The Arms Race Towards Hypersonic Weapons

Syllabus-GS 2: *International Relations*;

GS 3: *Science & Technology, Emerging technologies*

What are hypersonic weapons?

- They are **manoeuvrable weapons that can fly at speeds in excess of Mach 5**, five times the speed of sound. The speed of sound is Mach 1, and speeds up to Mach 5 are supersonic and speeds above Mach 5 are hypersonic.
- **Ballistic missiles**, though much faster, **follow a fixed trajectory and travel outside the atmosphere to re-enter only near impact**. On the contrary, hypersonic weapons travel within the atmosphere and **can manoeuvre midway** which combined with their high speeds makes their detection and interception extremely difficult. This means that radars and air defences cannot detect them till they are very close and little time to react.
- There are two classes of hypersonic weapons, **hypersonic glide vehicles (HGV)** and **hypersonic cruise missiles (HCM)**. HGVs are launched from a rocket before gliding to target while HCMs are powered by high-speed, air-breathing engines, or scramjets, after acquiring their target.
- Hypersonic missiles are a new class of threat because they are capable both of manoeuvring and of flying faster than 5,000 kms per hour, which would enable such missiles to penetrate most missile defences and to further compress the timelines for response by a nation under attack, **says a2017 book Hypersonic Missile Non-proliferation published by the RAND Corporation.**

Status Of Different Countries w.r.t. Hypersonic Technology

- **China has** tested a **nuclear-capable hypersonic missile**.
- **Russia** successfully test launched a **Tsirkon hypersonic cruise missile** from a **submarine** deployed in the **Barents Sea**. U.S. has active hypersonic development programmes but it is lagging behind China and Russia because most U.S. hypersonic weapons, in contrast to those in Russia and China, are not being designed for use with a nuclear warhead.A number of other countries - including Australia, India, France, Germany, and Japan—are also developing hypersonic weapons technology.
- India is developing an indigenous, dual-capable hypersonic cruise missile as part of its **Hypersonic Technology Demonstrator Vehicle (HSTDV)** program and successfully tested a Mach scramjet in June 2019. In a scramjet engine, air goes inside the engine at supersonic speed and comes out at hypersonic speeds.

The Barents Sea

It is a **marginal sea** of the **Arctic Ocean**, located off the northern coasts of Norway and Russia and divided between Norwegian and Russian territorial waters.

Known among Russians in the Middle Ages as the Murman Sea, the current name of the sea is after the historical Dutch navigator Willem Barentsz.

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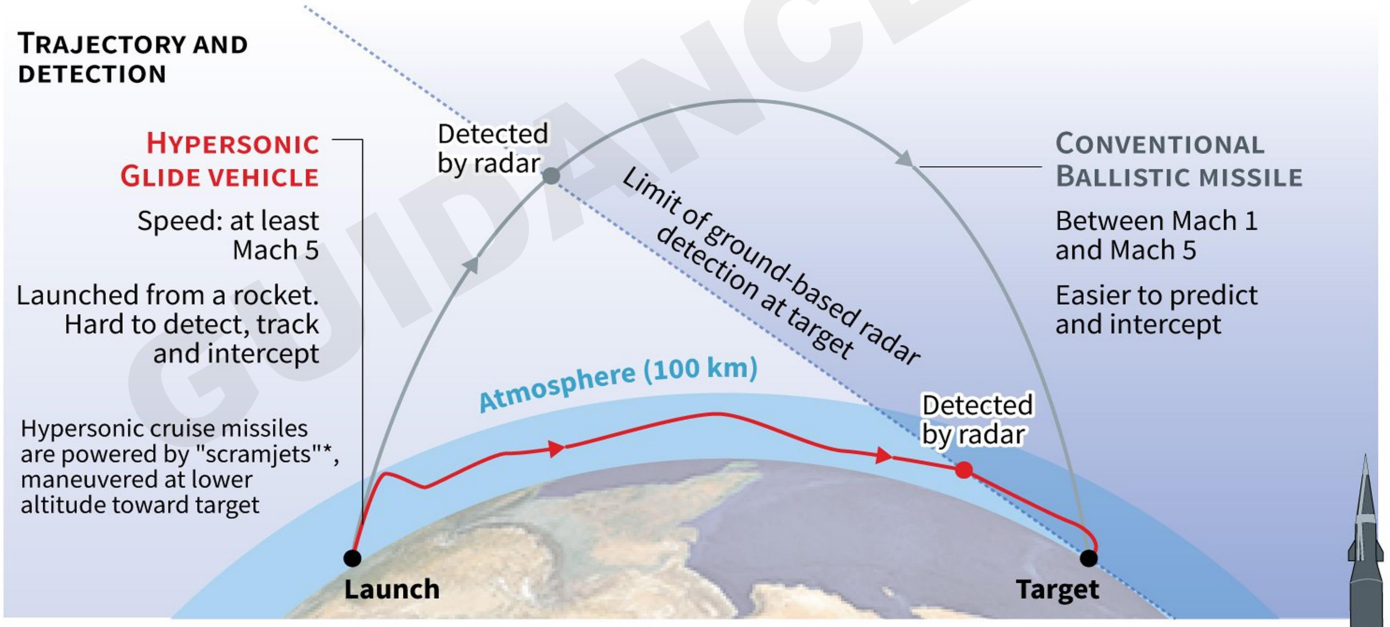
What are the impacts of hypersonic missile?

- Hypersonic missiles offer a number of advantages over subsonic and supersonic weapons, particularly with regard to the prosecution of **time-critical targets** (for example, mobile ballistic missile launchers), where the additional speed of a hypersonic weapon is valuable. It can also overcome the defences of heavily-defended targets (such as an aircraft carrier).
- The development and deployment of hypersonic weapon systems will provide states with **significantly enhanced strike capabilities** and potentially, **the means to coerce**. Such a proliferation of hypersonic capabilities to regional states could also be **destabilising, upsetting local balances of power**. However, it could **also strengthen deterrence**.
- Moreover, the development of **submarine-launched** hypersonic missiles would **raise the potential threat – real or perceived** – of ***attempted decapitation strikes***, utilising the combination of the inherent stealth of a nuclear-powered submarine and the speed of a hypersonic missile.

Hypersonic weapons

Considered the next generation of arms with conventional or nuclear warheads that are hard to detect and can travel more than five times the speed of sound



GLOBAL HYPERSONIC WEAPONS PROGRAMMES

ADVANCED (latest developments)

- Russia had completed two launches of hypersonic cruise missiles, including one from submerged submarine in October
- US successfully tested a scramjet-powered hypersonic in September
- China launched a nuclear-capable hypersonic missile but missed target in August

DEVELOPING, COUNTRIES INCLUDE

- Australia
- India
- France
- Japan
- Germany

BASIC RESEARCH

- Iran
- South Korea
- Israel

- North Korea claimed to have tested a hypersonic gliding missile (Hwasong-8) in September

Sources: Congressional Research Service/MDAA/UCS/Stratfor/KCNA/FT

*Supersonic combustion ramjets

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Can hypersonic missile be stopped?

- Hypersonic missiles are so valuable because there is **currently no operational or reliable method of intercepting them**. However, as defence technology progresses countermeasures will emerge. **Technologies such as directed energy weapons, particle beams** and **other non-kinetic weapons will be likely candidates for an effective defence against hypersonic missiles**.
- Although hypersonic threats would pose a significant challenge to current surface-to-air and air-to-air missile systems, such systems would, particularly in the conventional precision strike role, **require a robust intelligence, surveillance, target acquisition and reconnaissance (ISTAR) network.**
- Targeting the supporting network kinetically and through means such as cyber and electronic attacks could significantly degrade the operational effectiveness of long-range hypersonic weapons. In addition, counterforce operations targeting the launch platforms 'left-of-launch' can be undertaken, although, this may not be possible in the case of long-range systems. In the mid-to-long term, directed energy weapons and electromagnetic rail guns, as well as enhanced performance missile interceptors, could provide defence against hypersonic threats.
- Another countermeasure has been proposed by **the Missile Defense Agency**. A network of space-based satellites and sensors would theoretically be able to track hypersonic glide vehicles globally. This would be a huge first step in **hypersonic missile defence**.