Land based Boeing debris LBSD 1

## Table 5-1 Military Utility (MU) = Damage Expectancy (DE)

**DE = f (PA, PD)**

*PA= PLS (MOE1.1) * WSR (MOE1.2) assuming adequate Responsiveness (MOE1.3) and Security (MOE 1.4)

| MT 1: *Deter aggression. | | | |
|---|---|---|---|
| Dissuasion | Denial | Retaliation | Pre-emptive Capabilities. |

| MOE 1<br>Probability of Arrival (PA) | MOE 2<br>Probability of Target Destruction (PD) |
|---|---|
| MOE 1.1 Survivability (Pre and Post Launch) (PLC, ALS and LL) | MOE 2.1 Hard Targets (Surface) |
| MOP 1 Weapons of Mass Destruction Attack | MOE 2.2 Soft Targets (Surface and High Altitude) |
| MOP 2 Conventional Attack – pre/post-launch | MOE 2.3 Hard & Deeply Buried Targets (Sub-surface) |
| MOP 3 Intercept Attack | * The MOPs that follow apply to MOEs 2.1, 2.2 and 2.3 |
| MOP 4 Natural Disasters | MOP 13 PD Characteristics |
| MOE 1.2 Weapon System Reliability | MOP 14 Fusing Options |
| MOP 5 Launch reliability | |
| MOP 6 In-flight reliability | |
| MOP 7 Re-entry Vehicle reliability | |
| MOE 1.3 Responsiveness | |
| #MOP 8 Execution Orders | |
| #MOP 9 Rapid In-flight Retargeting | |
| MOP 10 Rapid In-silo Retargeting | |
| MOP 11 Range | |
| #MOP 12 Command, Control, Communications & Computer (C4) Systems | |
| MOE 1.4 Security | |
| #Note 1: MOP 8, 9 and 12 will be incorporated into the WSR inputs. | |

## 5.2 Working Military Utility Taxonomy Descriptions

**MT 1: Deter aggression.** (*Implies dissuasion, denial, retaliation and pre-emptive capabilities).

**MOE 1: Probability of Arrival (PA).** P (Arrival) = PLS (MOE 1.1) * WSR (MOE 1.2) assuming adequate Responsiveness (MOE 1.3) and Security (MOE 1.4). The Probability of Arrival (PA) is equal to Pre/Post Launch Survivability (PLS, a probability) times the Weapon System Reliability (WSR, a probability) assuming adequate Responsiveness (R - measured by various methods including time, distance and azimuths) and Security (S, determined by weapon system basing and techniques employed).

**MOE 1.1: Survivability (Pre and Post Launch) (Primary Launch Center, Alternate Launch System and Launcher Location).**
(DoD 5000.2-R). The probability of a system and crew to avoid or withstand a man-made hostile environment without suffering an abortive impairment of its ability to accomplish its designated mission. Survivability consists of susceptibility, vulnerability and recoverability.

**MOP 1: Weapons of Mass Destruction Attack.** Expected survival rate varies by type of WMD.

**Nuclear.** Must be able to operate through a nuclear attack and still be executable. Measures susceptibility to damage/degradation from blast, radiation (gamma, x-ray, etc.), thermal and other attacks. Survivability of LL, PLC, ALS, C4 infrastructure, critical support equipment and personnel is directly proportional to lethality of attacking system and hardness of employed system. Attacking system lethality will have to be determined based on most likely weapon system to be used by an adversary, as determined by intelligence methods. Survivability is the measure of the weapon system hardness/susceptibility to damage from physical, blast, radiation and thermal attack in all phases of its employment. The baseline for the new system must, as a minimum, achieve current survivability capabilities of MM III or PK ICBM (whichever is more survivable) and should incorporate the latest technologies to ensure the highest possible level of survivability to a nuclear attack.

**Chemical.** Must be able to operate through a chemical attack and still be executable. Measures susceptibility to damage/degradation from chemical attacks. Survivability of LL, PLC, ALS, C4 infrastructure, critical support equipment and personnel is directly proportional to lethality of attacking system and hardness of employed system. Attacking system lethality will

have to be determined based on most likely weapon system to be used by an adversary, as determined by intelligence methods. The baseline for the new system must; as a minimum, achieve current survivability capabilities of MM III or PK ICBM (whichever is more survivable) and should incorporate the latest technologies to ensure the highest possible level of survivability to a chemical attack.

**Biological.** Must be able to operate through a biological attack and still be executable. Measures susceptibility to damage/degradation from biological attacks. Survivability of LL, PLC, ALS, C4 infrastructure, critical support equipment and personnel is directly proportional to lethality of attacking system and hardness of employed system. Attacking system lethality will have to be determined based on most likely weapon system to be used by an adversary, as determined by intelligence methods. The baseline for the new system must, as a minimum, achieve current survivability capabilities of MM III or PK ICBM (whichever is more survivable) and should incorporate the latest technologies to ensure the highest possible level of survivability to a biological attack.

**MOP 2: Conventional Attack (pre/post launch).** Expected survival rate from all conventional attacks should be as a minimum at least equal to the current PK or MM III system (whichever survival rate is greater) and should take advantage of increasing survivability through emerging technologies. The following conventional attack methods are not necessarily the only conventional types of attacks the weapon system could encounter, but are provided as a baseline.

**Jamming.** Must be able to survive attack by conventional means. The weapon system and supporting C3 infrastructure needs to be able to operate correctly despite jamming to include PLC to LL, ALS to LL, ALS to PLC and potential commands to weapon system while in flight (during all phases of flight except terminal reentry). All weapon system commands in the aforementioned modes need to be addressed. This includes normal operating system commands to emergency war order procedural commands. The weapon system should operate in a day-to-day anti-jamming mode without degradation.

**Laser.** Must be able to survive laser attack to include an attack on the PLC, LL, ALS and the weapon system during all phases of flight. Also, any "critically" designated ground support systems, including supporting C4 infrastructure, must be protected. The weapon system should operate in a day-to-day laser denial mode without degradation.

**Microwave.** Must be able to survive microwave attack to include an attack on the PLC, LL, ALS, weapon system and supporting C4 infrastructure during all phases of flight. Also, any "critically" designated

ground support systems must be protected. The weapon system should operate in a day-to-day microwave denial mode without degradation.

**Electro-Magnetic Interference (EMI).** Must be able to survive EMI attack to include an attack on the PLC, LL, ALS, weapon system and C4 infrastructure during all phases of flight. Also, any "critically" designated ground support systems must be protected. This would include any platform for the ALS, to include support equipment for the platform. Weapon system should be protected from EMI in day-to-day operations without degradation.

**MOP 3: Intercept Attack.** Expected survival rate from all intercept attacks should at least equal current PK, MM III system or Submarine-Launched Ballistic Missile (SLBM) (whichever survival rate is greater) and should take advantage of increasing survivability through emerging technologies.

**Boost Phase.** Must be able to survive boost phase attack. Measures susceptibility to damage/degradation from blast, radiation, thermal and other attacks (see Conventional Attack requirements above) during boost phase of the missile launch, both for physical damage as well as communication and/or sensor degradation.

**In-flight.** Must be able to survive in-flight intercept. Measures susceptibility to damage/degradation from blast, radiation, thermal, kinetic and other attacks (see Conventional Attack requirements above) during in-flight phase, both for physical damage as well as communication and/or sensor degradation. This includes the ballistic environment produced by direct attack by missile defense/Anti-Ballistic Missile (ABM) systems.

**Terminal.** Must be able to survive terminal intercept attack of the reentry system (RS) or reentry vehicle (RV). Terminal Penetrator--Measures susceptibility to damage/degradation from blast, radiation, thermal and other attacks during the terminal/penetration phase of the weapon. This shall include expected engagements with missile and air defense systems. RV types will be considered for all target types. All weapons must ensure an acceptable PD (see MOE 2.1-2.3) against a nominal target set within weapon system capabilities. Weapon systems must have variable altitude delivery presets as well as independent altitude setting capability.

> **Standard (normal single RV straight-in) (SRV).** Surface – Measures the weapon system's capability to deliver a nuclear warhead intact utilizing a surface burst within nominal performance characteristics. Air – Measures the weapon system's capability to deliver a nuclear warhead intact utilizing an airburst to within nominal performance characteristics. High Altitude Burst (HAB) – Measures the weapon system's capability to deliver

a nuclear warhead intact utilizing a high altitude burst within nominal performance characteristics. Penetrator--Measures the penetrator's capability to deliver a nuclear warhead intact within nominal performance characteristics; the probability the penetrator will deliver the warhead intact to provide nominal warhead/ground coupling performance.

**No Penetration Aids.** Self-explanatory.

**Penetration Aids.** All types of penetration aids technologically achievable must be examined. This could include, but is not limited to, chaff, stealth technology, etc.

**Multiple Independently Retargetable Vehicle (MIRV).** Surface--Measures the weapon system's capability to deliver a nuclear warhead intact utilizing a surface burst within nominal performance characteristics. Air – Measures the weapon system's capability to deliver a nuclear warhead intact utilizing an air burst within nominal performance characteristics. HAB – Measures the weapon system's capability to deliver a nuclear warhead intact utilizing a high altitude burst within nominal performance characteristics. Penetrator--asures the penetrator's capability to deliver a nuclear warhead intact within nominal performance characteristics; the probability the penetrator will deliver the warhead intact to provide nominal warhead/ground coupling performance.

**No Penetration Aids.** Self-explanatory.

**Penetration Aids.** All types of penetration aids technologically achievable must be examined. This could include, but is not limited to, chaff, stealth technology, etc.

**Trajectory Shaping Vehicle (TSV).** Surface – Measures the weapon system's capability to deliver a nuclear warhead intact utilizing a ground burst within nominal performance characteristics. Air – Measures the weapon system's capability to deliver a nuclear warhead intact utilizing an air burst within nominal performance characteristics. Penetrator--Measures the penetrator's capability to deliver a nuclear warhead intact within nominal performance characteristics; the probability the penetrator will deliver the warhead intact to provide nominal warhead/ground coupling performance.

**No Penetration Aids.** Self-explanatory.

**Penetration Aids.** All types of penetration aids technologically achievable must be examined. This could include, but is not limited to, chaff, stealth technology, etc.

**Conventional Land-Based Strategic Deterrent (cLBSD).** Surface – Measures the weapon system's capability to deliver conventional munitions intact utilizing a ground burst with nominal performance characteristics. Penetrator--Measures the penetrator's capability to deliver conventional munitions intact within nominal performance characteristics; the probability the penetrator will deliver the conventional munitions intact to provide nominal warhead/ground coupling performance. Standard, MIRV, TSV, and CAV capabilities should be considered for cLBSD.

**No Penetration Aids.** Self-explanatory.

**Penetration Aids.** All types of penetration aids technologically achievable must be examined. This could include, but is not limited to, chaff, stealth technology, etc.

**MOP 4: Natural Disasters.** The only natural disaster considered is weather. Extreme temperature ranges could range from minus 100(F) to plus 120(F). High winds can damage ground equipment and affect launch safety. Deep snow and ice can damage ground equipment, communications, et cetera. Heavy rains and associated downdrafts can prevent successful fly-out during launch and damage support equipment and communications. Lightning can temporarily interrupt ground equipment and possibly disrupt Aerospace Vehicle Equipment (AVE) and even cause catastrophic failure of the boost vehicle during launch. Lightning can also can affect ALS/node operations and connectivity. As weather extremes are not anticipated to differ in the future from what has been experienced in the past 30 years, the capability to survive weather extremes should be at least equal to the current MM III or PK systems (whichever system's weather survivability is greater) and should incorporate the latest technologies to ensure the highest possible level of survivability.

**MOE 1.2: Weapon System Reliability (WSR).** The probability of a scheduled weapon arriving in the target area and detonating as planned excluding the effects of enemy action. Measures the ability of a weapon system to operate as advertised in the absence of a threat environment--the probability the weapon system will attain nominal performance characteristics. Minimum reliability standards, as envisioned by HQ AFSPC/XON for all components together (launch, in-flight and re-entry) should be no less than 93%. Acceptable standard for all components is 95%. Ideal standard would be 98%.

**MOP 5: Launch Reliability.** The probability of a scheduled weapon system surviving launch (actually launching).

**MOP 6: In-flight Reliability.** The probability of a scheduled weapon system surviving in-flight (completing in-flight phase).

**MOP 7: RV Reliability.** The probability of a scheduled weapon system RV surviving (arriving) and striking its intended target.

**MOE 1.3: Responsive.** Responsive–giving response, constituting a response, answering; quick to respond or react appropriately or sympathetically, sensitive. Responsive is defined in terms of the LBSD AoA to reflect both human (C2) and weapon system responsiveness in a rapid, timely manner reflected in minutes and seconds (not hours or days); distance; and azimuth.

**MOP 8: Execution Orders.**

**Human Processing.** Human processing (C2)–Timelines associated with human processing of an execution order. Includes copying, decoding and weapon system operations required to launch weapons. Baselines for current MM III and PK ICBM systems are acceptable minimum standards for new system (as defined in CJCSI 6811.01A, Nuclear Technical Performance Criteria); however, the latest technologies should be incorporated whenever possible.

**Weapon System Timeliness.** Timeliness associated with physical weapon system processing commands. Includes human commands and weapon system responsiveness to commands. Baseline launch execution timelines for current MM III and PK ICBM systems are acceptable minimum standards for new system, however, the latest technologies should be incorporated whenever possible.

**MOP 9: Rapid In-flight Retargeting.** Conventional weapons may be retargeted in-flight.

**Strategic Relocatable Targets (SRT).** SRTs are typed as a Soft Target. SRTs will be treated as an emerging soft target for nuclear weapons. Conventional weapons may be retargeted in-flight. The following information measures the ability of the a conventional weapon to receive/process retargeting data from various sources to effect retargeting of the conventional weapons in-flight.

**Search zone.** Measures the ability of a conventional weapon to receive and process retargeting data in the loiter or terminal phase. The conventional LBSD (cLBSD) should be able to search an area equal to 200 miles by 500 miles (notional only--exact area would

be classified, but needs to be determined). Area could vary widely depending upon capabilities of a cLBSD.

**Kill Zone.** Measures the ability of the cLBSD to receive/process retargeting data in the kill zone. The cLBSD should be able to successfully engage a given target/target type anywhere in the search zone upon successfully receiving/processing retargeting data. Search zone and kill zone area dimensions should be equal.

**Identification.** Measures the probability of the cLBSD to successfully collect/classify a specific target/target type within its search zone. The cLBSD should be able to achieve a probability of identification of at least 90% of a given target in its search/kill zone.

**Emerging Fixed Targets.** Measures the ability of the conventional weapon system to receive/process retargeting data in-flight and successfully strike an emerging fixed target. An SRT is also considered as an emerging fixed target. A nuclear weapon may be targeted against an emerging fixed target whose targeting coordinates are known prior to launch.

**MOP 10: Rapid In-silo Retargeting.** In-silo retargeting timing should at least equal current MM III or PK timelines (whichever is fastest) and should take advantage of new technology available to increase speed.

**System Alignment.** Weapon system must be capable of rapid retargeting. Weapon system must not experience any significant delays when directed to realign to different target coordinates, regardless of what the new coordinates may be.

**Rapid Input of Data.** Retarget timing. Measures the time required to transmit retargeting updates of various complexities to the weapon system both in-silo and in-flight.

**All Azimuth Capability.** Measures the weapon system's capability to encompass all azimuth requirements and associated parameters. Weapon system must be capable of 360-degree azimuth launch settings per guidance of HQ AFSPC/XON.

**MOP 11: Range.**

**Maximum.** Measures the ability to launch/transport the nuclear warhead(s) and conventional munitions within nominal performance characteristics to the maximum range possible. Currently, HQ AFSPC/DRM estimates maximum range requirement to be global.