

Directed Energy Weapons (DEWs) and Hypersonic Weapons

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Context- Recently, India's Air Chief Marshal emphasized the need to accelerate the development of **Directed Energy Weapons (DEW)** and **Hypersonic Weapons** and integrate them into airborne platforms to achieve the desired range and accuracy.

About Directed Energy Weapons (DEWs) and Hypersonic Weapons

- In layman's speech, a coordinated energy weapon harms or obliterates its objective utilizing centered energy through lasers, microwaves or molecule radiates.
 - Examples include drone defense systems, laser weapons, and microwave weapons.
- A hypersonic weapon can hit its target five to ten times faster than the speed of sound (Mach 5 to Mach 10).
- **Comparing DEWs to conventional munitions:**
 - High precision, low cost per shot, logistical advantages, and low detectability characterize DEWs, particularly lasers.
 - They do so at the speed of light—roughly 300,000 kilometers per second—and their beams are unaffected by atmospheric drag or gravity's restraints.
 - By altering the type and amount of energy delivered to targets, their effects can be tailored.

- **Disadvantages:**
 - **Restricted Range:** Most DEWs have restricted range, and their adequacy diminishes quickly as the distance between the objective and the weapon increments
 - **Significant expense:** DEWs and hypersonic weapons can be costly to create and fabricate, and the expense may not be legitimate by their adequacy in certain circumstances.
 - **Countermeasures:** Utilizing reflective materials or other countermeasures, which may reduce their effectiveness, can be used to combat DEWs.
 - **Rivalry in the Arms Race:** An arms race ensues as other nations attempt to develop their own hypersonic weapons in response to one nation's development of DEWs and hypersonic weapons. As a result, tensions and instability can rise.
- **Relevance to India:**
 - India will be able to produce cutting-edge platforms, weapons, sensors, and networks necessary to fight and win a future war thanks to the application of these technologies in the aerospace industry, which has the potential to change the way wars are fought.
 - DEWs and Hypersonic Weapons could go about as an impediment against threatening countries like China, Pakistan by expanding India's guard capacities.
- **Other nations that have DEWs:**
 - DEWs, or Laser Directed Energy Weapons, have reportedly been developed by Russia, France, Germany, the United Kingdom, Israel, and China, and several nations' militaries have used them.
 - In the past, the United States also said that Cuba carried out sonic attacks (Havana Syndrome).

What are India's Hypersonic Technology Projects and DEWs?

- **1KW laser Weapon:** A 1KW laser that could hit a target 250 meters away has been tested by DRDO.
- **DURGA II:** Directionally Unrestricted Ray-Gun Array A 100-kilowatt, lightweight DEW project known as DURGA II has been initiated by DRDO.
- **Development of Hypersonic Technology:** Both DRDO and ISRO have worked on and tested hypersonic technology in India.
 - The Hypersonic Technology Demonstrator Vehicle (HSTDV), which could travel at six times the speed of sound, was successfully flight-tested by DRDO in 2021.
 - As part of its Hypersonic Technology Demonstrator Vehicle Program, India is also developing an indigenous hypersonic cruise missile with dual capabilities (conventional and nuclear).

Way Forward

- The idea of "Atmanirbharta," or being self-reliant in defense, should include using Indian defense to develop new designs and capabilities.
- To improve our defense capability, we must increase investment in research and

development.