



# U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND SOLDIER CENTER

## FY23-27 Army Simulation and Technology Research Overview

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STTC

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## AGENDA



- STTC POM23 Planning Process
- POM23 User Capability Gap Priorities
- FY23-27 S&T Investment Strategy & Timeline
- FY23-27 Tech and Knowledge Research Focus Areas
- Path Forward



## STTC POM 2023-2027 PROCESS GOALS



- Start adjusting the Simulation and Training S&T program to meet Mid-Term (FY28) User Needs for Multi Domain Operations in support of Synthetic Training Environment (STE-CFT).
- Establish process to achieve up-front agreement on POM adjustments.
  - Achieve Concurrence on:
    - ✓ Process Timelines and Outputs
    - ✓ List of Prioritized User Capability Gaps
    - ✓ List of Prioritized S&T Efforts (Based on Capability Gaps)
    - ✓ Establish initial POM23 Position and UFR List
  - POM23 Decision Briefs



# POM23 PROCESS STAKEHOLDERS



## S&T Stakeholders

User Community Representatives	S&T / Acquisition Partners
CAC-T	CCDC (DEVCOM)
ACM-Live	PEO STRI
ACM-STE	
ACM-Constructive	
MEDCoE	
STE-CFT	
PEO STRI	

- The recurring STTC POM Planning Process is a common forum for User Communities, S&T and Acquisition Partners to Collect, Identify, Assign and Address Capability Gaps identified by our customers.
- Over 90+ participants in POM23
- Stakeholders who represent User Communities in this process own the defined Capability Gaps and their assigned Priorities.
- Stakeholders are tracing Capability Gaps to Official Guidance (i.e. memos, signed plans, etc.)



# POM23 PROCESS DETAILS



## Gap Analysis Overview – 59 User Capability Gaps (Priority 1-3)

### Gather Existing Simulation/Training Gaps (Guidance Memos)

DEPARTMENT OF THE ARMY  
U.S. ARMY COMBINED ARMS CENTER AND FORT LEAVENWORTH  
COMBINED ARMS CENTER - TRAINING  
307 JOSE AVENUE  
FORT LEAVENWORTH, KANSAS 66027-1301

ATZL-C7 JUN 05 2008

MEMORANDUM THRU Commanding General, U.S. Army Combined Arms Center, 415 Sherman Avenue, Fort Leavenworth, KS 66027-2300

FOR Commanding General, U.S. Army Futures Command (FCOP-DSI), 210 West 7th Street, suite 15300, Austin, TX 78701-0982

SUBJECT: Combined Arms Center-Training Training and Education Technology Needs for 2020 and Beyond

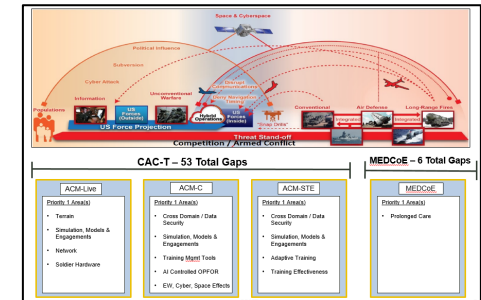
1. References:

- TRADOC Pamphlet 525-9-1, The U.S. Army in Multi-Domain Operations 2028 Concept, 6 December 2018
- Army Futures Command, Army Modernization Strategy (AMS) 1.5, 190315v01 (DRAFT) 15 MAR 2019.
- Army Futures Command OPRD 007-19, Future Force Modernization Enterprise Annual Mission Statement, 30 MAR 2019.

### CAC-T & MedCOE Generate Updated Capability Gap List, Use Cases & Prioritize (1-3)

STC Ref	Customer Need	Priority	ACM	Expected Need Date	PPER	Sub-Tech Areas	Use Cases
1	Enhancing high-resolution terrain data. Low frequency of updates and quality of terrain data is insufficient for high-resolution terrain data needs and quality of terrain data is insufficient for high-resolution terrain data needs.	1	Low	2028	Future	Terrain Processing	1. Update low-resolution terrain data to high-resolution terrain data. 2. Update low-resolution terrain data to high-resolution terrain data. 3. Update low-resolution terrain data to high-resolution terrain data.
2	Low frequency of updates and quality of terrain data is insufficient for high-resolution terrain data needs and quality of terrain data is insufficient for high-resolution terrain data needs.	1	Low	2028	Future	Terrain Processing	1. Update low-resolution terrain data to high-resolution terrain data. 2. Update low-resolution terrain data to high-resolution terrain data. 3. Update low-resolution terrain data to high-resolution terrain data.
3	Low frequency of updates and quality of terrain data is insufficient for high-resolution terrain data needs and quality of terrain data is insufficient for high-resolution terrain data needs.	1	Low	2028	Future	Terrain Processing	1. Update low-resolution terrain data to high-resolution terrain data. 2. Update low-resolution terrain data to high-resolution terrain data. 3. Update low-resolution terrain data to high-resolution terrain data.
4	Low frequency of updates and quality of terrain data is insufficient for high-resolution terrain data needs and quality of terrain data is insufficient for high-resolution terrain data needs.	1	Low	2028	Future	Terrain Processing	1. Update low-resolution terrain data to high-resolution terrain data. 2. Update low-resolution terrain data to high-resolution terrain data. 3. Update low-resolution terrain data to high-resolution terrain data.
5	Low frequency of updates and quality of terrain data is insufficient for high-resolution terrain data needs and quality of terrain data is insufficient for high-resolution terrain data needs.	1	Low	2028	Future	Terrain Processing	1. Update low-resolution terrain data to high-resolution terrain data. 2. Update low-resolution terrain data to high-resolution terrain data. 3. Update low-resolution terrain data to high-resolution terrain data.

### CAC-T & MedCOE Brief Capability Gaps & Use Cases to Stakeholder WG



## Tech Program Development – 12 POM23 S&T Efforts

### Develop Ideas against Priority 1 Gaps & Use Cases that require S&T

STC Ref	Customer Need	Priority	ACM	Expected Need Date	PPER	Sub-Tech Areas
1	Scalable simulation engine that manages virtual and constructive capabilities	1	STE			Advanced Terrain Management Simulation Management Simulation Architecture User Experience (UX)
2	Scalable simulation engine that manages virtual and constructive capabilities	1	STE			Advanced Terrain Management Simulation Management Simulation Architecture User Experience (UX)
3	Scalable simulation engine that manages virtual and constructive capabilities	1	STE			Advanced Terrain Management Simulation Management Simulation Architecture User Experience (UX)
4	Scalable simulation engine that manages virtual and constructive capabilities	1	STE			Advanced Terrain Management Simulation Management Simulation Architecture User Experience (UX)
5	Scalable simulation engine that manages virtual and constructive capabilities	1	STE			Advanced Terrain Management Simulation Management Simulation Architecture User Experience (UX)

### Review S&T Ideas with Stakeholders & choose top 12 ideas

POM23 SUB-WG SCHEDULE (JULY 2020)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
			5	6	7	8
			9	10	11	12
			13	14	15	16
			17	18	19	20
			21	22	23	24
			25	26	27	28
			29	30	31	

ACM-STE WG    ACM-C WG    ACM-Live WG    MEDCOE WG

### Develop, Brief & Prioritize S&T Efforts

REAL-TIME SYNTHETIC TERRAIN EFFECTS

SUMMARY

What Primary Capability Gap does this effort address?

ACM Live & Capability Gap

Technical Approach

Current State

Proposed Approach

Benefits

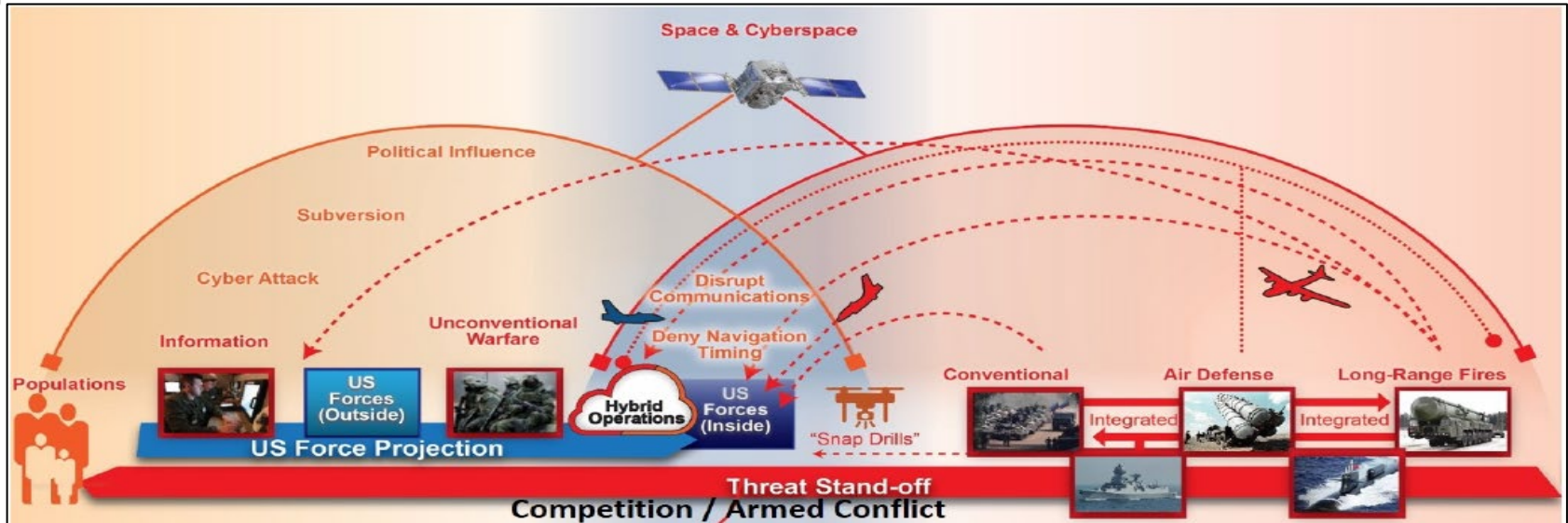
Risks

What are the risks?

How will risks be assessed through project lifecycle?



# CAC-T / ACMS / MEDCOE CAPABILITY NEEDS (MDO FOCUS)



## Priority 1 POM23 Capability Gaps

### TPO-Live

- High resolution terrain, data compression, storage and ballistic fly-out/engagements.
- Simulation, Models & Engagements, Area weapon range scoring
- Network optimization, and analytic tools for exercise support
- Soldier Hardware for direct, indirect/defilade engagement and Soldier sensory feedback.

### TPO-Constructive

- Cross Domain/data security/JIIM/Multinational
- Scalable Simulation, Models & Engagements (Sqd through CORPS) and Mission Command integration
- Exercise and Training Management Tools
- AI control OPFOR with adaptive capabilities
- EW, Cyber, Space effect link to other simulations to support CEMA training.

### TPO-STE

- Cross Domain/data security in support of multi-network/cross domain solutions for exercises
- Scalable Simulation, Models & Engagements that merge V/C capability
- MDO replication (Sqd through CORPS) and Mission Command integration
- Converting Live/Virtual entities with the Common Synthetic Environment
- Adaptive Training/Training Effectiveness research

### MEDCoE

- Prolonged Care & Tactical Combat Casualty Care (TC3)

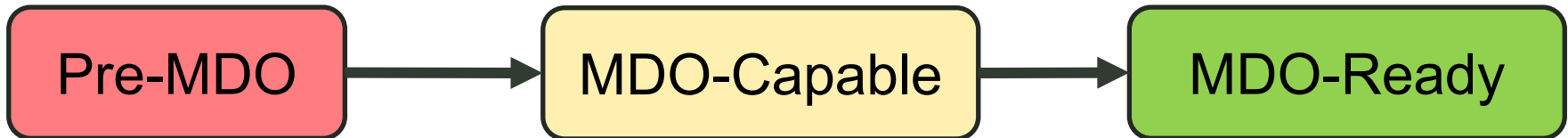


# S&T INVESTMENT STRATEGY



*S&T Investments towards an MDO Ready Force*

Near Term (Present-2023)	Mid Term (2023-2028)	Far Term (2028-2035)
<ul style="list-style-type: none"> <li>One World Terrain (OWT)</li> <li>Training Simulation Software (TSS)</li> <li>Training Management Tools (TMT)</li> <li>Soldier integrated Virtual Trainer (SiVT)</li> </ul>	<ul style="list-style-type: none"> <li>Cyber / Information Warfare</li> <li>Live Training</li> <li>Simulation Architecture (includes Next Gen Constructive)</li> <li>Training Effectiveness</li> <li>Medical</li> </ul>	<ul style="list-style-type: none"> <li>Live (12+5 Engagement Gaps)</li> <li>Simulation Architecture (includes NGC)</li> <li>Training Effectiveness</li> <li>Medical</li> </ul>



Continue leveraging POM Planning Process to maintain transparency and priorities across **S&T**, **User** and **Transition Partner** Communities





# RESEARCH FOCUS AREAS (FY23-27)



Training Effectiveness	Medical Simulations
<ul style="list-style-type: none"> <li>• Create a new common Multi-Domain Operation (MDO) Competency Framework to drive: <ul style="list-style-type: none"> <li>• Machine-supported training performance data collection</li> <li>• Tracking</li> <li>• Readiness projections</li> </ul> </li> <li>• Establish Data Interoperability Standards to: <ul style="list-style-type: none"> <li>• Create a common view of learners and how learners operate and navigate in the cognitive, affective, and psychomotor domains.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Develop simulation capabilities supporting the transfer of medical knowledge and skills to elevate understanding from assess and treat to total patient care. (Haptics, AR/XR/VR)</li> <li>• Develop physiology engines to support Prolonged Care across variety of simulation platforms.</li> <li>• Elevate capabilities of existing medical simulations to present signs, symptoms and reactions consistent with total patient care procedures.</li> </ul>

Live	Cyber	Simulation Architecture
<ul style="list-style-type: none"> <li>• Thin Client Data Compression and Processing</li> <li>• Enhanced Visual Terrain Effects (Live and Virtual)</li> <li>• Realistic Terrain Reasoning</li> <li>• Vertical Terrain Resolution for Defensive Fighting Positions</li> </ul>	<ul style="list-style-type: none"> <li>• Data exchange model for Cyberspace Effects</li> <li>• Brokering Architecture to propagate cyberspace effects to LVC models/sims</li> <li>• Operationalize PMESII-PT models necessary to train Information Warfare (IW)</li> </ul>	<ul style="list-style-type: none"> <li>• Automated and Unscripted BLUFOR/OPFOR for MDO Use Cases.</li> <li>• Automated and Agile Simulation Architecture to support Plan, Prepare, Execution and Assessment of Exercises.</li> </ul>





## PATH FORWARD



- Yearly STTC POM Process will continue to be leveraged by all Stakeholders (CAC-T, MEDCoE, STRI, STE, etc) to refine planned S&T efforts and identify new starts.
- S&T Investment Strategy will remain focused on Prioritized User Capability Gaps owned by CAC-T and MEDCoE.
- Innovative Technology and Knowledge Focus Areas being identified in FY22 to inform future S&T Investment Strategy decisions. i.e. Innovative areas requiring research but not directly tied to current Prioritized Capability Gaps.



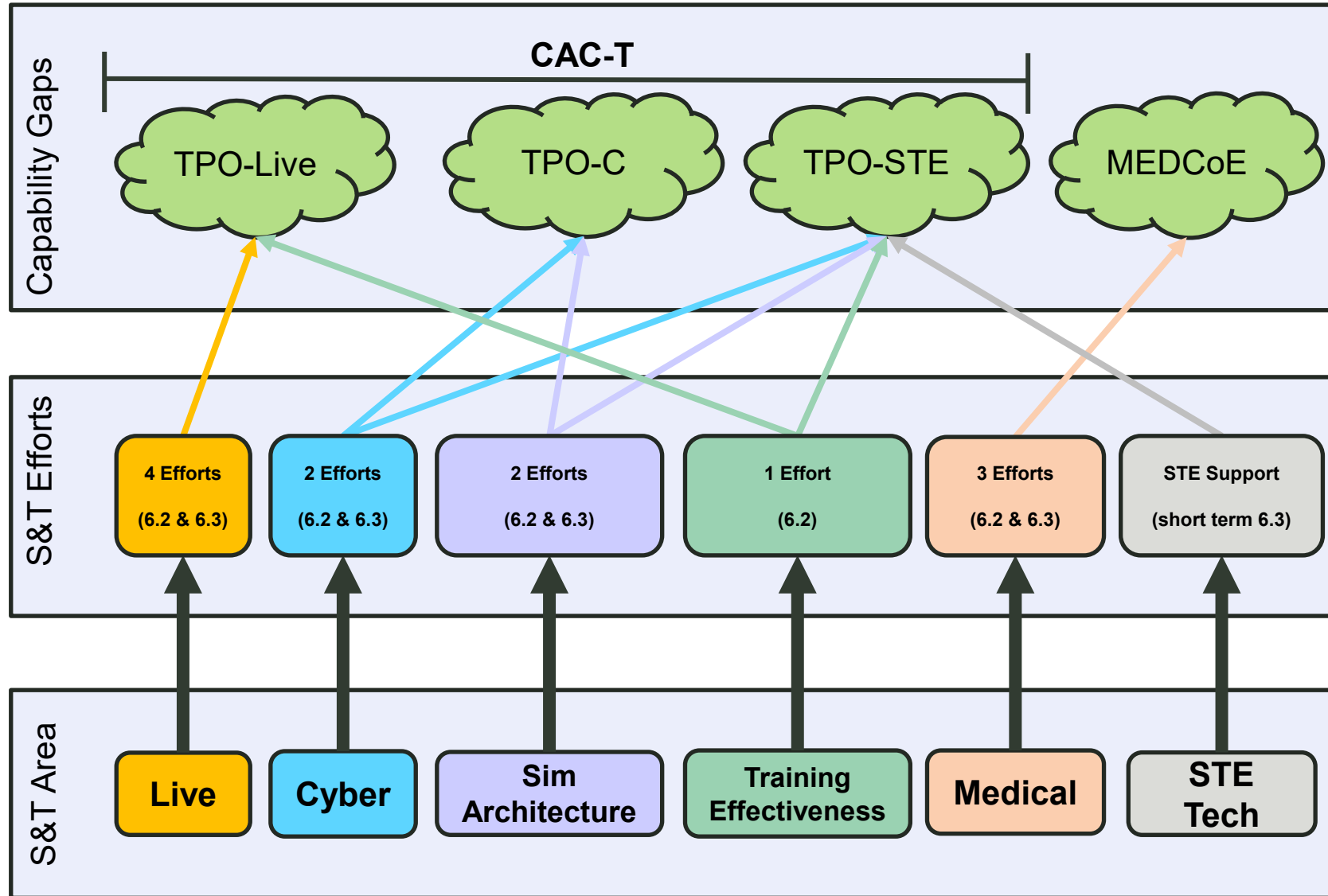
## QUESTIONS



# BACKUP

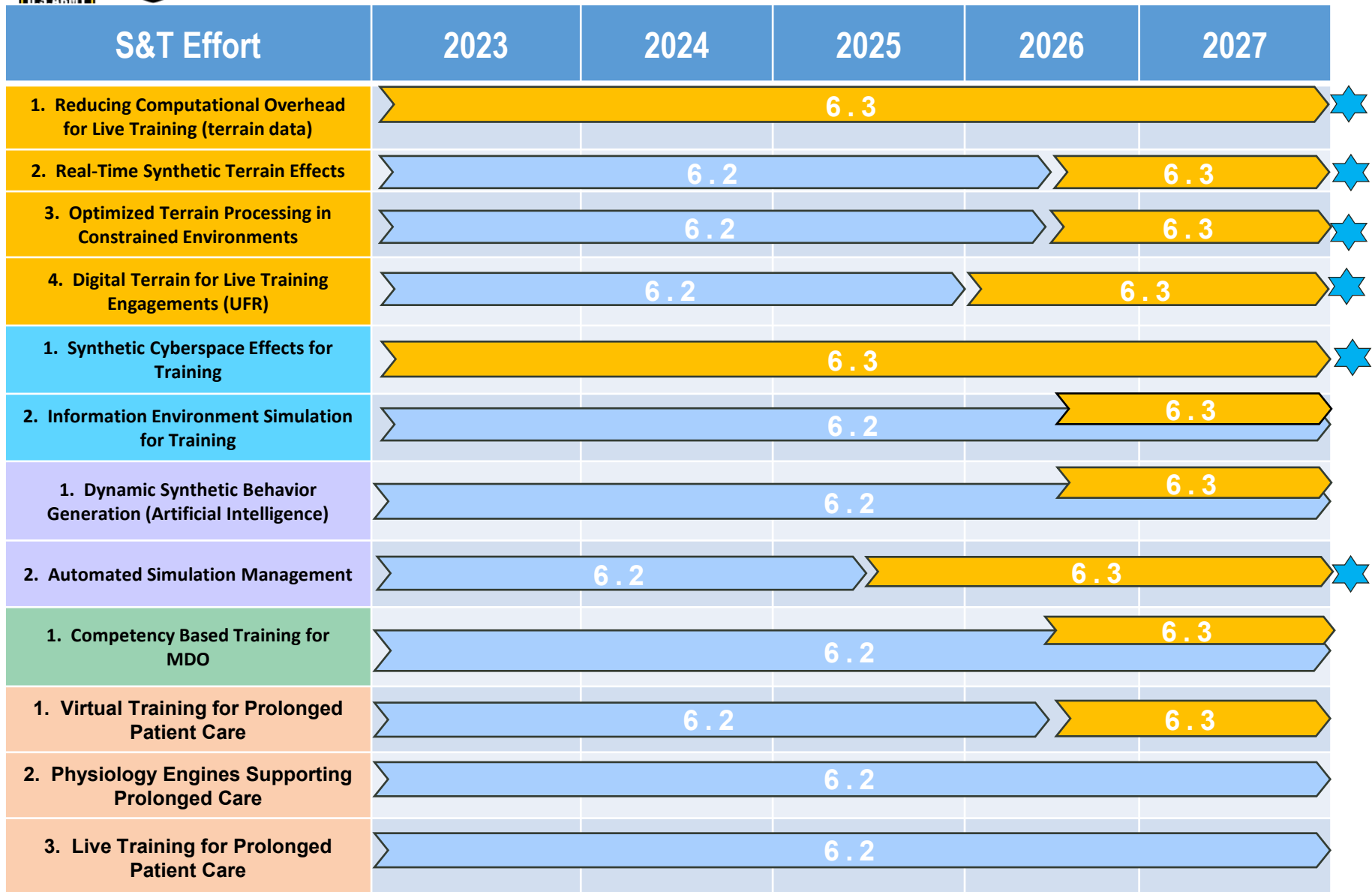


# FY23-27 S&T EFFORT OVERVIEW





# POM23 NEW EFFORTS SCHEDULE



★ Transition Point



# DETAILED S&T OBJECTIVES



## Live Training

1. Reduce computational burden, latency, and power consumption (battery weight) associated with dismounted Soldier based simulated tactical engagements that require virtual ballistic flyout calculations, casualty assessment, and AR based target terminal effects visualization.
2. Enhance visual effects and tactical impacts of munitions effects on the terrain and features critical to the Commander's training objectives for live training participants.
3. Research terrain, data compression and platform unit services required terrain reasoning for live engagement processing.
4. Research terrain vertical feature definition, design for terrain elevation representation required for terrain reasoning for live defensive fighting position engagements

## Cyber

1. Design a data exchange model for cyberspace effects and develop a brokering architecture to propagate those effects across Live, Virtual and Constructive models/simulations.
2. Operationalize PMESII-PT models necessary to train information warfare (IW) by representing effects in and through cyberspace by leveraging the CyberBOSS architecture.

## Simulation Architecture

1. Design and develop fully autonomous simulation forces representing OPFOR and BLUFOR in support of training readiness.
2. Design and demonstrate automated simulation execution architecture based on the training use case, simulation scenario, hardware resources and target user interfaces required for each training exercise.

## Training Effectiveness

1. Create a new common Multi-Domain Operation (MDO) Competency Framework to drive machine-supported training performance data collection, tracking and readiness projections. Establish data interoperability standards to create a common view of learners and how learners operate and navigate in the cognitive, affective, and psychomotor domains.

## Medical

1. Develop simulation capabilities supporting the transfer of medical knowledge and skills to elevate understanding from assess and treat to total patient care. Improve future capabilities of medical simulations to present signs, symptoms and reactions consistent with total patient care procedures.
2. Develop physiology engines to support Prolonged Care across variety of simulation platforms
3. Develop Live and Virtual simulation capabilities supporting the transfer of medical knowledge and skills in prolonged care scenarios. Elevate the capabilities of existing medical simulations to present signs, symptoms and reactions consistent with total patient care procedures.



# USER CAPABILITY GAP PRIORITY LEVELS



Priority Levels 1-3 Defined by User Community Stakeholders

CAC-T

ACM-Live

ACM-STE

ACM-C

MedCOE

**Priority 1** – Known/Potential KPP for Future Program

**Priority 2** – Critical Need, but not KPP

**Priority 3** – Required Gap, but not Critical



# SYNTHETIC TRAINING ENVIRONMENT MODERNIZATION OVERVIEW



# 2016


# 2020

# 2025

## 2030

**2035**

## STE Inc 1 (Virtual Training Systems)



**US Army Synthetic Training Environment**  
SOLDIERS AND LEADERS - OUR ASYMMETRIC ADVANTAGE

# As Is – To Be

## "As Is"

1980s technology – limits ability to train Combined Arms operations

57 terrain formats

Concurrency challenges and not designed to meet compliance directives

Facilities-based TADSS

High overhead and long exercise lead times

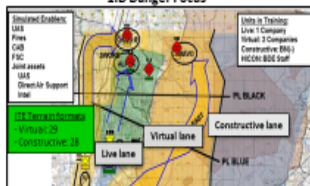
Stove pipe systems

Requires increased resources for TADSS

Cannot replicate the Operational Environment

No Joint/UA Integration

## 11D Danger Focus



**Units in Training:**  
Live: 1 Company  
Virtual: 2 Companies  
Constructive (BMS) HHCN: BDE Staff

**Threats:**  
PL BLACK  
PL BLUE

**Lines:**  
Live line  
Virtual line  
Constructive line

**Timeline:**  
0-20 Days, 4-60 Days, 4-40 Days, 5-120 Days, 10-120 Days, 1-120 Days

**Operational Timeline:**

	Phase I	Phase II	Phase III
BN BTA and Company CALPER Rotation	BN PTA Rotation	BN PCA Rotation	
BN BTA and Company CALPER Support	BN PTA Support	BN PCA Support	

## "To Be"

Common Synthetic Environment that fully enables Combined Arms maneuver in a multi-domain environment

Dynamic one-world terrain

Software-enabled updates

Less fixed infrastructure reliance – point of need delivery


Fewer contractors, less hardware, & faster exercise design

Reconfigurable trainers

Uses ongoing commercial innovation for updates

Full replication of the Operational Environment

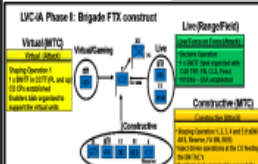
Joint and Unified Action (UA) integration



**Common Operational Context**

**Joint and Unified Action (UA) Integration**

## LVC/Range Phase I: Brigade FTX construct



**Virtual (MTC)**  
Training Scenario  
BN BTA and Company CALPER  
BN PTA and Company CALPER  
BN PCA and Company CALPER  
BN BTA and Company CALPER Support

**Live (RangeField)**  
Training Scenario  
BN BTA and Company CALPER  
BN PTA and Company CALPER  
BN PCA and Company CALPER  
BN BTA and Company CALPER Support

**Constructive (MTC)**  
Training Scenario  
BN BTA and Company CALPER  
BN PTA and Company CALPER  
BN PCA and Company CALPER  
BN BTA and Company CALPER Support

## Simplify Process

➔

## Integration to Convergence

Draft // Pre-Decisional // Unaffiliated

## STE Inc 2

(Live Training Systems)

**he Situation**

**“AS IS”**

**STE Live Training System**

**“TO BE”**

- sequences of artificialities live habit transfer tactics, techniques, and procedures
- live need for instrumented ranges at the Point of Need
- ged lag in currency
- Realistic weapons engagements to include those beyond line of sight
- STE provides dynamic scenarios and realistic terrain
- One converged training environment
- Accessible to the Commanders... bring training to the Solider and unit
- Software and technology drive capability growth, not retrofitted hardware
- Sustained readiness in the “band of excellence”

**ge and improve the necessity of live training**

**ibilities of emerging technologies?**

## STE Inc 3

(Next Gen Constructive)

## Capabilities Analysis

- ✓ TRAC Analysis
- ✓ A-CDD Appv
- ✓ SoN/OTA

## Capabilities Analysis

- ✓ TRAC Analysis
- A-CDD Appv
- ✓ SoN/OTA