CBRN Survivability

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CBRN Survivability

HQDA G-3/5/7 U.S. Army Nuclear and CWMD Agency (USANCA)

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AGENDA

Part 1 -- THREAT

- Growing Global WMD Threat
- CBRN Threat

Part 2 -- POLICY

- Policy Overview
- Definitions

Part 3 – REQUIREMENTS

- CBR Contamination Survivability
- Nuclear Survivability

Part 4 – CONCERNS

- Requirement Compliance
- Mission Critical Systems
- Middle of Tier Acquisition (Future Capabilities)

PART I

THREAT

THREAT

Cold War I

Cold War II

WMD Threat

CBRN-S reduces Risk to Mission and the Force

Why CBRN-S? Answer: **THREAT**

PAST: The US-Soviet Cold War, a bi-polar era that ended in 1992. CBRN-S requirements waned over the next two decades.

PRESENT: Nuclear threat is multi-polar: Near and intermediate-ranged nuclear weapons are gaining favor. Adversaries are increasing their reliance upon nuclear weapons in their security strategies. Advanced delivery technologies abound (space, robotics, drones, hypersonics, etc.). Past WMD taboos have fallen.

FUTURE: WMD threat, technology, and capability will continue to grow at alarming rates. WMD will be a key risk in future conflicts and force.

CBRN-S enhances the ability U.S. Military materiel to prevail in WMD environments.

NUCLEAR and CHEMICAL THREAT

CBRN Survivability (CBRN-S) Reduces Risk to Mission and the Force

Why CBRN-S? Answer: THREAT

The Soviet arsenal had (and Russia has) all forms of WMD. Although Post-1992 threat dropped, CBRN-S remains a requirement for critical combat weapon systems.

Today's CBRN threat environment is increasing beyond Cold War I levels. World WMD capabilities include from technology modernizations that increase effectiveness and accuracy (hi-speed computers, miniaturization, nanotechnology, hypersonics, quantum computing, etc.).

Strategic treaties are breaking down. Intermediate (500km to 5500km) nuclear ranged forces (INF) treaty was dissolved in 2019. Outer Space treaty is teetering.

Is the U.S. military prepared to win a dirty fight?

THREAT CAUSES NEED for CBRN-S

CBRN-S Reduces Risk to Mission and the Force

- The Army will operate in CBRN environments of an increasingly lethal nature. …CBRN-S is a part of force readiness and ironically an active deterrent for adversary use of WMD.
- CBRN-S has always been a requirement, but priority ebbed following the Soviet Union's demise (1992).
- CBRN-S priority has returned to beyond Cold War levels.

CBRN-S was reinstated Jan 16, 2018 via DODI 3150.09 as a mandatory requirement of mission critical development programs.

Renewed CBRN-S Priority

CBRN survivable materiel is essential for the Army to be ready to fight and win on a nuclear and contaminated battlefield. Inability to survive in a CBRN environment increases risk to mission and the force. Our readiness to confront a Great Power competitor is contingent on materiel systems that will survive during and after CBRN events.

Army resources are limited. The best approach to enhance the Army's ability to fight and win against a near-peer adversary is by ensuring all future mission critical systems are designed, built, and tested to survive in a CBRN environment.

Addressing survivability requirements early in development is key. When CBRN survivability is documented, tested and evaluated early in the acquisition process, cost and schedule impacts are minimal.

CBRN-S is a priority for all CBRN Mission Critical Systems.

PART II

POLICY

DoD CBRN-S Priority

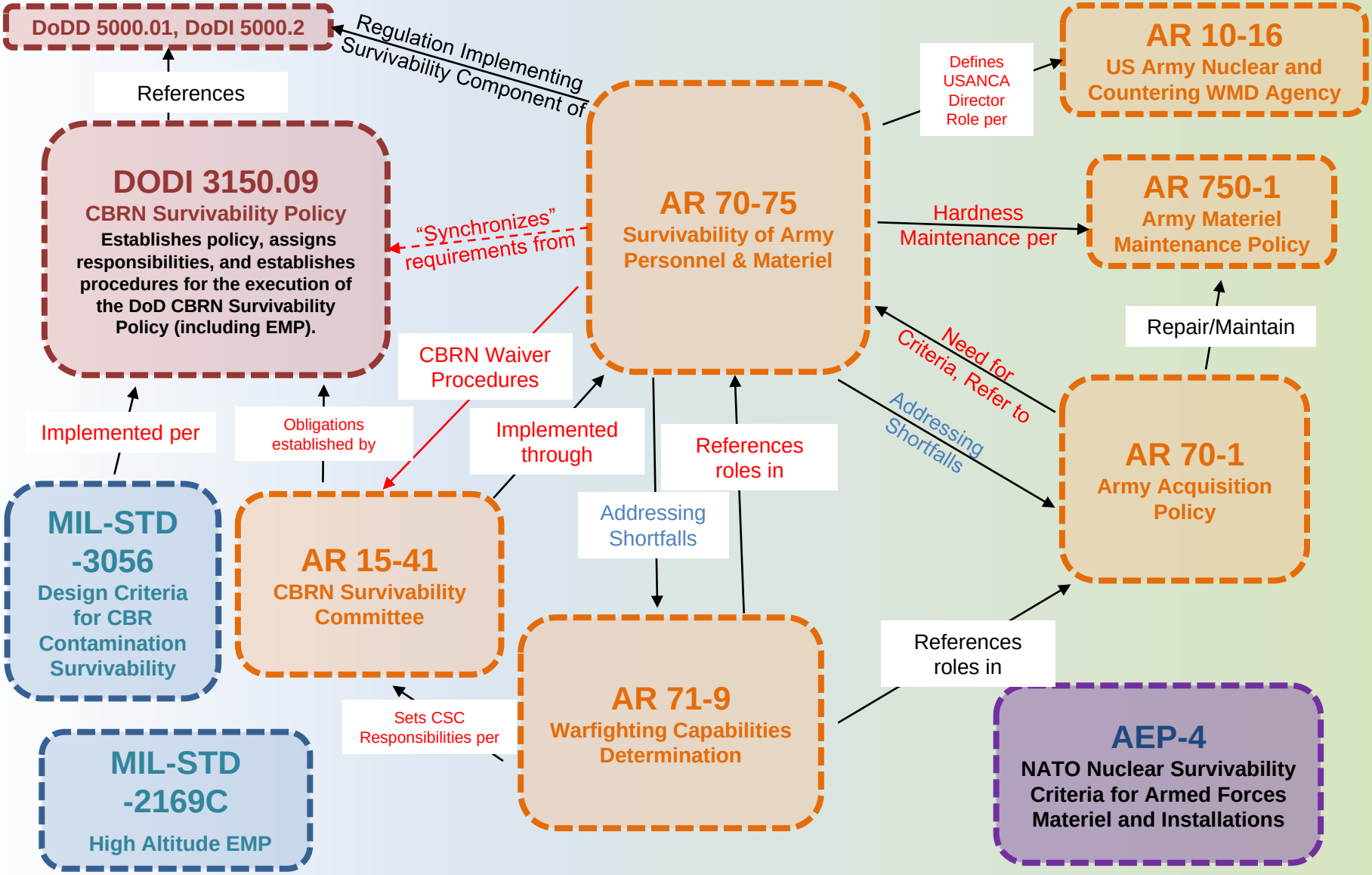
2006: JCIDS Manual updated to call for mandatory survivability Key Performance Parameter (KPP).

2008: DoDI 3150.09, details DoD CBRN-S policy.

2015: DoDI 3150.09 update increased the rigor of CBRN-S compliance for CBRN mission-critical systems. All ACAT I systems that perform mission in CBRN environments must be designated CBRN mission-critical systems (CBRN-MCS).

2018: DoDI 3150.09 updated 31 August 2018 to respond to JCIDS Manual update. Increases priority on CBRN-S. CBRN-S requirements are in the mandatory system survivability KPP 2.

CBRN-S Policy Overview



Joint Requirements

JCIDS Manual

A System Survivability Key Performance Parameter must state:

1. In accordance with DODI 3150.09, whether or not a system is mission critical

   …and if mission critical—

2. That system must survive and operate through and in a CBRN environment: “if applicable to the operational context.”

The JCIDS Manual Codifies CBRN Survivability Requirements

CBRN-S DEFINITIONS

Know the difference between CBRN-S, CBRCS, and NS

CBRN Survivability (CBRN-S): The capability of a system to avoid, withstand, or operate during and after exposure to a CBRN environment (and decontamination process) without losing the ability to accomplish the assigned mission. CBRN-S is concerned with contamination that includes fallout and initial nuclear weapon effects, including blast, EMP, and other initial radiation and shockwave effects.

CBR Contamination Survivability (CBRCS): The capability of a system and its crew to withstand a CBR contaminated environment, including decontamination, without losing the ability to accomplish the assigned mission. The three main principles of CBRCS are hardness, decontaminability, and compatibility.

1. **Hardness:** The capability to withstand the damaging effects of CBR contamination and decon.
2. **Decontaminability:** The ease of rapidly and effectively decontaminating a system.
3. **Compatibility:** The ability to operate, maintain, and resupply a system by personnel wearing full IPE.

Nuclear Survivability (NS): The capability of a system to withstand exposure to a nuclear environment without suffering loss of its ability to accomplish its designated mission.

NS may be accomplished by hardening, timely resupply, redundancy, mitigation techniques (to include operational techniques), or a combination thereof.

JCIDS Concepts to Capabilities

President, SECDEF & Chairman:
- Strategic Guidance

OSD/Joint Staff
- Integrated Security Constructs
- Family of Joint Concepts

Identification of Capability Requirements

- Operational Planning
- CBAs & Other Studies
- Exercises/Lessons Learned
- JCTDs/JUON/JEON/ Experiments
- JIEDDO Initiatives
- Defense Business Sys

Outputs

- Mission & Problem
- Capability Gaps
- Tasks
- Performance
- Conditions
- Operational Risk
- Non-Materiel Approaches
- Materiel Approaches
- Recommendations

- Analysis of Alternatives (AoA)
- Technology Development Strategy (TDS)
- Test & Evaluation (T&E) Strategy (TES)
- System Engineering Plan (SEP)

- Technology Demonstrated
- Initial Key Performance Parameters/Key System Attributes (KPPs/KSAs)
- Acquisition Strategy
- T&E Master Plan (TEMP)
- SEP

- Final Design
- Developmental T&E (DT&E)
- Operational Assessments
- Revise KPPs/KSAs
- Acquisition Strategy
- Acquisition Program Baseline (APB)
- TEMP
- SEP

- Low Rate Initial Production (LRIP)
- Initial Operational T&E (IOT&E)
- Acquisition Strategy
- APB
- TEMP
- SEP

Activity

Select Joint Concept | Develop CONOPS | *Capabilities-Based Assessment / Other* | ICD | Materiel Development Decision | Materiel Solution Analysis | *Sponsor - Approved* CDD | MS "A" | Technology Development | MS "B" | CDD | Engineering & Manufacturing Development | MS "C" | CPD | Production & Deployment

CCMD

Analysis of Alternatives | Competitive Prototyping | Evolutionary Acquisition

Military Services

SECDEF | Joint Staff / Joint Requirements Oversight Council / OSD | OSD (AT&L, CAPE), Services and OSD (DOT&E) -- Joint Staff (JROC)

Policy | ***Identify Capability Requirements*** | ***Select Materiel Solution*** | ***Develop, Test, Produce & Field***

Getting the Front End Right is the Key to Success

PART III

REQUIREMENTS

MCS Determination

1 Does the system perform mission critical functions?

2 Does the system's mission profile operate under threat of CBRN environments?

3 Is the system a weapons system?

4 Does the system have electronics?

5 Does the system support a mission critical weapon system or perform critical functions (command, control, communications, intelligence, recon, etc.)?

If the answer is yes to 1 and 2, you likely have an MCS. If 1,2, and 3 and three, you need INWE. If yes to 4, you need HEMP. If 5 and a higher dollar system, but not a weapons system, you can very well be an MCS.

Army CBRN-S Requirements

(The Big Three)

From AR 70-75 Army Survivability…, paragraph 1-7f:

All CBRN mission critical systems, must be have protections for:

1) **CBRCS.** CBR contamination survivability
2) **HEMP.** If this critical item or component has electronics, at a minimum, it will be survivable to HEMP and an electronic attack environment, including directed energy weapons
3) **INWE.** If this critical item is a weapon system (including all mission critical components of the weapon system), it will also survive the INWE of blast, thermal radiation, initial nuclear radiation, and source region electromagnetic pulse.

CAUTION: The use of critical Commercial Off-The-Shelf (COTS)/Non-Development Items (NDI), does not obviate the need for CBRN-S compliance.
NOTE: Per AR 15-41, a waiver process exists for CBRCS, HEMP, INWE, and related testing primarily for address of failed or partially met results.
MYTH: Waivers permit CBRN-S requirements to be dropped.
FACT: A waiver does not relieve a system from the need to meet a CBRN-S requirements. A waiver is a proposed “get-well plan” to meet CBRN-S.

CBRCS PHILOSOPHY

Philosophy behind CBR Contamination Survivability (CBRCS) Criteria:

"A soldier or crew surviving an NBC attack should be able to continue using mission-essential systems and equipment, in a full protective ensemble if necessary. When the mission permits, the systems and equipment should be capable of rapid restoration to a condition such that all operations can be continued in the lowest protective posture consistent with the mission and threat, and without long-term degradation of the materiel."

Source: NBC Contamination Survivability Criteria for Army Materiel (HQDA, USANCA May 05) (U)

Decontamination

CBR CS Challenge Criteria

Characteristic		Key Requirements	
Decontaminability	Challenge Levels	Chem	10 g/m^2 of GD
		Chem	10 g/m^2 of VX
		Chem	10 g/m^2 of HD
		Bio	10^5 Spores/m^2
		Rad	4 g/m^2 Radioactive Contaminants
	Timeline	C-B-R	Begin 1 hour after Contamination
		C-B-R	Complete within 75 minutes
	Negligible Risk Levels	Chem	0.25 mg*min/m^3 VX vapor (2.5 for GD, 50 for HD)
		Chem	1.4 mg/70-kg man VX liquid (30 for GD, 180 for HD)
		Bio	500 spores/m^2
		Rad	25 cGy /12 hrs from Radiological Contaminants or Induced Activity
Hardness	Degradation Period	C-B-R	30 days
	Decon Cycles	C-B-R	5
	Degradation	C-B-R	20% for mission essential components
Compatibility	Mission Time	C-B-R	12 hours
	Performance Decline	C-B-R	15%

Source: NBC Contamination Survivability Criteria for Army Materiel (HQDA, May 05) (U)

Will These Criteria need Revision for Future Environments?

DoD MIL-STD Health Criteria

C-B-R Negligible Health Effects Levels

Data table deleted as not yet cleared for Public Release

Discussion of Operational Exposure Guideline concepts will be conducted during this webinar

Preventive Maintenance Checks and Services (PMCS)

The CBRCS CARC Maintenance Program

- CARC requirement detailed in AR 750-1, Chapter 8-9. Army Chemical Agent Resistant Coating, Camouflage, and Marking Program
- PMCS schedules are included in the system technical manuals
- PMCS of CARC is in AR 750-1, 8-9,(8) “Scratches, chips, or marring of the paint surface observed during PMCS will be repaired at field level to prevent corrosion damage (see TB 43–0242, which provides guidance for ground support, and TM 1–1500–345–23, which pro-vides guidance for aircraft).”
- PMCS is a unit and depot maintenance responsibility

NUCLEAR SURVIVABILITY PHILOSOPHY

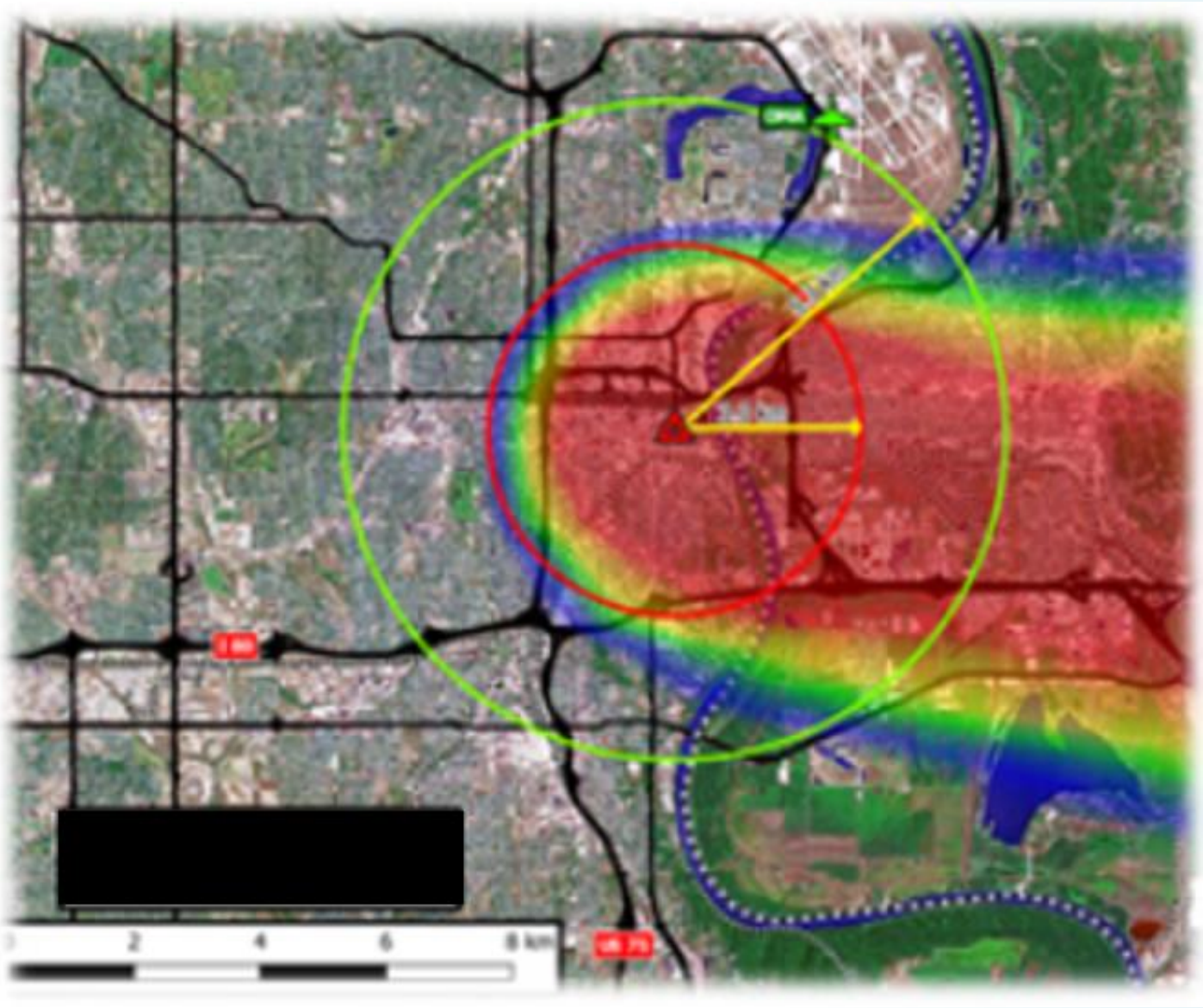
Philosophy behind NS Criteria:

"When man and equipment experience the same environment…balanced hardening criteria are determined by man's vulnerability"

"The basic principle is that the equipment should be designed to survive at levels where the associated operating personnel will remain combat effective long enough to perform the unit's mission"

If the Warfighter Survives, the Equipment Must Also

Nuclear Effects



CBRN Survivability Criteria

Environment		Analytical Basis	US Document	ABCA Document	NATO Document
CBR Contamination Survivability		References Deleted	References Deleted	References Deleted	References Deleted
Nuclear	HEMP	References Deleted	References Deleted	References Deleted	References Deleted
	Nuclear Effects Besides HEMP (i.e., Blast, Thermal, Initial Nuclear Rad., SREMP)	References Deleted	References Deleted	References Deleted	References Deleted

Army Criteria are Used Internationally

Hardness Maintenance / Hardness Surveillance (HM/HS) Program

Nuclear Hardness Program

- HM/HS is independent of INWE
- HM/HS applies to mission critical systems with electronics/HEMP
- HM/HS is the periodic maintenance sustainment checks for continued protections form HEMP
- List of systems is maintained by ASA(ALT), USANCA and in the Army CBRN Mission Critical Report
- HM is a unit responsibility
- HS is a MATDEV responsibility

AR 750-1, Chapter 8-23, Nuclear HM/HS Program

PART IV

CONCERNS

CONSEQUENCES of No CBRN-S

CBRN Survivability Reduces Risk to Mission and the Force

Without CBRCS:
Chemicals present immediate and long term health effects. Chemicals will block ability to target, corrode material, bind moving parts, dissolve seals, and destroy coating's ability to mask critical weapon systems, and interfere with computer displays, communications, and sensitive devices.

Without HEMP:
High-altitude Electro-Magnetic Pulse (HEMP) can render unprotected electronic combat systems useless. Technical capabilities reduced.

Without INWE:
Initial Nuclear Weapons Effects (INWE) on critical combat systems ability to complete mission ends.

CBRN-S REQUIREMENTS

CBRN-S are divided into two major test areas:

CBRCS: Chemical, Biological, and Radiological Contamination Survivability

NS: Nuclear Survivability

- **HEMP – High-altitude Electromagnetic Pulse**
- **INWE – Initial Nuclear Weapons Effects**

Capabilities Development

JCIDS Capability Requirements Documents

ICD - Initial Capability Document

CDD - Capability Development Document

CPD - Capability Production Document

CS Requirement Levels

KPP – Key Performance Parameter

KSA – Key System Attribute

APA – Additional Performance Attribute

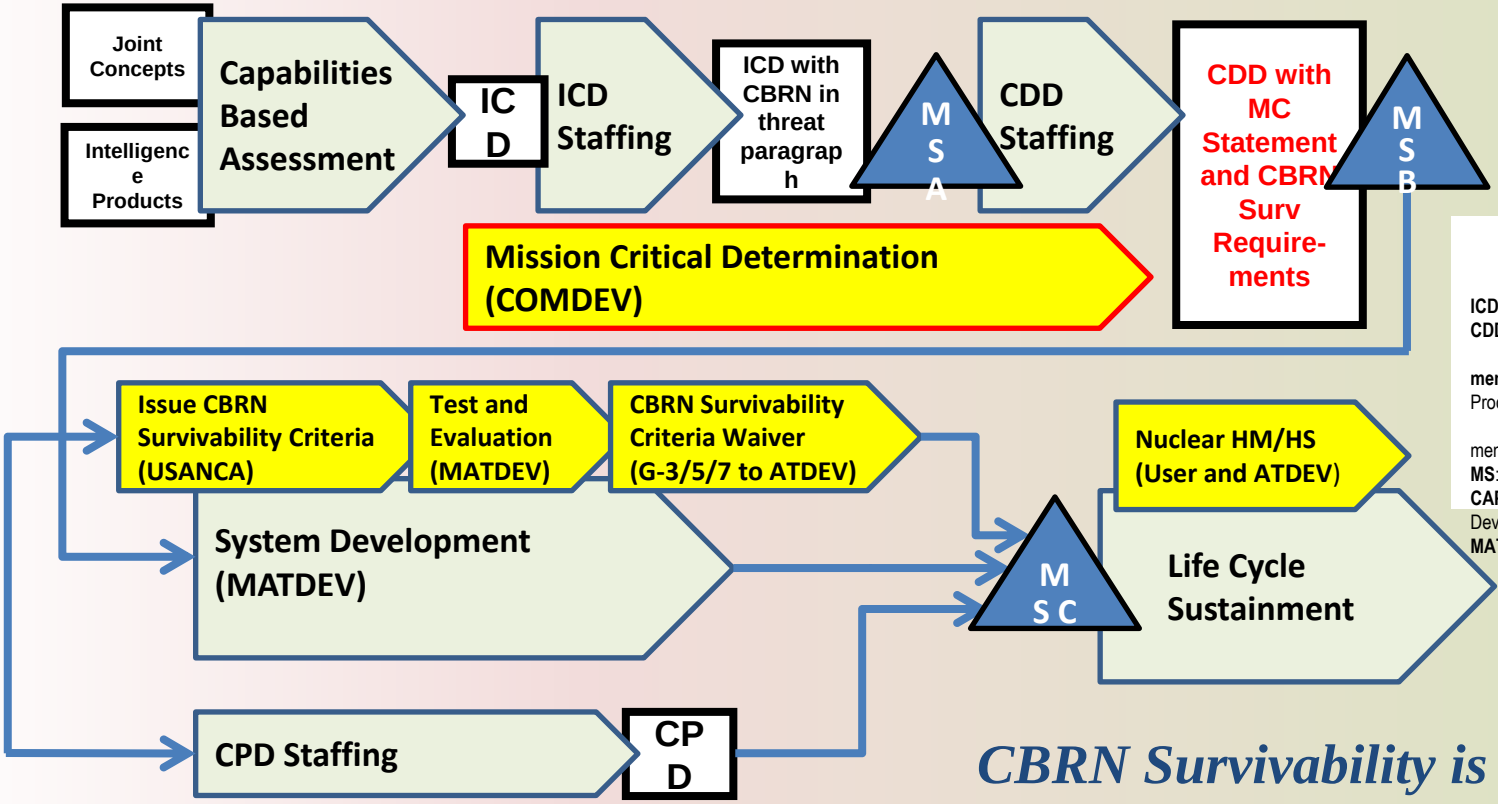
OSA – Other System Attribute

Mandatory	Optional
KPP	APA
KSA – MDA decides	OSA
Threshold	Objective

Note: MDA only sees KPP/KSA results
APA/OSA are in “Trade Space”

JCIDS Process

Where CBRN Survivability Integrates with the JCIDS Process



Acronyms

ICD: Initial Capability Document
CDD: Capability Development Docu
ment CPD: Capability Production Docu
ment
MS: Milestone
CAPDEV: Capability Development
MATDEV: Materiel Development

CBRN Survivability is Fully Integrated within JCIDS

Middle Tier Acquisition (MTA) by Congressional Law: Rapid Acquisition Initiatives

National Defense Authorization Act (NDAA)

NDAA 2016 Sec. 804, NDAA 2017 Sec. 884, and NDAA 2018 Sec. 866

Middle Tier Acquisition (MTA)

--Rapid Prototyping (with DOD cost sharing) and Rapid Fielding

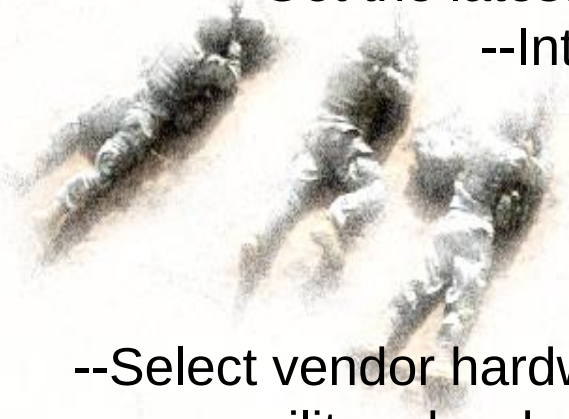
--Expedited Process cuts the "red tape" of formal Joint Capabilities Integrated Development System (JCIDS) and standard DODI 5000.2 acquisition requirements promoting use of streamlined processes

MTA Program Characteristics

--Get the latest urgently-needed emergent technologies fielded faster

--Intended to reduce program life cycle development costs

--Fielding in 2 to 5 years



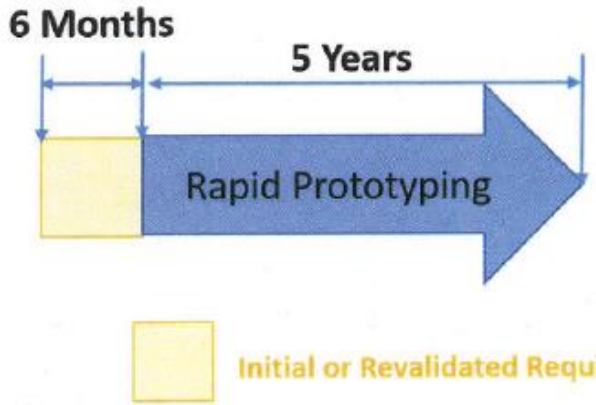
MTA Process

--Select vendor hardware, demonstrate enhanced capabilities, down select, military harden, rapidly test & evaluate to support a fielding decision.

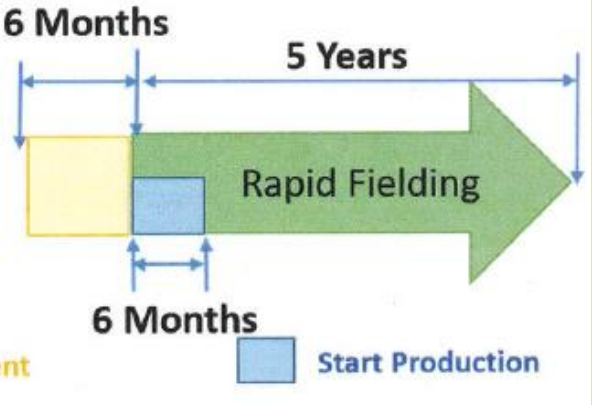
MTA in Practice for the Army

Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)) MTA Policy as of September 25, 2018

Rapid Prototyping (for Innovation)



Rapid Fielding (for Proven Tech)



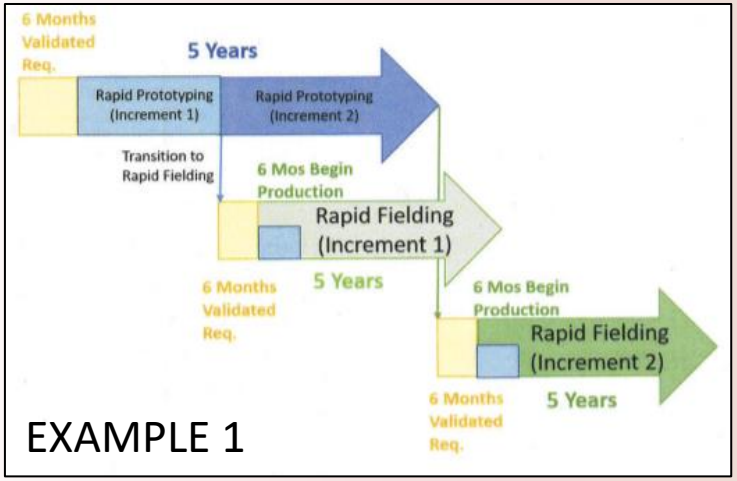
The MTA Rapid Prototyping option has a small window of time to ensure CBRN-S requirements are addressed early with minimal program cost impact.

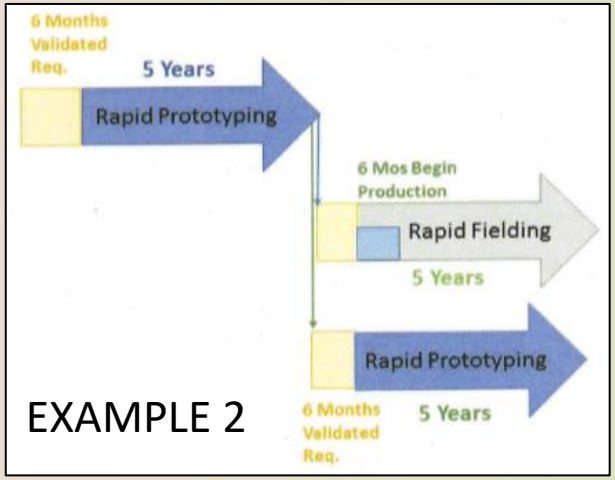
The MTA Rapid Fielding option provides a chance for test and evaluation of CBRN-S performance, but field remedies that involve retrofitting can be costly.

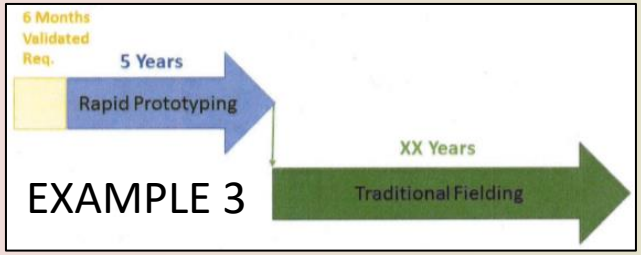
MTA Transfer to the Field

Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)) MTA Policy as of September 25th, 2018

Transition from MTA to a fielded system can happen in several ways:

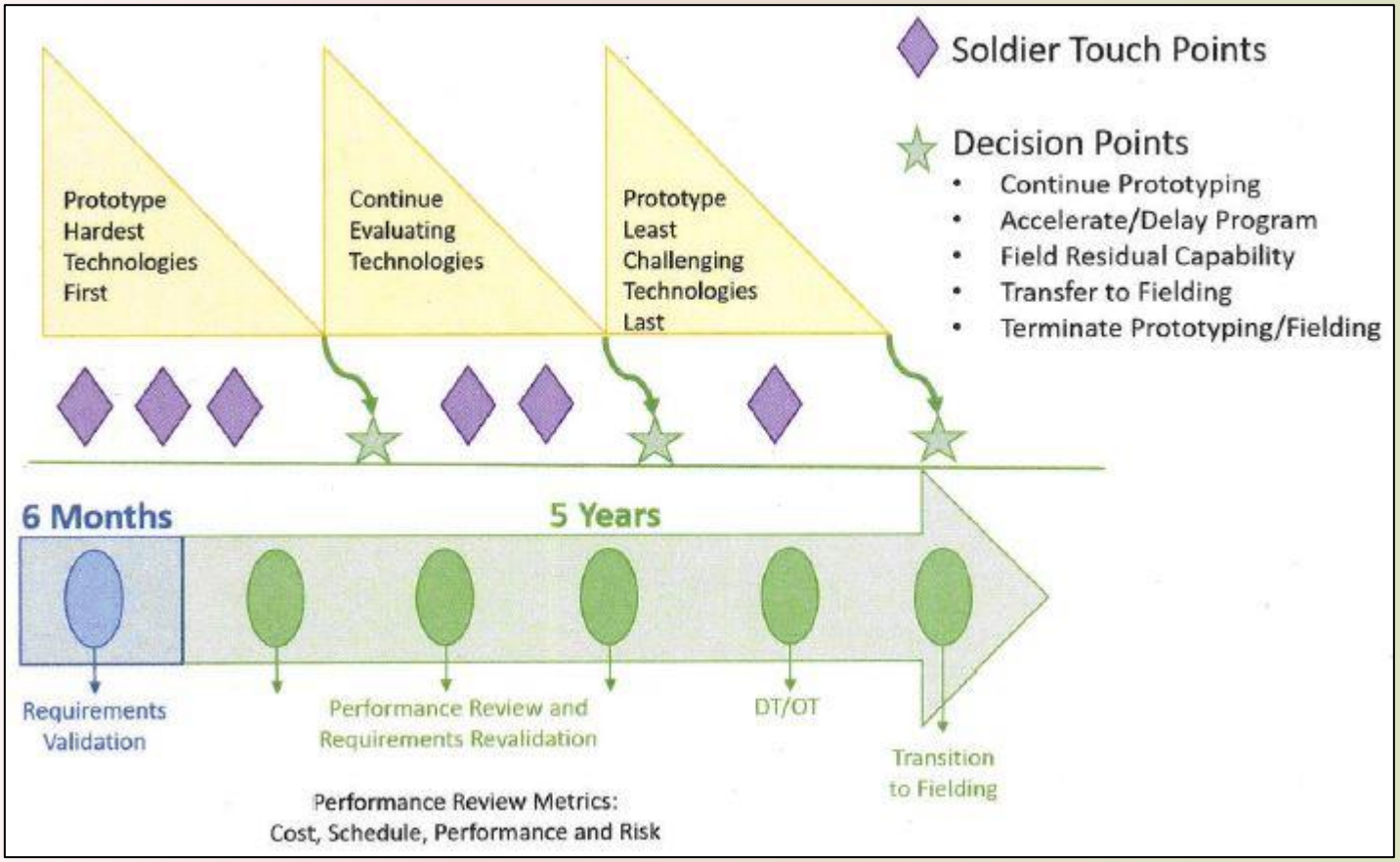






When transitioning to a standard fielded system, finding ways to comply with Army and DOD policies such as CBRN-S may be costly when not previously addressed.

MTA Prototype Timeline



Rapid Prototyping effort can precede validated requirement and may inform the final requirement. The PM team must have an approved requirement within 6 months from the time the MTA process is initiated. The PEO/PM must collaborate with HQDA staff to reduce risk and facilitate information sharing pre-approval.

MCS Concerns

Will MCS that operate in or under threat of Weapons of Mass Destruction be CBRN survivable and support mission success?

A robust program of properly applying CBRN-S requirements early in the development process can ensure performance levels are test, evaluated and assessed for remedy.

The waiver process can address failed or partially failed CBRN-S compliance. Once performance is known, solution sets in the Doctrine, Organization, Training, Materiel, Leadership, Personnel, Facilities and Policy (DOTmLPF-P) Domains

The “m” for Materiel is not capitalized to emphasize that a design change is a last resort for resolving survivability issues.

Take Aways

- No longer a stable unipolar or bipolar world— Multipolar nuclear stakeholders increase chance of nuclear conflicts. The U.S. needs to be prepared.
- Readiness today and for a future of intense lethality requires designing CBRN survivability into systems early in the development process.
- CBRN Survivability is vital for Mission Critical Systems to perform in uncertain environments.

CBRN Survivability is Increasingly Important in a future Multipolar World of Growing Instability and WMD Capability

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