

Topic: N142-084

Nokomis, Inc.

Detection of Permethrin in Military Uniforms via Microwave NDE

Permethrin content in the United States Marine Corps Combat Utility Uniform (MCCUU) decreases during active field duty, potentially exposing Marines to disease-carrying insects. Chemical based tests are currently impossible to perform in-situ under field condition and are time- and labor-intensive. Nokomis, Inc. has developed an innovative technology to reliably detect permethrin concentration in the MCCUU using a handheld device. This technology uses low power microwave energy for rapid and accurate measurements of MCCUU effectiveness. Nokomis has specialized in ultra-sensitive sensors for over a decade, and is leveraging this unique expertise to maximize the maturity, flexibility, and ruggedness of the developed technology. Transition of this technology will directly mitigate risks of disease exposure to the Warfighter, increasing military readiness and effectiveness while significantly reducing sustainment costs.

Technology Category Alignment:

Advanced Electronics

Test, Evaluation, Validation, and Verification

Military Infectious Diseases

Radio Frequency (RF) (non-EW)

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SYSCOM: MARCOR

Contract: M67854-16-C-6501

Department of the Navy SBIR/STTR Transition Program

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Nokomis, Inc.

WHO

SYSCOM: MARCOR

Sponsoring Program: PM Infantry Combat Equipment

Transition Target: Marine Corps Combat Utility Uniform (MCCUU)

TPOC:

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Other transition opportunities: Testing of non-factory treated uniforms by the Navy and other service branches (Army, Air Force)

Testing for additional chemicals or uniform treatments, such as Flame Resistant Operational Gear (FROG)

World Health Organization (WHO) / Non-Governmental Organizations (NGOs) who work in regions with disease-carrying insects

Notes:

AFPMB: Amed Forces Pest Management Board
FST: Forum for SBIR/STTR Transition



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WHAT

Operational Need and Improvement: The MCCUU is required to provide protection against disease carrying insects, which is currently accomplished using a permethrin treatment. Current methodology to verify permethrin concentration is destructive and cannot be performed under field conditions, which increases the risk of exposure to disease carrying insects.

Specifications Required: While no formal requirements have been issued, the permethrin detection technology is expected to achieve the following:

- Sensitivity to the permethrin concentrations in the range known to be effective for insect protection
- Man-portable device
- Operable under field conditions without significant need for reagents or calibration
- Operable by a technician with minimal training
- Results achieved in real-time without need for offline data processing

Technology Developed: Nokomis has developed a handheld device for the detection of permethrin in military uniforms. The device uses low power microwave energy for ultra-sensitive detection of permethrin in the MCCUU. Test results have shown sensitivity levels that are 1000 times higher than minimum technology requirements. Since the system uses microwave energy, there is no need for chemical reagents or other consumables. All signal processing is fully automated within the handheld device, enabling operations by a technician with minimal training. The technology enables rapid and reliable verification of uniform effectiveness by calculating the permethrin concentration within the tested MCCUU. A green/red indicator provides an easy means of conveying current uniform status.

Warfighter Value: The developed technology will enable the Warfighter to verify uniform effectiveness, ensuring that no loss of combat ability occurs due to disease carrying insects. Technology transition will enhance mission assurance, especially in battlefields prone to insects carrying malaria and other debilitating illnesses. The technology will identify those MCCUUs where the permethrin is at an unacceptable level for defeating disease carrying insects. The technology platform is flexible, enabling extension to additional chemicals as requirements evolve.

WHEN

Contract Number: M67854-16-C-6501 Ending on: February 22, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Device design completed	Low	Successful design review	5	2nd QTR FY18
Measurement automation completed	Med	Successful testing on known materials	5	1st QTR FY18
Prototype system manufactured	Low	Prototype system operational	6	4th QTR FY18
Field testing completed in representative environment	Med	Test results in outdoor environment	7	1st QTR FY19
AFPMB testing completed	Low	Verification by AFPMB	8	2nd QTR FY20

HOW

Projected Business Model: Multiple revenue streams are anticipated from the transition of the technology under development. Nokomis will manufacture and sell the handheld permethrin detection device to the Government and applicable entities within the Department of Defense supply chain. Uniform treaters are currently required to test all garment lots. Nokomis would further pursue direct sales with field units such that issuing facilities and/or Warfighters within fielded battalions have a unit for field testing.

Nokomis will additionally support fielded units through training, maintenance, and sustainment activities as a secondary revenue stream. In parallel, Nokomis will continue to seek R&D / S&T funding for continued technology performance enhancement and expansion of capabilities.

Company Objectives: Nokomis' objective is to transition the developed technology and to identify additional transition opportunities. Identification of decision makers and stakeholders in the Navy, other DOD service branches, and in industry will be a primary focus of activities at the FST. In addition, Nokomis will seek to identify other requirements that could be met by technology enhancement or application-specific engineering of the developed technology. Such enhancement could be additional SWaP reduction, extension to other chemical species of interest, or other handheld detection applications.

Potential Commercial Applications: Permethrin treated clothing is used by outdoorsman, law enforcement, firefighters, and other officials operating in regions with disease carrying insects. Nokomis will market the developed capability to these commercial entities as well as aid groups performing humanitarian work in regions of the world that contain malaria and other debilitating illnesses.

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