BALLISTIC MISSILES - DEFENCE

News: North Korea test-fired ballistic missiles in latest military display.

What's in the news?

Ballistic missiles

- **Power:** Ballistic missiles are powered initially by a rocket or series of rockets in stages, but then follow an unpowered trajectory that arches upwards before descending to reach its intended target.
- **Warhead:** Ballistic missiles can carry either nuclear or conventional warheads.

Classifications based on their range

- **Short-range:** less than 1,000 kilometers (approximately 620 miles), also known as "tactical" ballistic missiles.
- **Medium-range:** between 1,000 and 3,000 kilometers (approximately 620-1,860 miles), also known as "theater" ballistic missiles.
- **Intermediate-range:** between 3,000 and 5,500 kilometers (approximately 1,860-3,410 miles)
- **Long-range:** more than 5,500 kilometers (approximately 3,410 miles), also known as intercontinental or strategic ballistic missiles.

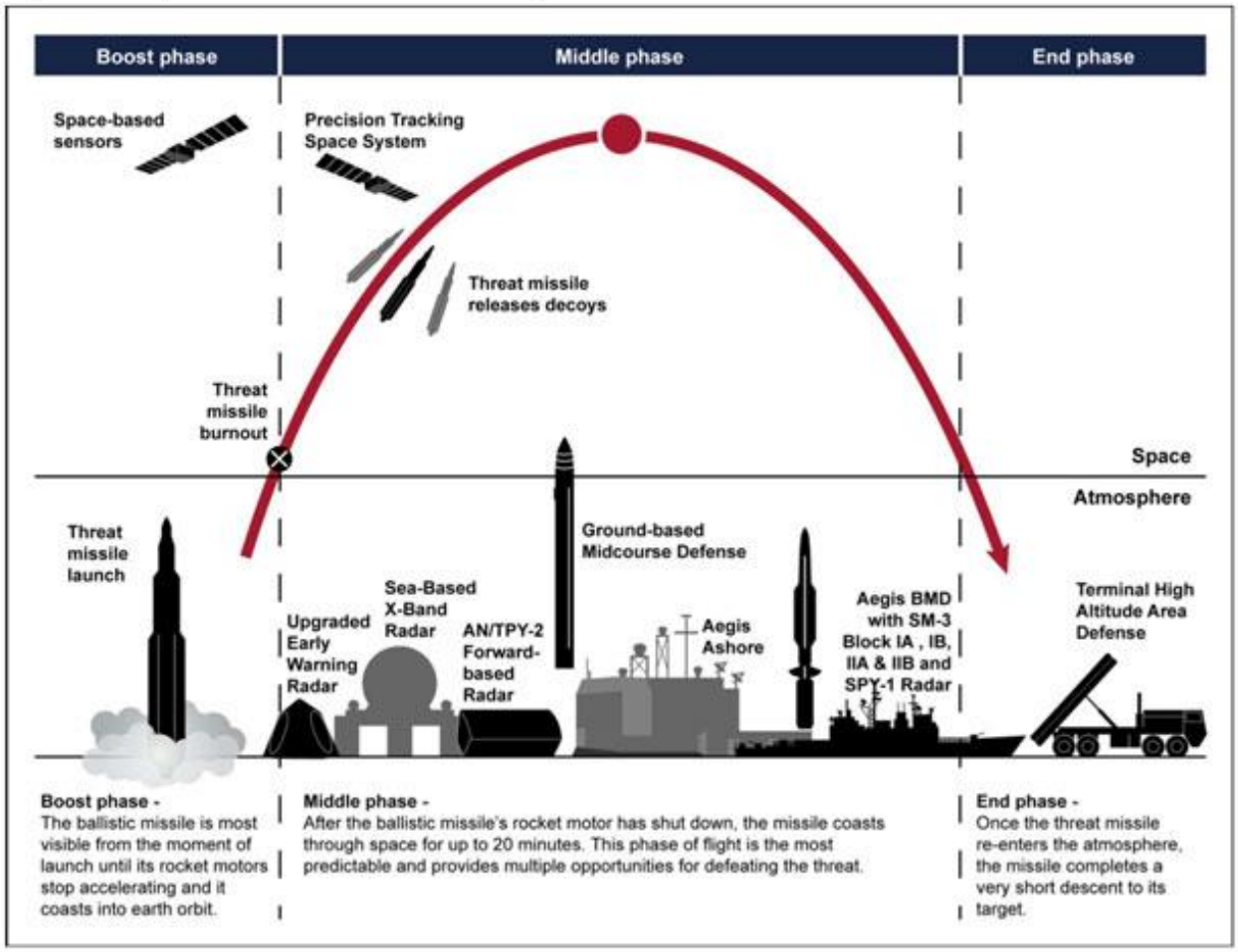
Stages of flight

Boost Phase

- This phase begins at launch and lasts until the rocket engine(s) stops firing and the missile begins **unpowered flight.**
- Depending on the missile, boost phase can **last three to five minutes**.

- Most of this phase takes place in the **atmosphere**.

Figure 1: Primary Roles of Selected BMDS Elements against a Threat Missile



Source: GAO analysis of DOD data (data); GAO (images).

Note: The BMDS elements are depicted in their primary defensive role during a threat missile's phase of flight. BMDS elements may provide some defensive capabilities in other phases of flight.

Midcourse Phase

- This phase begins after the rocket(s) **stops firing**.
- The missile continues to **ascend toward the highest point in its trajectory**, and then begins to **descend toward Earth**.
- This is the longest phase of a missile's flight; for ICBMs, it can last around **20 minutes**.
- During midcourse phase, **ICBMs can travel around 24,000 kilometers per hour** (15,000 miles per hour).

Terminal Phase

- This phase begins when the **detached warhead(s)** reenter the Earth's atmosphere and ends upon impact or detonation.

- During this phase, which can last for **less than a minute, strategic warheads** can be traveling at speeds greater than 3,200 kilometers per hour (1,988 miles per hour).

Cruise missiles

- Cruise missiles are unmanned vehicles that are **propelled by jet engines**, much like an airplane.
- **Launch platform:** They can be launched from ground, air, or sea platforms.

Flight

- Cruise missiles remain within the atmosphere for the **duration of their flight** and can fly as low as a **few meters off the ground.**
- Flying low to the surface of the earth **expends more fuel but makes a cruise missile very difficult** to

Guiding system

- Cruise missiles are self-guided and use multiple methods to accurately deliver their payload, **including terrain mapping, global positioning systems (GPS) and inertial guidance, which uses motion sensors and gyroscopes** to keep the missile on a pre-programmed flight path.
- As advanced cruise missiles approach their target, remote operators can use a camera in the nose of the **missile to see what the missile sees**.
- This gives them the option to **manually guide the missile** to its target or to **abort the strike.**

Source: https://epaper.thehindu.com/ccidist-ws/th/th_international/issues/100005/OPS/G2KDBJS6F.1.png?cropFromPage=true