Doolittle Institute Technical Showcase
Multi-Domain Weapons Technologies – Part I:
Terminal Effects

Dr. Anne Marie Petrock, ST
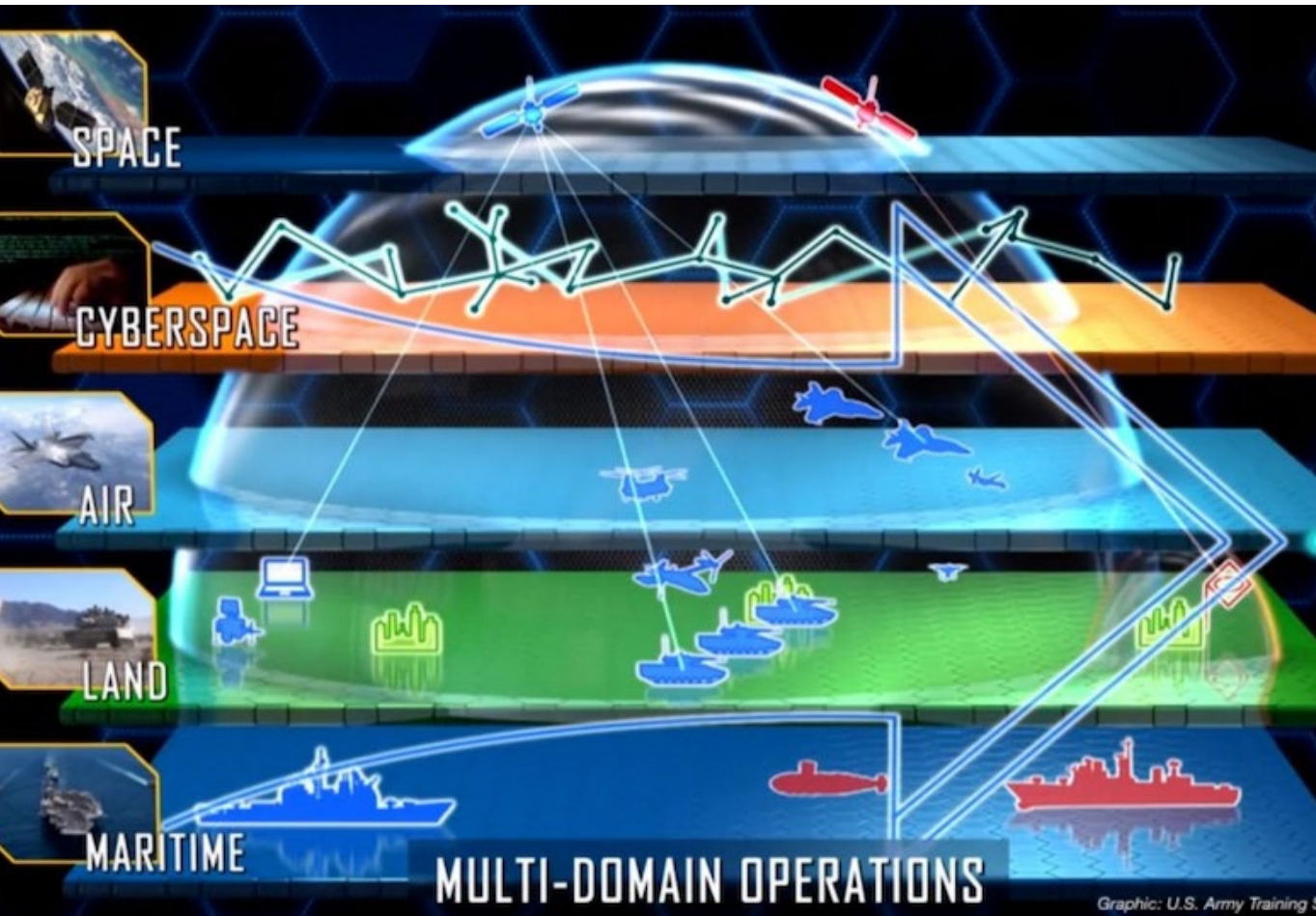
US ARMY DEVCOM, Picatinny Arsenal, NJ

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Graphic: U.S. Army Training S...

Multi-domain operations (MDO) are military operations across all domains, enabled by integrated systems and strategies

Operations are dynamic, complex and engage multiple operational nodes

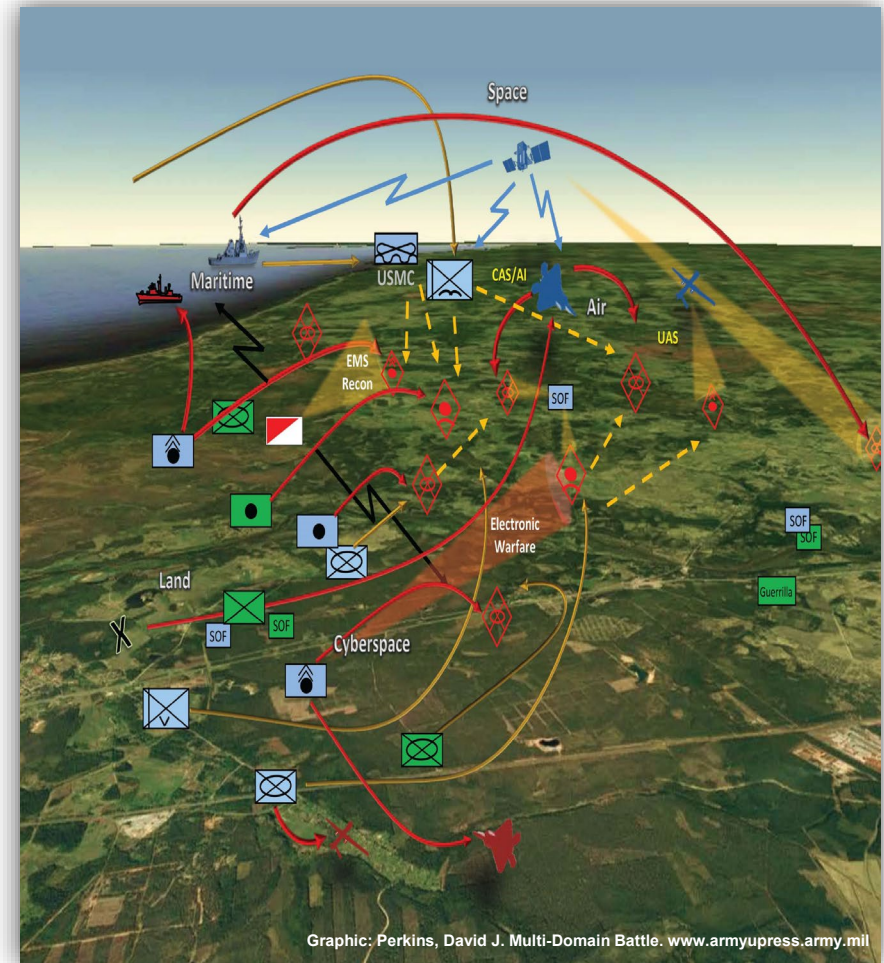# NATIONAL DEFENSE STRATEGY: THREE CORE TENETS

Integrated deterrence

– **Deter adversaries by synchronizing efforts across warfighting domains, regions and the spectrum of conflict in conjunction with all instruments of U.S. national power**

Campaigning

– **Sequencing logically linked military activities to shift the security environment in favor of the United States**

Building enduring advantages

– **Accelerating DoD modernization for the future fight**

Graphic: Perkins, David J. Multi-Domain Battle. www.armyupress.army.mil

Source: Association of the US Army

KEY ENABLING TECHNOLOGIES FOR INTEGRATED DETERRENCE AND CAMPAIGNING

Enable long duration operations for real-time target discrimination and identification, tracking, aim-point selection, prosecution

– Contextual fuzing

– Advanced data collection and processing

– Next generation power

– Novel initiation, explosives, and tailorable warhead technologies

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Contextual Fuzing, Advanced Data Analytics and Next Generation Power

On-the-fly discrimination and targeting using fusion of sensor and effector information

- Power hungry – multiple modalities for sensing, discriminating, prosecution – two-way communications between all nodes and commanders
- Latency – need real-time sensing, analysis, decision making, communications to command and other nodes
- Robustness – AI/computer vision challenges; spoofing, miscalculations, weather, contested areas, etc.
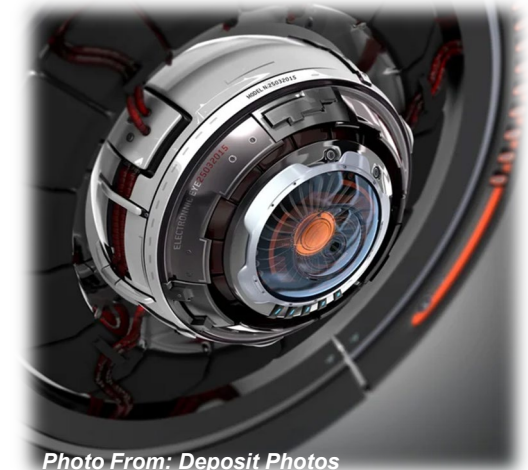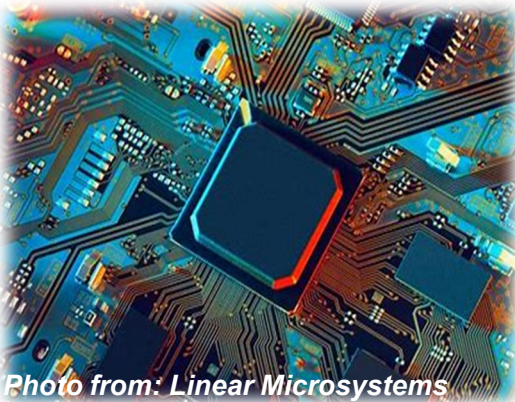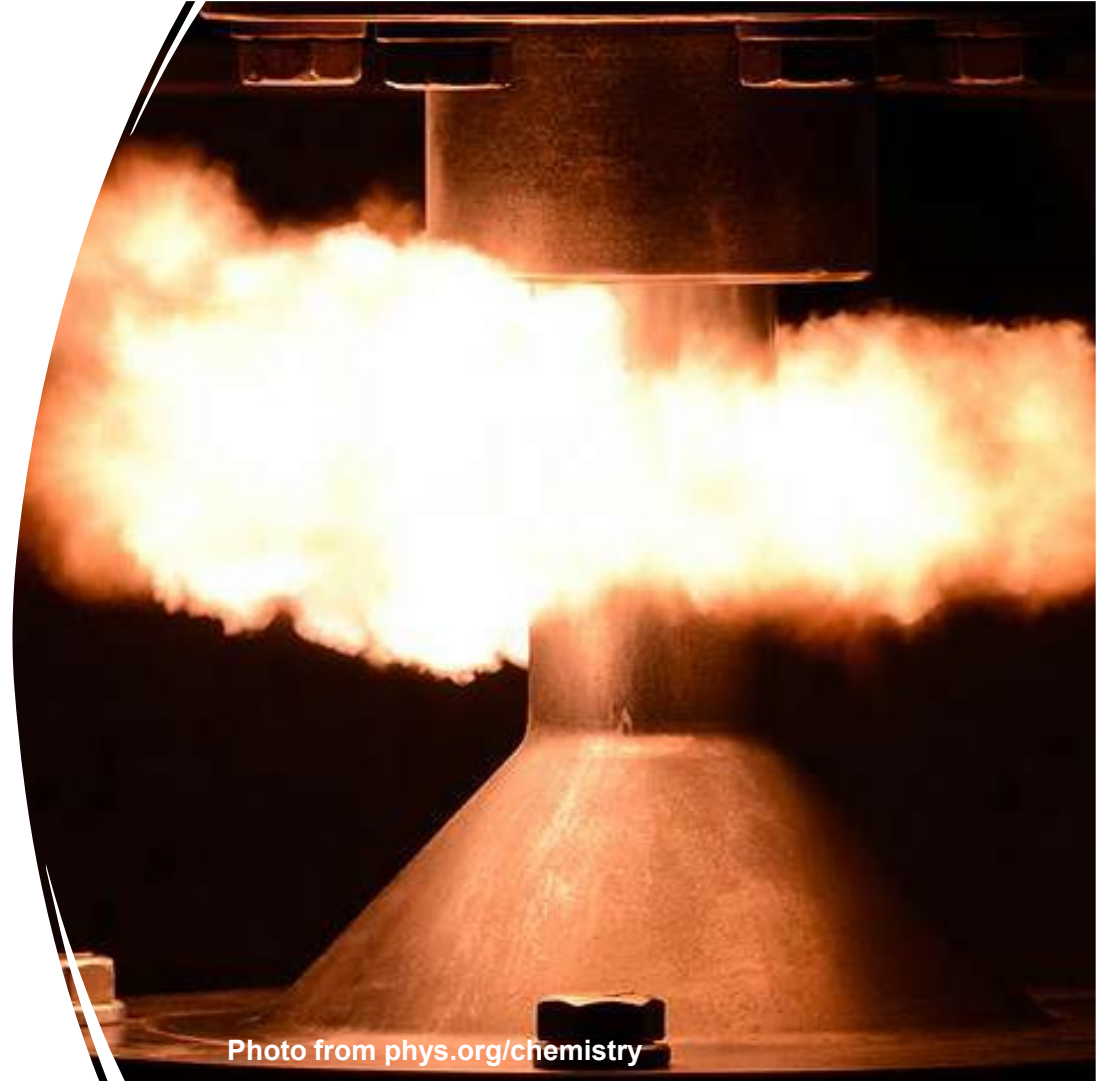
Photo From: Deposit Photos

Deeper fires, Extended Ranges and Durations

- Survivability/Robustness – survive launch and trajectory conditions, counter-measures
- Power - typically constant burn rate, initiated at launch; size scales with duration – limits other capabilities
- Need maneuver authority to close with target; must have reserve power to engage

Photo from: Linear Microsystems

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NOVEL INITIATION, EXPLOSIVES, AND TAILORABLE EFFECTS

- Ignition for terminal maneuvering and target engagement

- No longer just sensors: on-board analytics to determine best integration of effects/temporal/spatial aspects to achieve desired outcome

- Smaller, more lethal payloads enabled by higher performance explosives and smarter warheads
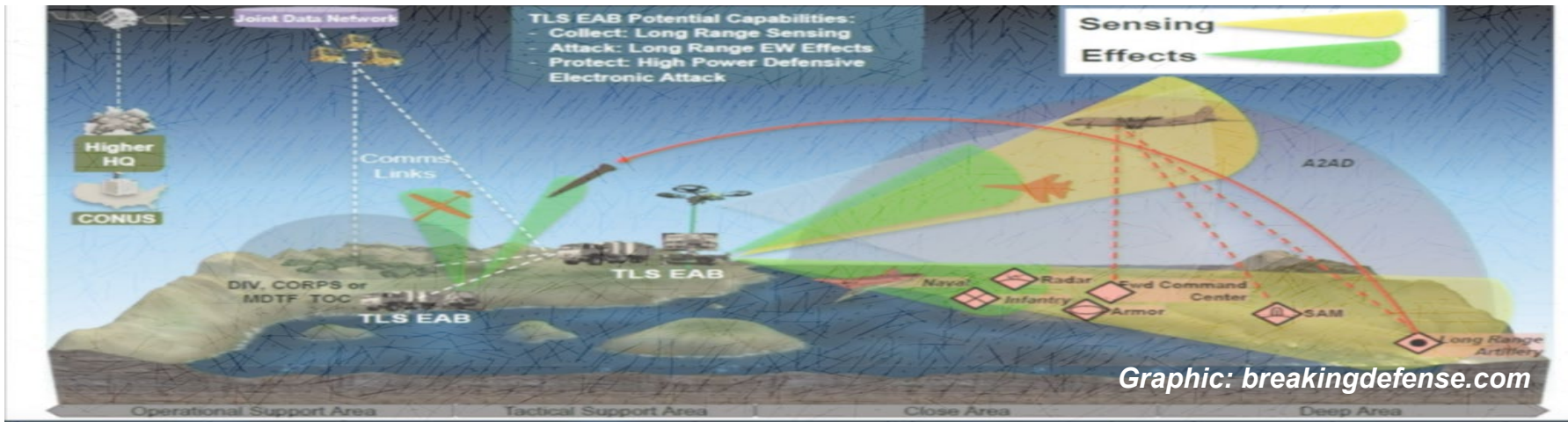
Photo from phys.org/chemistry

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CONCLUSION

- Component technology development and system integration is critical to transforming the military landscape
- Jumping down the path of buzzy technologies like AI/ML may not be the cure all; attention to simple countermeasures of denial, deception and camouflage during design and integration is critical.
- System must be robust to loss of nodes, communications, etc
- System must be modular, inter-operable and stand-alone capable

Graphic: breakingdefense.com

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