defence readiness to global powers.

8. UPSC Relevance

- **GS Paper II (International Relations)** → India's regional security dynamics.
- **GS Paper III (Security & Defence Technology)** → Defence R&D, Atmanirbhar Bharat.
- **Essay** → "Hypersonic technology and future of warfare".

□ In Summary:

Dhvani represents a **transformational leap** in India's defence capabilities, combining **speed, stealth, manoeuvrability, and precision**. It bridges the technological gap with global powers and strengthens India's security posture in an evolving geopolitical environment.

FAQs on Dhvani - India's Hypersonic Missile

Q1. What is Dhvani missile?

Dhvani is India's upcoming **hypersonic glide vehicle (HGV)** missile capable of traveling faster than **Mach 5** with high manoeuvrability and stealth.

Q2. When is Dhvani expected to be tested and deployed?

- First test: **By end of 2025**
- Likely operational deployment: **2029-30**

Q3. What makes hypersonic missiles like Dhvani significant?

They combine **extreme speed, unpredictable manoeuvres, and stealth**, making them nearly impossible for existing missile defence systems to intercept.

Q4. What is the estimated range of Dhvani?

Between **6,000 km and 10,000 km**, nearly double that of **Agni-5**.

Q5. How does Dhvani strengthen India's security?

- Creates a **technological edge** over Pakistan.
 - Reduces the gap with China's hypersonic programme.
 - Enhances **strategic deterrence** and **regional stability**.
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Q6. What is the global context of hypersonic weapons?

- **Russia**: Avangard HGV (operational).
 - **China**: DF-ZF HGV (operational).
 - **USA**: Dark Eagle, HACM (under development).
 - **India**: Dhvani (indigenous, upcoming).
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Q7. What materials are used to withstand extreme heat in Dhvani?

It uses **ultra-high-temperature ceramic composites** that can survive **2,000°C-3,000°C** during re-entry.

Q8. What are the strategic roles of Dhvani?

- Nuclear deterrence.
 - Anti-ship capability.
 - Long-range precision strike.
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Q9. Why is Dhvani important for UPSC preparation?

It is relevant for:

- **GS Paper II** – International Relations (India-China-Pakistan security dynamics).
 - **GS Paper III** – Science & Technology, Defence, Atmanirbhar Bharat.
 - **Essay** – “Future of Warfare” / “Indigenous Defence Technology”.
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Q10. How does Dhvani showcase India's self-reliance?

The missile is **largely indigenous**, developed after HSTDV trials, marking a milestone in India's journey towards **Atmanirbhar Bharat in defence technology**.

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