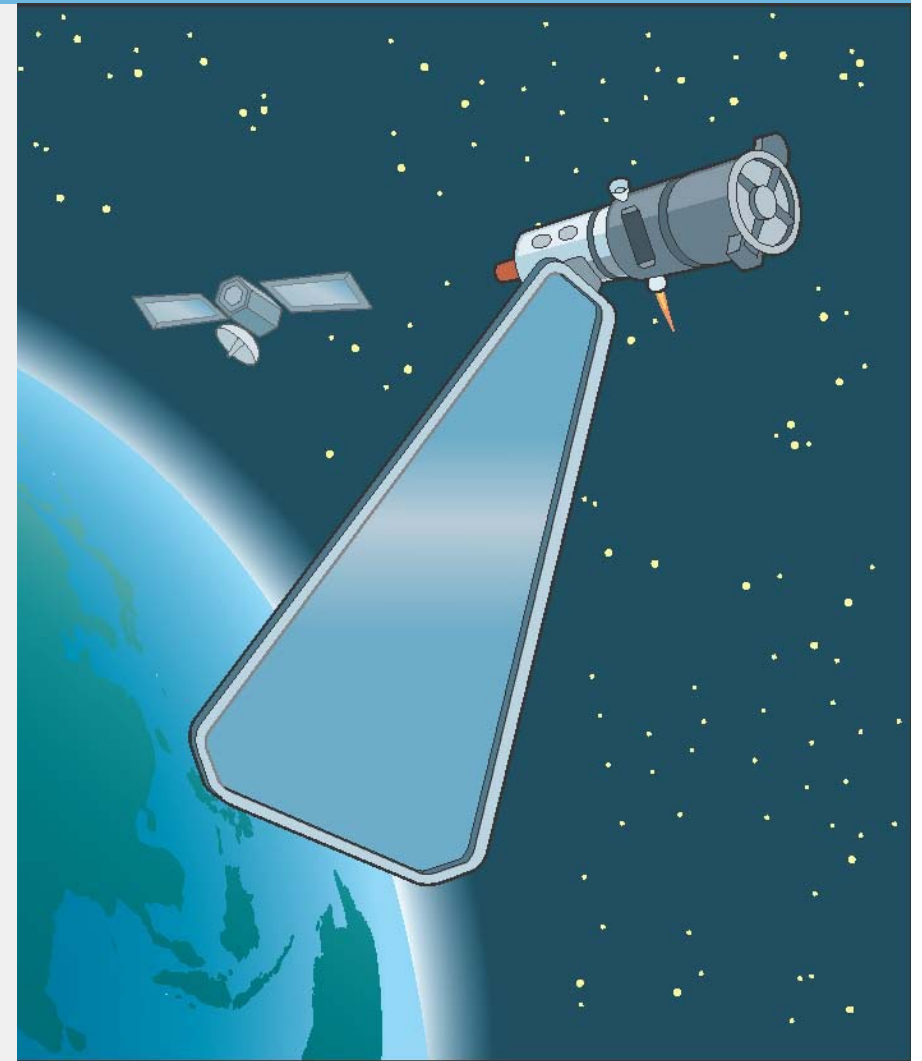


A stylized illustration of a satellite in space. The satellite is cylindrical with two solar panel arrays extending from its sides. A large parabolic dish antenna is mounted on the front, and a red laser beam is shown originating from the dish and pointing towards the Earth's surface. The background is a dark blue space filled with yellow stars and a large, bright yellow moon in the upper left. The Earth's horizon is visible in the lower right, showing a blue and green gradient.

Available and Emerging Weapons Technologies

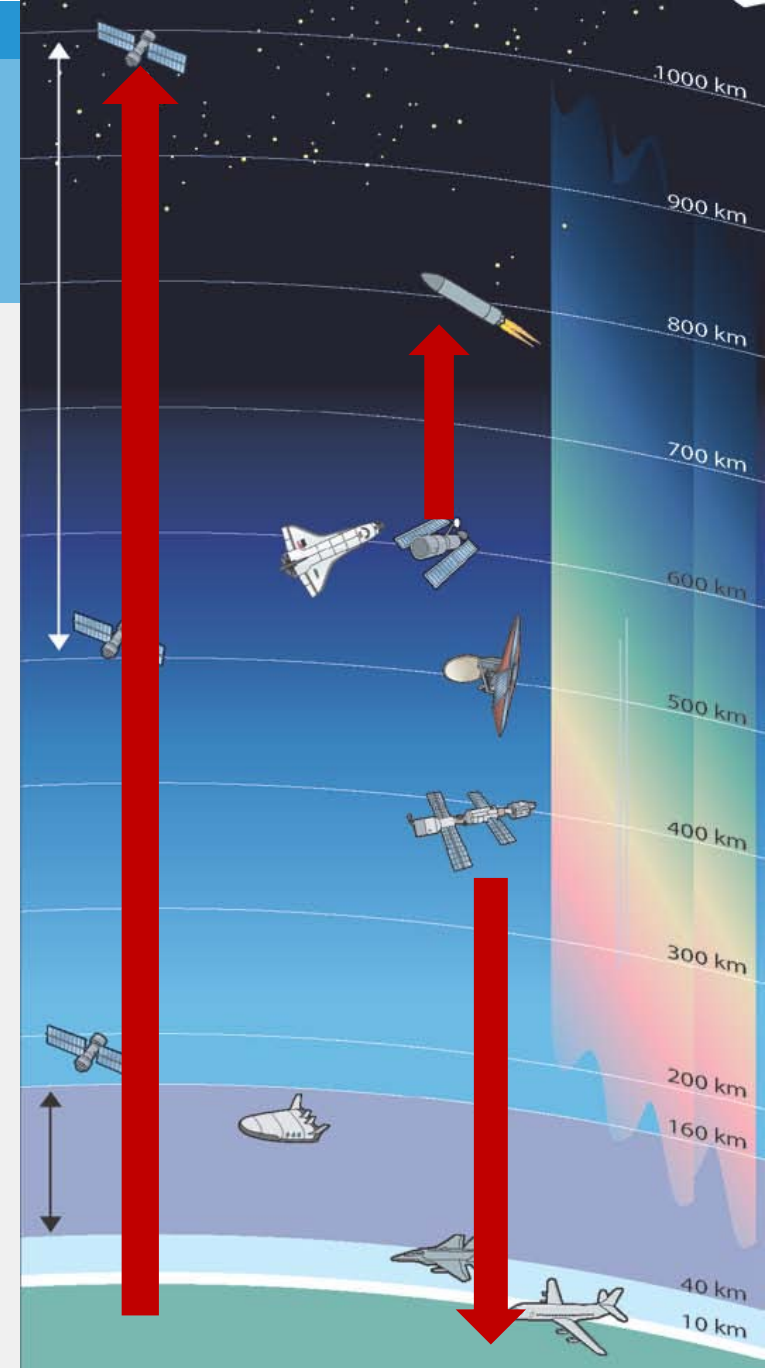
Contents

- The concept of *Space Weapons*
- How *Space Weapons* work
- Some examples of possible (and impossible) weapon systems
- Conclusions



The Concept of Space Weapons





- We usually don't talk about *Sea Weapons* or *Air Weapons*
- *Space Weapons* constitute a variety of often theoretical weapon systems with different capabilities
- Defined by the relation between launch platform and target, i.e.
 - Earth-to-Space
 - Space-to-Space
 - Space-to-Earth






Weapons Effect and Launch

- Kinetic energy
 - Hit-to-kill
- Explosives
 - Conventional
 - Nuclear
- Directed energy
 - Laser
 - High powered microwave (HPM)
- Direct ascent ASAT
 - Less launch energy
 - High relative velocity
 - Launch on attack
 - Complicated intercept
- Co-orbital ASAT
 - Larger launchers
 - Demands a warhead
 - Deployed in advance

Some *Earth-To-Space* systems

- Ground based ASAT missiles €  
 - Medium Range Ballistic Missile
 - Homing device
 - Hit-to-Kill, explosive or HPM
- Ground Based Laser €  
 - Large fixed infrastructure
 - High Energy Consumption
 - Not necessarily Debris Creating

Some *Space-to-Space* Systems

- Space-Based ABM-missile   
(cf. *Brilliant Pebbles*)
 - Pre-deployed in orbit in large numbers
 - Hit-to-kill
- Space Based Laser against   
space targets
 - Requires large space segment
 - High energy consumption
 - Low degree of coverage

Some *Space-to-Earth* Systems

- Kinetic energy rods



- Extremely expensive
- Technologically challenging
- Vulnerable when deployed

- Hypersonic space planes



- Platform, not a weapon
- More in common with aircraft than satellites
- Could attack Earth from space

Conclusions

- *Space Weapons* constitute a wide variety of systems for various purposes
 - Ground based ASAT and ABM systems already exist
 - Three countries has demonstrated ASAT capability
 - Space based systems are not likely in a near future
 - Expensive
 - Technologies are not mature or proven
 - Vulnerable to ASAT attack
- Discussions should address the various capabilities, not space weapons as a whole



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