Appendix N

Glossary of Acronyms and Terms

List of Acronyms

ABM —anti-ballistic missile
ALCM —air-launched cruise missile
ASAT —anti-satellite
BMD –ballistic missile defense
C^3I —command, control, communications, and intelligence
CONUS –continental United States
DEW –directed-energy weapon
DSAT –defensive satellite
GLCM –ground-launched cruise missile
ICBM —intercontinental ballistic missile
IR —infrared
IRBM —intermediate-range ballistic missile
KEW —kinetic-energy weapon
KKV –kinetic-kill vehicle
LWIR –long-wave infrared
MaRV —maneuverable reentry vehicle
MIRV —multiple independently targeted reentry vehicle
MILSAT–military satellite
MPS —multiple protective shelters, once to be used for basing MX
MWIR —medium-wave infrared
MX —experimental missile, newest addition to U.S. ICBM arsenal, also called "Peacekeeper"
PBV –post-boost vehicle
RV —reentry vehicle
SDI –Strategic Defense Initiative
SDIO –Strategic Defense Initiative Organization
SLBM —submarine-launched ballistic missile
SLCM —sea-launched cruise missile
SWIR —short-wave infrared
UV —ultraviolet

Definitions of Terms

Ablative Shield: A shield that evaporates when heated, absorbing laser energy and protecting the object which is behind it from heat damage.

ABM Treaty: A Treaty of 1972, signed and ratified by the Soviet Union and the United States, prohibiting development of many types of anti-ballistic missile systems and limiting deployments on each side to a specified number of land-based units, which use only rocket interceptors and ground-based radar.

Acquisition: Detection of a potential target by the sensors of a weapons system.

Active Sensor: One that illuminates a target, producing return secondary radiation, which is then detected in order to track and/or identify the target. An example is ladar (cf.).

Adaptive Optics: Optical systems which can be modified (e.g., by controlling the shape of a mirror) to compensate for distortions. An example is the use of information from a beam of light, passing through the atmosphere to compensate for the distortion suffered by another beam of light on its passage through the atmosphere. Used to eliminate the "twinkling" of stars in observational astronomy and to reduce the dispersive effect of the atmosphere on laser beam weapons.

Air-breathing: Describing a flying weapon that travels through the atmosphere and uses air in its propulsion system. Examples are jet aircraft and cruise missiles. Specifically does not include ballistic missiles.

Analog Processing: Problem solving in a computer by means of direct manipulation of the magnitudes of a physical quantity. For example, the sizes of different voltage pulses may be compared, added, subtracted, etc., in the course of solving a problem (cf. digital processing).

Anti-satellite Weapon (ASAT): A weapon to destroy satellites in space.

Anti-simulation: Deceiving adversary sensors by making a strategic target look like a decoy.

Area Defense: An ABM defense covering a large area. Usually implies the capability to protect "soft" (i.e. not hardened missile silos or bunkers) targets.

Ballistic Missile Defense (BMD): A defense system that is designed to protect territory from attacking ballistic missiles. Usually conceived as having several independent layers.

Battle Management: The set of instructions and rules and the corresponding hardware controlling the operation of a BMD system, Sensors and interceptors are allocated by the system, and the updated battle results are presented to the (human) command for analysis and possible intervention.

Birth-to-death Tracking: The tracking of objects from the time that they are deployed from a booster or post-boost vehicle until they are killed or detonated.

Bistatic Radar: Radar systems in which the receiver and transmitter are separated.

Blackout: The disabling of radar by means of a nuclear explosion. The intense electromagnetic energy released generates a large background that obscures signals and renders many types of radar useless for minutes or longer.

Boost Phase: The phase of a missile trajectory from launch to burnout of the final stage. For ICBMs, this phase typically lasts from 3 to 5 minutes, but studies indicate that reductions to the order of 1 minute could be possible.

Brightness: In this report, the amount of power that can be delivered per unit solid angle by a directed-energy weapon.

Coherence: The matching, in space and time, of the wave structure of different parallel rays of a single frequency of electromagnetic radiation. This results in the mutual reinforcing of the energy of these different components of a larger beam. Lasers can produce coherent radiation.

Command Guidance: The steering and control of a missile by transmitting commands to it.

Common Mode Failure: Refers to a type of system failure in which diverse components are disabled by the same single cause.

Constellation Size: The number of defensive weapon satellites placed in orbit about the Earth as part of a BMD system.

Counter-countermeasures: In this report, measures taken by the defense to defeat offensive countermeasures.

Countermeasures: In this report, measures taken by the offense to overcome aspects of a BMD system.

Cruise Missile: A missile traveling within the atmosphere at aircraft speeds and, usually, low altitude, whose trajectory is preprogrammed. It is capable of achieving high accuracy in striking a distant target. It is maneuverable during flight, is constantly propelled, and therefore does not follow a ballistic trajectory. Cruise missiles may be nuclear armed, but do not have to be.

Dazzling: In this report, the temporary blinding of a sensor by overloading it with an intense signal of electromagnetic radiation, e.g., from a laser or a nuclear explosion.

Decoy: An object that is designed to make an observer believe that the object is more valuable than is actually the case. Usually, in this report, a decoy refers to a light object, not containing a warhead, designed to look like a nuclear-armed reentry vehicle.

Defensive Satellite Weapon (DSAT): A device that is intended to defend satellites in space by destroying attacking ASAT weapons,

Defensive Technologies Study Team (DTST): A committee, generally known as the "Fletcher Panel," after its Chair, appointed by President Reagan to investigate the technologies of potential BMD systems.

Diffraction: The spreading out of electromagnetic radiation as it leaves an aperture, such as a mirror. The angle of spread, which cannot be eliminated by focusing, is proportional to the ratio of the wavelength of radiation to the diameter of the aperture.

Digital Processing: The most familiar type of computing, in which problems are solved through the mathematical manipulation of streams of numbers.

Directed-Energy Weapon: A weapon that kills its target by delivering energy to it at or near the speed of light. Includes lasers and particle beam weapons.

Discrimination: The ability of a defensive system to differentiate decoys or other nonthreatening objects from targets, e.g., a threatening booster rocket, post-boost vehicle, or RV.

Early Warning: In this report, early detection of an enemy ballistic missile launch, usually by means of surveillance satellites and long-range radar.

Electromagnetic Radiation: A form of propagated energy, arising from electric charges in motion, that produces a simultaneous wavelike variation of electric and magnetic fields in space. The highest frequencies (or shortest wavelengths) of such radiation are possessed by gamma rays, which originate from processes within atomic nuclei. As one goes to lower frequencies, the electromagnetic spectrum includes X-rays, ultraviolet light, visible light, infrared light, microwaves, and radio waves.

Electron-volt: The energy gained by an electron in passing through a potential difference of one volt.

Endoatmospheric: Within the atmosphere; an endoatmospheric interceptor reaches its target within the atmosphere.

Exoatmospheric: Outside the atmosphere; an exoatmospheric interceptor reaches its target in space.

Fast-Burn Booster: A ballistic missile that can burnout much more quickly than current versions, possibly before exiting the atmosphere entirely. Such rapid burnout complicates a boost-phase defense.

Fission: The breaking apart of the nucleus of an

atom, usually by means of a neutron. For very heavy elements, such as uranium, a significant amount of energy is produced by this process, When controlled, this process yields energy which may be extracted for civilian uses, such as commercial electric generation. When uncontrolled, energy is liberated very rapidly: such fission is the energy source of uranium- and plutonium-based nuclear weapons; it also provides the trigger for fusion weapons.

Fratricide: The destructive effect of the earlier-detonating weapons in a barrage on those weapons which arrive later.

Functional Kill: The destruction of a target by disabling vital components in a way not immediately detectable, but nevertheless able to prevent the target from functioning properly. An example is the destruction of electronics in a guidance system by a neutral particle beam.

Fusion: The fusing of two atomic nuclei, usually of light elements, such as hydrogen. For light elements, energy is liberated by this process. Hydrogen bombs produce most of their energy through the fusion of hydrogen into helium.

Geosynchronous Orbit: An orbit about 35,800 km above the Equator. A satellite placed in such an orbit revolves around the Earth once per day, maintaining the same position relative to the surface of the Earth. It then appears to be stationary, and is useful as a communications relay or as a surveillance post.

Hard Kill: Destruction of a target in such a way as to produce unambiguous visible evidence of its neutralization.

Hardness: In this report, a property of a target, measured by the power needed per unit area to destroy the target by means of a directed-energy weapon. A hard target is more difficult to kill than a soft target.

Homing Device: A device, mounted on a missile, that uses sensors to detect the position or to help predict the future position of a target, and then directs the missile to intercept the target. It usually updates frequently during the flight of the missile.

Impulse Kill: The destruction of a target, using directed energy, by ablative shock. The intensity of directed energy is such that the surface of the target violently and rapidly boils off, delivering a mechanical shock wave to the rest of the target and causing structural failure.

Inverse Synthetic Aperture Radar (ISAR): A type of radar similar to synthetic aperture radar (cf.), but which uses information from the motion of targets in order to provide high resolution.

Ionization: The removal or addition of one or more electrons to a neutral atom, forming a charged ion.

Keep-out Zone: A volume around a space asset, off limits to parties not owners of the asset. Keep-out zones could be negotiated or unilaterally declared. The right to defend such a zone by force and the legality of unilaterally declared zones under the Outer Space Treaty remain to be determined.

Kill Assessment: The detection and assimilation of information indicating the destruction of an object under attack. Kill assessment is one of the many functions to be performed by a battle management system.

Kinetic-Energy Weapon: A weapon that uses kinetic energy, or energy of motion, to kill an object. Weapons that use kinetic energy are a rock, a bullet, a nonexplosively armed rocket, and an electromagnetic railgun.

Ladar: A technique analogous to radar, but which uses laser light rather than radio or microwaves. The light is bounced off a target and then detected, with the return beam providing information on the distance and velocity of the target.

Laddering Down: A hypothetical technique for overcoming a terminal phase missile defense. Successive salvos of salvage-fused (cf.) RVs attack. The detonations of one salvo disable local ABM abilities so that following salvos are able to approach the target more closely before being, in turn, intercepted. Eventually, by repeating the process, the target is reached and destroyed.

Lasant: A material that can be stimulated to produce laser light.

Laser: A device that produces a narrow beam of coherent radiation through a physical process known as stimulated emission. Lasers are able to focus large quantities of energy at great distances, and are among the leading candidates for BMD weapons.

Layered Defenses: The use of several layers of BMD at different phases of the missile trajectory. Each layer is designed to be as independent as possible of the others, and each would probably use its own, distinctive set of missile defense technologies.

Leverage: In this report, refers to the advantage gained by boost-phase intercept, when a single booster kill may eliminate many RVs and decoys before they are deployed. This could provide a favorable cost-exchange ratio for the defense, and would reduce stress on later layers of the defense system.

Limited Test Ban Treaty: The multilateral Treaty signed and ratified by the United States and the U.S.S.R. in 1963 which prohibits nuclear tests in all locations except underground.

Megawatt: One million watts; a unit of power. A typical commercial electric plant generates about 500 to 1,000 megawatts.

Mev: One million electron-volts. A unit of energy usually used in reference to nuclear processes. It is equivalent to the energy that an electron gains in crossing a potential of 1 million volts.

Micron: One-millionth of a meter (equivalently, one-thousandth of a millimeter). Roughly twice the wavelength of visible light.

Midcourse Phase: The phase of a ballistic missile trajectory in which the RVs travel through space on a ballistic course towards their targets. This phase lasts up to 20 minutes.

Military Satellite (MILSAT): A satellite used for military purposes, such as navigation or intelligence gathering.

Monostatic Radar: A radar system in which the receiver and transmitter are colocated.

Multiple Independently-targetable Reentry Vehicle (MIRV): One of several RVs on the same post-boost vehicle that can be independently placed on a ballistic course towards a target after completion of the boost phase.

Multiple Phenomenology: A system using repeated observations of potential targets by means of different physical principles and different sensor systems. In the case of sensor systems, the use of multiple phenomenology makes it more difficult for an adversary to deceive them.

Multistatic Radar: A radar system with a transmitter and several receivers, all separated.

Optical Processing: A type of analog processing (q.v.) in which the behavior of light beams, passed through optical systems, is used in problem solving.

Outer Space Treaty of 1967: A signed and ratified agreement between the Soviet Union, the United States, and other nations, forbidding the basing of nuclear or other weapons of mass destruction in space.

Parallel Processing: The use of different paths in a computer to work simultaneously on different calculations needed to solve a single problem, thus reducing the time needed for the overall calculation.

Passive Sensor: One that detects naturally occurring emissions from a target for tracking and/or identification purposes.

Penetration Aid: In this report, a device mounted on a post-boost vehicle with RVs, that is used to confuse defenses, It may be a decoy or anything else that renders more difficult the defense's job of detecting and killing the RVs or the PBV.

Phased-Array Radar (PAR): A radar with elements that are physically stationary, but with a beam that is electronically steerable and can switch rapidly from one target to another. Used for tracking many objects, often at great distances.

Pointing: The aiming of sensors or defense weapons at a target with sufficient accuracy either to track the target or to aim with sufficient accuracy to destroy it.

Post-boost Phase: The phase of a missile trajectory, after the booster's stages have finished firing, in which the various RVs are independently placed on ballistic trajectories towards their targets. In addition, penetration aids (cf.) are dispensed from the post-boost vehicle. The length of this phase is typically 3 to 5 minutes, but could be drastically reduced.

Power Supply: In this report, a source of energy for a BMD component. It may be ground- or space-based, and may range from commercial electric plants to space-based nuclear reactors.

Preferential Defense: The concentration of (usually limited) defensive assets on a subset of sites in order to assure the survival of some of them.

Preferential Offense: The concentration of offensive assets on a subset of targets.

Pumping: In this report, the raising of the molecules or atoms of a lasant (cf.) to an energy state above the normal lowest state, in order to produce laser light. This results when they fall back to a lower state. Pumping may be done using electrical, chemical, or nuclear energy.

Redout: The blinding or dazzling of infrared detectors due to high levels of infrared radiation produced in the upper atmosphere by a nuclear explosion.

Reentry: The return of objects, originally launched from Earth, into the atmosphere.

Reentry Vehicle (RV): As used in this report, reentry vehicles are small containers containing nuclear warheads. They are released from the last stage of a booster rocket or from a post-boost vehicle (cf.) early in the ballistic trajectory. They are thermally insulated to survive rapid heating during the high velocities of reentry into the atmosphere, and are designed to protect their contents until detonation at their targets.

Responsive Threat: The threat (cf.) after taking

into account modernization and BMD countermeasures.

Robust: In this report, describing a system, indicating its ability to endure and perform its mission against a reactive adversary. Also used to indicate ability to survive under direct attack.

Safeguard: A U.S. midcourse and terminal-phase defense for ICBMs, deployed in 1975 and deactivated in 1976 due to its limited cost-effectiveness.

Salvage-fused: Describing a warhead that is set to detonate when it is attacked. Usually refers to a nuclear warhead.

Selectivity: In this report, refers to choosing a subset of targets, either for attack or defense. See preferential defense and preferential offense.

Semi-active Sensor: One that does not generate radiation itself, but that detects radiation reflected by targets when they are illuminated by other BMD components. Such devices are used for tracking and identification and can operate without revealing their own locations.

Sensors: Electronic instruments that can detect radiation from objects at great distances. The information can be used for tracking, aiming, discrimination, attacking, kill assessment, or all of the above. Sensors may detect any type of electromagnetic radiation or several types of nuclear particles.

Sentinel: ABM system designed for light area defense against a low-level ballistic missile attack on the United States. Developed into the Safeguard (cf.) system in late 1960s.

Shoot-back: In this report, the technique of defending a space asset by shooting at an attacker.

Signature: Distinctive type of radiation emitted or reflected by a target, which can be used to identify that target.

Simulation: The art of making a decoy look like a more valuable strategic target (cf. anti-simulation).

Slew Time: The time needed for a weapon to reaim at a new target after having just fired at a previous one.

Soft Kill: Same as functional kill.

Space Mines: Hypothetical devices that can track and follow a target in orbit, with the capability of exploding on command or by pre-program, in order to destroy the target.

Spartan: Nuclear-armed long-range midcourse interceptor used in Safeguard/Sentinel systems (cf.).

Sprint: Nuclear-armed short-range interceptor used in Safeguard/Sentinel systems (cf.).

SS-18: Largest ICBM in current Soviet inventory, credited with carrying 10 RVs, but capable of holding many more.

Stimulated Emission: Physical process by which an excited molecule is induced by incident radiation to emit radiation at an identical frequency and in phase with the incident radiation. Lasers operate by stimulated emission.

Structured Attack: An attack in which the arrival of warheads on their diverse targets is precisely timed for maximum strategic impact.

Synthetic Aperture Radar (SAR): A radar technique that processes echoes of signals emitted at different points along a satellite's orbit. The highest resolution achievable by such a system is theoretically equivalent to that of a single large antenna as wide as the distance between the most widely spaced points along the orbit that are used for transmitting positions.

Terminal Phase: The final phase of a ballistic missile trajectory, lasting about a minute or less, in which the RVs reenter the atmosphere and detonate at their targets.

Thermal Kill: The destruction of a target by heating it, using directed energy, to the degree that structural components fail.

Threat: The anticipated inventory of enemy weapons. In the context of this report, the inventory is of nuclear weapons and their delivery systems, as well as of decoys, penetration aids, and other BMD countermeasures.

Track File: Information stored in computer memory containing position coordinates and velocity components of a target. In this report, refers to such information concerning offensive weapons during their trajectories: e.g., boosters, RVs, decoys.

Tracking: The monitoring of the course of a moving target. Ballistic objects may have their tracks predicted by the defensive system, using several observations and physical laws.

Transition: In this report, the period in which the world strategic balance would shift from offense-dominance to defense-dominance.

Warhead: A weapon, usually a nuclear weapon, contained in the payload of a missile.

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