



NAVAIR NDI

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Presented to:

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Our Focus Areas



Increase speed to the fleet . . .

Through program of record planning and execution; and rapid response to urgent warfighter needs.

Deliver Integrated and Interoperable warfighting capabilities . . .

I&I includes platforms, sensors and weapons operating seamlessly in a systems-of-systems environment that produce an immediate and sustainable increase in warfighting effectiveness.

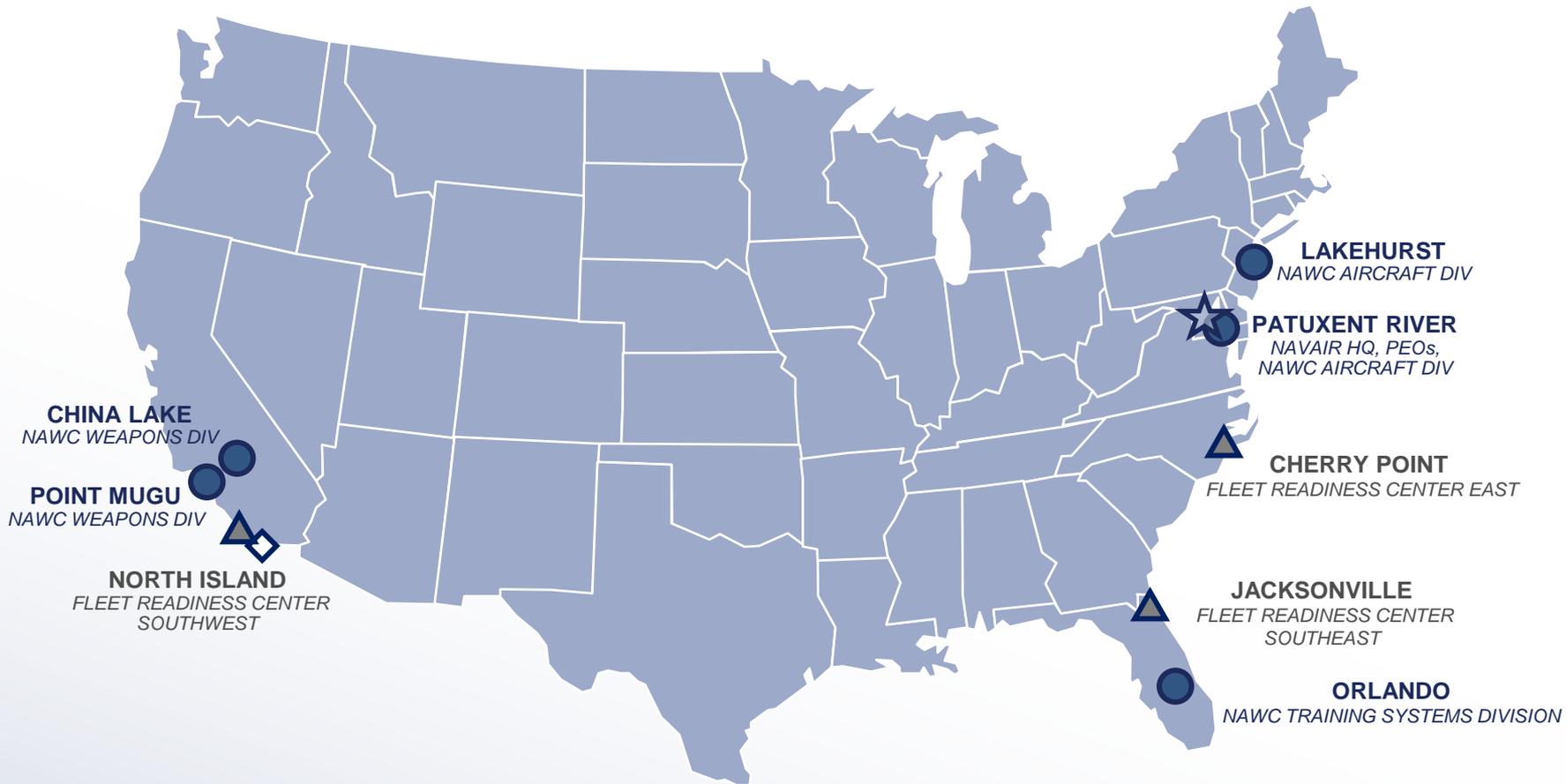
Improve affordability . . .

By reducing operating and sustainment costs for fielded systems and implementing life-cycle cost reduction initiatives as part of new systems development.

***Making the Navy and Marine Corps more capable, ready and affordable
in a joint/coalition environment***



Major Locations



- ★ NAVAIR HQ
- NAVAL AIR WARFARE CENTER
- ▲ DEPOT/INDUSTRIAL SITE (FLEET READINESS CENTERS)
- ◊ LOGISTIC SUPPORT ACTIVITY

▲ **ATSUGI, JAPAN**
FLEET READINESS CENTER



Acquisition Management Support

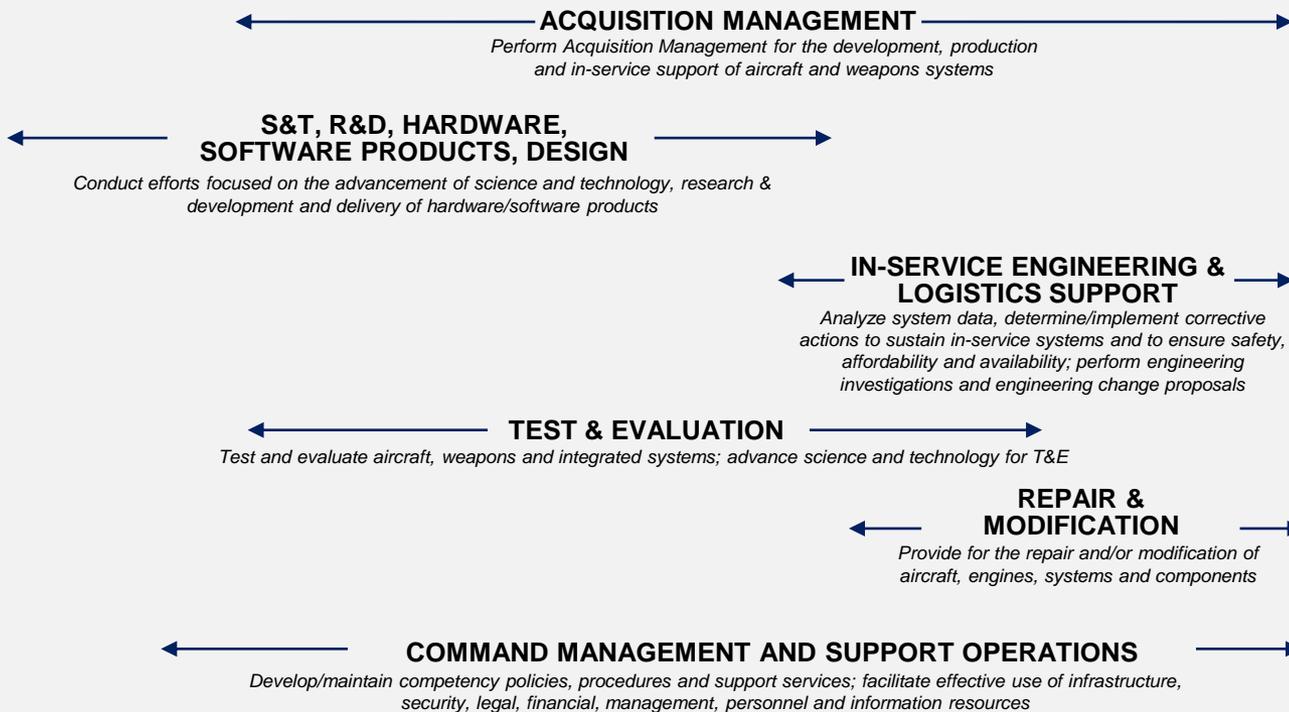
FULL LIFE-CYCLE MANAGEMENT

FUTURE CAPABILITIES

CURRENT READINESS



CORE FUNCTIONS/PROCESSES



PRODUCTS



Tactical Aircraft



Air ASW, Assault and Special Mission



Unmanned Aircraft and Strike Weapons



Common Systems/Mission Systems/ Training/ALRE



NAVAIR Business Fiscal Year 2012



TACTICAL AIRCRAFT



AIR ASW, ASSAULT & SPECIAL MISSION



TEST & EVALUATION RANGES

Overview

~\$37.4 billion/year

~35,000 People (Civ/Mil/Ktr)

~8 Primary Sites

~90 ACAT Programs

~200 New Aircraft Deliveries

~550 Aircraft Repairs

~3,900 Aircraft Supported

~100 Type/Model/Series



UNMANNED AIRCRAFT & STRIKE WEAPONS



COMMON SYSTEMS/MISSION SYSTEMS/TRAINING/ALRE



FLEET READINESS CENTER INDUSTRIAL FACILITIES



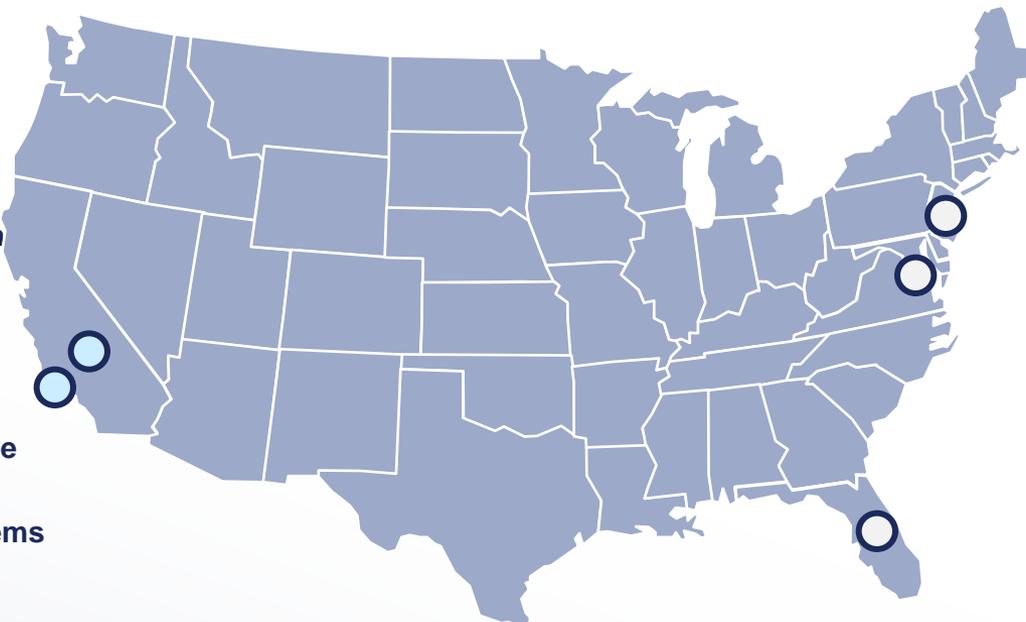
Naval Air Warfare Centers

Weapons Division

○ WEST COAST

China Lake/Pt. Mugu

- Land and Sea Ranges
- Live Fire Testing
- Missiles/Freefall Weapon
- Energetics
- Air-to-Air Weapons
- Air-to-Ground Weapons
- Anti Radiation Missiles
- Weapon System Software Support Activities
- Electronic Warfare Systems
- Systems of Systems Integration



Aircraft Division

○ EAST COAST

Lakehurst/Patuxent River/Orlando

- Land and Sea Ranges
- Air Vehicles
- Propulsion & Power
- Avionics & Sensors
- Crew Systems
- Aircraft Launch & Recovery Equipment/ Support Equipment
- Ship Interface & Support Systems
- Human Performance/ Simulator Systems
- Training Systems

- Navy's principal activities for research, development, acquisition, test and evaluation (RDAT&E), engineering and fleet support for naval aviation platforms, weapons and systems
- Fifth-generation weapon systems integration and ship/shore/air integration
- Integrated national ranges and labs (unique and unavailable in private sector)
- Technical authority and acquisition decision support



Fleet Readiness Centers Depots/Industrial Sites

Southwest – North Island

Aircraft

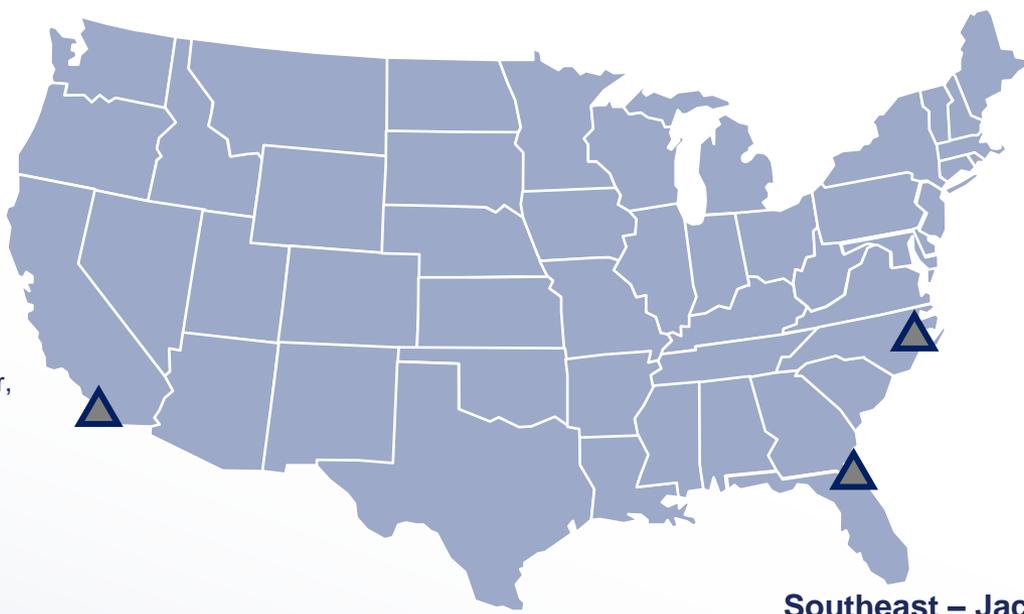
AV-8B, C-2, E-2, F/A-18, H-1, H-60, H-53, V-22, H-46, P-3

Engines

LM2500, T700, T56

Components

Instruments, Canopies, E-2 Radar, Composites, Components for above T/M/S



East – Cherry Point

Aircraft Repair

AV-8B, EA-6B, H-1, H-46, H-53, V-22

Engine Repair

F402, T56, T58, T64, T400

Component Repair

Dynamic Components, Rotor Blades, Props, Blades/Vanes, APU/GTC, E-2 and P-3 Props

Southeast – Jacksonville

Aircraft

EA-6B, F/A-18, H-60, P-3

Engines

F414, J52, T56, T700

Components

Electro-Optics, Air Refueling Stores, Racks/Launchers, Components for above T/M/S

▲ West Pacific – Atsugi, Japan

Aircraft Repair

C-130, EA-18G, E-2, F/A-18, H-1, H-53, H-60, P-3

Integrated maintenance, repair and overhaul of naval aircraft, systems and components



Fleet Readiness Centers

- FRC mission is to create high velocity repair loops by inserting depot level capability into intermediate level repair sites
 - Sites typically located near operational organizations and closer to the flight line
 - Proximity minimizes lengthy delays and transportation costs, and returns component to the flight line and warfighter quicker and at far less expense



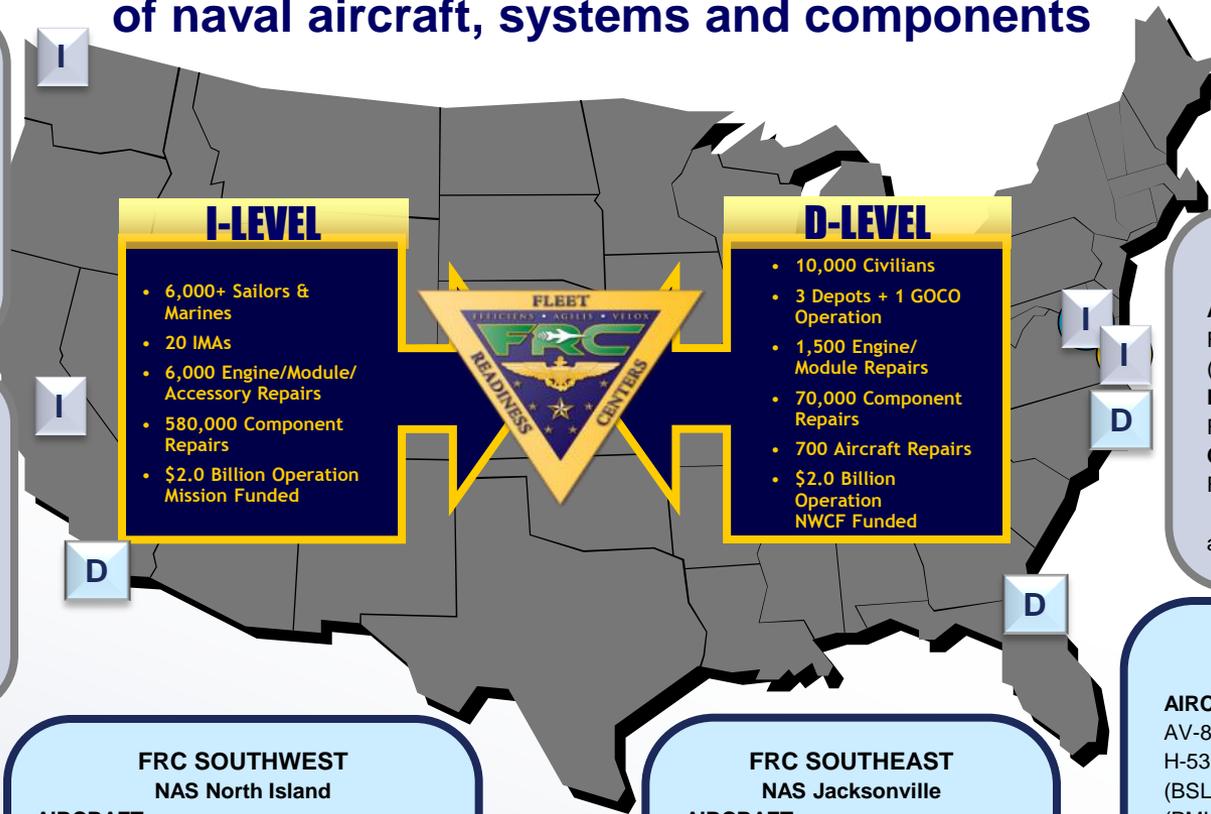
- To date, the FRCs have avoided more than \$940 million
 - About \$120 million more than the to-date-targeted projection
 - On course to meet the \$1.2 billion goal established under BRAC 2005



Fleet Readiness Centers

D NAVAIR Depot/Industrial
I Intermediate-Level Repair

Integrated maintenance, repair and overhaul of naval aircraft, systems and components



FRC NORTHWEST
NAS Whidbey Island
AIRCRAFT
 E/A-6B, E/A-18G, P-3
ENGINES
 T56, J52
COMPONENTS
 ALQ-99, E/A-6, canopies, components for above T/M/S

FRC WEST
NAS Lemoore
AIRCRAFT
 F/A-18 (PMI 2, AEPD), E/A-18G
ENGINES
 F414, T56
COMPONENTS
 F/A-18 RADAR, composites, components for above T/M/S

FRC SOUTHWEST
NAS North Island
AIRCRAFT
 F/A-18, E-2, C-2, H-1, H-60, AV-8 (PMI 2,3), H-53 (PMID), (PMI 1N, 2N, PMI 2 Mods, P&E), P-3
ENGINES
 LM2500, T700, T56
COMPONENTS
 Instruments, E-2 radar, composites, components for above T/M/S

FRC WEST PAC
NAF Atsugi, JA (Formerly NAPRA)
AIRCRAFT
 H-53, C-130, E/A-6B, F/A-18, H-46, H-60, H-1 P-3, E-2, E/A-18G

FRC SOUTHEAST
NAS Jacksonville
AIRCRAFT
 E/A-6B (PMI 1, 2, 3, 4), P-3 (PH 1, 2, 3, SSI), F/A-18 (PMI 1, 2, 1M, 2M), H-60 (PMI 1N, 2N)
ENGINES
 T56, J52, TF34, F414, T700
COMPONENTS
 Electro-Optics, air refueling stores, racks/launchers, components for above T/M/S

FRC SEFAC
NRC Solomons
 Repair, modification and overhaul of common and peculiar Support Equipment and Test Cells

FRC MID-ATLANTIC
NAS Oceana
AIRCRAFT
 F/A-18 (PMI 1, 2), E-2 (PMI 1, 2), C-2 (PMI 1, 2), H-60
ENGINES
 F404, T56, T700, T64, T400
COMPONENTS
 F/A-18 and E-2 radar composites, components for above T/M/S

FRC EAST
MCAS Cherry Point
AIRCRAFT
 AV-8B (PMI 1, 2, 3, 4, SWRK), H-53 (AWI, SDML, PMID), H-1 (BSL, 1N, 2N, SDLM), EA-6B (PMI 2, 3, 4), H-46 (DLM for DOS)
ENGINES
 T58, F402, T64, T400, T56
COMPONENTS
 Dynamic components, rotor blades, props, blades/vanes, APU/GTC, components for above T/M/S and E-2 and P-3 props

I-LEVEL

- 6,000+ Sailors & Marines
- 20 IMAs
- 6,000 Engine/Module/Accessory Repairs
- 580,000 Component Repairs
- \$2.0 Billion Operation Mission Funded

D-LEVEL

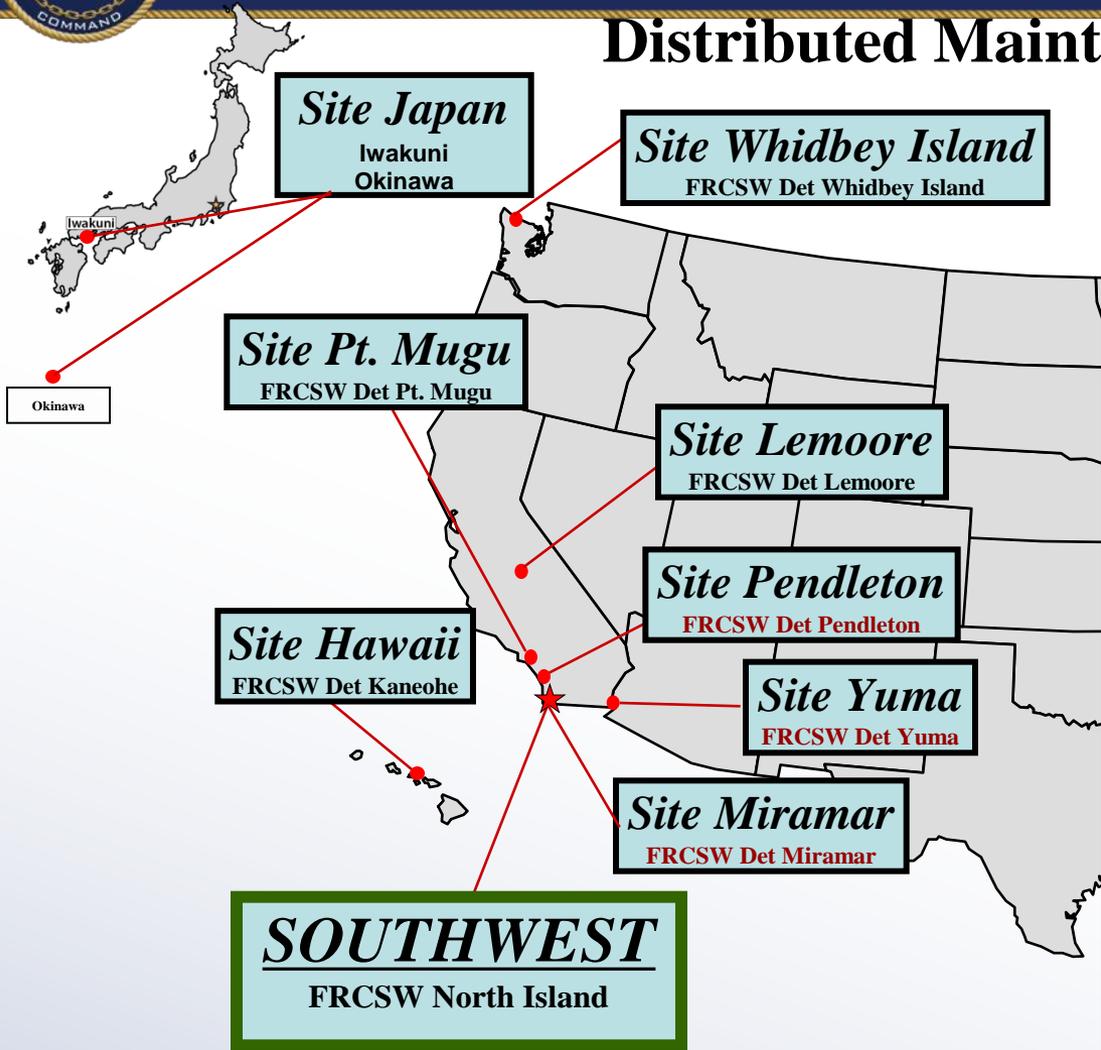
- 10,000 Civilians
- 3 Depots + 1 GOCO Operation
- 1,500 Engine/Module Repairs
- 70,000 Component Repairs
- 700 Aircraft Repairs
- \$2.0 Billion Operation NWCF Funded





FRCSW Support Architecture

Distributed Maintenance



Red = Marine Corps MAG/MALS relationships

PRODUCTS

- | <u>AIRCRAFT</u> | <u>ENGINES</u> | <u>SERVICES</u> |
|----------------------|----------------|-------------------|
| • F/A-18 | • LM2500 | • Maritime |
| • E-2C | • T700 | • Paint |
| • C-2A | • T56 | |
| • AV-8B | | |
| • EA-6B | | |
| • P-3 (ISR) | | |
| • V-22 (ISR) (Depot) | | |
| • H-60 | | |
| • H-53 | | (Future Workload) |
| • H-46 | | |
| • UH-1Y/AH-1W/Z | | |
| • F-35 (JSF) | | |
| • UAV | | |

COMPONENT REPAIR

- AVIONICS & INSTRUMENTS
- RADAR
- CSD / ROTATING ELEC
- COMPOSITE REPAIR
- CALIBRATION
- HYDRAULICS

MANUFACTURING

- WET PROCESSING
- FORMING / DROP HAMMER
- MULTI-AXIS MACHINING
- COMPOSITE FABRICATION



F/A-18
Hornets /
Super Hornets

E-2C Hawkeyes &
C-2A Greyhounds

Ground Support
Equipment
(GSE)

Training &
Field Service
Teams

Components
&
Manufacturing

Aircraft Catapults &
Arresting Gear

Intermediate
Maintenance (AIMD)

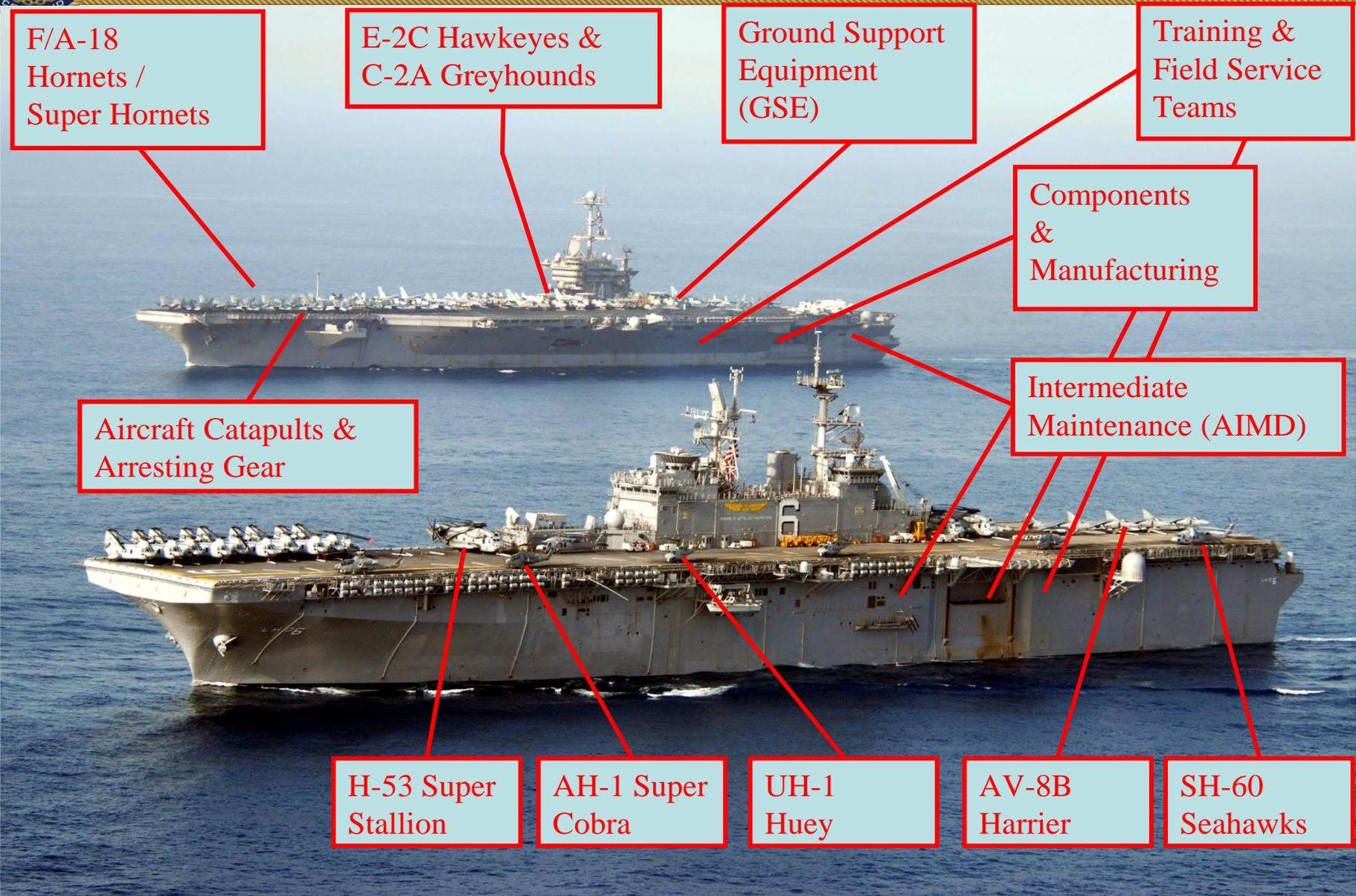
H-53 Super
Stallion

AH-1 Super
Cobra

UH-1
Huey

AV-8B
Harrier

SH-60
Seahawks





Team FRCSW

A Diverse Workforce of 4,121 Personnel

- **2,675 Civil Service Employees**
- **446 Contractors**
- **1,000 Military**
- **5 Labor Unions**



Public-Private Partnerships



***AV-8B Harrier
HISS***



EA-6B CSD



***F/A-18
TEF & Stab Actuators***



H-60 "Tip-to-Tail"



***Cockpit Displays
& E/F HUD***

Performance Based Logistics Workload for Components = 18%



FRCSW: Designated a Federal Laboratory

[15 USC, § 3703 (4)]

Cooperative Research and Development Agreement (CRADA)

Allows for collaborative research or development efforts which are consistent with the missions of the laboratory. [15 USC 3710a(d)(1)]

- Laser Scanning
- Additive Manufacturing “3D Printing”
- Job Performance Aides
- Electro Discharge Machining Drill
- Atmospheric Plasma for Bonding
- Composite Heat Damage Assessment
- Cold Spray Dimensional Restoration

Why Collaborate with FRCSW Federal Lab?

- Gain access to FRCSW expertise, intellectual property and unique facilities
- Perform mutually beneficial R&D
- Government laboratory with unique resources could successfully develop commercial product
- DoN may grant a patent to the CRADA collaborator



FRCSW Materials Laboratory NDI Team

Primary Technical Specialties & Unique Equipment and Capabilities

- Magnetic Particle, Fluorescent Liquid Penetrant, Eddy Current, Ultrasonic, and Radiographic Testing
- Ultrasonic
 - Olympus OmniScan Phased Array Ultrasound Equipment
 - Matec Immersion and Gantry C-Scan Systems
 - NDTs® MAUS® Automated C-Scan Inspection Equipment
- Radiography
 - VMI and Fuji Computed Radiography Systems
 - NorthStar Imaging Real Time X-Ray System
 - Boeing/NUCSAFE Backscatter X-Ray System
 - Proto Manufacturing X-Ray Diffraction System
- Thermal Wave Imaging, X, and Inframetrics Pulsed Thermal Imaging Systems
- Grinding Burns – AST Barkhausen Noise Equipment
- Residual Stress Measurement
- Welder Certifications (CWI)



FRCSW NDI Essential Products & Services

- In-Service Engineering (ISE)
 - Fleet and Depot Non-Destructive Inspection Techniques (NDIT)
 - Depot NDI Certification & Qualification Program
 - Engineering Investigations (EI)
 - Technical Directives (Changes & Bulletins)
 - Field Team / In-Service Repair (ISR) Support
 - Request for Engineering Information – Temporary Engineering Instructions (REI-TEI)
 - Local Engineering Directives (LPS/LES)
 - Capability Establishment Support
 - Restrictive Ferry/One-Time Flight Authorizations
- Acquisition & Certification Engineering (ACE)
 - Service Bulletins & Placard Advisories
 - Non-Destructive Inspection Techniques (NDIT)
- Research & Development
 - Small Business Innovation Research (SBIR)
 - Non-Program Related Engineering (NPRE)
 - Office of Naval Research (ONR)



Driving Requirements

- **Heat damaged composites**
- **Recurring fatigue inspections**
- **High maintenance costs (e.g., corrosion)**
- **High A/C usage rates**
- **Budget constraints**
- **Tighter NDI requirements (moving toward damage tolerance design approach)**



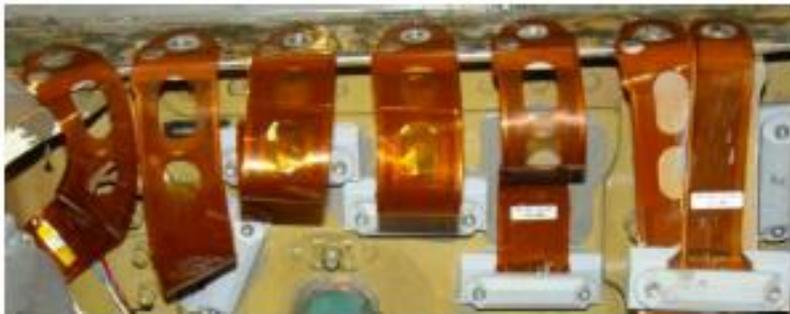
NDI Applied Research

- **Structural Health Monitoring**
 - Predictive models
 - Crack detection
 - JENTEK MWM sensors
 - Fiber optic Bragg gratings (Redondo Optics, Los Gatos Research, University of Nebraska, Northwestern University, Intelligent Fiber Optic System)
 - Acoustic emission
 - Lamb wave
 - Corrosion
 - Luna Innovations Corrosion Environment Sensing Suite
- **Additive Manufacturing**
 - Computed tomography
 - Rapid prototyping / qualification / tooling
 - Custom parts
- **Inspection of ceramic matrix composites for propulsion applications**
- **Low-cost remote viewing capability for ET and UT (second-layer defects)**



Structural Health Monitoring

Problem: Need to reduce aircraft maintenance cost and downtime by avoiding unnecessary inspection and maintenance through structural health monitoring technologies



JENTEK Sensors' meandering winding magnetometer (MWM) provide capabilities to monitor for cracks and corrosion in specific hard to access locations



- 23 MWM-Array sensors installed
- Now in flight testing
- U.S. Navy personnel trained to take data with JENTEK GridStation

