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

ACCELERATING INNOVATION

CTMA ANNUAL PARTNERS AND INTEGRATED PROJECT MEETING 2017

DEFENSE LOGISTICS AGENCY

AMERICA'S COMBAT LOGISTICS SUPPORT AGENCY

DLA Research & Development
Agile Combat Support

2017 CTMA Partners Meeting Sustainment Innovation Panel

Ms. Kelly Morris
Logistics Research & Development

4 April 2017

WARFIGHTER FIRST - PEOPLE & CULTURE - STRATEGIC ENGAGEMENT - FINANCIAL STEWARDSHIP - PROCESS EXCELLENCE

NCMS NATIONAL CENTER FOR MANUFACTURING SCIENCES

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

DLA Troop Support

- **Class I: Subsistence**
  - Food & Combat Rations
- **Class II: Clothing & Textile**
  - Dress & Combat Uniforms
- **Class IV: Construction & Equipment**
  - Facilities Maintenance
- **Class VIII: Medical**
  - Pharmaceutical & Medical Equipment
- **Class IX: Industrial Hardware**

DLA Aviation

- **Class IX:**
  - Engine Components, Air Frames
  - Flight Safety Equipment

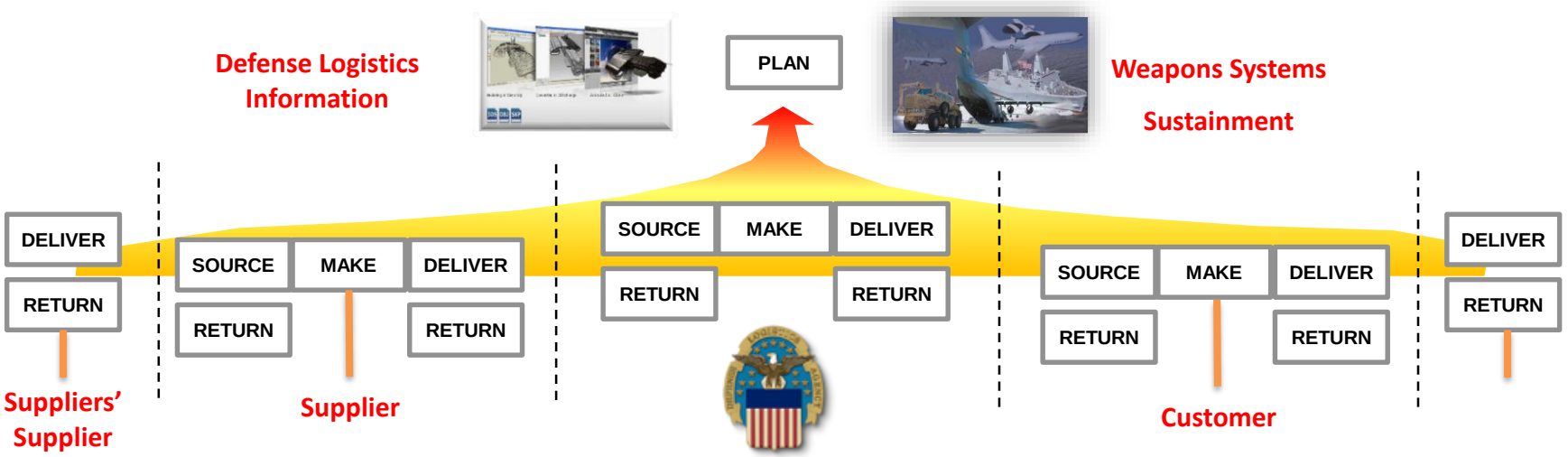
DLA Land and Maritime

- **Class IX: Maritime**
  - Valves, Fluid Handling
  - Electrical/Electronics
- **Class IX: Land**
  - Wheeled, Tracked & Heavy Vehicle Parts
  - Small Arms Parts

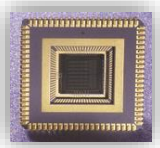
DLA Energy

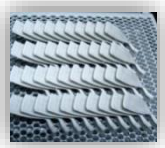
- **Class III: Energy**
  - Bulk Petroleum, Natural Gas, Coal, Electricity
  - Aerospace Energy

R&D Integration into the DLA end-to-end supply chain




Strategic Materials

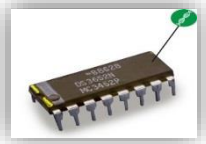

Microcircuit Emulation

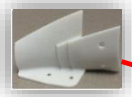

Castings


Forgings


Batteries


Distribution / Disposition


Counterfeit Parts



Additive Manufacturing

Energy


Subsistence


Military Unique Sustainment Technology

SUPPORT THE WARFIGHTER

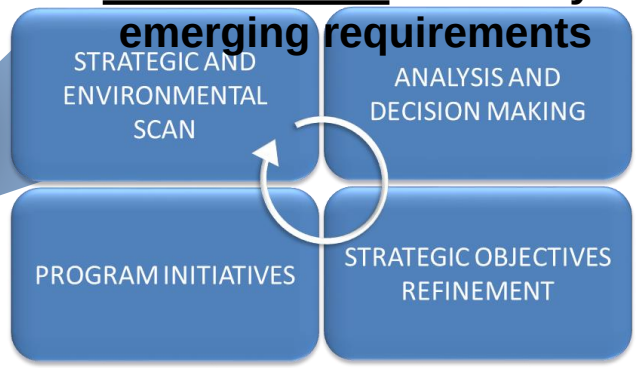
DLA R&D Strategic Guidance & Assessments help drive Innovation Sustainment

DLA Strategic Guidance to achieve the Mission

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

DLA leverages R&D to infuse innovation into disruptive solutions that achieve DLA's 1st Strategic Goal **– "Warfighter First"**

DLA R&D Strategic Assessments to identify emerging requirements



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

ManTech Programs - In Summary

Casting Technology

Objective:

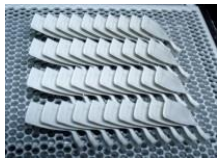
- Ensure a viable and competitive metal casting Industrial base to provide affordable and high quality parts for the Warfighter

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



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

Forging Technology

Objective:

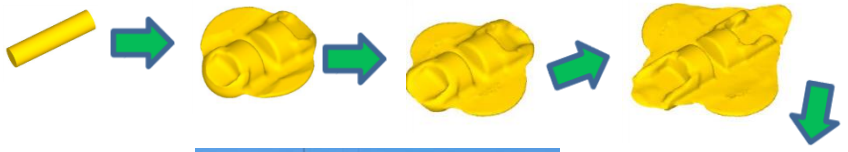
- Ensure a viable and competitive forging Industrial base to provide affordable and high quality parts for the Warfighter

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



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

ManTech Programs - In Summary

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

Latest MAE Project Transition supports 42 weapon systems including A-10 & F/A-18

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

Defense Logistics Agency SBIR·STTR America's SEED Fund™

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

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

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

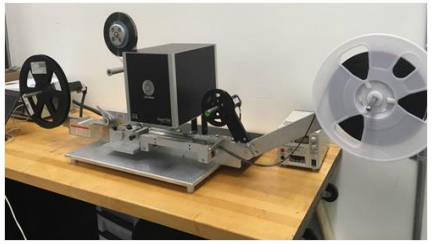
SBIR Sustainment Innovation Projects

Electromagnetic Braking Systems

Objectives:
- Reduce F-18 Braking System Replacement Costs ($400
- Improve Lifespan of Aircra Braking Systems

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

Microprocessor Enrollment & Authentication

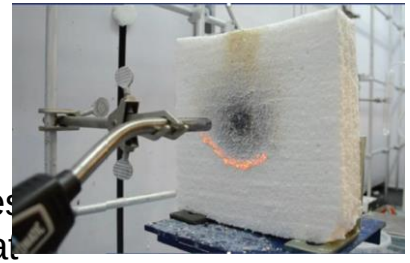


- Uniquely Identify Microprocessors
- Provide Traceability

Innovative Solution:
- Utilize Imaging Technologies to Uniquely Identify and Validate Microprocessors
- Enrollment in 1 second per Unit

Fire Blocking Additive Polymer Derived Ceramics Components

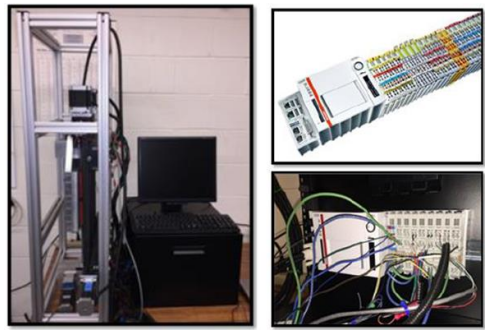
Objectives: Optimize 3D PDC additive laminating technology for use in military weapons systems



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

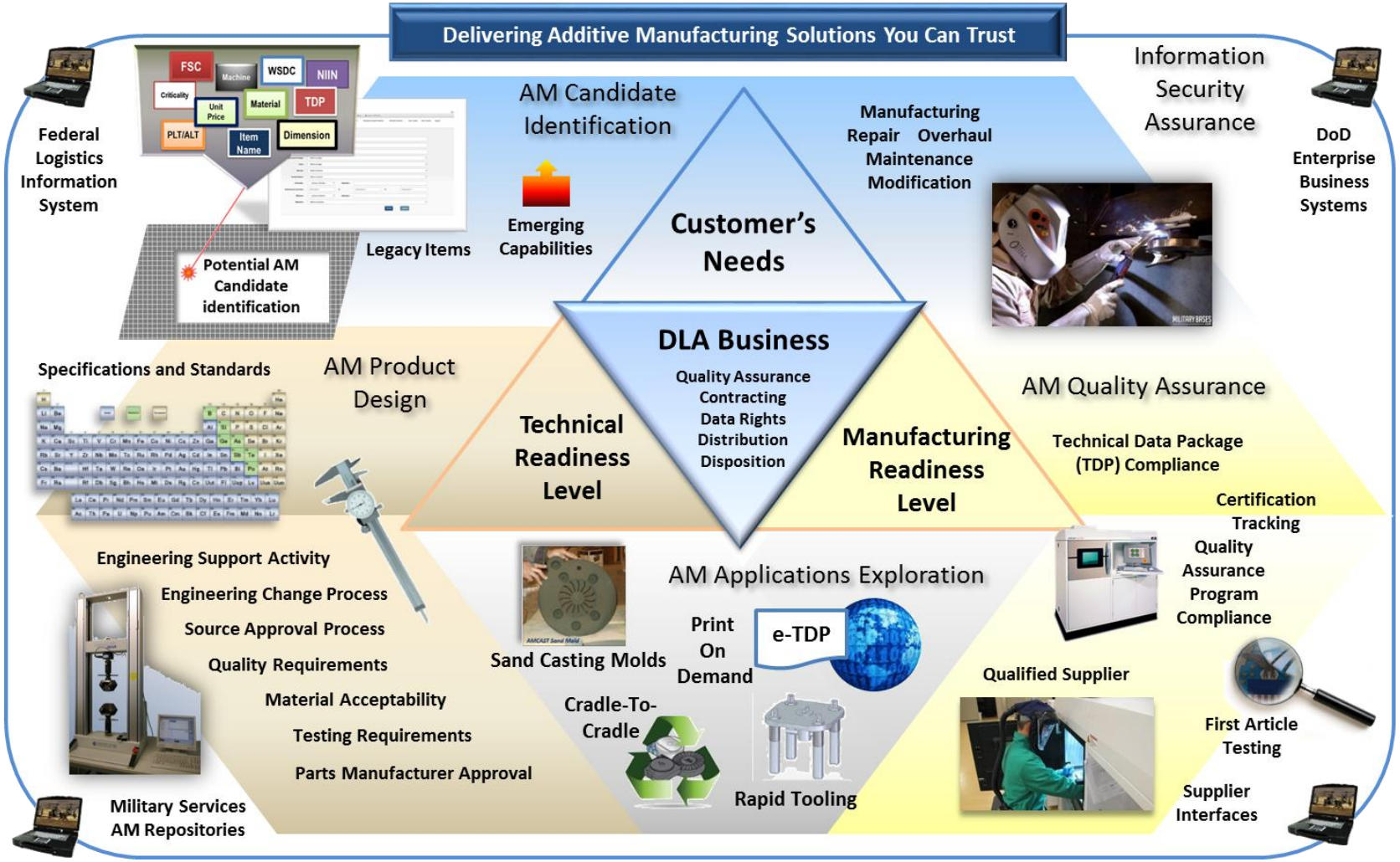
Discrete Manufacturing of Aircraft Structural Components

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	
Business Case	Digital Technical Data
3D AM Design	Engineer Reviews
SC Integration	Cyber Security
Quality	Qualified Vendors

CH-53E

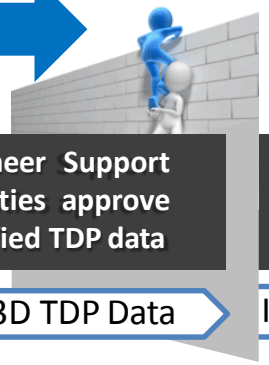
Tomahawk

Repeatability

AV-8B Harrier

Redesign

AM Candidate Parts



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
Identify Problematic Parts for AM	Build AM Models	Store 3D TDP Data	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)

Kelly.Morris@dla.mil
703-767-3285

AF Life Cycle Management Center

AFLCMC… Providing the Warfighter's Edge

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!

AFLCMC/EZP Organization

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

Debbie Naguy
Division Chief

Product Support Engineering Division

Matt Phillips
Tech Director

Frank Erdman
Branch Chief

Reliability Maintainability & Sustainment

John Hedke
Technical Expert

Mark Smallwood
Branch Chief

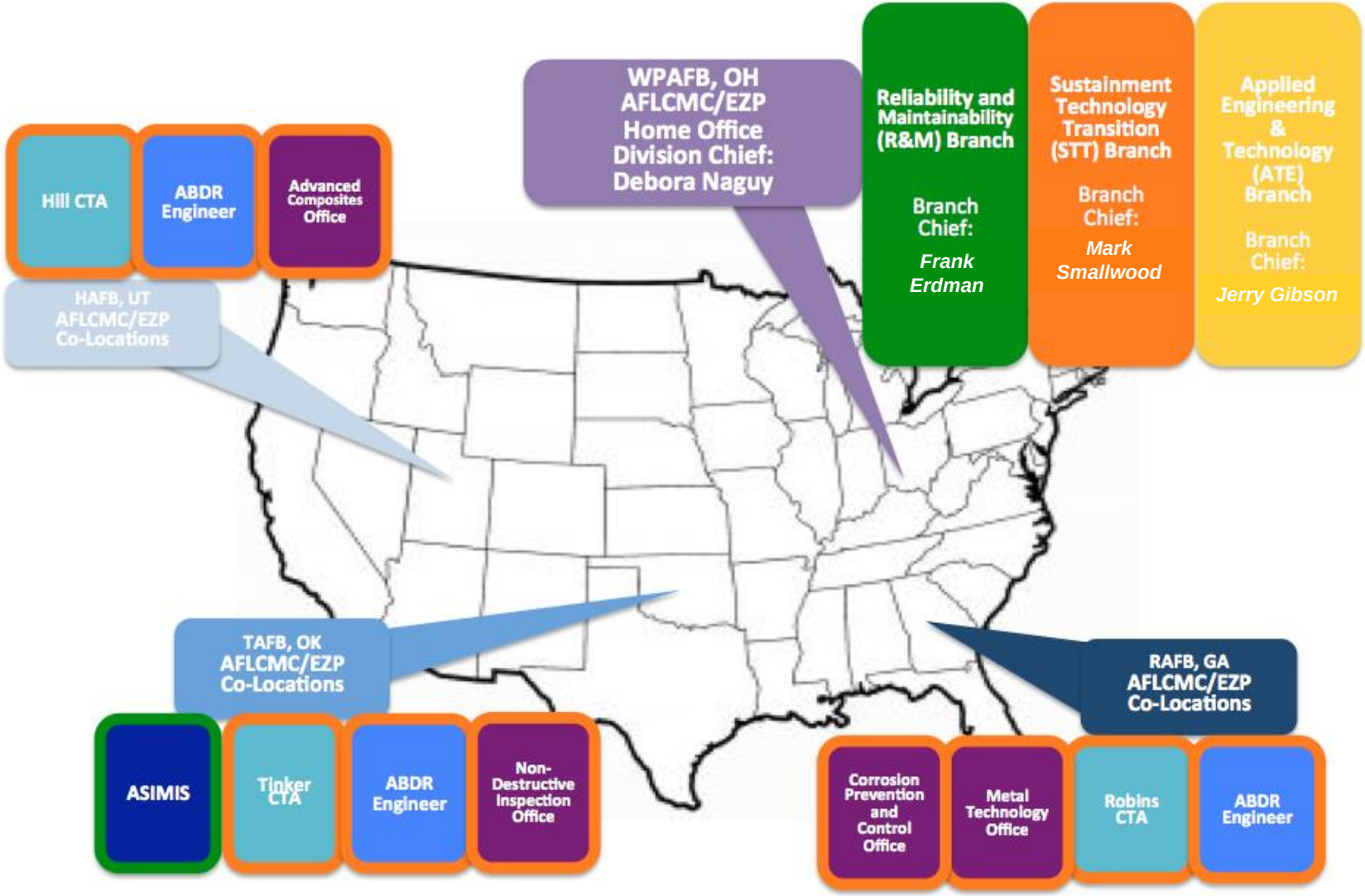
Sustainment Technology Transition

Mike Froning
Technical Expert

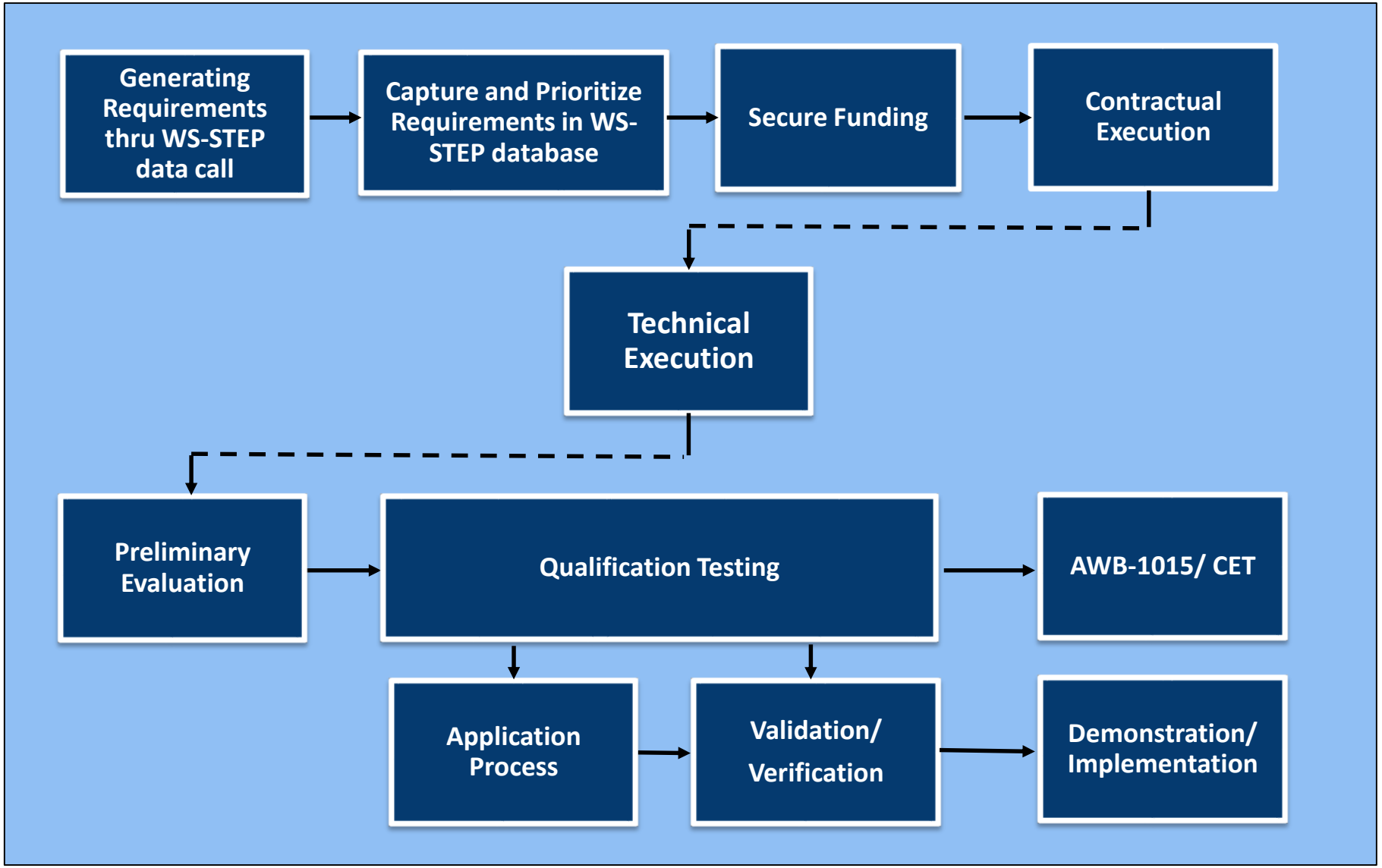
Jerry Gibson
Branch Chief

Applied Engineering & Technology

AFLCMC/EZP Nationwide Team

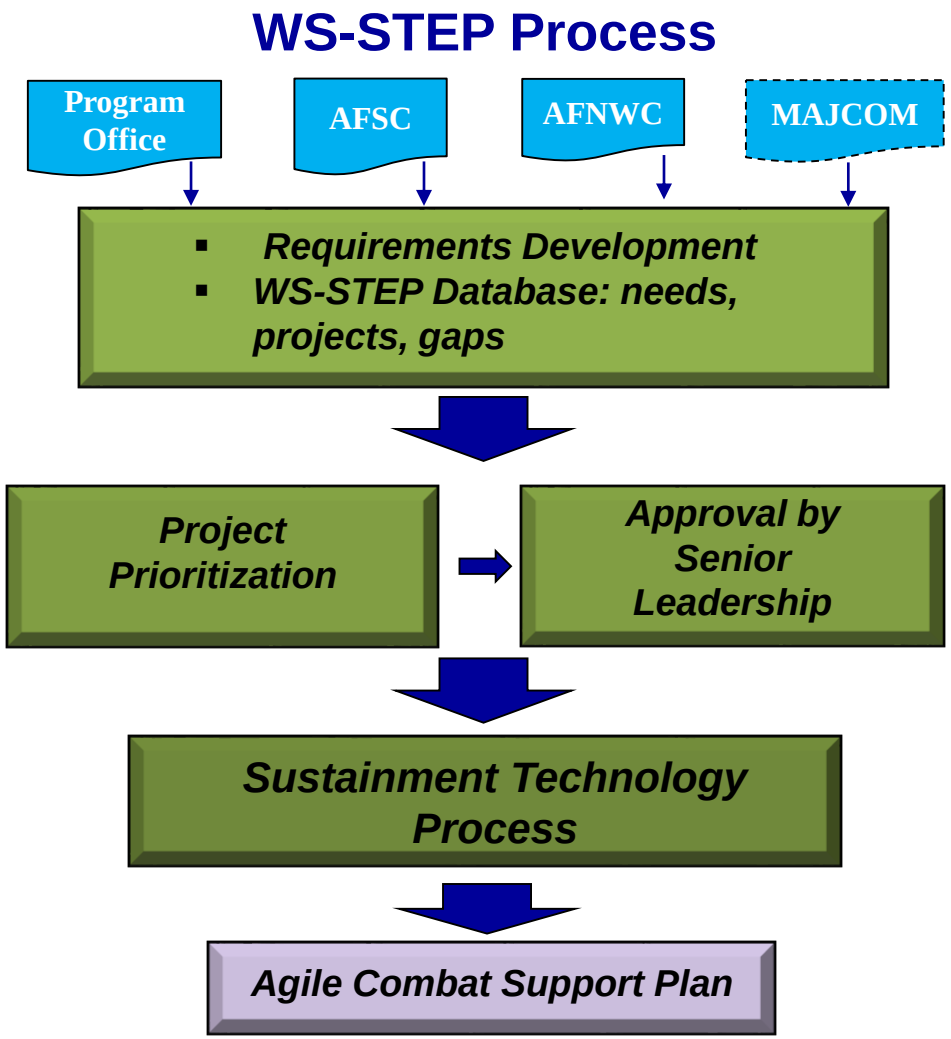


AFLCMC/EZP's Technology Insertion Process



Weapon System Sustainment Technology Enterprise Program

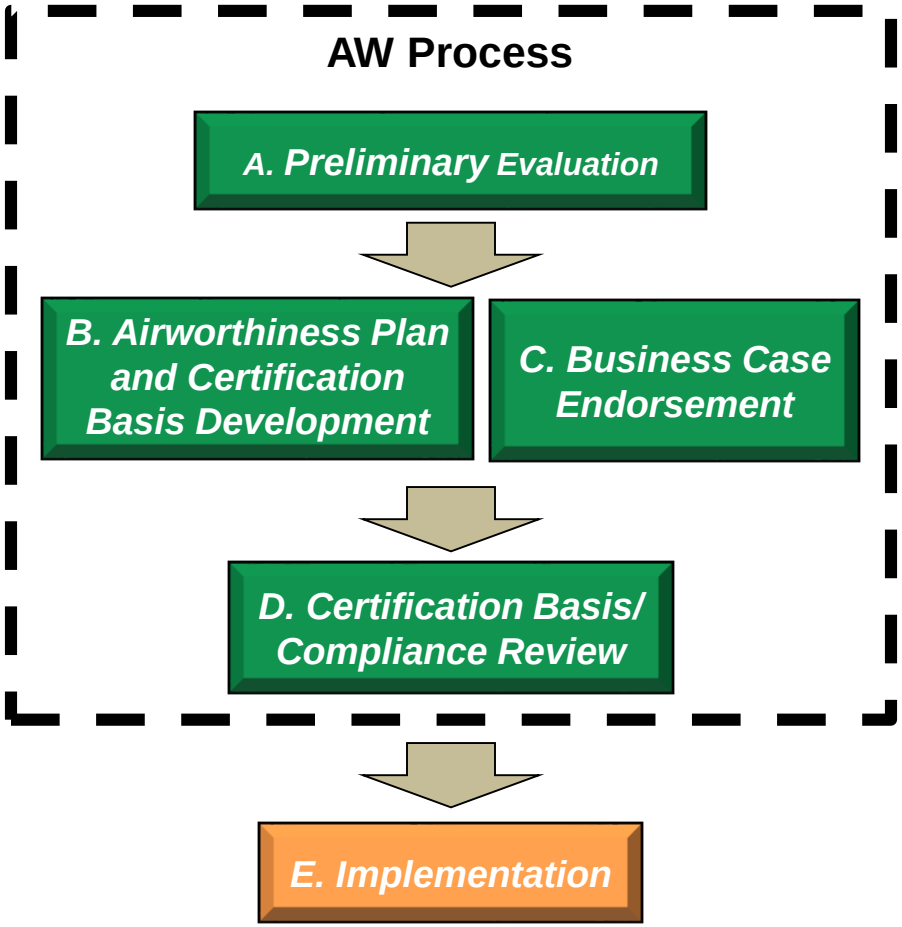
- Identify and document weapon system sustainment technology needs/gaps/projects
  - Program Offices
  - AFNWC
  - AFSC
  - MAJCOM (*future*)
- Provide HQ AFMC STP data call with AFLCMC sustainment technology projects prioritized list approved by SLs
- Focus on Enterprise Solutions
- Follow Airworthiness Process for funded projects



Feed STP to Ensure AF Enterprise Focus

AWB-1015 Process

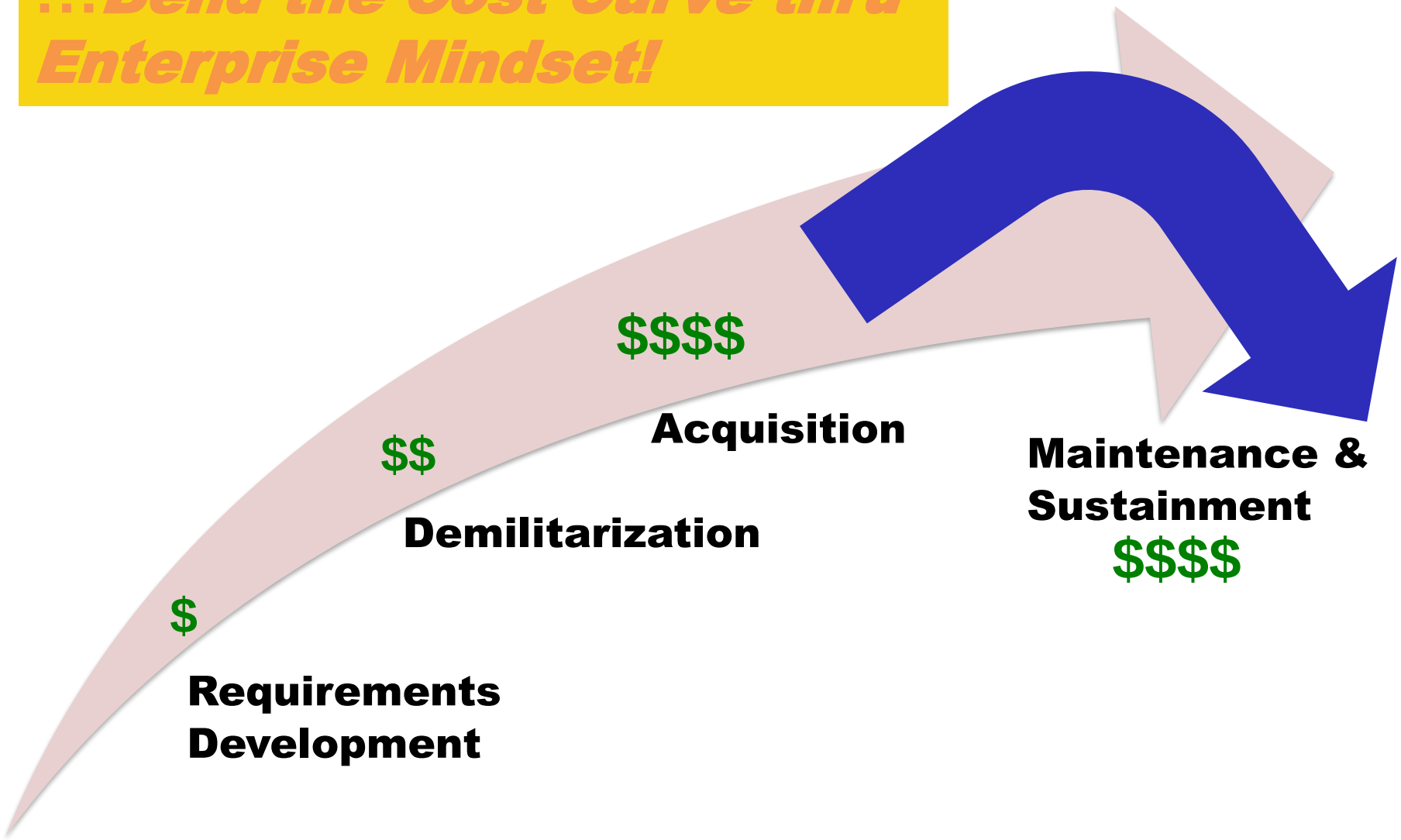
- Applies to all new/substitute materials, processes and products on currently certified platforms
  - Reduces duplication
  - Ensures technology is mature and ready for implementation
  - Ensures airworthiness requirements are addressed
  - Faster implementation of technology across the enterprise
- Review artifacts, develop baseline requirements and initial qualification plan for ***safely*** deploying new/substitute materials, processes or product forms



Signed by USAF TAA on 15 Jul 15

Tomorrow's Lifecycle Overview…

…Bend the Cost Curve thru Enterprise Mindset!



Opportunities for Technology Insertion
Big Rock Approach to Organic A/C PDM

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

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

ONE SYSTEM… NUMEROUS BENEFITS

Utilized a spiral approach to qualify technology

Mobile Robotic Systems for Full Aircraft

Robotic Lasers for Aircraft Components

Handheld Laser for Small Areas

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

Robotics Applications

Robotic Corrosion Inspection

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

Robotic Depaint Confined Space

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

Robotic NDI

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

Robotic Laser for Surface Prep

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

Robotic Paint

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

Additive Manufacturing

Today

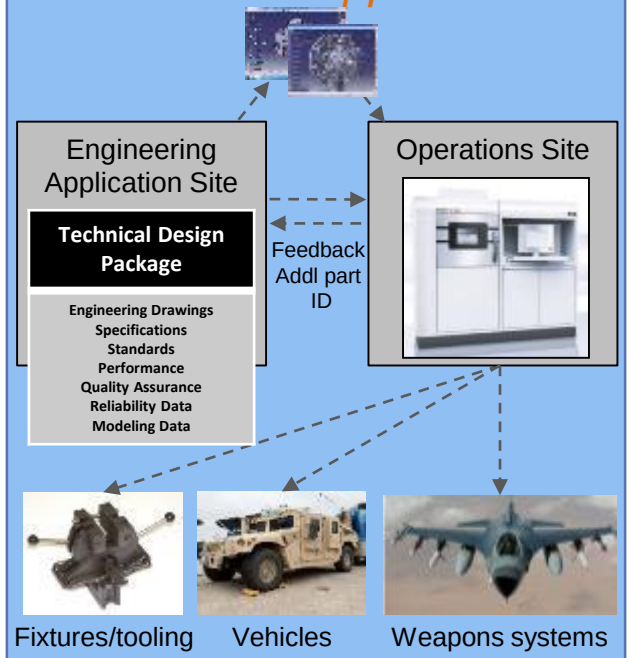
Decentralized Applications
Mainly Polymer Based

No…

- Configuration control
- Part/material validation
- Process standardization
- Rigor or IT security
- Limited dedicated engineers/ operators

Tomorrow

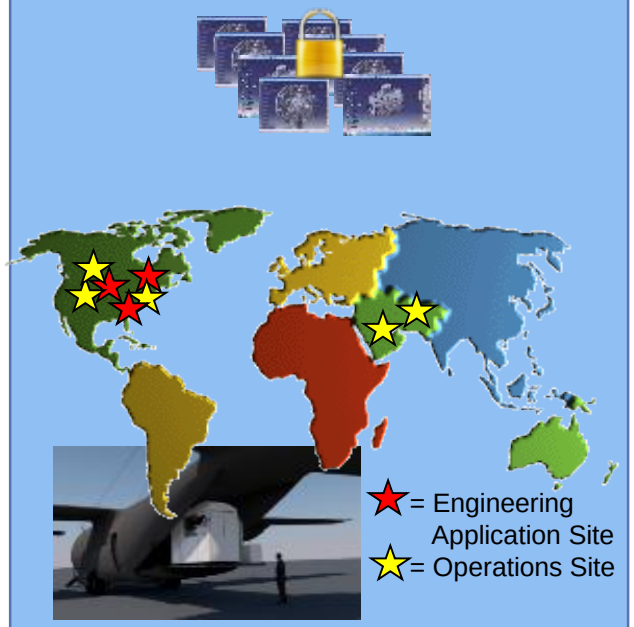
Agile Combat Support
Centralized Applications



- 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

AIR FORCE LCMC

ACCELERATING INNOVATION

CTMA ANNUAL PARTNERS AND INTEGRATED PROJECT MEETING 2017

COMFRC
Commander, Fleet Readiness Centers

COMMANDER FLEET READINESS CENTERS
FRC
EFFICIENS · AGILIS · VELOX

CTMA Partners Meeting – Sustainment Innovation Panel

4 April 2017

Presented By: Joe Sparks
Advanced Technology Lead
COMFRC HQ

NCMS NATIONAL CENTER FOR MANUFACTURING SCIENCES

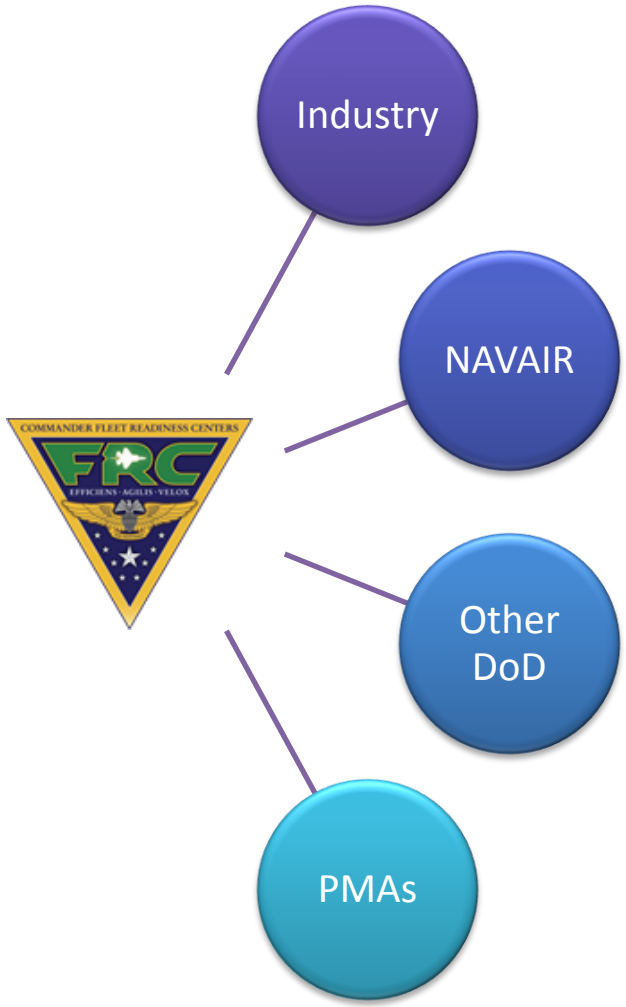
COMFRC Mission

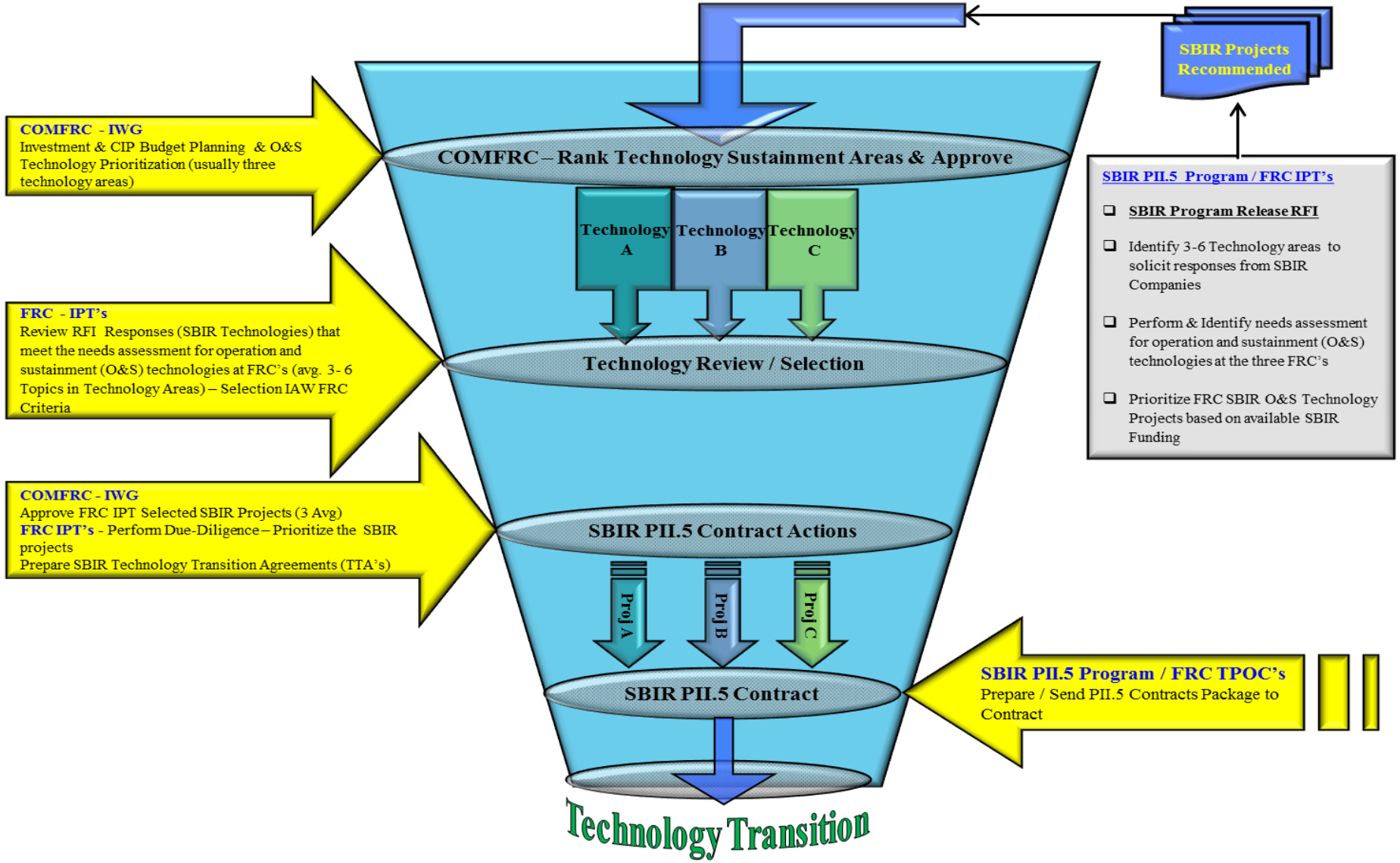
Commander, Fleet Readiness Centers (COMFRC) delivers effective and efficient flight-line readiness through a globally managed, responsive and integrated sustainment system.

COMFRC Advanced Technology & Innovation IPT

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




SBIR Projects Recommended
COMFRC - IWG
Investment & CIP Budget Planning & O&S Technology Prioritization (usually three technology areas)
COMFRC – Rank Technology Sustainment Areas & Approve
Technology A
Technology B
Technology C
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 IAW FRC Criteria
Technology Review / Selection
SBIR PII.5 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
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)
SBIR PII.5 Contract Actions
Proj A
Proj B
Proj C
SBIR PII.5 Contract
SBIR PII.5 Program / FRC TPOC's
Prepare / Send PII.5 Contracts Package to Contract
Technology Transition

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

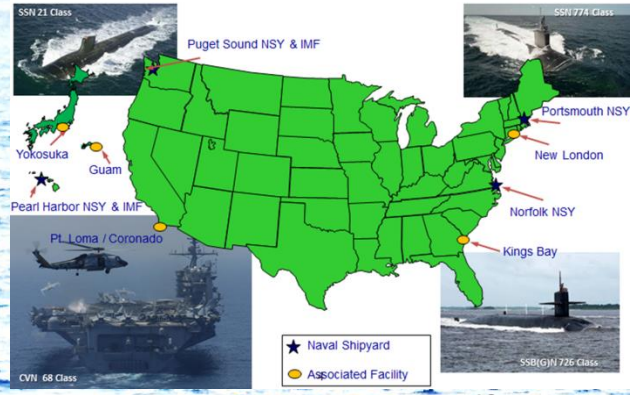
- **The Industrial Base Workforce and Infrastructure is a National Asset**

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

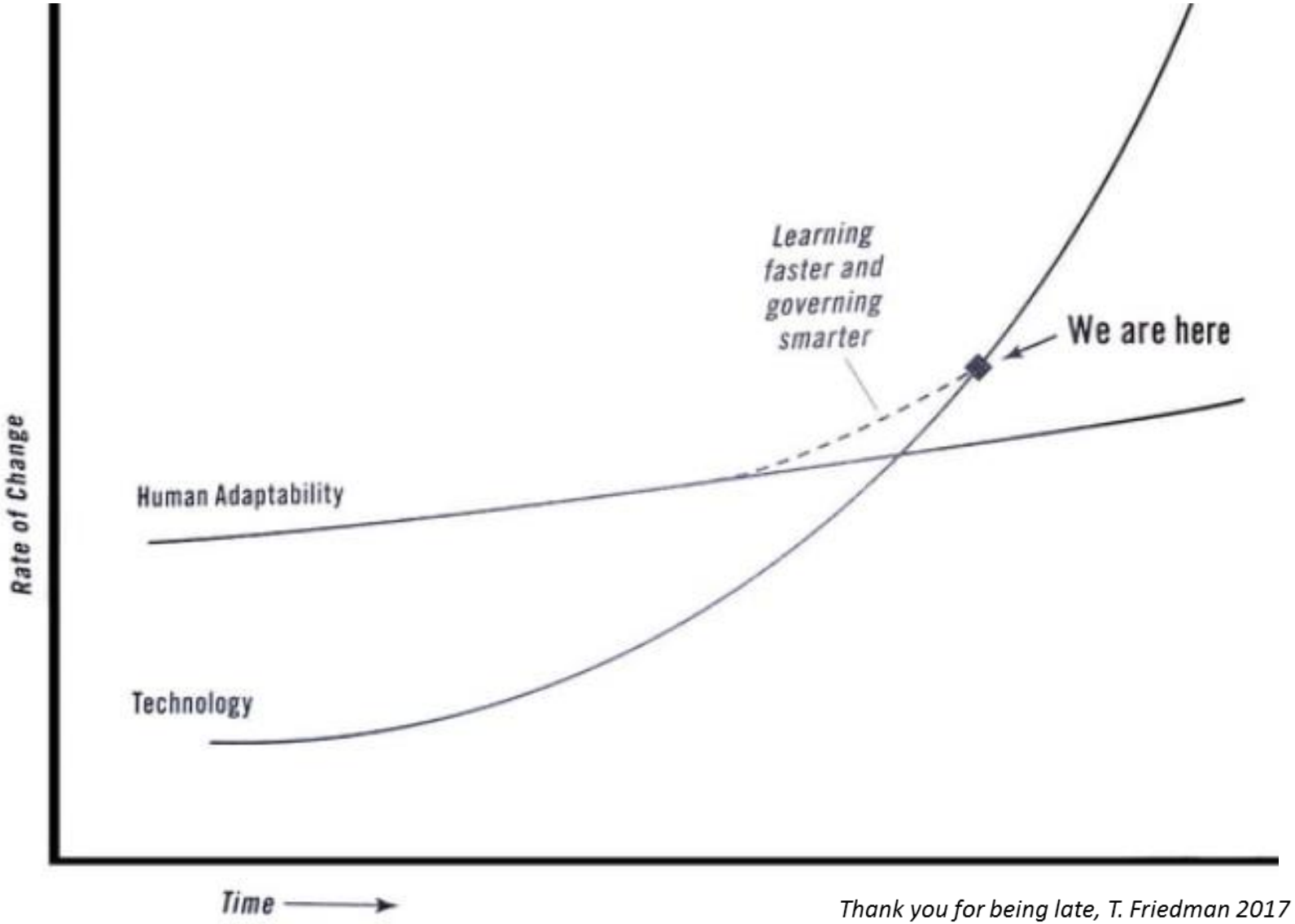
- **Requires continuous investment to sustain for coming decades, and**
  - **Requires periodic overhauls and modernization (mid-life extension) to continue to perform it's mission**

- **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….

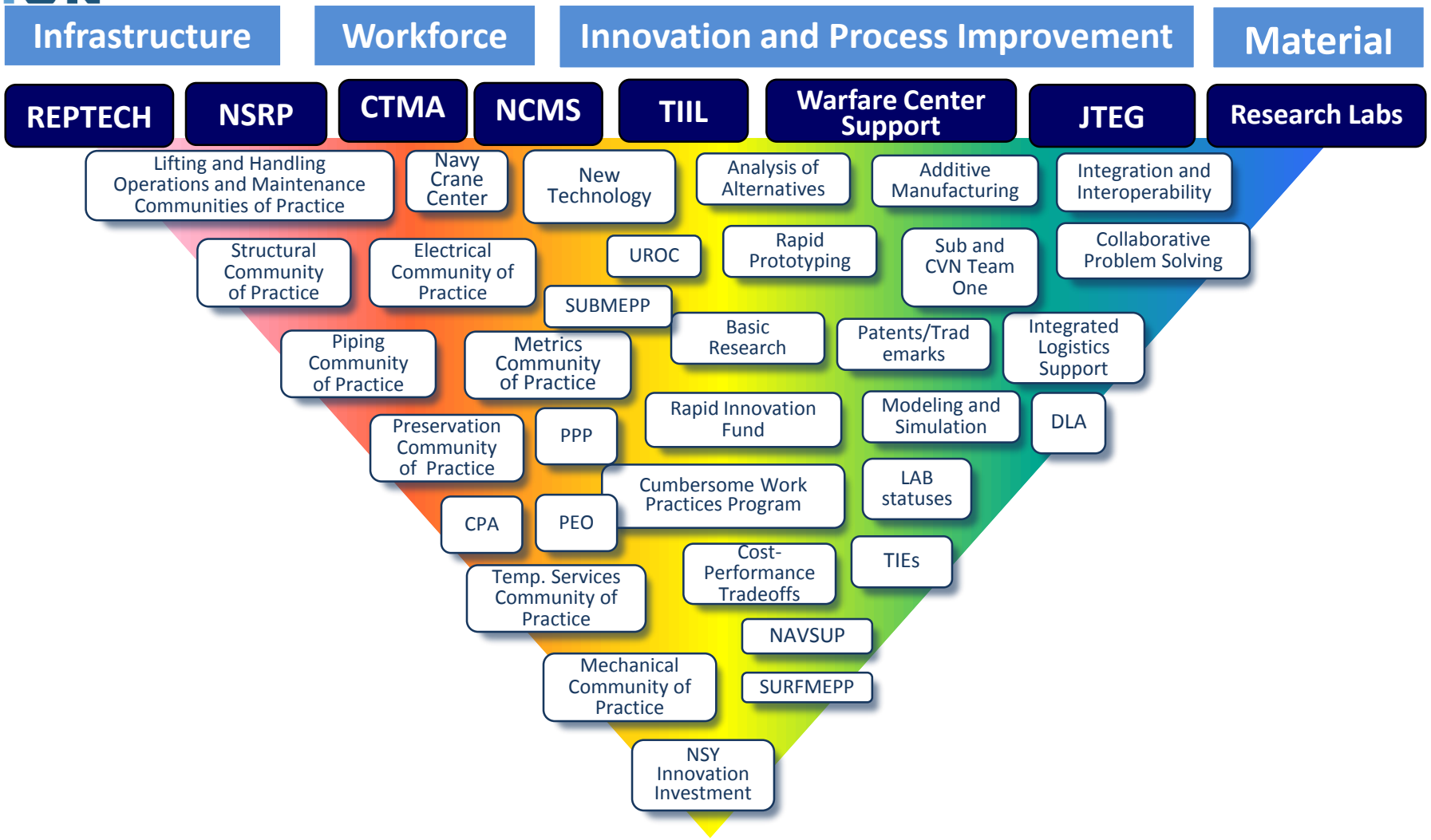


Thank you for being late, T. Friedman 2017

Future solutions may be undefined, but the concepts can be..

- Know where everything is
- Meta Data Everywhere
- X-ray vison
- 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 (TIIL)

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

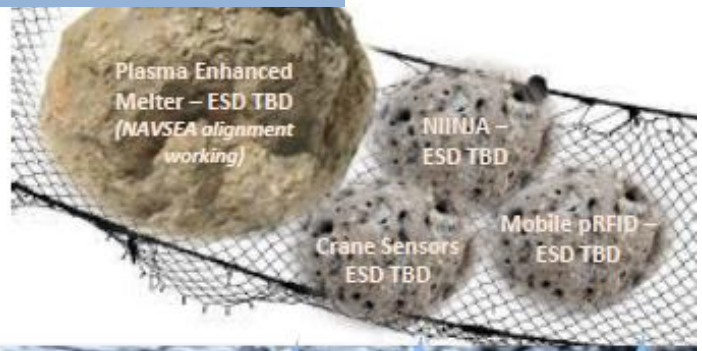
recipe: **Tactical Implementation Exercise**

SERVES: **The Naval Fleet**

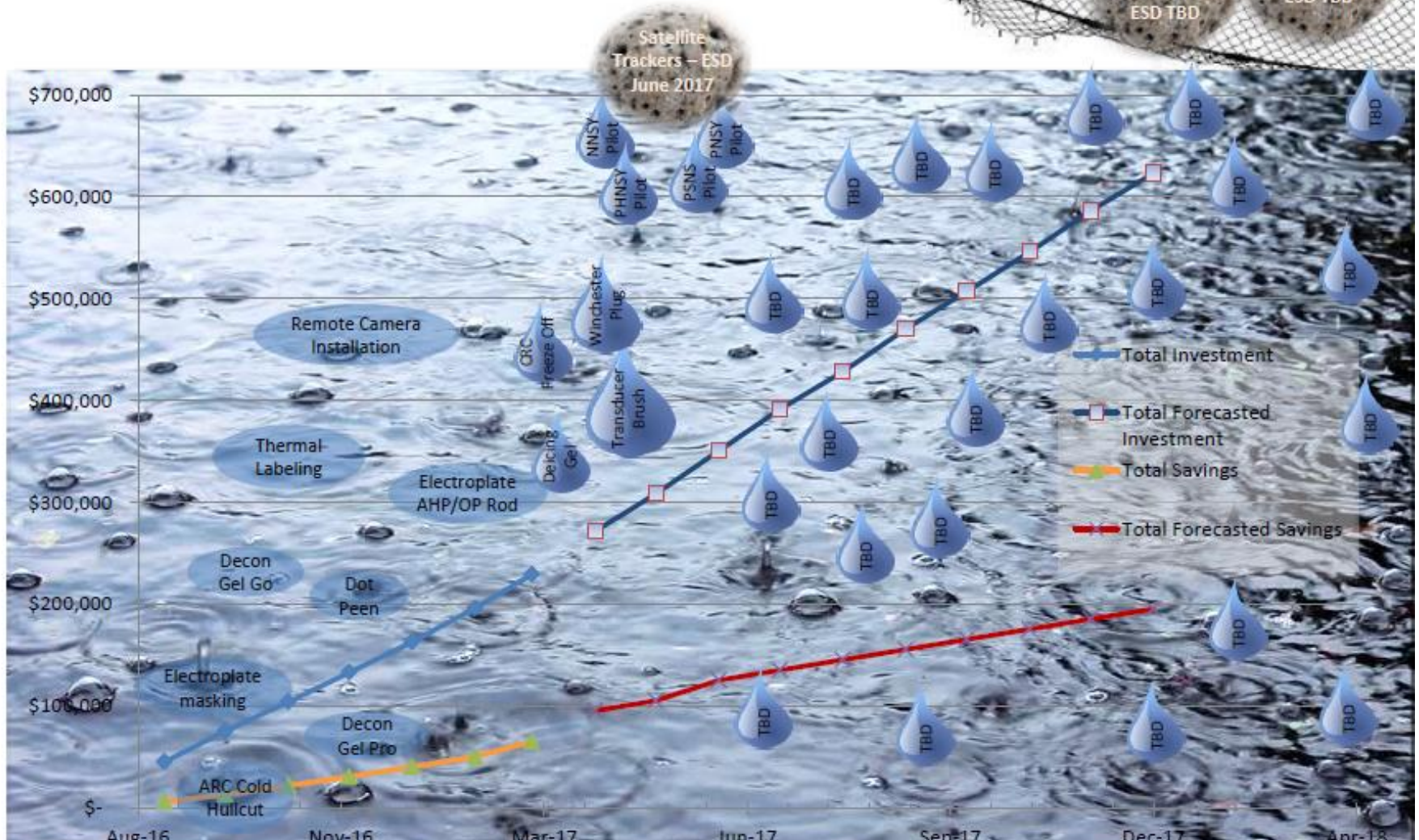
- ❑ Determine broader fleet impact
- ❑ Bring together decision makers – the right people at the right time
- ❑ Understand your deliverables, what can be accomplished?
- ❑ Capture baseline metrics
- ❑ Explore and investigate the new process or idea
- ❑ Does the idea work? Have the team make an informed decision
- ❑ Capture the Return on Investment (ROI)
- ❑ Create Standard Work Documents
- ❑ Capture ordering info, contact information and anything that the next insertion point will need to implement.
- ❑ Tell the story! Publicize and share your win and lessons learned
- ❑ REPEAT AGAIN AND AGAIN!

Create Sustainable Change

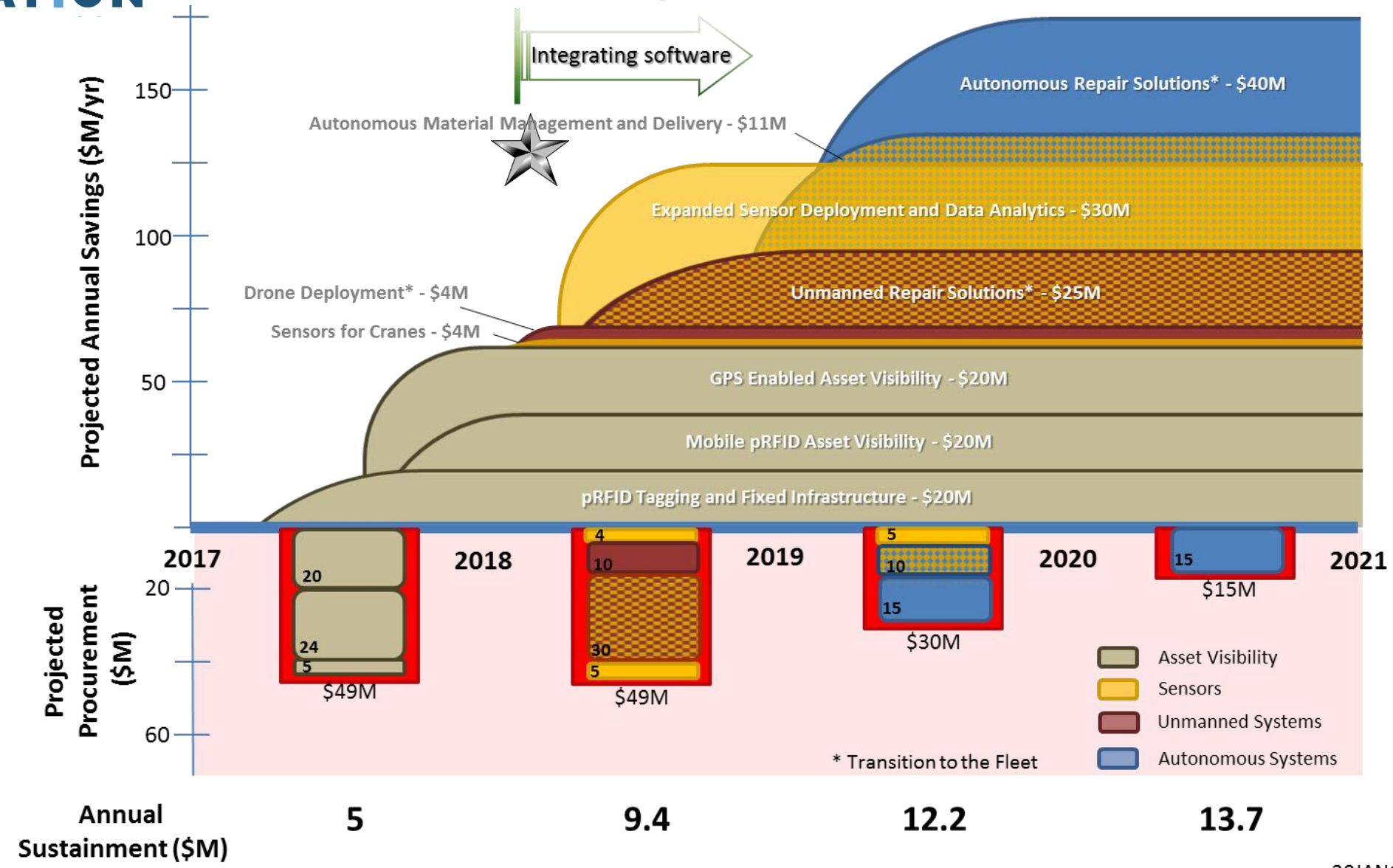
Driving innovation to recast naval ship maintenance and deliver ships on-time, every time.



Creating standard work for all shipyards and inspiring innovators to meet the mission!



Understand the System



Annual Sustainment ($M)	5	9.4	12.2	13.7

Capture Today and Tomorrow
Manufacturing and Repair Capabilities - NSY

ACCELERATING INNOVATION

CTMA ANNUAL PARTNERS AND INTEGRATED PROJECT MEETING 2017

Army ARL | Penn State ARL | Warfare Centers | Naval Shipyards | NAVAIR | NAVSEA

Today's Capabilities:

Prototypes
Mock Ups
One Off Tooling & Solutions
Enables Worker Innovation

Additive Manufacturing with Polymers

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

AM molds for conventional castings

Repair of 6061 Aluminum Submarine Hydraulic Valve Installed Shipboard

Additive Repairs with Cold Spray

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

Additive Repair with Laser Cladding

Future needs:

Portable, Hatch-able Cold Spray

In Progress with:
RIF project (funded)
REPTECH (initiated)
SBIR (needs funding)

AM with new materials , new ways

Needed for:
Shipboard and Support Components, Tooling, Crane and Facility Equipment

Expand AM/R Capabilities

To Deliver:
Structural Repairs
Larger Scale Solutions
Faster Builds

Expanded IT

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)

**** All Thermoplastic Printers**

NCMS NATIONAL CENTER FOR MANUFACTURING SCIENCES

Workload Defines "Centers of Excellence" for each NSY

Make a Difference Today

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

80% time savings

"The transducers weigh more than 90 lbs so it's labor intensive to bring them onboard and use them as a source of measurement. With a light-weight plastic replica, we can easily take measurements, cutting normal ship check time down by more than 80 percent."

- Albert James, C294 Engineer

97% cost savings

"The AM mockup valve was developed for only 1/36th of the cost of an actual component and can be reproduced in large quantities that meet shipyard and fleet training needs."

- Tim Queen, Fleet Maintenance Support Branch (FMSB)

470 manhour savings

$23,500 savings

"We were able to fit-up the 3d printed model using the disassembled valves to show proof of concept. This ensured the new part would physically work as intended."

- Brian Helm, C265 Engineer

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