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Agni (ICBM) vs China's Hypersonic missile



Context: *India successfully test-fires Agni-5 missile: Agni 5 is India's long-range surface-to-surface ballistic missile, which can hit a target with a precision that is 5,000 km away.*

Details:

- **Agni-5 ballistic missile, with 5,000-km range, successfully tested in India:** Though inducted over three years ago, India's foremost Agni 5 ballistic missile was tested for the first time by the user agency, the Strategic Forces Command.
- The nuclear-capable missile is India's contender for the Intercontinental Ballistic Missile (ICBM) with a range of 5,000 km.
- The latest test comes at a time when the relations between India and China are at a nadir, and after reports that China had tested a new hypersonic missile in August.

What is the Agni 5 missile?

- Agni 5 is India's long-range surface-to-surface ballistic missile, which can hit a target with a precision that is 5,000 km away.
- This range puts almost the entire China within the missile's target range.
- Though officially an ICBM needs a missile to have a range of at least 5,500 km, the Agni 5 is India's closest contender for an ICBM, as it can reach countries across other continents, including parts of Africa and Europe.
- Though the government has claimed that it has a maximum range of around 5,000 km, several reports suggest that it can hit targets as distant as 8,000 km.
- The nuclear capable missile can carry a warhead of around 1,500 kg and has a launch weight of 50,000 kg, making it one of the most potent missiles in the country.

What is the history of Agni missiles?

- India began testing the Agni series of missiles in 1989 with the first test for Agni 1, an Intermediate Range Ballistic Missile, with a range of around 1,000 km.
- At that time only the US, the erstwhile Soviet Union, China, France and Israel, had IRBM technology.
- Since then, Defence Research and Development Organisation (DRDO) labs have continued to work on it, bringing the latest available Agni 5 to its present capability.
- In addition to the IRBM-capable nations, only North Korea and the UK have ICBM technology at the moment.

Why is it important for India?

- The government said in a statement, after the test, which was the first to be done independently by the user agency—the Strategic Force Command, which is a joint tri-services command, responsible for



India's nuclear weapons—that the test's success “is in line with India's stated policy to have ‘credible minimum deterrence’ that underpins the commitment to ‘No First Use’.”

- What makes Agni 5 agile is that it is a “canisterised” missile. It means that the missile can be launched from road and rail platforms, making it easier for it to be deployed and launched at a quicker pace. The canisterisation, which is an encapsulated system in which the missile is stored and launched from, also gives the missile a longer shelf life, protecting it from the harsher climatic conditions.
- While India is among the handful of nations with (arguably) ICBM capability, the next generation of the missile, Agni VI, under development, is expected to have a range of around 8,000 km.
- Regarding hypersonic missile technology (tested by China recently), India is among a select few serious contenders working towards it, even though it is behind China, the US and Russia.

What is a Hypersonic Glide Vehicle that China tested?

- About 10 days ago, *The Financial Times* reported that China had in August tested a new hypersonic missile, which is nuclear capable, which circled the earth before moving towards its target, missing it by two dozen miles.
- While China denied the report claiming it to be a “spacecraft” and not a missile, it demonstrated the capability in hypersonic glide vehicle technology, which raises strategic concerns not just for its neighbours like India, but even its rivals like the US.
- A hypersonic glide vehicle is launched by a rocket which moves in the Earth's lower orbit, at more than five times to 25 times the speed of sound. The vehicle is capable of carrying nuclear payloads, which gives the launching country the strategic capacity to attack almost any target across the world.
- *The Financial Times* reported that the test by China had caught the US intelligence agencies by surprise.
- Though many of the targets that a hypersonic missile can hit are already reachable through the ICBMs, China's almost successful test has given rise to a lot of anxiety to military powers world over.

How is it different from an ICBM?

- Intercontinental Ballistic Missiles, which have a range of over 5,500 km, have existed since around World War II. These missiles, meant to carry nuclear payloads, have the capacity to carry several warheads.
- While an ICBM follows a parabolic trajectory, which mean it goes up and then comes down in a high arc—like when you throw up a ball, only much higher, further and faster—a hypersonic glide vehicle orbits the earth at a lower height, and is manoeuvrable. The ability to change track or target, mid-trajectory, along with the speed, makes them tougher to track and defend against.
- According to a report in 2017 by Rand Corporation, the global policy think tank specialising in defence, hypersonic missiles can travel approximately at 5,000 to 25,000 km per hour, which makes them six to over 25 times faster than modern commercial aircraft. They fly at the heights of a few tens and 100 km.
- The mix of the high altitude, high speed and the ability to be manoeuvred makes them, Rand said, “both challenging to the best missile defenses now envisioned and, until the last minutes of flight, unpredictable as to their targets”.
- According to the report hypersonic missile's capability gives them both offensive and defensive advantages. The manoeuvrability of such missiles can potentially provide them to use “in-flight updates to attack a different target than originally planned” and the “ability to fly at unpredictable trajectories, these missiles will hold extremely large areas at risk throughout much of their flights”.
- But, according to Joshua Pollack, who edits *The Nonproliferation Review*, ICBM would remain the preferred choice, because they are more efficient. He called the hypersonic glide vehicle “exotic”.

Which countries have hypersonic technology?

- Apart from China, the US and Russia are working on the technology. While this would be China's first such test for the capability, Pollack stated on Twitter that the “US military often flies an unarmed orbiter-glider, the X-37B ‘space plane’”.



- According to the Rand Corporation's 2017 report, France and India "are the most committed" about gaining the capability, and "both draw to some extent on cooperation with Russia". It noted that Australia, Japan, and European entities are also working towards it.
- The report stated that hypersonic technology has a dual-use character, as it can be used for non-military purposes like space launch and spacecraft retrieval, but "once a nation acquires hypersonic technology, its intentions can change".
- "The current situation, with hypersonic research openly disseminated and widely spread among governments, industries, and universities, presents challenges for nonproliferation," it said.

What are the main concerns about China developing such technology?

- America's topmost military officer Gen Mark Milley, Chairman of the Joint Chiefs of Staff stopped just short of comparing it to Russia taking the lead in space technology with the launch of the Sputnik satellite in 1957, hinting that China might have left the US behind in hypersonic capability.
- *Bloomberg* reported Milley saying, on Wednesday, "What we saw was a very significant event of a test of a hypersonic weapon system. And it is very concerning... I don't know if it's quite a Sputnik moment, but I think it's very close to that. It has all of our attention." According to *Bloomberg*, Milley continued saying that China is "expanding rapidly—in space, in cyber and then in the traditional domains of land, sea and air".
- China developing hypersonic missile capability would mean that it, potentially, would have weapons to overwhelm America's aerial defence systems. Though China already has ICBM missiles to attack the US, the unpredictability of hypersonic glide vehicles would give them an advantage. (Though Pollack mentioned on Twitter that "none of the weapons are good for surprise attacks against the US, which has exceptional detection capabilities" and though ICBMs are easier to predict, even hypersonic vehicles "will be detected at launch and tracked in flight".)
- A major concern for the US is that all its defences are aimed at protecting any threats from north and west, and it remains vulnerable to a threat coming from the south, as the hypersonic missile can potentially fly over Antarctica.
- But globally the main concern is that once the technology is successfully established by even one country, it would lead to a larger race for the capability and its eventual proliferation. Rand noted in its report that "major powers are also threatened by the proliferation of hypersonic missiles and the crises they can exacerbate. The more that hypersonic missiles proliferate into the hands of additional nations, the more paths develop for crises".
- It also stated that there are "strategic considerations" for limiting the technology's proliferation. "Hypersonic missiles do not necessarily increase the vulnerability of nations that do not have missile defenses; they are already vulnerable to current types of missiles.
- However, an increasing number of nations are acquiring missile defenses that could be penetrated by hypersonic missiles. A hypersonic attack could occur with very little warning time; this factor and the unpredictability of the targets of a hypersonic attack compress the timeline for response by the party being attacked."

What kind of long-range ballistic capabilities does China have?

- The Pentagon said in a report last year that for land-based conventional ballistic and cruise missiles, China may have either achieved parity, or may have even exceeded the US. It noted that China has over 1,250 ground-launched ballistic missiles and ground-launched cruise missiles with ranges between 500 and 5,500 kilometers, while the US has one type of conventional GLBM with a range of 70 to 300 kilometers and no GLCM.
- But when it comes to long-range ballistic missiles, China has created a People's Liberation Army Rocket Force (PLARF), which takes care of China's strategic land-based nuclear and conventional missile forces.



- The Pentagon said in its report that China is “developing new intercontinental ballistic missiles (ICBMs) that will significantly improve its nuclear-capable missile forces” and the number of warheads that China’s land-based ICBMs, which are capable of threatening the US “is expected to grow to roughly 200 in the next five years”.
- It is “expanding its inventory of the multi-role DF-26, a mobile, ground-launched intermediate-range ballistic missile system capable of rapidly swapping conventional and nuclear warheads”.
- China’s robust ground-based conventional missile forces, the Pentagon report said, “complement the growing size and capabilities of its air- and sea-based precision strike capabilities”.
- According to the report, China’s DF-26 has a range of around 4,000 km, DF-31 can reach over 11,200 km while DF-41 can hit targets within a range of 12,000 km.

