



NAVAIR Cold Spray Initiative Update

For CSAT

Presented to:

Presented by:
NAVAIR- AIR 4.3.4.6

October 2012



Objective

The US Navy has the need to perform dimensional restoration of metallic components caused by corrosion, restoration of material due to wear or damage, and the ability to easily and rapidly repair structures in place on Naval Aircraft.

The objective is to develop a metallization process that can be used to facilitate repairs on naval aviation assets at all levels of maintenance.

Naval S&T Focus Areas:

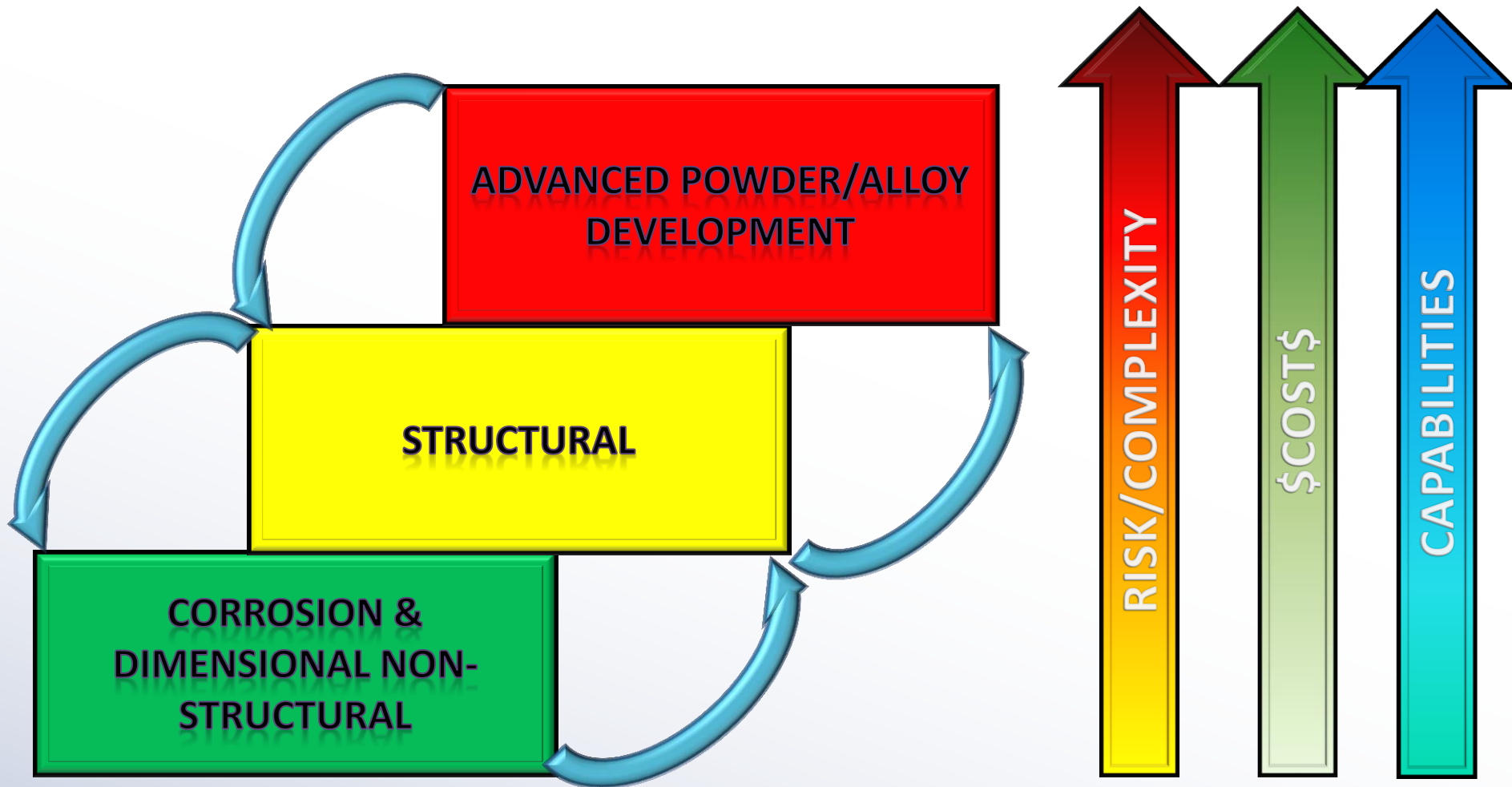
- Affordability ✓
- Maintainability ✓
- Reliability

Naval S&T Objectives:

- Platform Affordability ✓
- Availability ✓

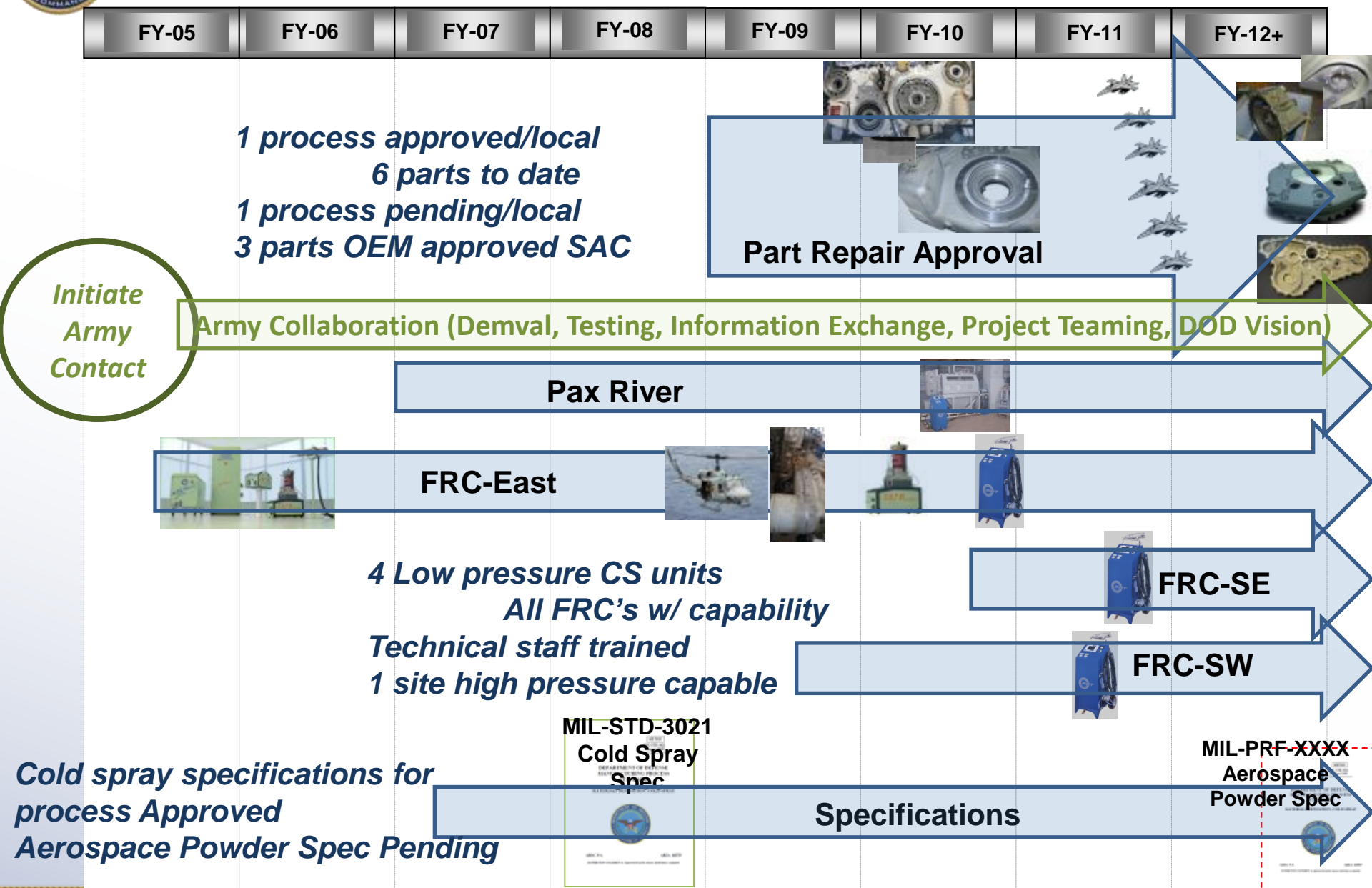


Hierarchy of Cold Spray Application Projects



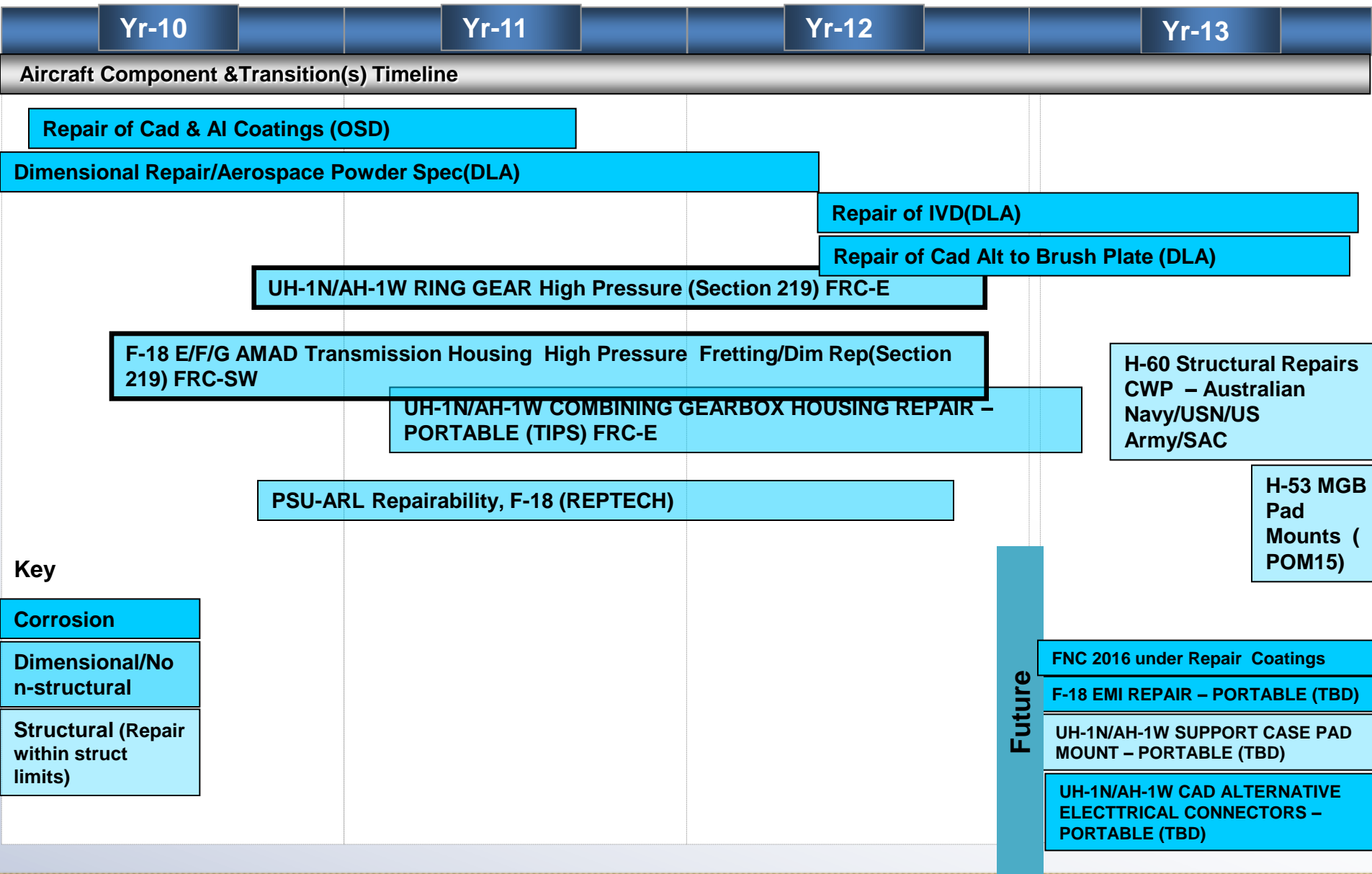


NAVAIR Cold Spray Timeline





Current & Future Projects

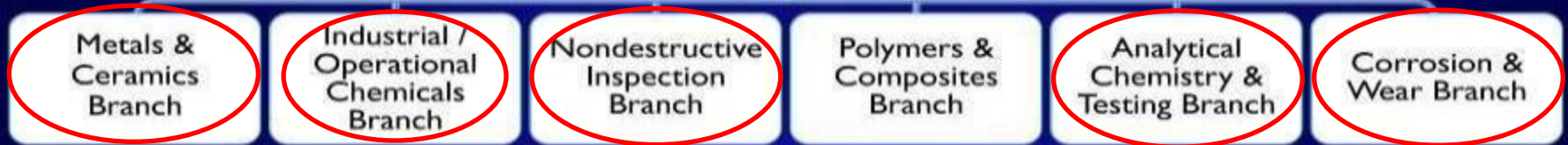




NAVAIR Workforce Development

NAVAIR MATERIALS ENGINEERING

Materials Engineering Division





Current Navy Cold Spray Capabilities

NAVAIR Facilities

- FRC-East
- Pax River
- FRC Southeast (Jax),
- FRC Southwest (NI),

NAVSEA

- NSWCCD
- Keyport

NPS

- Centerline Low Pressure cabinet



Technology Assessment

Target Material Applications Air Vehicles

- Aluminum alloys used for naval aviation applications
 - 7075-T73651 Plate,
 - 7075-T76511 Extruded,
 - 7075-T6 sheet/clad skin,
 - 2024-T3 – sheet/cladskin,
 - A356-T61 Cast,
- Steel alloys used for naval aviation applications
 - AISI 4130 & AISI 4340,
 - Stainless Steel PH13-8Mo,
 - High Strength Steels (landing gear, arresting hooks),
 - 300M,
 - Aermet 100,
 - AF1410
- Magnesium alloys



Analysis

Issues for all materials of interest to the Navy/NAVAIR

- Process parameters
 - Repair limitations
- Coating optimization
 - Powder
 - Surface preparation
 - Spray parameters
- Coating bond strength
- Coating cohesion
- Post-coating preparation
 - Sealing
 - Welding
 - Machining
- Microstructural characterization
 - Metallurgical bond
 - Dislocation density
 - Coating formation
- Mechanical properties (comparison to existing technology)
 - Residual stress
- Fatigue
- Corrosion
- Evaluation/Development of NDT
- Significance of Flaws
- Specifications and Requirements
 - Fitness for service acceptance criteria & logistics
- In-service repair
- Safety/Environmental concerns
- Application based cost benefit analysis
- Modeling, process & materials
- Logistics constraints
 - Material
 - Equipment

Need to tie fundamental understanding of process parameters/operating envelope to coating properties



Approach

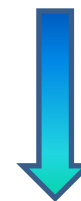
Establish Procedure(s)

- Develop Process(es) & Equipment
 - NRL, ARL, NSWC-Carderock, Industry, Academia
- Certify Testing & Results (laboratory)
 - Physical Tests
 - Corrosion Tests
 - Non-destructive
- Develop Process Certification Procedures/Methods
 - Modeling
 - NDI
- System/Process Functional Tests
 - Apply to aircraft
 - Flight Test

Develop



Qualify



Check



Assure



Summary

- **Responsive to fleet needs with solutions that keep fleet assets affordable & maintainable**
- **Establishing for NAVAIR a solid base to grow from**
 - **Material & Process Protocols**
 - **Capabilities**
 - **Processes**
 - **Manpower**
 - **Logistics**