N244-P01: NAVAIR Open Topic for Advanced Robotic Automation for Fleet Readiness Center Industrial Processes

ADDITIONAL INFORMATION

N/A

TECHNOLOGY AREAS:

None

MODERNIZATION PRIORITIES:

Human-Machine Interfaces | Trusted AI and Autonomy

KEYWORDS:

Robotics; Automation; Artificial Intelligence; Manufacturing; Production; Inspection

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 (ML), computer vision, and artificial intelligence (AI). The automation of industrial processes at Naval Fleet Readiness Centers that overhaul both fixed wing and rotary wing aircraft is imperative to become more competitive and efficient. Automation will also aid to alleviate workers of repetitive or mundane tasks and can provide higher quality and precision only achieved with automation. Technology areas of interest are below. Proposals should focus on or incorporate one or more of the following areas technology areas of interest. Please indicate the technology area of interest within the Abstract section of the Cover Sheet, Volume 1.

1. Advanced Robotic Systems Integration for Aircraft Maintenance and Repair: 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, and suitable for deployment across diverse FRC environments. Additionally, it may involve the integration of AI, computer vision, or ML for autonomous decision-making to enhance efficiency and productivity.
2. Human-Robot Collaboration and Safety in Aviation MRO: 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.
3. Emerging Technologies for Autonomous Aviation Maintenance: 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 AI and 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.

PHASE I:

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
- Quad Chart, due 120 days from start of Base award
- Initial Phase II Proposal, due 120 days from start of Base award

PHASE II:

All Phase I awardees may submit an Initial Phase II proposal for evaluation and selection. The evaluation criteria for Phase II are 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 a simple innovative user interface to be used by a person with average technical skills.

PHASE III DUAL USE APPLICATIONS:

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

REFERENCES:

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4. Caruso, Francesco, et al. "Robotic automation and industry 4.0: a systematic literature review on adoption, drivers, impacts and future perspectives." International Journal of Production Research 58.7 (2020): 2172-2199.
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7. Rosati, Gianluca, et al. "An advanced robotic solution for manufacturing in industry 4.0." Procedia CIRP 81 (2019): 729-734.
8. Rajaram, Rajesh, et al. "Advanced robotic automation in manufacturing industry: current trends and future challenges." Journal of Manufacturing Processes 67 (2021): 454-469.
9. De Carvalho, Miguel, et al. "Advanced robotics for industrial manufacturing: A review." Robotics and Computer-Integrated Manufacturing 69 (2021): 102098.

TOPIC POINT OF CONTACT (TPOC):

None