Sustainment Innovation

Panel Moderator: Frank Zahiri
Air Force Sustainment Center Operating Location - Robins
Why Sustainment Innovation

– Sustainment: The provision of logistics and personnel services necessary to maintain and prolong operations through mission accomplishment and redeployment of the force

– Logistics: Supply, maintenance operations, deployment and distribution, health service support (HSS), logistic services, engineering, and operational contract support
Sustainment Innovation:
Making Sustainment Smarter

• Tools/Processes To Perform Sustainment Tasks Better
• Technologies To Fundamentally Change Sustainment
• Sustainable Technologies for the Future Fleet
Affordability & Technology Deployment

• Support Sustainment of Current Fleet (Field & Depot)
• Improve Fleet Health Management
• Improve Manufacturability of Systems
• Enable Longer Life, Lower Life-Cycle Cost Systems
• Enable Robust Design of New Systems
Sustainment Innovation Lead

- Kelly Morris, DLA
- Mark Smallwood, Air Force
- Joe Sparks, COMFRC
- Janice Bryant, NAVSEA
- Bernard Goodly, Army Materiel Command
DLA Research & Development
Agile Combat Support

2017 CTMA Partners Meeting Sustainment Innovation Panel

Ms. Kelly Morris
Logistics Research & Development

4 April 2017
Agenda

• DLA Overview
• DLA Research & Development Integration for DLA Supply Chain
• DLA R&D Strategic Guidance & Assessments
• Closing the Gap in Sustainment - DLA R&D Selected programs and Future Priorities
Who is DLA?

• DLA generated more than $34 billion in sales and revenue last year. The agency employs about 25,000 civilians and military, located in most states and 28 countries.
• DLA operates 25 distribution centers supporting more than 2,300 weapon systems; and, manages nine supply chains with nearly 5.1 million line items. In 2014, DLA received nearly $40 billion in excess and surplus property that was reutilized, transferred, disposed of or donated.
• Additionally, DLA administers the storage and disposal of strategic and critical materials to support national defense. Headquartered at Fort Belvoir, Virginia, DLA is a global enterprise – wherever the United States has a significant military presence, DLA is there to support.
Global Supply Chains at the DLA
Primary-Level Field Activities

<table>
<thead>
<tr>
<th>DLA Troop Support</th>
<th>DLA Aviation</th>
<th>DLA Land and Maritime</th>
<th>DLA Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class I: Subsistence</strong></td>
<td><strong>Class IX:</strong></td>
<td><strong>Class IX: Maritime</strong></td>
<td><strong>Class III: Energy</strong></td>
</tr>
<tr>
<td>Food &amp; Combat Rations</td>
<td>Engine Components, Air Frames</td>
<td>Valves, Fluid Handling</td>
<td>Bulk Petroleum, Natural Gas, Coal, Electricity</td>
</tr>
<tr>
<td><strong>Class II: Clothing &amp; Textile</strong></td>
<td>Flight Safety Equipment</td>
<td>Electrical/Electronics</td>
<td>Aerospace Energy</td>
</tr>
<tr>
<td>Dress &amp; Combat Uniforms</td>
<td><strong>Class IX: Land</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Class IV: Construction &amp; Equipment</strong></td>
<td>Wheeled, Tracked &amp; Heavy Vehicle Parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilities Maintenance</td>
<td>Small Arms Parts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
R&D Integration into the DLA end-to-end supply chain

Defense Logistics Information

Suppliers’ Supplier

Supplier

Customer

Source

Make

Deliver

Return

PLAN

Weapons Systems Sustainment

Source

Make

Deliver

Return

Source

Make

Deliver

Return

Source

Make

Deliver

Return

Source

Make

Deliver

Return

Source

Make

Deliver

Return

Suppliers’ Supplier

Supplier

Customer

SUPPORT THE WARFIGHTER

Strategic Materials

Microcircuit Emulation

Casting

Forgings

Batteries

Distribution / Disposition

Counterfeit Parts

Additive Manufacturing

Energy

Subsistence

Military Unique Sustainment Technology

ACCELERATING INNOVATION

NATIONAL CENTER FOR MANUFACTURING SCIENCES
DLA R&D Strategic Guidance & Assessments help drive Innovation Sustainment

DLA Strategic Guidance to achieve the Mission

DLA Senior leadership relies on DLA’s Research and Development to achieve their vision & strategic goals

DLA R&D Strategic Assessments to identify emerging requirements

DLA leverages R&D to infuse innovation into disruptive solutions that achieve DLA’s 1st Strategic Goal – “Warfighter First”

Use data and information to drive strategies, plans and make decisions
DLA Senior Leader Priorities

Align investments to priorities

• Additive Manufacturing
• Sustainment focused on Digital Manufacturing (continuation & expansion)
  – 3D Technical Data Use in Procurement
  – 3D Digital Technologies for Virtual Sizing and Fit Optimization
• Sustainment focused with Information Technology enterprise efforts
  – Augmented Technical Drawings (Manufacturing Technology)
• Logistics Interoperability Technology Extension (LITE)
• Nanotechnology in MRE Packaging
• Electron-Beam Lithography

Support continued investments

Strategic Assessments provide insights to investment priorities

DLA R&D should be on the leading edge. . . not the bleeding edge
Casting Technology

**Objective:**
- Ensure a viable and competitive metal casting Industrial base to provide affordable and high quality parts for the Warfighter

**Impact:**
- Reducing tooling lead time and cost, includes: improving Production Lead Times by three months; and eliminating time and cost of core tooling

**Plans:**
- Faster affordable upgrades and legacy and obsolete part replacement

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Forging Technology

**Objective:**
- Ensure a viable and competitive forging Industrial base to provide affordable and high quality parts for the Warfighter

**Impact:**
- Reduce forging costs & design time by minimizing material and waste; and refining production processes

**Plans:**
- Utilize continuous process improvement to improve forging supply chains and acquisition processes

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3D Printed (CSL) Casting Cores for Blade/Vanes for Gas Turbine Engines of MQ-9 Reaper and M1 Abrams Tank

Improving Forging Simulations for increased yield and reduced scrap rates for ground vehicles, such as the M2 Bradley
Material Acquisition Electronics

Objective:
- Develop manufacturing capabilities for microcircuits which are no longer available from industry; 100 percent interchangeable; same NSN; on-demand, low-volume.

Impact:
- Emulation affects 99 of the top 100 Weapon Systems
- 20,000 parts in 375 different systems

Plans:
- Develop Initial Linear/Analog capabilities

Small Business Innovation Research (SBIR)
Small Business Technology Transfer (STTR)

Objective:
- Foster technology transfer through cooperative R&D between small businesses and research institutions. Increase private sector commercialization of innovations derived from federal R&D

Impact:
- Transitioned 12 of 40 (30 percent) Phase I Projects to Phase II
- DLA Investment $14.4 million Commercialization $122 million/Commercialization Return on DLA Investment 8:1

Plans: OSD-OSBP Solicitations
In 2016, SBIR 16.1 Solicited topics
- Manufacturing Improvements for DLA Lithium Batteries
- Aircraft Alternative Braking Systems for Reduced Cost of Sustainment
- Advanced Technologies for Smart Connected Logistics

In 2016, SBIR 16.2 Projected topics: Material Handling Equipment Automation for Safety Ergonomics Environment

DLA R&D ManTech synergies provide a good foundation for SBIR Phase III
SBIR Sustainment Innovation Projects

**Electromagnetic Braking Systems**

**Objectives:**
- Reduce F-18 Braking System Replacement Costs ($400 million/Year)
- Improve Lifespan of Aircraft Braking Systems

**Innovative Solution:**
- Electromagnetic Brake (No Need for Replacement)
- Improved Safety through control of Braking Forces

**Microprocessor Enrollment & Authentication**

**Objectives:**
- Uniquely Identify Microprocessors
- Uniquely Identifying Technologies to Uniquely Identify and Validate Microprocessors
- Enrollment in 1 second per Unit

**Innovative Solution:**
- Utilize Imaging Technologies to Uniquely Identify and Validate Microprocessors

**Fire Blocking Additive Polymer Derived Ceramics Components**

**Objectives:**
- Optimize 3D PDC additive laminating technology for use in military weapons systems

**Innovative Solution:**
- Affordable Manufacturing for:
  - Engine Insulation
  - Fire Blocking Clothing and Textiles
  - Fire Blocking Headliners and Seat cushions

**Discrete Manufacturing of Aircraft Structural Components**

**Objectives:**
- Develop Digital Manufacturing capability to Manufacture Discrete Structural Parts for B-52 Stratofortress, KC-135 Stratotanker, D-3 Sentry in house, in-theater and for OEMs

**Innovative Solution:**
- Using computer numerical control, manufacture a range of parts used in aircraft
- Reduced cost per unit; improved lead time
**VISION:** A secure digital network that contains all the technical qualifications, logistics and supplier base data needed to certify an AM solution, in order to procure hard to source parts, reduce production lead times and meet the Warfighter’s needs.
Additive Manufacturing Initiatives

AM Part Candidate Considerations

<table>
<thead>
<tr>
<th>Business Case</th>
<th>Digital Technical Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D AM Design</td>
<td>Engineer Reviews</td>
</tr>
<tr>
<td>SC Integration</td>
<td>Cyber Security</td>
</tr>
<tr>
<td>Quality</td>
<td>Qualified Vendors</td>
</tr>
</tbody>
</table>

CH-53E

AV-8B Harrier

Need an Automated Capability to sort through Inventory, Business, Readiness and Technical Attributes

Military, OEMs, DLA, & Industry develop 3D Model/SAR/TDPs

Engineer Support Activities approve qualified TDP data

DLA purchases have ESA approval, meet acquisition policies, legal, and quality assurance requirements

Integrate Procurement Process

2017 AM Procurement Pilot seeks the Integration of AM Parts into the Supply Chains
Example of Innovative Sustainment Effort

Additive Manufacturing (AM) Parts Pilot
Developing and Executing Process for feasibility for AM parts & tooling
AM Part (and TDP) that is procured, qualified and integrated into the DLA Supply Chain

Process
Identification: Identifying and evaluating part candidates
Outreach: Contacting stakeholders to support the parts pilot
Development: Guiding appropriate manufacturer solicitation responses
Engagement: Working with stakeholders to initiate procurements
Source Approval: Coordinating with ESAs and Quality Assurance

Part
Application: Springholder - weapon
PLFA: Land & Maritime
Challenge: (Backordered; traditionally cast)
Thank you!

Kelly.Morris@dla.mil
703-767-3285
AF Life Cycle Management Center

Sustainment Technologies Insertion

USAF Life Cycle Management Center
Product Support Engineering Division

Mark Smallwood
AFLCMC/EZP

4 April 2017
AFLCMC/EZP DNA – It’s Who We Are!

Vision: *Affordable Warfighter Readiness…Innovative Product Support Engineering Capabilities*

Mission: *Ensure AF Enterprise Focus by Applying Airworthiness Approach that Promotes Cost-Effective Technology and Sustainment Solutions*

We Raise the bar!
Technical Disciplines
Reliability & Maintainability (R&M) & Sustainment Branch
• Reliability Analysis, Planning, Tracking, & Reporting
• Reliability Centered Maintenance (RCM)
• Condition Based Maintenance Plus (CBM+)
• Engineering Technical Assistance Reports (ETARs)
• Critical Safety Items (CSIs)
• Aircraft Structural Integrity Management Information System (ASIMIS)

Sustainment Technology Transition Branch
• Airworthiness New Materials and Substitution Lead
• Weapon System Sustainment Technology Enterprise Program (WS-STEP)
• Laser De-Paint Initiative
• Chromium Risk Mitigation Initiative
• Cadmium Risk Mitigation Initiative
• AF Additive Manufacturing Implementation Plan
• Sustaining Engineering Requirements Support
• AF Corrosion Technical Working Group
• Aircraft Battle Damage Repair Engineering (ABDRE)
• Center Test Authorities (CTAs)
• Corrosion Prevention & Control Office
• Non-Destructive Inspection Office
• Advanced Composites Office
• Metals Technology Office

Applied Engineering & Technology Branch
• Materials Handling Engineering
• Packaging Technology & Engineering

Product Support Engineering Division
Debbie Naguy
Division Chief

Reliability Maintainability & Sustainment
Frank Erdman
Branch Chief

Sustainment Technology Transition
Mark Smallwood
Branch Chief

Applied Engineering & Technology
Jerry Gibson
Branch Chief

Matt Phillips
Tech Director

John Hedke
Technical Expert

Mike Froning
Technical Expert

Matt Phillips
Tech Director

John Hedke
Technical Expert

Mike Froning
Technical Expert
AFLCMC/EZP’s Technology Insertion Process

Generating Requirements thru WS-STEP data call

Capture and Prioritize Requirements in WS-STEP database

Secure Funding

Contractual Execution

Technical Execution

Preliminary Evaluation

Qualification Testing

AWB-1015/ CET

Application Process

Validation/Verification

Demonstration/Implementation
• Identify and document weapon system sustainment technology needs/gaps/projects
  – Program Offices
  – AFNWC
  – AFSC
  – MAJCOM (future)

• Provide HQ AFMC STP data call with AFLCMC sustainment technology projects prioritized list approved by SLs

• Focus on Enterprise Solutions

• Follow Airworthiness Process for funded projects
• Applies to all new/substitute materials, processes and products on currently certified platforms
  – Reduces duplication
  – Ensures technology is mature and ready for implementation
  – Ensures airworthiness requirements are addressed
  – Faster implementation of technology across the enterprise
• Review artifacts, develop baseline requirements and initial qualification plan for *safely* deploying new/substitute materials, processes or product forms
Tomorrow’s Lifecycle Overview...

...Bend the Cost Curve thru Enterprise Mindset!

Requirements Development

Demilitarization

Acquisition

Maintenance & Sustainment

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### Opportunities for Technology Insertion

**Big Rock Approach to Organic A/C PDM**

<table>
<thead>
<tr>
<th>Category</th>
<th>Total FY14 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>De-paint</td>
<td>63,280.1</td>
</tr>
<tr>
<td>Paint</td>
<td>57,390.4</td>
</tr>
<tr>
<td>Paint &amp; De-paint</td>
<td>20,771.3</td>
</tr>
<tr>
<td>NDI</td>
<td>15,138.6</td>
</tr>
<tr>
<td>Corrosion Prevention</td>
<td>10,379.4</td>
</tr>
<tr>
<td>Corrosion Inspection &amp; Repair</td>
<td>5,325.8</td>
</tr>
<tr>
<td>Hazmat Handling</td>
<td>6,099.9</td>
</tr>
<tr>
<td>Towing</td>
<td>3,931.4</td>
</tr>
<tr>
<td>Composite Honeycomb Inspection</td>
<td>2,671.3</td>
</tr>
<tr>
<td>Weight &amp; Balance</td>
<td>1,556.9</td>
</tr>
<tr>
<td>Sealant Application</td>
<td>655.4</td>
</tr>
<tr>
<td>Pressurization</td>
<td>560.6</td>
</tr>
<tr>
<td>Component Drilling</td>
<td>254.6</td>
</tr>
</tbody>
</table>

*Note: hours based on FY12 published, total organic aircraft, one induction, and includes occurrences*
Laser Coating Removal Technology

Exceeding expectations! Offering numerous benefits...

- Increased Mission Readiness
- Reduced Environmental Impacts
- Decreased Maintenance Costs
- Improved Substrate Conditions

Utilized a spiral approach to qualify technology

One System... Numerous Benefits

Laser energy safely applied to surface for decomposition and removal of coating into collection system
Robotic Applications

- Increase mission readiness
- Decrease maintenance costs
- Provide significant cost savings and reduction in process flow time

- Replace current labor-intensive plastic media blast removal process
- Reduce damage potential from media blast process

- Decrease labor intensive nature associated with NDI processes
- Enable full aircraft inspection and greatly increase throughput capacity

- Replace manual cleaning processes prior to painting
- Provide significant cost savings
- Reduce process flow time

- Provide significant cost savings and reductions in total process times
- Eliminate hazardous environment work
Additive Manufacturing

Today
Decentralized Applications
Mainly Polymer Based

No...
- Configuration control
- Part/material validation
- Process standardization
- Rigor or IT security
- Limited dedicated engineers/operators

Tomorrow
Agile Combat Support
Centralized Applications

- Engineering Application Site
  - Technical Design Package
  - Engineering Drawings
  - Specifications
  - Standards
  - Performance
  - Quality Assurance
  - Reliability Data
  - Modeling Data

- Operations Site
- Fixtures/tooling
- Vehicles
- Weapons systems
  - Qualify parts/components
  - Address AM challenges
  - Build AM capability
  - Establish process discipline
  - Establish Innovation Centers

Future
Agile Manufacturing

- Deployable AM capability
- Cyber secure parts library
- Future Operational CONOPS

Ensuring agility & flexibility for the warfighter of the future
Condition Based Maintenance Plus (CBM+): Pilot Programs C-5 and B-1

Imagine Knowing When a Failure Will Occur Before It Happens…

- Enables Predictive Mx Processes --- Anticipate What Will Break
- Drives Enhanced Supply Chain Mgt
- Enables Logistics C2
- Encourages Collaborative Environment Across Enterprise
- Facilitates Visual Electronic, Real-time Asset Monitoring
- Promotes Interactive Mx & Trng Tools
- Supports Future AF CONOPS
- Increases Asset Availability & Decreases Mx Costs

No Unplanned Mx! Making the Maintainer’s Job Better
CTMA Partners Meeting – Sustainment Innovation Panel

4 April 2017

Presented By: Joe Sparks
Advanced Technology Lead
COMFRC HQ
COMFRC Mission
Commander, Fleet Readiness Centers (COMFRC)
delivers effective and efficient flight-line readiness
through a globally managed, responsive and
integrated sustainment system.
Intent is to accelerate the development and transition of Advanced and Emerging Technology across the enterprise

– The focal point for all Science and Technology (S&T), Research Development Test and Evaluation (RDT&E), technology development, technology transition and innovation for the FRCs

– Ensuring alignment of S&T projects with focus areas at the FRCs for leadership support

– Formulation and implementation of advanced technology strategies to address identified gaps in sustainment technologies for the FRCs

– Process development and execution

– Promote maximum interaction and technology exchange with NAVAIR and Program Management Office organizations

– Champion Technologies for the FRCs
COMFRC - IWG
Investment & CID Budget Planning & O&S Technology Prioritization (usually three technology areas)

FRC - IPT's
- Review RFI Responses (SBIR Technologies) that meet the needs assessment for operation and sustainment (O&S) technologies at FRC’s (avg. 3-6 Topics in Technology Areas) – Selection JAW FRC Criteria

COMFRC - IWG
- Approve FRC IPT Selected SBIR Projects (3 Avg)
- FRC IPT’s - Perform Due Diligence – Prioritize the SBIR projects
- Prepare SBIR Technology Transition Agreements (TTA’s)

COMFRC - Rank Technology Sustainment Areas & Approve

Technology Review / Selection

SBIR PIL5 Contract Actions

SBIR PIL5 Contract

Technology Transition

SBIR PIL5 Program / FRC IPT’s
- SBIR Program Release RFI
- Identify 3-6 Technology areas to solicit responses from SBIR Companies
- Perform & Identify needs assessment for operation and sustainment (O&S) technologies at the three FRC’s
- Prioritize FRC SBIR O&S Technology Projects based on available SBIR Funding

SBIR PIL5 Program / FRC TPOC’s
- Prepare / Send PIL5 Contracts Package to Contract
Fostering Innovation from the Workforce

• **FAB LABs**
  
  – Workspace used to enhance fleet and artisans knowledge on 3D design and printing; to encourage innovation in Maintenance, Repair & Overhaul (MRO) activities; and to promote STEM activities

• **Innovation Challenges**
  
  - Beginning Q3 CY 2017

FAB LAB team is
Accelerating Innovation
Sustainment Innovation Panel

CTMA Principles Meeting
4 April 2017

Ms. Janice Bryant
Senior Strategic Innovation Analyst for NAVSEA 04X3
Sustainability Innovation

• The Industrial Base Workforce and Infrastructure is a National Asset

• Much like the ships that are repaired, Naval Shipyards have a life-cycle
  – Facilities and Infrastructure – Hull
  – Process, Methodology, Technology – Systems
  – People - Warfighters

• Requires continuous investment to sustain for coming decades, and
  – Requires periodic overhauls and modernization (mid-life extension) to continue to perform its mission

• Must also consider transformative elements of the mission in the future

“Innovators are the ones whose dreams are greater than the reality that tells them they are crazy.” Simon Sinek
The pace of change....

Thank you for being late, T. Friedman 2017
Future solutions may be undefined, but the concepts can be...

- Know where everything is
- Meta Data Everywhere
- X-ray vision
- Automate the dirty, dangerous, dull work
- Agile, configurable and adaptable solution
- Face, places and cases for maintenance change
- New Core Competencies and compensation for workers
- New Materials, New Ways, New Capabilities
Create and Leverage an Innovation Architecture

Create the opportunity for on-time delivery of ships to the warfighter with the ultimate goal of protecting our national interests
Focus on Implementation

Tactical Innovation Implementation Lab (TILL)

Rapidly implement concepts, ideas and technologies with the intent to improve ship maintenance at the root of the concept.
Create Sustainable Change

Driving innovation to recast naval ship maintenance and deliver ships on-time, every time.
Understand the System

- Autonomous Repair Solutions*: $40M
- Expanded Sensor Deployment and Data Analytics: $30M
- Unmanned Repair Solutions*: $25M
- Drone Deployment*: $4M
- Sensors for Cranes: $4M
- Autonomous Material Management and Delivery: $11M
- GPS Enabled Asset Visibility: $20M
- Mobile RFID Asset Visibility: $20M
- RFID Tagging and Fixed Infrastructure: $20M

Projected Annual Savings ($M/yr):
- 2017: 20 $49M
- 2018: 10 $49M
- 2019: 15 $30M
- 2020: 15 $15M
- 2021: $15M

Annual Sustainment ($M):
- 2017: 5
- 2018: 9.4
- 2019: 12.2
- 2020: 13.7

* Transition to the Fleet
Capture Today and Tomorrow

Manufacturing and Repair Capabilities - NSY

Army ARL  Penn State ARL  Warfare Centers  Naval Shipyards  NAVAIR  NAVSEA

** Workload Defines “Centers of Excellence” for each NSY**

**Today’s Capabilities:**

Additive Manufacturing with Polymers

AM molds for conventional castings

Additive Repairs with Cold Spray

Additive Repair with Laser Cladding

**Future needs:**

Portable, Hatch-able Cold Spray

AM with new materials, new ways

Expanded IT

** In Progress with: **

- RIF project (funded)
- REPTECH (initiated)
- SBIR (needs funding)

** Needed for: **

- Shipboard and Support Components, Tooling, Crane and Facility Equipment
- To Deliver:
  - Structural Repairs
  - Larger Scale Solutions
  - Faster Builds
  - New Workforce Skills:
    - Coding Competency
    - Digital Design and File Manipulation

** Norfolk Naval Shipyard **

Fortus 250mc **
Fortus 400mc **
Maker bot (misc. models) **
Binder Jetting: Z-printer 650 **
Fortus 900mc (pending) **

** Pearl Harbor Naval Shipyard **

Fortis 360MC **
Insight 9.0 3D Systems Cube-Pro**
3DP Workbench **
VRC Gen III Cold Spray (ordered)

** Portsmouth Naval Shipyard **

2 Replicators **
2 Fortis 400mc Printers **
2 Fortis 450ms Printers **
1 Fortis 900 Printer (ordered) **
VRC Gen III Cold Spray (ordered)

** Puget Sound Naval Shipyard **

3 Fortus 450mc **
Toolmakers, Electrical and Structural Shops **
2 Dimension SST – NEPD **
(upgrading to Fortus 450mc)

Prototypes
Mock Ups
One Off Tooling & Solutions
Enables Worker Innovation

Collaboration with NUWC
Keyport and Naval Foundry produced two submarine components for installation

Repair of 6061 Aluminum Submarine Hydraulic Valve Installed Shipboard

Collaboration with NUWC Keyport and Penn State ARL produced a new system for repair of VLS tubes

Additive Repairs with Cold Spray

Additive Repair with Laser Cladding

For more information, visit [Army ARL](http://www.armyarl.army.mil), [Penn State ARL](http://www.pennstatearl.psu.edu), [Warfare Centers](http://www.warfarecenters.com), [Naval Shipyards](http://www.navalshipyards.com), [NAVAIR](http://www.navair.navy.mil), and [NAVSEA](http://www.navsea.navy.mil).
TD-63 Actuator body ($70K) was beyond repair and unavailable in the stock system to support project schedule. This first time repair ($30K due to the research and development efforts) was installed on SSN 22. Subsequent repairs for this type of actuator are now $3K as proven on a TD-16 repair (installed on SSN 23, removed after 18 months in service still in pristine condition).

- Communication/Visualization of Concepts
- Design Validation
- Functional End Use Applications
- Obsolescence and Life Extension
- STEM Outreach
- Recruiting
- Workforce Engagement Workshops
Army Sustainment
Technology Challenges/Opportunities

U.S. Army Materiel Command

Dr. Bernard Goodly
Chief, Industrial Base Capabilities Division

4 April 2017
• NCMS/CTMA has not yet received approval to post Dr. Bernard Goodly’s presentation. We will update this file as soon as permission is received. We apologize for the inconvenience.
Joint Sustainment Innovation Priorities

• Availability/Mission Readiness
• Cost Drivers
• Investments in Processes & Technology Capabilities