In Depth: A-SAT Missile

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On 27th March, 2019, India successfully conducted an Anti-Satellite (A-SAT) missile test from the Dr. APJ Abdul Kalam Island launch complex. Called as Mission Shakti, this technological mission was carried out by the Defence Research and Development Organisation (DRDO) with an aim to strengthen India's overall security.

A-SAT Missile

- It is an interceptor missile that destroys or jams satellites in space.
- Two types of A-SATs: Kinetic and Non-Kinetic A-SATs.
- **Kinetic A-SATs,** like ballistic missiles physically strike an object in order to destroy it.

- **Working:**
  - To destroy any satellite, firstly exact speed and location of the same needs to be known in real time.
  - Depending upon the speed of the satellite and also the orbit in which it is moving, an A-SAT missile is launched.
  - The information about the position of satellite in the orbit is communicated to the missile in real time every second.
  - Based on that information, the missile takes a path towards the satellite.
  - The missile has a Kinetic Kill Vehicle (KKV) within it, which after sensing the satellite, hits it.
- Non-Kinetic A-SATs are the ones that use non-physical means to disable or destroy space objects, which include frequency jamming, blinding lasers or cyber attacks.
- The theoretical maximum range of A-SATs is limited which means satellites above 20,000 km are out of range.

Evolution

- The United States of America (U.S.A.) tested Anti-Satellite Weapons in October, 1959, when satellites themselves were new.
  - According to the Federation of American Scientists, an air-launched ballistic missile was fired from a B-47 bomber of the U.S. Air Force at Explorer VI satellite.
  - In 1985, it tested the AGM-135. Launched from an F-15 fighter jet, AGM-135 destroyed U.S.A's own satellite Solwind P78-1.
  - In 2008, it carried out **Operation Burnt Frost** using a ship-launched SM-3 missile to destroy a defunct spy satellite.
- The Soviet Union is the second country to test fire the A-SAT technology.
  - It began research into Anti-Satellite Weapons in the 1950s but the first test of A-SAT was conducted in 1963.
  - Unlike the U.S. strategy of relying on missiles, Soviet Union adopted a **co-orbital method** which involves launching a killer satellite that would enter the same orbit as its target and approach it for destruction.
  - At least 20 tests of the co-orbital A-SAT system were reportedly conducted by it, recording both successes as well as failures.
- In January 2007, China destroyed an old weather satellite in a high polar orbit which created the largest orbital debris cloud in history with more than 3000 objects.
- There were no tests of the technology for more than one decade. On March 27, 2019, India became the fourth country to acquire such technology.

Potential of A-SATs in War

- They can intercept and jam communication or military satellites of enemy countries.
- They can also access critical information about troop movements or incoming missiles.

- They can even launch cyber attacks on space systems and thus can also direct laser based weapons.

Outer Space Treaty and the Space Law

- It came into force on 10th October, 1967 and forms the basis of International Space Law.
- Parameters of Space Law include Space exploration, liability for damage, use of weapons, rescue efforts, environmental preservation, information sharing, new technologies etc.
- The treaty states that exploration of outer space shall be done to benefit all countries and that space shall be free for exploration and use by all the countries.
- It prohibits any weapons of mass destruction in outer space, but does not ban conventional weapons within space.
- It exclusively limits the use of the moon and other celestial bodies for peaceful purposes.
- It explicitly forbids any government to claim a celestial resource like the moon or planets.
- Also as per the treaty, states are liable for damages caused by its space objects.
- As of February 2019, 108 countries are party to the treaty. 23 are such countries that have signed it but have not completely ratified it. India ratified the treaty in 1982.
- The treaty, till now, has never been violated.

Challenges to the Treaty

- Development of A-SATs despite the fact that the treaty does not allow use of such weapons.
- In order to protect assets in space, there is a possibility that countries will claim zones around their assets as their respective national territories, which will be against the principles of the treaty.
- There is additional danger of terrorism as terrorist activities have become sophisticated. To curb such activities, military activities in space is required which the treaty discourages.
- The treaty mainly focuses only on countries. Private companies exploit this aspect and sell the plots of land on celestial bodies like the moon.

Mission Shakti

- Led by the DRDO, it is aimed at strengthening India's overall security.
- For testing its anti missile capabilities, India on 27th March, 2019, shot down one of its existing satellites operating in the low earth orbit.
- For this, India used DRDO's Ballistic Missile Defence Interceptor as a Kinetic A-SAT missile. The missile hit the target within the three minutes of its launch with high degree of precision after travelling 300 kms from the earth.

- India now has become the fourth country in the world after U.S.A, China and Russia to test an anti-satellite weapon.
- This successful test will deter countries from attacking India's assets in the space during the war, if any.
- Also, India will have a say in global conversations on the anti-satellite technology.

Test of A-SAT technology and other such technologies can trigger a space war among countries. To avoid this, countries should take such initiatives that will help in maintaining peace in the outer space.