

Department of the Navy SBIR/STTR Transition Program

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Topic # N153-132

High Energy High Flux X-ray Detector
VJ Technologies Inc.

WHO

SYSCOM: SSP

Sponsoring Program: US Navy Strategic Systems Programs

Transition Target: Trident II D5 Fleet Ballistic Missile (FBM) Program

TPOC:

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Other transition opportunities:

Possible customers include Army, Navy, Air Force, NASA, large solid rocket motor industry suppliers, Department of Homeland Security, and other countries that use K15 Linatron x-ray sources to inspect rockets for their space program.

Notes: Image depicts Trident II Missile, part or all of which is inspected by HECT using the existing Linear Diode Array (LDA) detectors.



Photo courtesy of NAVSEA - <https://www.navsea.navy.mil/Home/Teams/Ships/Media-Gallery/Photo-Gallery-Copy/igphoto/2001553085/>

WHAT

Operational Need and Improvement: The current HECT system, used to inspect the D5 Trident II rocket motors, is an old design using outdated technology. As such, it has become expensive to maintain and support. The intention of this effort is to develop a new x-ray detector that is improved for performance (based on bit depth and resolution) and supportability (based on ability to procure and maintain hardware), using modern electronics, components, and interfaces. This is a difficult problem as the radiation environment is both high energy and high flux. Radiation hardening impacts detector performance. This program will develop a new detector with modern components and materials that has equal or improved performance and is more supportable for the inspection of these rocket motors.

Specifications Required: One of the (non-Navy owned) HECT systems currently in use was updated in the early 1990s and resulted in large improvements in system performance and supportability. This demonstrates that system performance can be greatly improved in all aspects. However, the materials, technology, and design from that upgrade have been made obsolete by improvements in detector technology and electronics, which made huge leaps in capability in the 2000s. A research and development (R&D) effort is necessary to ensure that new detector technology can be modified and/or redesigned to be able to operate in our specific environment (specifically, radiation hardening).

Technology Developed: Commercially-available, off-the-shelf (CA-OTS) detector elements have been identified to replace their specialized counterparts used in multiple HECT labs using LDAs to inspect defense products. There are existing cargo and fielded border inspection markets that demand high volumes of the detector elements, assuring their availability and innovation for an indefinite amount of time. Preliminary R&D and testing has been performed on the elements to confirm their eligibility to be integrated into an existing LDA with no loss of - and potentially improved - inspection performance.

Warfighter Value: Having CA-OTS detector elements will significantly reduce replacement and inventory costs. Moreover, it will assure LDAs can continue to be maintained, thereby extending the service life of them and reducing LDA replacement costs. Lastly, the high market demand for CA-OTS detector elements will ensure continuous improvement upon them, allowing the end user to reap the benefits of cutting-edge technology, performance, and cost-savings.

WHEN

Contract Number: N00030-19-C-0239 **Ending on:** August 15, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Benchmark Current Technology and Compare Against New Technology	N/A	Acquisition of Measured Output Parameters by Current and New LDA	4	June 2019
Procure, Integrate, and Test New Components at 9 MeV	Low	Verification of Repeatability of Results Obtained in Phase I	4	January 2021
Acquire 15 MeV Data on New Components	Med	Acquisition of Measured Output Parameters by New Detector and Verification of Similar Performance as that of Current LDA	4	March 2021
Decide Target Detector Configuration and Construct Selected Prototype Detector	Low	Making an Educated, Logical, Data-Driven Decision on Final System Configuration	4	June 2021
Validate Selected Detector with 9 and 15 MeV CT Scanning	Med	Meeting all Site Acceptance Criteria Met by Current LDA	4	August 2021

HOW

Projected Business Model: Founded in 1987, VJ Technologies is a leading global provider of digital X-ray inspection solutions. We apply our radioscopic digital imaging expertise to government agencies and nondestructive testing (NDT) markets throughout the world. Our business model is to identify, test, debug, integrate, and validate another manufacturer's technology so that HECT labs with LDA detectors can easily transition themselves to newer, better technology. We will fabricate a full-scale High Energy High Flux X-ray Detector Array and transition to Navy for use in inspecting D5 Trident II rocket motors in the High-Energy Computed Tomography (HECT) inspection system in China Lake.

Company Objectives: Our short term objective is to successfully complete the Phase II portion of our project to realize the benefits revealed in Phase I. Our long term objective is to transition all HECT labs using LDA detectors to new technology, and to demonstrate our expertise in Digital Radiography Systems and Services for various Program Offices. We seek to meet with Primes and Program Offices that would benefit from an upgraded inspection system to analyze their weapon systems such as those associated with the Trident II D5 Fleet Ballistic Missile (FBM) Program.

Potential Commercial Applications: This technology would be applicable to any HECT lab using LDA detectors, particularly those with X-ray source energies of 9-15 MeV. The range of applications spans from inspection of rocket motors and components to high-density aerospace parts, weapons assemblies, munitions, and large infrastructure parts/assemblies. Engage in broader commercialization efforts to field this x-ray detector suitable for use in high energy environments.

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