Technology Demands on the Future Industrial Base
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Unclassified
New technologies are being developed and new materials are being used that will affect the Industrial Base.

To successfully transition these new technologies and materials the Industrial Base needs to be prepared to manufacture these new technology.
**Mission:**
To develop and maintain a customer focused, world-class workforce that will execute, manage and continuously improve integrated life cycle engineering processes required for the research, development, production, field support and demilitarization of munitions, weapons, fire control and associated items.

**Vision:**
Innovative Armaments Solutions for Today and Tomorrow.
ARDEC Technology Focus Areas

Advanced Weapon Systems
- Direct Fire
- Indirect Fire
- Scalable Effects
- Non-Lethal Systems
- Small/Medium/Large caliber ammunition
- Directed Energy
- Remote Armaments
-Insensitive Munitions
- Fuzes
- Telemetry
- Precision Armaments
- Grenades
- Maneuver Support Munitions
- Demolitions

Fire Control
- Battlefield Digitization / SW Applications
- Embedded Systems SW
- Firing Tables
- Ballistics
- Automated Test Systems

Emerging Technologies

Advanced Energetics and Warheads
- Propellants
- Explosives
- Pyrotechnics
- Warheads
  - Kinetic Energy
  - Chemical Energy
  - Shaped Charges
  - EFPs
  - Fragmentation

Logistics
- Ammunition Logistics RDTE
- Battlefield Tools and Equipment

Collaboration Mechanisms
- ATOs/Tech Base
- CRADAs
- Test Agreements
- Rapid Prototyping
- Defense Ordnance Technology Consortium
- National Small Arms Consortium
- ...

Networked Lethality
- Defense Against Unmanned Systems
- Counter Terrorism Technologies
- Homeland Defense Technologies
- Advanced Materials / Nanotechnologies
- Novel Power & Energy Systems
- Manufacturing Science Technologies

Defense Against Unmanned Systems
- ...
New Technologies & Materials Needing IB Support

- Lightweight Small Arms Technologies (LSAT)
- Composite and Reactive Materials
- Nano Materials
- Coated Propellants
- MEMS Safe & Arm (S&A)
- Hyper X Chip
- Insensitive Munitions (IM) Energetics
- Electronic Assembly and Soldering
Lightweight Small Arms Technologies

- Cased Telescoped Ammunition
  - Capacity to produce injection molded parts with high-grade polymers
  - Modifications to existing ammunition load, assemble and pack facilities

- Caseless Ammunition
  - Use of HMX-based propellant
  - Mixing and molding of monolithic grain into near net shape, with tight tolerance for dimensions and density
  - Significant change to load, assemble and pack process

Unclassified
Scalable Technology for Adaptive Effects (STAR ATO)

- **Scalable & Adaptive Munitions**
  - Cost effective processes for Non-metallic & metallic structural *composite* projectile & munition components

- **Nano & High Energy Explosives**
  - Continuous Manufacturing Process for Improved Morphology & *Lower Cost*

- **Coated Propellants**
  - *Propellant Coating Processes* – precise coating control & consistency (thickness & coverage)
• Micro-Electromechanical Systems (MEMS) for munitions
  – Utilize metal micro-machining processes for gun-launch environment (not Silicon)
  – Integrating a micro-scale firetrain for fuzing applications
  – MEMS-based Safe and Arm (S&A) achieved TRL6/MRL7
  – Currently in EMD for MK19 40 mm HEPD application
    • MEMS S&A solicitation currently under technical evaluation

• Applicable to high-volume low cost applications or volume constrained systems
  – E. g. Medium cannon-caliber, Grenades, Precision artillery

• A paradigm shift for the Fuze Industry

**Traditional Approach - Watchworks used in Fuzes**
HyperX Technology Platform

Key HyperX Advantages and Features:
- Internal power management
- Flexible computational power
- Ideal for multi-sensor fusion
- Easily reconfigured
- Rapid extensibility
- Good power to performance profile

System Uses
- Complex Computational Environments (Acoustic Sensors, multi-sensor networks, etc)
- Extended battery power applications (hand-held or man-wearable computers)

HyperX Drawbacks and Disadvantages
- Tools are still being developed
- Limited third party support of technology

Hybrid HyperX System
• New Inensitive Munitions Formulations
  – Contain new novel ingredients requiring novel manufacturing technologies
  – Significant changes to load, assemble and pack process
  – Performance and Quality are strongly affected by minor process and formulation variations

PAP-8386: Etherless Propellant for 120 mm Tank Training Rounds

PAX 3
**Electronic Assembly and Soldering**

- Solder technology is being driven to change by commercial industry (i.e. Reduction of Hazardous Substances – RoHS)
  - RoHS compliance is forcing early obsolescence of tin/lead packages
  - RoHS paste formulas are evolving. All come with new reliability issues
  - Mixed solder processes (i.e. SnPb & Pb Free) create new reliability issues

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**Stress induced failure**

VOID (acceptable)

Tin Whiskers
Summary

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