



The Weapons Technologies Community of Interest (CoI)

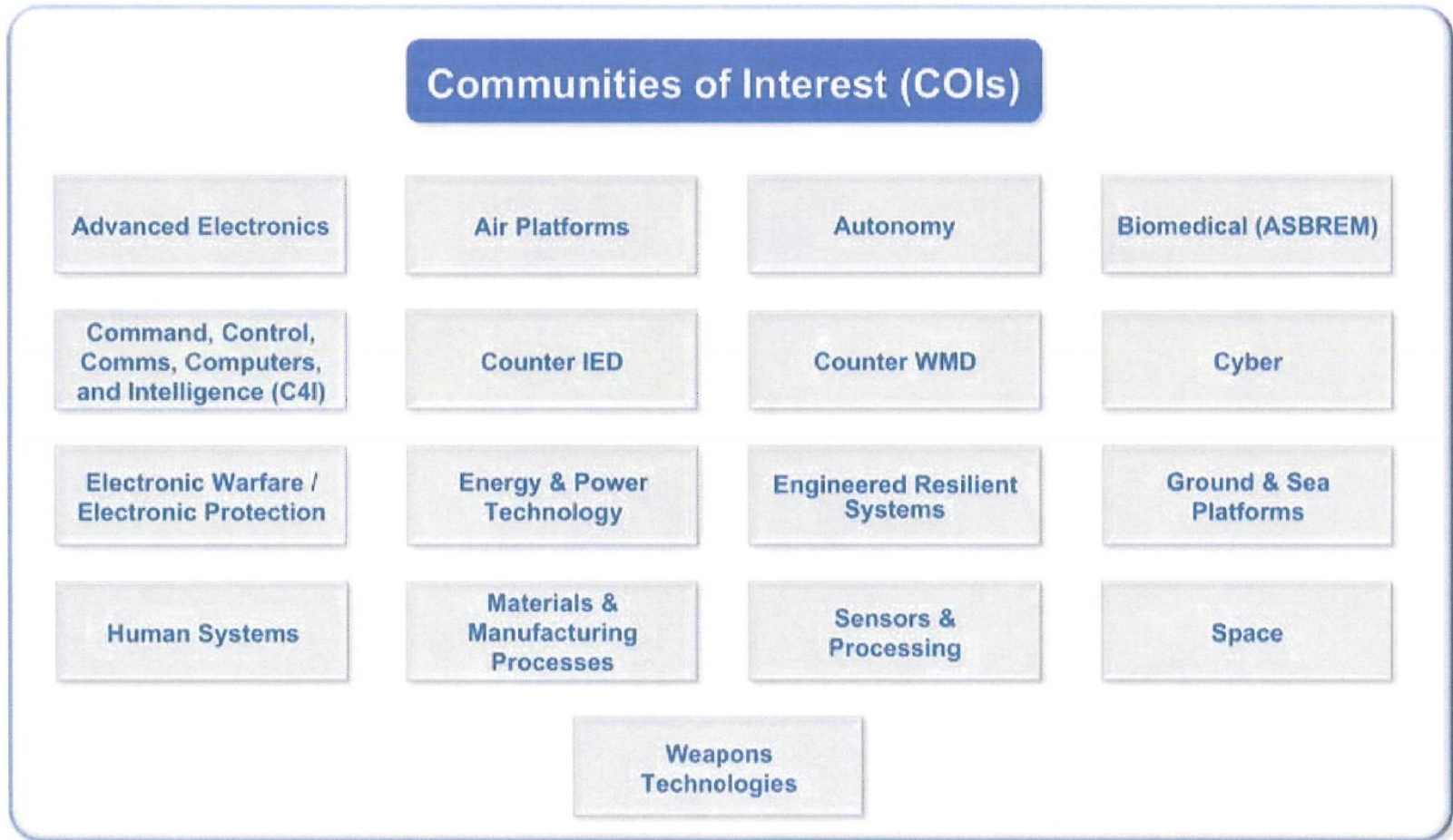
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DISTRIBUTION STATEMENT Distribution A – Approved for Public Release



Communities of Interest



~\$12B for all COIs covering 6.2 and 6.3 S&T



Weapons Technologies *Initial Comments*



- Portfolio Value - ~\$1.1 to \$1.2B
 - Kinetic/Non-Kinetic Effects - \$0.7B/0.4B
- Common themes emerge across components
 - Smaller, lower mass weapons (carriage-constrained)
 - Higher speed and maneuvering capability with reduced signature
 - Denied environments (A2/AD)
 - Extended stand-off / range
 - Denied Distributed-Collaborative-Cooperative (D2C2) engagements (manned/unmanned)
 - Directed energy combined with kinetic effects offers leap ahead
 - Affordable and sustainable - cost-trade favorable



Structure and Scope

Purpose – Conduct R&D to Provide Leap Ahead Tactical and Strategic Offense and Defensive Weapons for Air, Land and Sea Combat

Ordnance

- Performance in extreme environments
- Scalable and lethal effects
- Asymmetric effects

Guidance, Navigation & Control and Data Links (GN&C and DL)

- Weapon position, navigation & timing (PNT)
- Networked precision
- High speed guidance

RF Weapons (RFW)

- Compact HPM systems (improved SWaP)
- Optimized wave forms for target effects
- Improve source efficiency

Undersea Weapons

- Torpedo technologies, e.g., warheads, sensors, propulsion, signal processing
- Torpedo countermeasures
- Supercavitating weapon technology

Propulsion

- ICBM/GBSD booster technology
- Tactical missiles and gun-launched projectiles
- Capacity (reduced size/weight/hazards/cost)

High Energy Lasers (HEL)

- High-power/high-energy laser sources
- Improve laser output power and beam quality
- Mature component technologies – beam control, power, thermal & field demonstrations

Non-Lethal Weapons (NLW)

- Active Denial Technology (smaller, lighter, lower cost)
- Vehicle/vessels stopping at distance
- Characterize trades (effects/risks/system reqs)

Integrated Weapon Demonstrators (GWD)

- S&T prototyping/transition
- Integrated demonstrations – full ensemble of weapons system technologies needed to achieve effects
- **Hypersonics (reported in Air Platforms COI)**



Weapons Technologies *Strategic Vision*



Current Capabilities Deficient

Standoff Assured Delivery + Desired Effects

Dominant Future Capabilities

Mission Space & Examples

Active defenses against

- Aircraft
- Tactical and Strategic Missiles
- Rockets, artillery, mortars
- Torpedoes
- UAV/UGV/USV/swarms

Attack

- Area targets
- Point targets
- Mobile Targets - Land/Sea/Undersea/Air
- New threats – swarms, UAV/UGV/USV
- Networks/Systems of Systems

Kinetic and Non-Kinetic / Lethal and Non-Lethal effects



Goal: Gain back overmatch and offset - affordably



Weapons Enabling Technologies



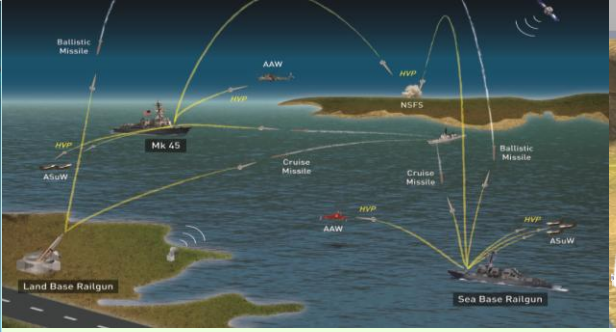
Near Term (2020) Mid Term (2030) Far Term (2040)

High Speed, Highly Maneuverable, Extended Range Weapons with Selectable Output



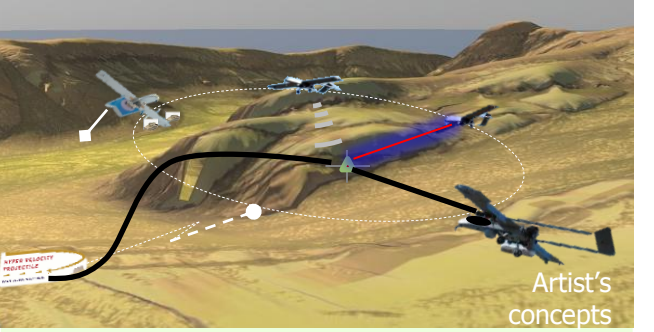
- Omnisonic Flight and Navigation
- Adaptive Control and Estimation Techniques
- Higher Energy within IM Constraints for propulsion and effects

Integrated Kinetic and Non-Kinetic Effects



- Integrated System-of-Systems Techniques w/ predictive effects
- DE devices/systems to enable denial, disruption and destruction
- Hypervelocity (Rail gun) launchers

Integrated Kinetic and Non-Kinetics Weapons in a Denied Distributed Collaborative Cooperative (DC2) Environment



- Extreme energy materials with energy coupling
- Increased energy DE devices
- Coordinated swarms with autonomous behaviors
- Switchable Non-lethal to lethal effects



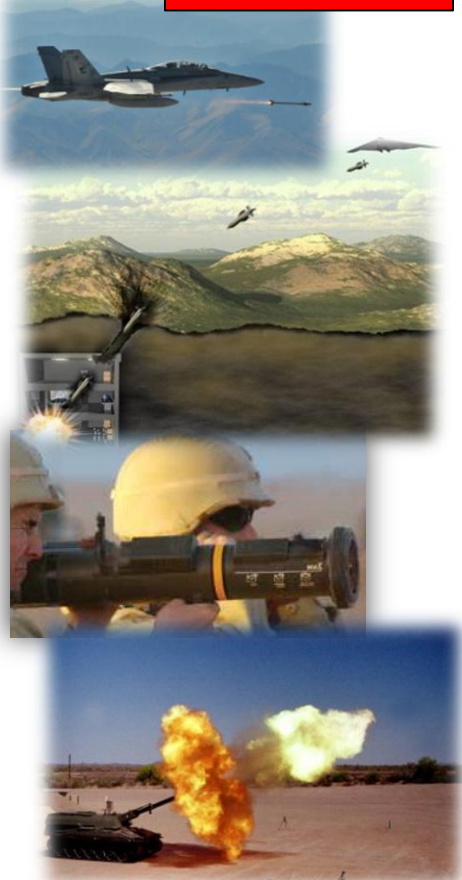
Ordnance Strategic Vision



Current Capabilities Deficient



Dominant Future Capabilities



- **Performance in Extreme Environments**
 - Survivable
 - Insensitive Munitions Hazards
- **Scalable and Lethal Effects**
 - Enhanced Performance for Limited Volumes
 - Multi-effects / multi-mission
 - Prescribed and Tailored Effects
 - Distributed, Collaborative and Collective Effects
- **Asymmetric and Cross-Domain**
 - Kinetic Effects on Hypersonic Platforms
 - Disruptive Energetics
 - Access Denial



Goal: Ordnance S&T for Affordable, Mitigating, and Surprise Weapon Capabilities



Ordnance Sub-Area Grand Challenge Areas



Ordnance sub-Area

- **Performance in Extreme Environments:** (*delivery and target interaction*)
Reliably function under severe conditions: temperature, vibration, and acceleration loading. Ensure Insensitive Munitions and fuze reliability.

- **Scalable and Lethal Effects:** Affordable reduced size, increased carry capacity and carriage distance of delivery platforms, and multi-effect technologies that secure the capability of reduced-size delivery platforms. Provide affordable target prosecution.
 - **Enhanced Performance for Limited Volumes**
 - **Multi-effects / multi-mission**
 - **Prescribed and Tailored Effects**
 - **Distributed, Collaborative and Collective Effects**

- **Asymmetric and Cross-Domain Effects:** Provide ordnance capabilities to enable surprise weapons; Ensure robust/daunting output, functionally defeat targets, and KE effects with DTRA to deny all CBRNE and WMD.
 - **Kinetic Effects on Hypersonic Platforms**
 - **Disruptive Energetics**
 - **Access Denial**
 - **Asymmetric Solutions**



Capability Deficiency/Gap Focused Technical Challenges – Ordnance



Grand Challenge Area	Gaps and Shortfalls	Deficiency / Gap							
		A2AD / LR Precision Strike	C-UAS / Subsonic Cruise Missiles	Counter Air-Air	Long Range Precision Fires	Area Attack Air Interdiction	Counter HDBT	Anti-Surface Warfare (ASuW)	Strategic Deterrent (ICBM/ SLBM)
1	Survivable / Environment	Temperature Shock		Shock	Temperature	IM	Loads IM		
2, 3	Reduced Size /Longer range	Smaller	25% less than SOTA	Smaller	50% less than SOTA at equal lethality	Form Fit	Smaller More Capable		
2, 3	Volume Constraints				50% of legacy length	Lethal Radius	Weapon Carrier		
2	Collaborative Mission	2+ blast-frag						Multi-Strike	
2	Multi-Effects / Mission Flexibility	Many modes HOB,Contact		Hit to Kill Close Miss		Many modes HOB Contact			
1	Reliable & Stable at Long-Term	Thermal cycling. Aging		Thermal cycling. Aging		< 1% non-function			

1 – Extreme Environments, 2 – Scalable and Lethal, 3 - Asymmetric



Focus Going Forward

- Weapon Technologies that Provide Offset Capability
 - » High speed, highly maneuverability, low signature
 - » Some level of autonomy through manned/unmanned teaming
 - » Machine learning navigation

Engagement Opportunities with Industry

- Army Open Campus
- Component BAAs (Army, AF, Navy, DARPA)
- Weapons Technology IRAD and Innovation Review (Spring 2017)
- Attend Industry IRAD Reviews



Questions