Technical Aspects of Space Based Missile Defense and Space-to-Ground Weapons

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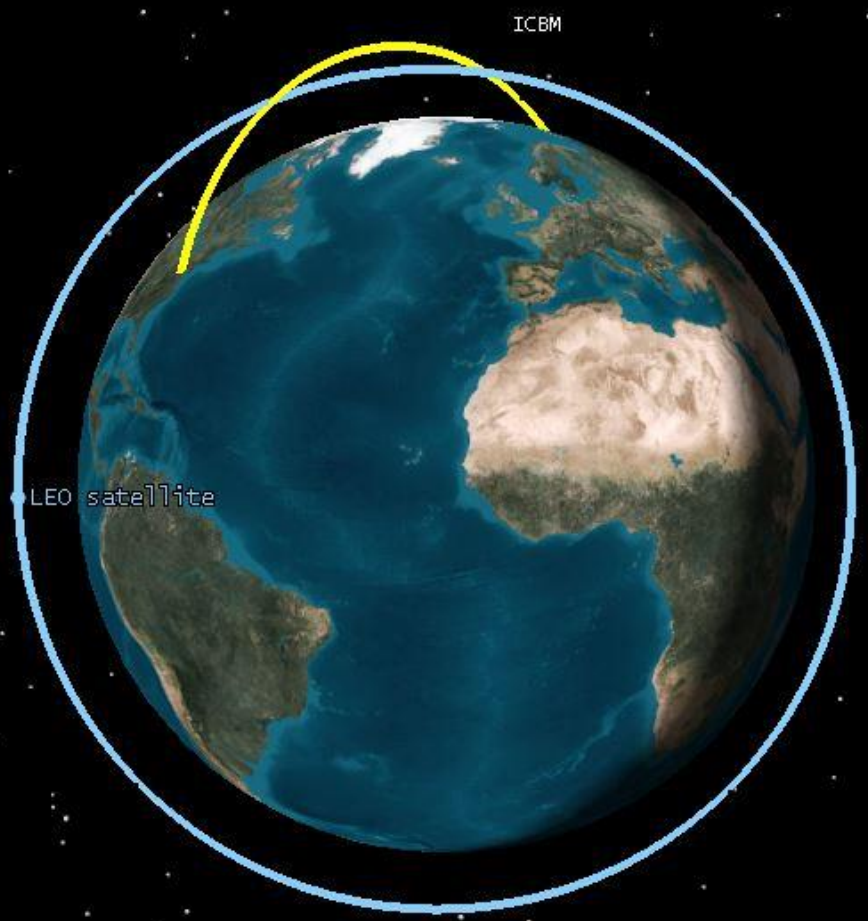
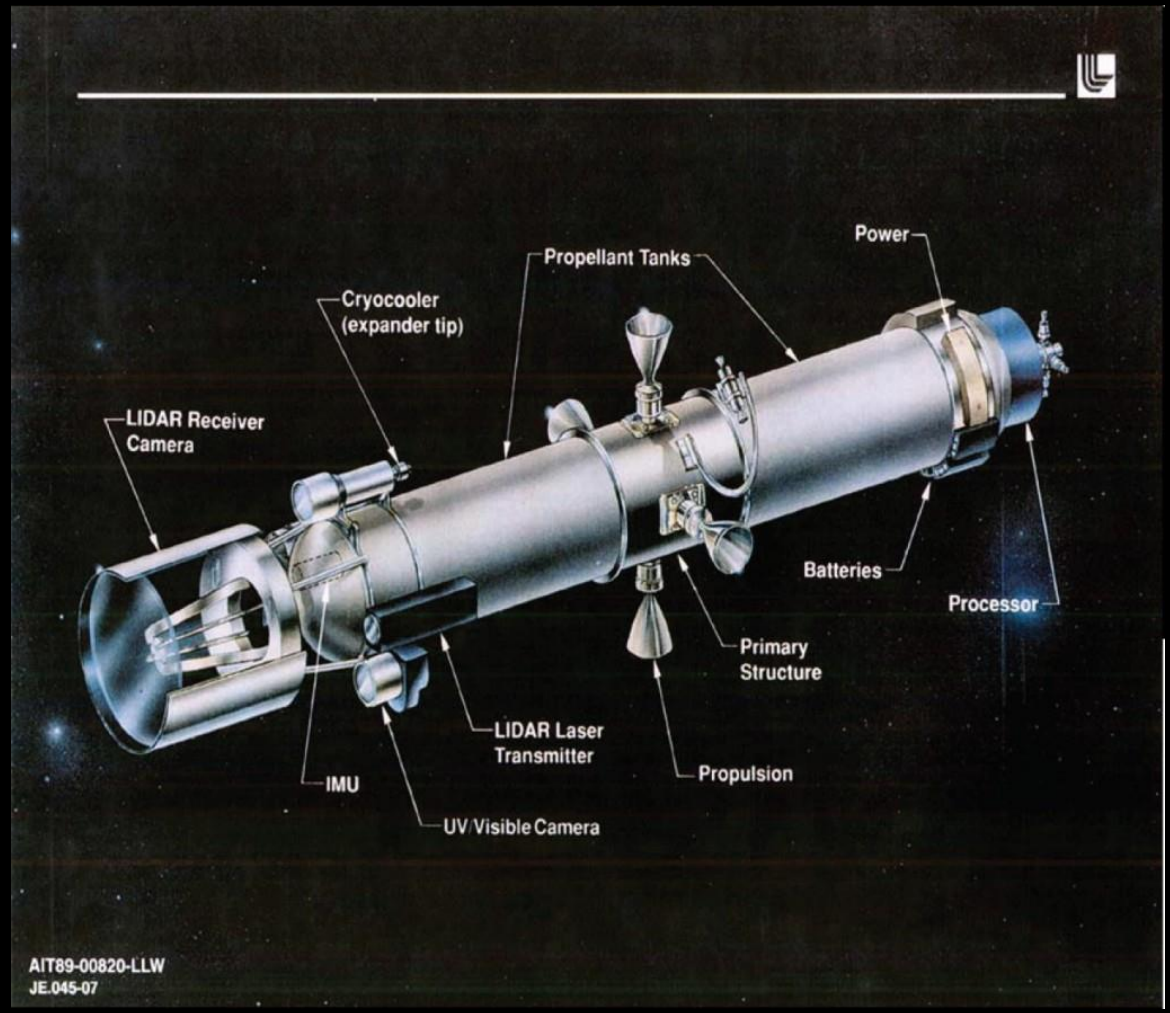
Intercontinental range ballistic missiles (ICBMs) travel in similar regions as low earth orbiting satellites.



Time-sensitivity & persistence require a constellation

Union of Concerned Scientists https://www.ucsusa.org/resources/space-based-missile-defense-0

Notional space-based interceptor



Typical interceptor and constellation sizes

TABLE E-18 Number of Satellites, Other Parameters, and LCC

Description	Optics Diameter (cm)	KV Mass (kg)	KV Divert (km/sec)	SBI Mass (kg)	N_{sat}	20-Yr LCC Cost (FY 2010 billion $) Minimum	Maximum
Decision time t_d = 0 sec							
Case 1: BPI solid + liquid BPI	10	164	2.5	1,978	1,000	296	500
Case 2: BPI liquid + midcourse	20	149	2.0	1,796	400	119	200
Decision time t_d = 30 sec							
Case 3: BPI solid + liquid	10	164	2.5	1,978	2,000	581	978
Case 4: BPI liquid + midcourse	20	149	2.0	1,796	650	187	311
Case 5: Midcourse only	20	81	0.6	977	200	43	73

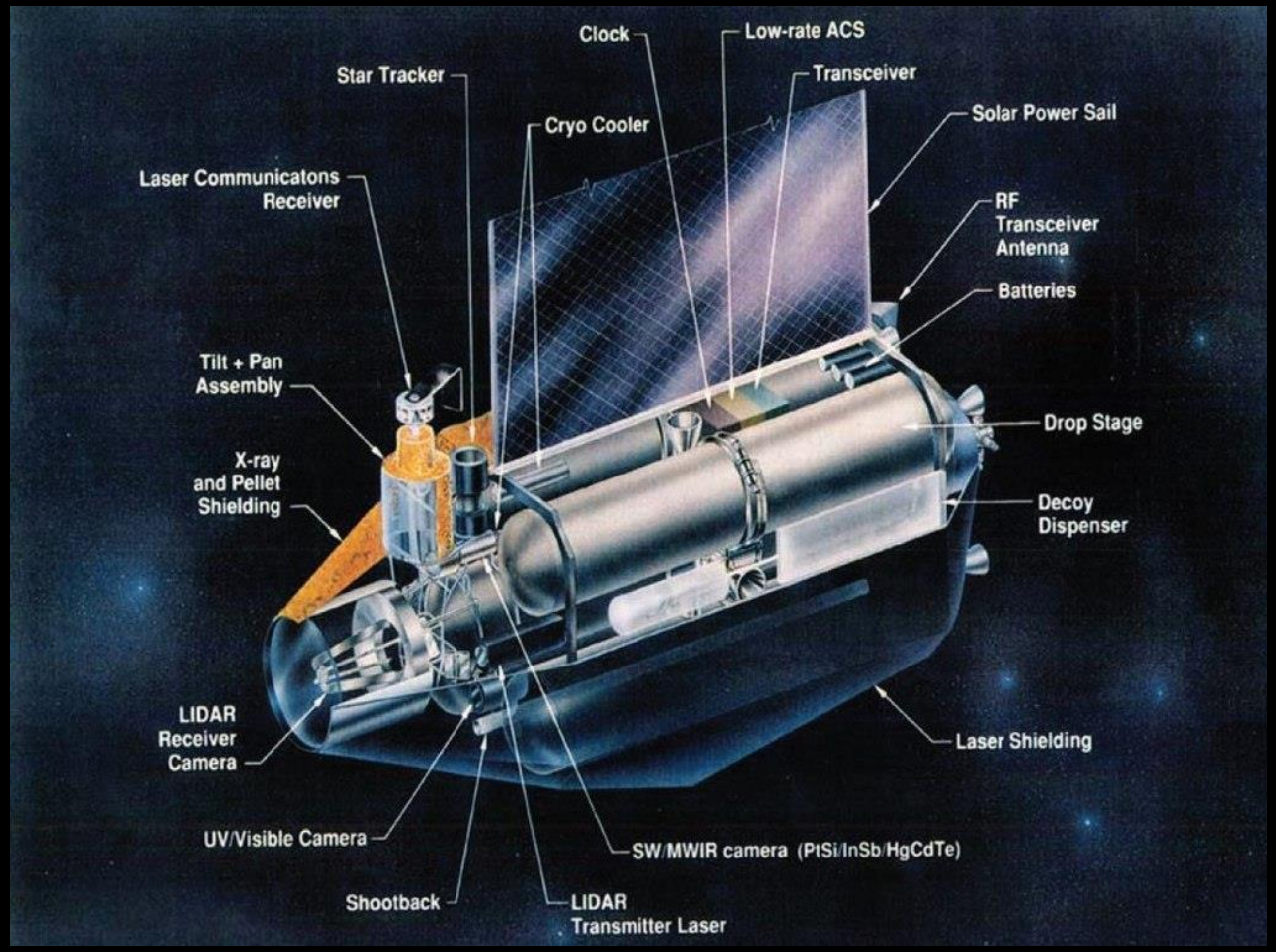
From “Making Sense of Ballistic Missile Defense,”
US National Academies of Science, 2012

TABLE E-19 SBI Life-Jacket Subsystems and Hardware

Propulsion
Hall effect ion engine and controls (apogee kick motor)
Propellant
Structure and shielding (survivability housing) radiators
Electrical power
Solar panel power distribution unit
Batteries
DC-to-DC convertors (power convertor electronics)
RF receiver and antenna (tracking telemetry and communications)
Attitude determination and control
Momentum wheels and controller
Horizon/star tracker sensors
Low-rate attitude control system for momentum dump

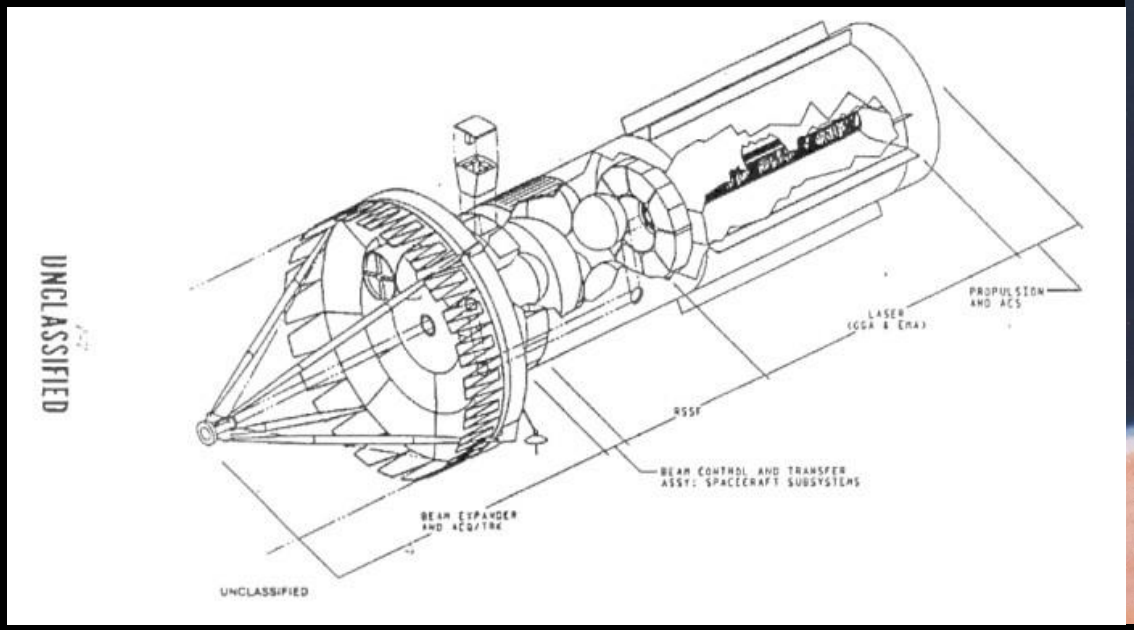
From “Making Sense of Ballistic Missile Defense,”
US National Academies of Science, 2012

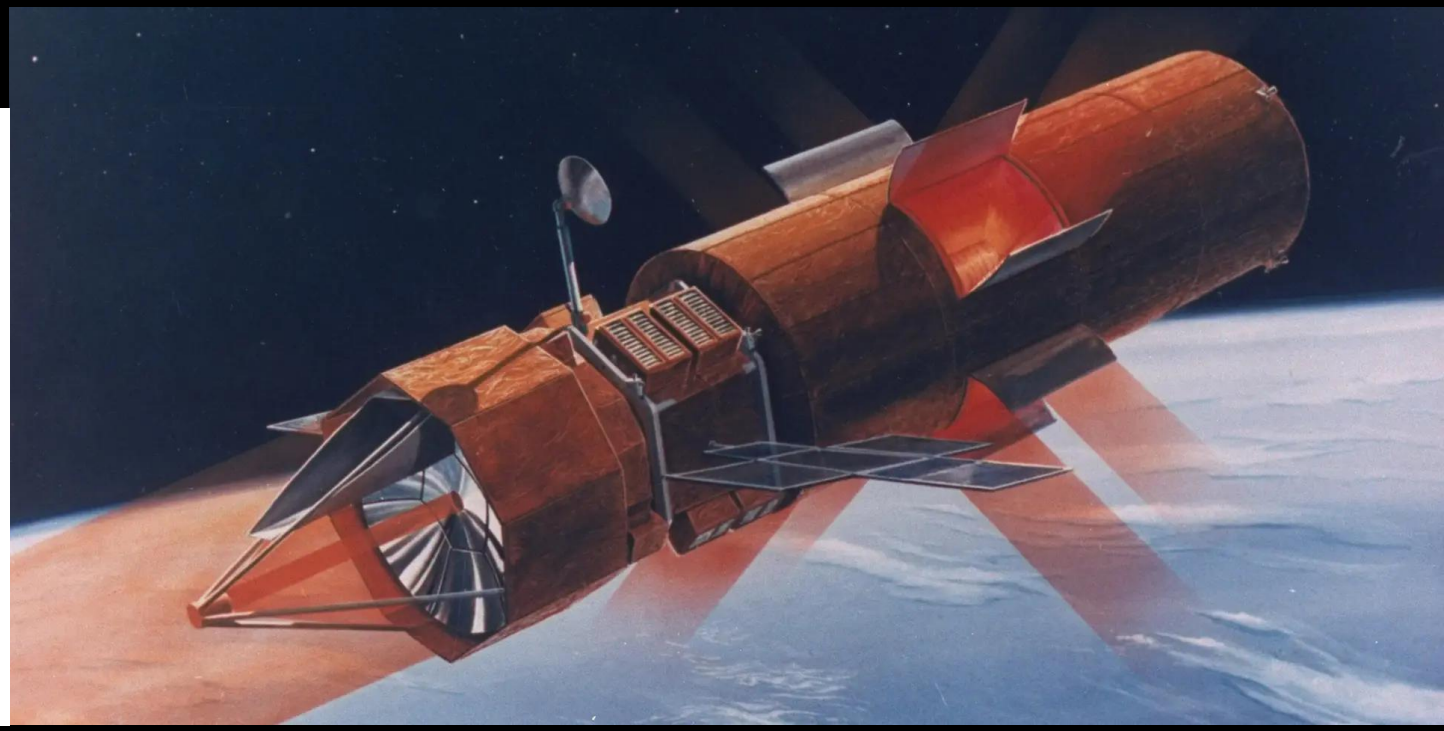
Notional “garage” or “life jacket”



Brilliant Pebbles Concepts, Source: Missile Defense Agency

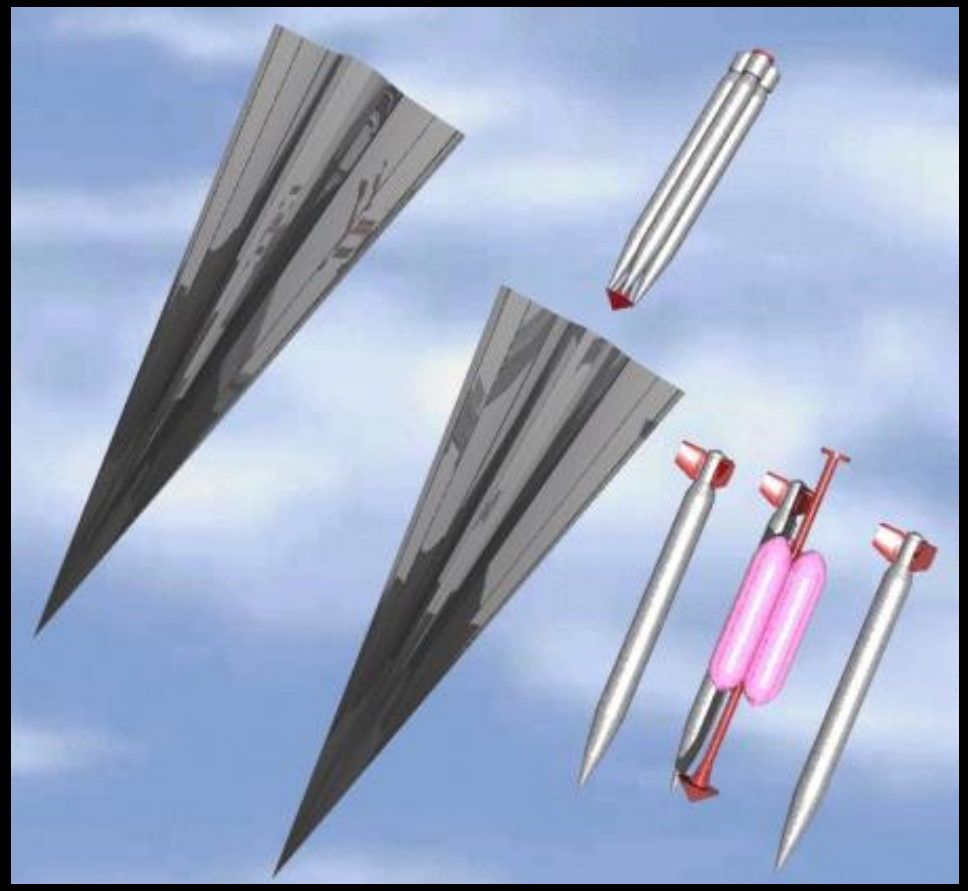
Space-based Laser for Missile Defense





US Air Force reference design for a space based laser circa 1990

Ground-attack Weapon: Projectiles



Concept for a Common Aero Vehicle
1997-98