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Defense Management

Commentary

Short Note on Missile Defense

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DESCRIPTION

Missile defense refers to a system, weapon, or technology that detects, tracks, intercepts, and destroys incoming missiles. Originally designed to counter nuclear-armed Intercontinental Ballistic Missiles (ICBMs), its use has expanded to include non-nuclear tactical and theatre missiles with shorter ranges.

Categories of missile defense

Missile defense can be on the basis of below mentioned categories:

- Missile type/range intercepted.
- The point in the trajectory where the intercept occurs.
- Whether detected within or without the earth's atmosphere.

Type/range of missile intercepted

Strategic, theatre, and tactical are examples of these types/ranges. Each has its own set of intercept criteria, and a defensive system capable of intercepting one type of missile is typically unable to intercept others. However, there can sometimes a capability overlap.

Strategic

Long range ICBMs with a speed of around 7 km/s are targeted (15,700 mph). The Russian A-135 system, which guards Moscow, and the US Ground Based Midcourse Defense System (GBMDS), which protects the US from missiles launched from Asia, is two examples of currently operational systems. Strategic defense can be localized (Russian system) or national in scope (U.S. system).

Theater

Medium range missiles with a speed of less than 3 km/s (6,700 mph) are targeted. The term "theatre" refers to the entire localized territory for military operations, which is normally a radius of several hundred kilometers in this context. This is usually the order of defense range of theatre defensive systems. The Israeli Arrow missile, the American THAAD, and the Russian S-400 are all examples of deployed theatre missile defenses.

Tactical

Targets tactical ballistic missiles with a range of less than 1.5 kilometers and a speed of less than 1.5 kilometers per second (3,400 mph). The range of tactical anti-ballistic missiles (ABMs) is typically 20 km-80 km (12–50 miles). The American MIM-104 Patriot and the Russian S-300 V are two examples of tactical ABMs currently in use.

Trajectory phase

The boost phase, midcourse phase, or terminal phase of a ballistic missile's trajectory can all be intercepted.

Boost phase

Intercepting the missile when its rocket motors are active, usually over the launch area (e.g., the Boeing YAL-1 laser weapon mounted on an American aircraft).

Benefits

- Rocket exhaust is bright and hot, making identification and targeting easier.
- During the boost phase, decoys are not allowed to be employed.
- The missile is full with flammable propellant at this point, making it extremely vulnerable to explosive warheads.

Drawbacks

- It's difficult to position interceptors geographically to intercept missiles in the boost phase (not always possible without flying over hostile territory).
- Interception time is limited (typically about 180 seconds).

Mid-course phase

After the rocket burns out, intercepting the missile in space (example: US Ground-Based Midcourse Defense (GMD), Chinese SC-19 and DN-series missiles, Israeli Arrow 3 missile).

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Benefits

- Time to make a decision/intercept has been extended (the coast period through space before reentering the atmosphere can be several minutes, up to 20 minutes for an ICBM).
- Geographically extensive defensive coverage; possibly continental.

Drawbacks

- Large, heavy anti-ballistic missiles are required, as well as sophisticated, powerful radar, which is frequently supplemented by space-based sensors.
- Potential space based decoys must be dealt with.

Terminal phase

After the missile reenters the atmosphere, intercept it (examples: American Aegis Ballistic Missile Defense System, Chinese HQ-29, American THAAD, American Sprint, Russian ABM-3 Gazelle).

Benefits

- It is sufficient to use a smaller, lighter anti-ballistic missile.
- During reentry, balloon decoys are ineffective.
- Radar that is smaller and less sophisticated is required.

Drawbacks

- Interception time is likely to be less than 30 seconds.
- Geographic coverage is less well-defended.
- In the event of the detonation of a nuclear bomb, the target area could be blanketed with dangerous elements (s).

Intercept location relative to the atmosphere

Missile defense can take place both inside and outside the earth's atmosphere (end atmospheric and exoatmospheric). Most ballistic missiles have a trajectory that takes them both inside and outside the earth's atmosphere, and thus can be intercepted in either location. Both intercept techniques have advantages and limitations. Some missiles, like THAAD, can intercept both within and outside the earth's atmosphere, giving them two chances to intercept.

Endo-atmospheric

Endo-atmospheric anti-ballistic missiles have a lower range than conventional anti-ballistic missiles (e.g., American MIM-104 Patriot, Indian Advanced Air Defence).

Exo-atmospheric

Exo-atmospheric anti-ballistic missiles have a longer range than conventional anti-ballistic missiles (e.g., American GMD, Ground Based Midcourse Defense).