CTO SBIR 24.1:Advanced Robotic Automation for Fleet Readiness Center Industrial Processes

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NAVAIR's Role in Naval Aviation

DEVELOP, acquire and support aircraft, weapons and related systems which can be operated and sustained at sea

PROVIDE analysis and decision support for cost / schedule / performance trades and investment decisions

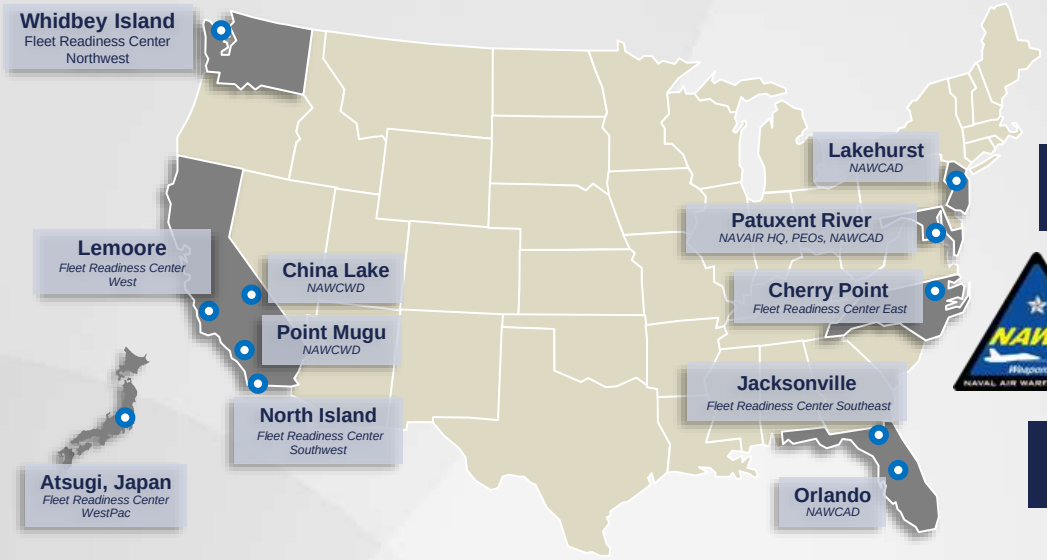
INCREASE Navy and Marine Corps capability, readiness and affordability in a joint / coalition environment

Deliver integrated air warfare capabilities to enable the fleet to compete, deter and win – tonight, tomorrow and in the future.

NAVAIR Snapshot

Full Life-Cycle Management

Requests, Risks from Fleet, OPNAV	Materiel Solution Analysis	Technology Maturation & Risk Reduction	Engineering & Manufacturing Development	Production & Deployment	Operations & Support



NAWCAD
East Coast Hub

NAWCWD
West Coast Hub

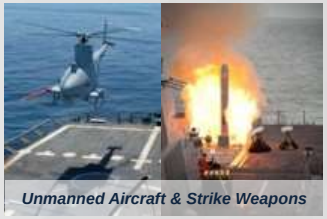
COMFRC
Fleet Readiness Centers

43,500	29,700	1,600	12,200
FY23 Workforce	Civilians	Military	Contractors

Products


Tactical Aircraft

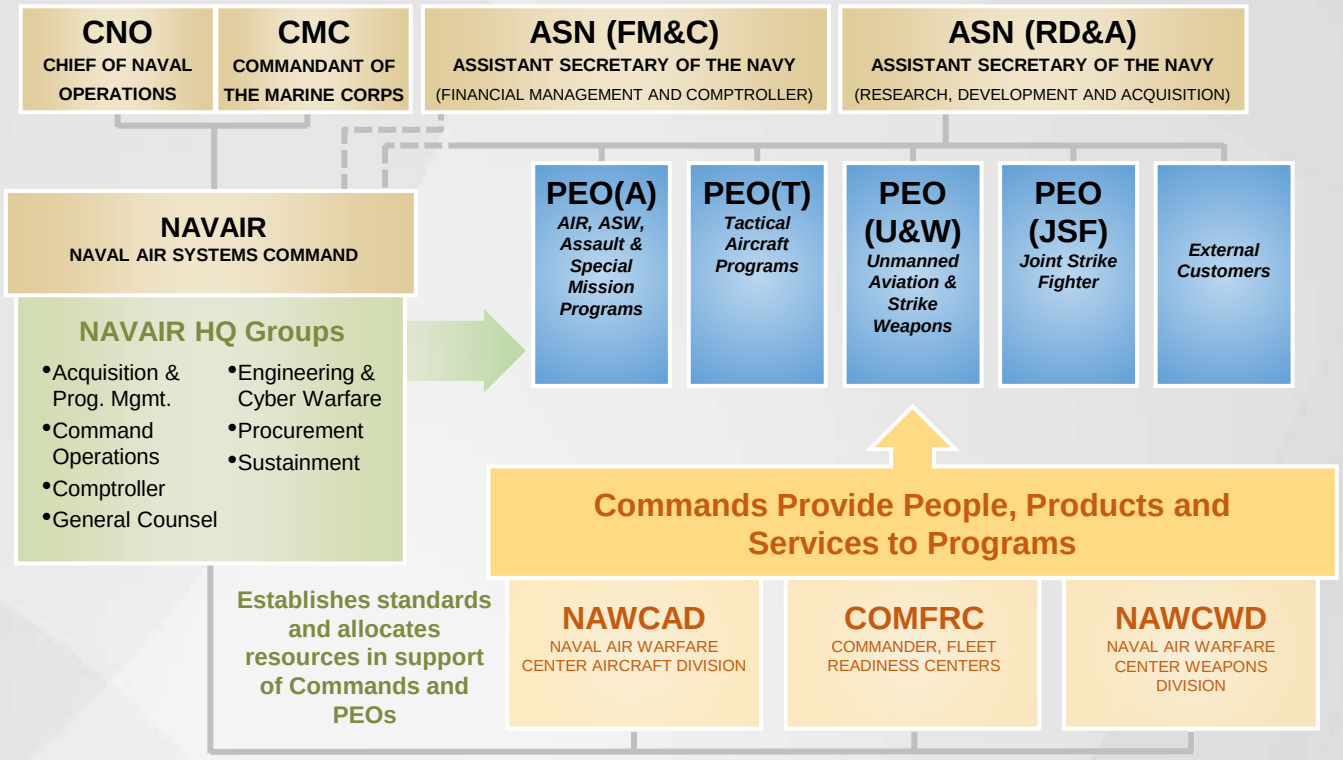

Air ASW, Assault & Special Mission


Unmanned Aircraft & Strike Weapons


Common Systems, Mission Systems, Training, ALRE

PEOs

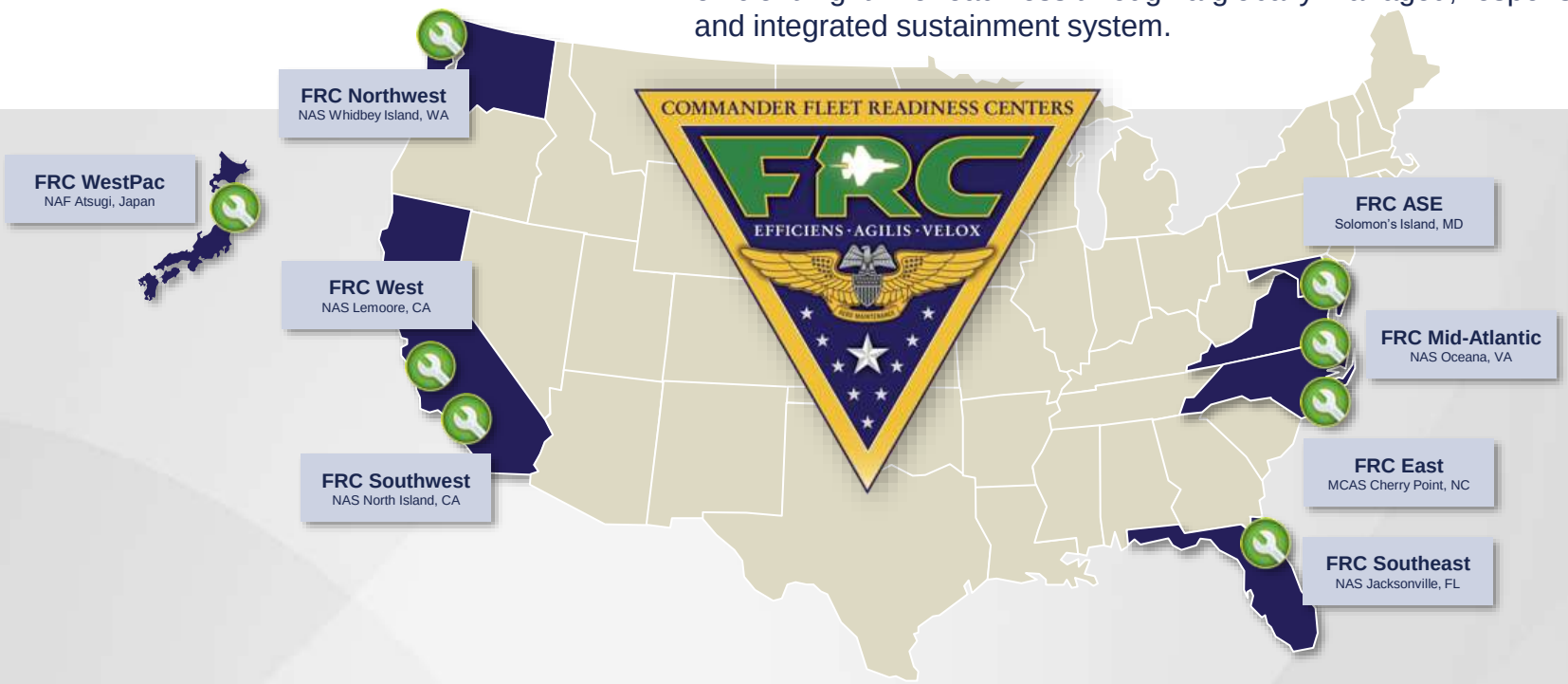
Operating Construct



COMFRC

Mission

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



Topic Objective

The Naval Air Systems Command (NAVAIR) is seeking proposals from small businesses to advance the automation of industrial processes within Fleet Readiness Centers (FRCs). The aim is to enhance efficiency, quality, safety, pollution prevention, and productivity through the integration of advanced robotic technologies.

Description:

Fleet Readiness Centers (FRCs) play a critical role in sustaining naval aviation readiness. These centers are responsible for the maintenance, repair, and overhaul of naval aircraft and components. Automation has the potential to streamline these processes, remove workers from hazardous environments, provide new capabilities to overhaul sensitive substrates, improve productivity, reduce turnaround times, and enhance overall readiness. NAVAIR is committed to fostering innovation and enhancing the efficiency of Fleet Readiness Centers through advanced robotic automation, machine learning, computer vision and artificial intelligence.

SBIR 24.1 CTO Office: NAVAIR Open Topic for Advanced Robotic Automation for Fleet Readiness Center Industrial Processes

Advanced Robotic Systems Integration for Aircraft Maintenance and Repair: Team 1

- This area encompasses the integration of robotic or automated systems for various aircraft maintenance and repair tasks, including disassembly, non-destructive inspection, repair, composite fabrication, metal forming, grinding welding, reassembly, coating removal, surface preparation, and coating application (e.g. organic or inorganic). It involves the development and implementation of robotic solutions that are cost-effective, scalable, upgradeable and suitable for deployment across diverse Fleet Readiness Center (FRC) environments. Additionally, it may involve the integration of artificial intelligence, computer vision, or machine learning for autonomous decision-making to enhance efficiency and productivity.

Human-Robot Collaboration and Safety in Aviation MRO: Team 2

- This area focuses on ensuring worker well-being and productivity through effective human-robot collaboration and safety mechanisms in industrial processes. This includes the development of collaborative robots (cobots) to optimize workflow efficiency. Dexterity, versatility, payload capacity, and ease of use by the operator are critical design factors for implementation and safety systems to mitigate risks. It encompasses the development and implementation of ergonomic design considerations, as well as safety features and protocols to facilitate safe interaction between humans and robots for aircraft maintenance and repair operations.

Emerging Technologies for Autonomous Aviation Maintenance: Team 3

- This area explores the integration of emerging technologies, such as machine learning, artificial intelligence, and computer vision, for autonomous decision-making in aviation maintenance processes. It involves leveraging Artificial Intelligence (AI) and Machine Learning (ML) algorithms to analyze data, optimize maintenance schedules, optimize maintenance, predict equipment failures, and end of life, and automate decision-making processes. This includes but is not limited to the development of intelligent systems capable of autonomously assessing maintenance needs, prioritizing tasks, and optimizing resource allocation to improve overall maintenance efficiency and effectiveness.

Schedule

- June 13 pre-release
- June 13-July 11th – Q&A period
- June 13- July 20th – Form Review Teams
- June 26 – Open Topic Ask Me Anything
- August 1st – Training Sessions for Reviewers announced
- September 4 SBIR Closes
- Sept-Oct Review
- November probable selection then awards
- CY 2025 Q1 Start
- 2026 Phase I Options award
- 2026 Start Phase II
- 2028 End Phase II
- Transition systems CY2029-2032
- ~4 ~8 Phase I awards anticipated

Phase I Approach

- The DON is planning to issue multiple Phase I awards for this topic but reserves the right to issue no awards. Each Phase I proposal must include a Base and Option period of performance. The Phase I Base must have a period of performance of four (4) months at a cost not to exceed $75,000. The Phase I Option must have a period of performance of six (6) months at a cost not to exceed $100,000.
- Phase I feasibility will describe the existing proposed technology, existing FRC industrial processes to improve, modifications required, anticipated improvements to existing capabilities, impacts to current logistics if any (i.e., transportation, storage, maintenance, safety, etc.) and transition approach to the FRC. Proposed solutions should address key challenges in aircraft maintenance, repair, component fabrication, inspection, and related activities. Features such as the ability to generate a digital twin, capture of process data, monitor machine health and remote operation are also desired. Results of Phase I will be detailed in a final technical report (Final Report).
- Phase I deliverables include:
  - Kick-Off Briefing, due 15 days from start of Base award
  - Final Report, due 120 days from start of Base award
  - Initial Phase II Proposal, due 120 days from start of Base award

Phase II Approach

- All Phase I awardees may submit an Initial Phase II proposal for evaluation and selection. The evaluation criteria for Phase II is the same as Phase I (as stated in this BAA). The Phase I Final Report and Initial Phase II Proposal will be used to evaluate the small business concern's potential to adapt commercial products to fill a capability gap, improve performance, or modernize an existing capability for DON and transition the technology to Phase III. Details on the due date, content, and submission requirements of the Initial Phase II Proposal will be provided by the awarding SYSCOM either in the Phase I contract or by subsequent notification.

- The scope of the Phase II effort will be specific to each project but is generally expected to harden, ruggedize, and/or marinize the technology for integration into an operational environment. **The outcome to be a working prototype that can be tested and/or certified, including a fielding approach** (including updated logistics and safety consideration) and further commercialization (non-DoD), if appropriate. They should also provide innovative simple methods to program to the level appropriate for a person with average technical skills (rephrase to discuss simplified user interface).

Phase III Approach

Deploy advanced robotic automation solutions tailored to FRC industrial processes and provide logistics support.

Benefits:

The technology deployed should have a significant and measurable impact on Affordability, by reductions in the areas of;

- Acquisition Costs
- Maintenance Costs
- Manning, Labor Cost
- Cycle Times

And an increase to the overall Operation tempo and Productivity

Candidate Processes for Automation

- Painting
  - Masking
  - Stenciling
- Coatings Removal & Surface Preparation
  - Sanding
  - Grit Blasting for Bonding Prep
  - Media Blasting
  - Glass Media Blasting
  - Aluminum Oxide Media Blasting
  - Laser Paint removal
  - Shot Peening
  - Chemical Depaint
  - High Pressure Waterjet Blasting/HVOF Stripping
- Inspection
  - Microwave Mapping
  - Borescope
  - FPI Blade Processing
  - Mobile Structured Light Scanning
  - Mobile Microwave Mapping
  - Mobile X-Ray
  - Ultrasonic
- Thermal Spray
  - HVOF Thermal Spray
  - Low Pressure Cold Spray
  - High Pressure Cold Spray
  - Plasma Spray
- Other Applications
  - Low Plasticity Burnishing
  - Low Plasticity Burnishing
  - Belt Grinding
  - Chrome Shaft Grinding
  - Mobile Wing Defastening
  - Mobile Core Milling
  - Brush Plating
  - Mobile Single Robot Incremental Metal Forming
  - Welding
  - Sealant Application
- Composites
  - Composite Repair
  - Composite Layup

Ranking/Prioritization

- **Rubric**
- **Category Management**