

Topic: N131-012

TRITON SYSTEMS, INC.

Universal In-Ear Warfighter Monitoring System (1002-062)

The wireless sensing system developed allows for sensing in and around the body (e.g. hypoxia monitoring, physiological status monitoring, acoustic dosage, hearing protection validation). Triton Systems is a technology incubator with a long track-record of developing innovative solutions and successfully transitioning many of them to commercial products. The initial application is wireless in-ear pressure monitoring for pilots and is also being expanded for physiological status monitoring and acoustic dosage monitoring. The microsystem developed is the only in-ear sensing system platform successfully developed for extended use and continuous transmission of data. The first complete sensing systems have been developed. Triton also develops nonlinear hearing protection. Triton is seeking additional Defense customers in need of tiny sensing solutions such as hypoxia monitoring, and hearing protection validation.

Technology Category Alignment:

Satellite Communications (SATCOM)

Robotics/Automated Material Handling Equipment

Shipyards/Shipbuilding

Supply; Storage

Satellite Communications (SATCOM)

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Supply; Storage

Supply; Storage

Satellite Communications (SATCOM)

Shipyards/Shipbuilding

Robotics/Automated Material Handling Equipment

Robotics/Automated Material Handling Equipment

Robotics/Automated Material Handling Equipment

Robotics/Automated Material Handling Equipment

Protection, Sustainment, and Warfighter Performance

Medical Chem-Bio Defense

Military Infectious Diseases

Propulsion and Extreme Environments

Fixed Wing Vehicles (includes UAS)

Survivability

Maintainability/Sustainability

Unmanned Ground and Sea Vehicles

Corrosion

Advanced Computing/Software Development

Networks and Communications

Modular/Open/Reconfigurable Architectures

RF Components for sensing, transmission and communication

Electronics Integration

Broadband/Multispectral Components and Systems

Sensors, Electronics and Photonics

Radio Frequency (RF) (non-EW)

Survivability

Broadband/Multispectral Components and Systems

RF Components for sensing, transmission and communication

Radio Frequency (RF) (non-EW)

Networks and Communications

Guidance, Navigation & Control (GN&C) and Data Links

RF Components for sensing, transmission and communication
Networks and Communications
Cognitive/Adaptive Capabilities
Preemptive/Proactive Effects
Broadband/Multispectral Components and Systems
Advanced Computing/Software Development
Networks and Communications
Personalized Assessment, Education, and Training
System Interfaces & Cognitive Processes
Aircraft Propulsion, Power and Thermal
Modeling, Simulation & Test Infrastructure
Rotary Wing Vehicles
Fixed Wing Vehicles (includes UAS)
Fixed Wing Vehicles (includes UAS)
Acoustic, Seismic and Magnetic
Rotary Wing Vehicles
Structures and Protection
Energy storage
Unmanned Ground and Sea Vehicles
Mobility
Power and Energy
Synthesis/Analytics/Decision Tools
Information Collection/Management
Advanced Computing/Software Development
Survivability
Unmanned Ground and Sea Vehicles
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Energy storage
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Maintainability/Sustainability
Advanced Computing/Software Development
EO/IR Components for sensing, transmission and communication
Microelectronics and Nanoelectronics
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Mobility
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Sensors, Electronics and Photonics
Structures and Protection
Electro-Optical/Infrared (EO/IR)
Human/Autonomous System Interaction and Collaboration
Maintainability/Sustainability
System Interfaces & Cognitive Processes
Aircraft Propulsion, Power and Thermal
Power Generation/Energy Conversion
High Energy Lasers (HEL)

Propulsion
Biomedical Informatics / Health Information Systems & Technology
Protection, Sustainment, and Warfighter Performance
Modeling, Simulation & Test Infrastructure
Maintainability/Sustainability
Mobility
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High-Speed/Hypersonics
Power Generation/Energy Conversion
Acoustic, Seismic and Magnetic
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RF Components for sensing, transmission and communication
Electromechanical conversion
Energy storage
Power Control and Distribution
Power Generation/Energy Conversion
Thermal Transport and Control
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RF Components for sensing, transmission and communication
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Fixed Wing Vehicles (includes UAS)
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Energy storage
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Information Collection/Management
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Rotary Wing Vehicles
Protection, Sustainment, and Warfighter Performance

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Modeling, Simulation & Test Infrastructure
Radio Frequency (RF) (non-EW)
Machine Perception, Reasoning and Intelligence
Assuring Effective Missions
Modular/Open/Reconfigurable Architectures
Personalized Assessment, Education, and Training
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Machine Perception, Reasoning and Intelligence
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Maintainability/Sustainability
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Aircraft Propulsion, Power and Thermal

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Military Infectious Diseases
Military Operational Medicine
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Modularity
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Biomedical Informatics / Health Information Systems & Technology
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High Energy Lasers (HEL)
EO/IR Components for sensing, transmission and communication

Networks and Communications
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Human Computer Interfaces (HCI) for Decision Making
Information Collection/Management
Synthesis/Analytics/Decision Tools
Human Aspects of Operations in Military Environments
System Interfaces & Cognitive Processes
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EO/IR Components for sensing, transmission and communication
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Modularity
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Energy storage
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Undersea Weapons
Human Computer Interfaces (HCI) for Decision Making
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Department of the Navy SBIR/STTR Transition Program

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Topic # N131-012

Universal In-Ear Warfighter Monitoring System (1002-062)

TRITON SYSTEMS, INC.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PEO Joint Strike Fighter

Transition Target: Aircraft Systems Program Office (PMA 202)

TPOC:
(301)342-9213

Other transition opportunities: National Institute for Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA) for hearing protection evaluations for earplugs and earmuffs, and real-time noise dose monitoring.



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WHAT

Operational Need and Improvement: There is a need to objectively measure commercial-off-the-shelf (COTS) earplug performance and safety, but it is currently difficult to obtain these measurements because no sensors exist to measure within the ear canal without compromising earplug performance. Miniature wireless sensors integrated into COTS earplugs would assist in more accurate evaluations of earplug performance for pilots and aircrew personnel and for continuous monitoring of warfighter physiological status during military operations.

Specifications Required: Accuracy: +/- 0.5%
Pressure range: 0-15 psi
Duration: 4 hours
Size: Capable of fitting in ear canal
Sample Rate: 25 samples/sec

Technology Developed: Triton Systems has developed a modular, in-ear canal wireless sensing microsystem to evaluate the true risk associated with using sealed earplugs. The extremely small size of the sensing system allows it to easily fit inside the ear canal. Sensing arrays can be placed inside the ear canal, on the pinna, or on the head in close proximity to the ear (e.g. temple, postauricular region, or even occipital region). The system permits the pressure in the ear canal to be monitored in real-time without impacting the performance of the earplug.

Warfighter Value: Earplug-integrated wireless miniature sensors for personnel monitoring would benefit warfighters by increasing mission effectiveness and safety by providing objective measurements to evaluate the performance and safety of COTS earplugs for pilot use and to ensure a warfighter does not exceed their daily noise exposure limit.

WHEN

Contract Number: N68335-15-C-0035 **Ending on:** May 15, 2016

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Create a low-power, small in-ear sensor.	N/A	Demonstrate pressure readings on a system capable of fitting in the ear canal	5	July 2015
Create the behind-the-ear unit.	Med	Demonstration of behind-the-ear unit interacting with the in-ear unit	6	October 2015
Create the user interface.	Med	Demonstrate data logging and user interface to adjust data collection	6	January 2016
Deliver the full system.	Med	Deliver a full system for measuring the in-ear pressure	6	February 2016

HOW

Projected Business Model: The commercialization strategy for the in-ear canal wireless pressure sensing technology is to retain the design, assembly, and packaging portions of the product manufacture internal to Triton. The electronic board manufacture will be outsourced to U.S. vendors (e.g. Advanced Circuits) who specialize in electronics manufacturing. The product will be a Triton-branded item with marketing and sales provided by Triton and audiology product distributors.

Company Objectives: Triton Systems is a small business located in Chelmsford, MA that employs 50+ science and engineering staff with expertise of photonics, biotech, electronics, advanced materials and engineered systems. The commercialization model includes Federal funding combined with private equity and strategic partners from industry and academia. Products created are licensed into existing distribution and supply chains, sold from Triton to Federal customers or result in spin-outs. Triton intends to use this extensive product development experience to develop noise dose monitoring and hearing protection evaluation sensors for military, industry, and commercial markets.

Potential Commercial Applications: The base technology developed for this device has a commercial application as a noise dosimeter for field microphone in real ear (F-MIRE) measurements of actual noise exposure, and hearing protection evaluation and monitoring to determine the actual hearing protection provided by hearing protection equipment as worn by the user and/or to ensure the user is wearing their hearing protection properly. This technology can also be used for physiological status monitoring system.

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