

Topic: N151-025

TDA Research, Inc.

Ignition Composition with Low Moisture Susceptibility

TDA Research, Inc. (TDA) has developed a moisture stable igniter formulation for Navy countermeasure flares. TDA's novel igniter has been shown to be up to 90% more stable to degradation in high humidity conditions than the current igniter formulations and is thus more reliably ignited when exposed to moisture. The moisture stable igniter formulation has energetic properties that are comparable to the current Navy igniter, with no loss in performance when substituted in Navy hardware. The formulation can be used as a drop-in replacement for the current Navy igniter and is relatively similar in cost. TDA is a small technology manufacturing, research and development company in Wheat Ridge, Colorado and intends to manufacture and supply the igniter formulation directly to the Navy and other customers.

Technology Category Alignment:

Manufacturing Technology for Affordability

Ordnance

Corrosion

Contact:

Dr. Girish Srinivas

gsrinivas@tda.com

(303) 940-2321

<http://tda.com/>

SYSCOM: NAVAIR

Contract: N68335-17-C-0090

Booth: 918

Room: Club Room North

Presenting: Apr 10th at 3:20 PM

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0090

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2018-692

Topic # N151-025

Ignition Composition with Low Moisture Susceptibility

TDA Research, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA 272 within PEO (T): Advanced Aircraft Protection Systems

Transition Target: Subcomponent of a decoy device.

TPOC: (812)854-6631

Other transition opportunities: Army and Air Force Decoy Flares; Cartridge-actuated Device/Propellant-actuated Device (CAD/PAD)

Notes: The image shows the decomposition rate of a Magnesium/Teflon/Viton (MTV) igniter composition (red) compared to two moisture stable igniter formulations (green and blue) developed by TDA Research, Inc. (TDA). The decomposition rate is determined by the amount of decomposition by-product formed upon prolonged exposure to 75% relative humidity (RH) at 80 C. TDA's moisture stability is based on a novel, hydrophobic fuel that can be utilized generally in composite energetic formulations.

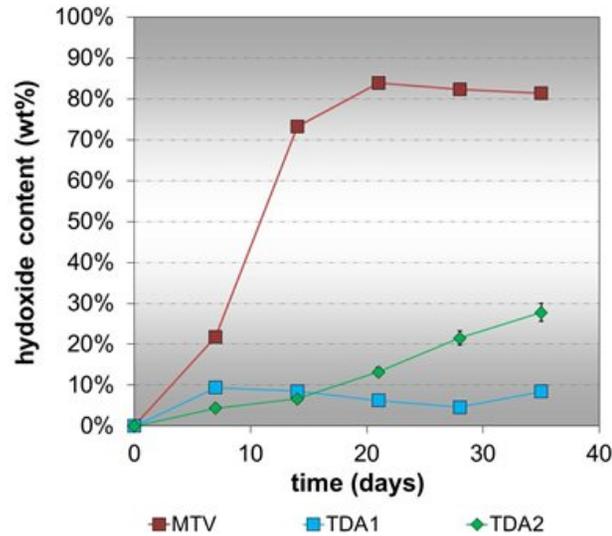


Image courtesy of TDA Research, Inc. Copyright 2018.

WHAT

Operational Need and Improvement: Airborne Expendable Infrared Countermeasures (AEIRCMs) are deployed to decoy infrared guided missiles away from a targeted aircraft. AEIRCMs (a.k.a. decoy flares) are ignited by an ignition pellet as the flare is being ejected from the aircraft. The ignition pellet currently consists of a composition based on MTV. Magnesium is known to degrade when exposed to moisture, which in return can increase ignition times and, in more extreme cases, can result in non-ignitions. Another consequence of this degradation is the evolution of hydrogen gas, which poses an ignition hazard. The Navy is seeking an ignition composition that is less susceptible to moisture than the current igniter formulation and can be used as a drop-in replacement for MTV.

Specifications Required: A novel ignition composition that can replace the current MTV based ignition is desired. The formulation should be pelletized and sympathetically ignitable for operation in current Navy hardware (i.e., a pellet in a Safe-and-Arm (S&A) type igniter). The MTV-replacement should not be susceptible to moisture degradation, should be stable in long term storage, should be reliably ignitable by an impulse cartridge, should provide rapid ignition transfer to the primary pyrotechnic, should be simple to fabricate, and should be safe to handle and process. The operational conditions in which this ignition pellet will be evaluated range from -65 degrees F to 160 degrees F.

Technology Developed: TDA has developed new igniter compositions that are less susceptible to moisture than the current igniter formulations and can be used as a drop-in replacement for MTV. The moisture stability of these formulations has been tested and compared to the moisture stability of a conventional MTV formulation. After 5 weeks of highly accelerated aging at 75% relative humidity (RH) and 80 °C, the MTV igniter was c.a. 90% decomposed, while the novel TDA igniter formulations were only decomposed by 7-14%; this is as much as 90% LESS moisture-decomposition than the MTV control. TDA's moisture stable igniter compositions can be easily pressed into pellets, are safe to handle, and can be used as a drop-in replacement for MTV pellets.

Warfighter Value: TDA's moisture stable igniter formulation will increase reliability and safety of decoy flares by eliminating igniter formulations that can decompose upon storage and form flammable by-products. As a drop-in replacement, TDA's igniter will not sacrifice performance and will be cost-competitive with current igniters.

WHEN

Contract Number: N68335-17-C-0090 **Ending on:** March 31, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Successful Phase I performance evaluation completed by Navy	N/A	Demonstration of moisture stable igniter in Navy flare	4	December 2015
Scale-up of moisture stable ingredient to 1-kilogram scale	N/A	Large scale synthesis has same properties as experimental batch	4	September 2016
In Phase II, Deliver 150 S&As with TDA igniter for independent Navy testing	High	Ability to manufacture igniter-loaded S&As for integration into hardware	5	January 2019
Begin Phase II Option qualification and conditioning experiments	Med	Award of gated Phase II Option	5	April 2019

HOW

Projected Business Model: The technology being developed in this project is a novel countermeasure flare igniter formulation. The igniter is used in very small amounts in each flare manufactured, and thus, a kilogram of this material can supply igniters for >5000 flares. As a result, this production level is well within TDA's capabilities to produce and supply to the Navy. The Navy is the customer and TDA does not plan to work with a prime supplier at this time. Due to the small amounts of igniter to be needed, this is likely to be a very small business, but could grow modestly if other military applications require moisture stable igniter formulations for similar pyrotechnics. TDA currently maintains and operates chemical production facilities capable of producing 100-ton quantities of inorganic chemicals and catalysts.

Company Objectives: TDA's moisture stable energetic fuel particles and the igniter formulations they are used in have the potential to be used by the Military in any application that employs metal fuels or igniter compositions, including countermeasure applications. Due to the large number of potential applications, we believe that other DoD agencies would also be potential investors in this technology, such as the Army and Air Force. TDA's goal is to grow this business to supply the Military with moisture stable igniter compositions for a variety of applications across many energetic materials and device platforms. There are several countermeasure flare manufacturers for the Military, including Chemring Kilgore, Armtec™ Esterline, and Orbital-ATK to name a few. Depending on the number of applications identified for our igniter formulation, we could potentially license technology to a major manufacturer to meet production demands and integrate our igniter formulations into other energetic materials platforms.

Potential Commercial Applications: Our moisture stable igniter formulation potentially has applications in any composite energetic system in which a fuel and an oxidizer are used. Potential commercial applications include the fireworks and pyrotechnics industry, as well as novel ignition materials for automobile air-bag applications.

Contact: Dr. Girish Srinivas, Vice President of Business Development
gsrinivas@tda.com 303-940-2321

Topic: N152-116

SA Photonics, Inc.

Affordable Compact HPRF/HPM Attack Warning System

SA Photonics' Wideband Agile Threat Sensor (WATS) addresses the Navy's need for an affordable and compact High-Power Radio Frequency / High-Power Microwave (HPRF/HPM) attack warning technology that detects, characterizes and precisely geo-locates HPRF threats while being fully immune to HPRFs. WATS consists of multiple completely passive HPM probes connected by fiber optic cables to an electronic processing system, designed for UAVs and other aircraft and surface vessels. Furthermore, WATS's tolerance of extremely high electromagnetic amplitudes enables the system to survive repeated exposure to attack without losing sensitivity. SA Photonics, which specializes in the development of advanced photonics systems to solve demanding problems for military and commercial customers, envisions in-house product manufacturing, as it has on past product developments.

Technology Category Alignment:

RF Components for sensing, transmission and communication

Fixed Wing Vehicles (includes UAS)

Broadband/Multispectral Components and Systems

Preemptive/Proactive Effects

Radio Frequency (RF) (non-EW)

Contact:

Dave Pechner

d.pechner@saphotonics.com

(408) 560-3500115

<http://www.saphotonics.com/>

SYSCOM: ONR

Contract: N68335-17-C-0112

Booth: 705

Room: Club Room North

Presenting: Apr 10th at 3:30 PM

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0112

WHO

SYSCOM: ONR

Sponsoring Program: ONR Code 35: Counter Directed Energy Weapons Research

Transition Target:

TPOC:

Mr. Ryan Hoffman
ryan.hoffman@navy.mil

Other transition opportunities: This attack warning technology is not limited to Navy systems. SA Photonics is also pursuing applications with other DoD assets, from UAVs and manned aircraft to terrestrial vehicles and bases.

Notes: The image at right shows the system configuration for WATS, SA Photonics' "Wideband Agile Threat Sensor."



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WHAT

Operational Need and Improvement: Advances in high power microwave threats pose significant dangers to critical naval electronic systems. The Navy has a need for an affordable and compact High-Power Radio Frequency / High-Power Microwave (HPRF/HPM) attack warning technology that detects, characterizes and precisely geo-locates HPRF threats while being fully immune to HPRFs.

Specifications Required: The HPRF sensor should be able to provide frequency information of the attack, which may be wideband pulses (100-500 MHz, pulse widths 2 – 200 ns) or narrowband (500 MHz – 5 GHz, pulse widths 1ns-5µs). It is desirable to obtain HPRF geolocation information with an error of less than 5 degrees in both the azimuth and elevation/declination and provide an approximate target range. The system should be able to survive HPRF field intensities in excess of 50 W/cm² without damage to the detection system. Furthermore, a low SWaP footprint is needed such that the product can be easily integrated into Navy platforms (including helicopters and UAVs).

Technology Developed: WATS is a low-cost, agile HPRF/HPM attack warning system, consisting of multiple completely passive HPM probes connected by fiber optic cables to an electronic processing system. WATS is able to detect, characterize and precisely geo-locate HPRF threats while being fully immune to HPRFs. Additionally, WATS is a low SWaP device that functions over a wide range of possible attack frequencies.

Warfighter Value: This technology will provide significant protection to low flying UAVs and rotorcraft, ground and surface vessels, and even military and government complexes, all of which are especially vulnerable to HPM attack. Since HPM sources are readily available that can generate high energy microwave pulses powerful enough to disable or damage electronic systems, WATS technology will be crucial in providing future real-time notifications of an HPM attack. Furthermore, since these attacks occur without an explosion or any other type of external indication, the accurate source localization WATS provides will be essential to the warfighter.

WHEN

Contract Number: N68335-17-C-0112 **Ending on:** April 5, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Preliminary Design Review	N/A	Design Analysis Complete	3	4th QTR FY17
Critical Design Review	N/A	Detailed Design Complete	3	2nd QTR FY18
Lab Integration	Low	System integration complete	4	1st QTR FY19
Performance Validation	Low	Performance validated in lab setting	5	2nd QTR FY19
Testing at China Lake	Med	Performance validated in outdoor test range	6/7	2nd QTR FY19

HOW

Projected Business Model: SA Photonics intends to undergo initial production of the WATS system onsite. The company has a history of successful small-scale production for commercialized SBIR products. We envision teaming with a prime contractor for WATS product sales. We would look for the prime contractor to supply sales support, installation support, and maintenance support.

Company Objectives: SA Photonics' WATS is positioned to be a low-cost, performance-improving attack warning tool not just for Navy use, but with military assets across the DoD. As a result, we are excited to present the product to a range of program offices at the FST, as well as a number of prime contractors, specifically those who work with aircraft and electronic warfare.

Potential Commercial Applications: In addition to military applications with UAVs, rotorcraft, fixed-wing aircraft, naval ships, and military bases, civilian uses of WATS technology will allow for commercial sales. These primarily include larger passenger and cargo aircraft, as well as some private jets and helicopters. Additionally, high-value ground facilities, in particular those vulnerable to industrial, political or financial sabotage, will find value with WATS. These include industry offices (e.g. defense contractors), commercial data centers, airports, and banks and financial institutions.

Topic: N112-089

Forward Photonics LLC

Ultra-High Brightness Mid-Infrared Laser Beam Fiber Combiner for Infrared Counter-Measures Applications

Forward Photonics is developing a 100 W laser in the mid-wave infrared with integrated cooling system. This power level represents an order of magnitude increase in power over what is available commercially. This is enabled by the proprietary wavelength beam combination (WBC) technology that allows for the combination of a number of individual quantum cascade lasers into a single high brightness output beam. The intended Navy application is infrared countermeasures (IRCM) for both fixed wing and rotary wing aircraft, as well as ship-based. The goal is for the laser system to be integrated into an IRCM platform with a prime contractor partner with multi-platform uses. Forward Photonics specializes in high brightness direct diode laser systems for electronic warfare, including IRCM and direct energy weapons.

Technology Category Alignment:

EO/IR Components for sensing, transmission and communication

Broadband/Multispectral Components and Systems

Survivability

High Energy Lasers (HEL)

Contact:

Mike Cruz

mikecruz@forwardphotonics.com

(978) 224-5488

<http://www.forwardphotonics.com>

SYSCOM: NAVAIR

Contract: N68335-17-C-0147

Booth: 919

Room: Club Room North

Presenting: Apr 10th at 3:10 PM

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0147

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2018-741

Topic # N112-089

Ultra-High Brightness Mid-Infrared Laser Beam Fiber Combiner for Infrared Counter-Measures Applications

Forward Photonics LLC

WHO

SYSCOM: NAVAIR

Sponsoring Program: PEO(T)

Transition Target: Direct Infrared Countermeasures (DIRCM)

TPOC:
(904)790-5916

Other transition opportunities:
Tactical Aircraft Directable Infrared Countermeasures (TADIRCM)

Notes: 100 W Medium Wavelength Infrared (MWIR) Laser Concept Design

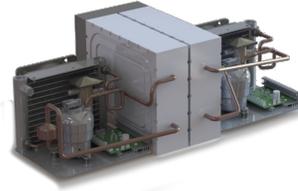


Image Provided by Forward Photonics LLC, 2018

WHAT

Operational Need and Improvement: There is a present need for an inexhaustible infrared (IR) countermeasure system for defeating IR heat-sinking missiles for a number of Direct Infrared Countermeasures (DIRCM) systems. A 100 W MWIR system with integrated cooling and fiber coupling supports multiple needs across the forces. With such high power and with the fiber coupling, only one laser will be required per craft and routed to multiple jam heads throughout the aircraft, representing a significant cost savings.

Specifications Required: \geq 100 W Output in the Mid-Infrared
Laser Modulate-able
Integrated Water Free Cooling System
Fiber Coupling
Hardened for environmental and vibrational operation

Technology Developed: Forward Photonics will use its proprietary Wavelength Beam Combination (WBC) to expand its current mid-infrared lasers based on quantum cascade lasers (QCLs) to reach power levels of 100 W or more. In addition to this unprecedented power level Forward Photonics has developed an integrated high capacity cooling system that eliminates the need for recirculating water in these high power systems, as water is not a flight qualifiable coolant. Additionally Forward Photonics is developing MWIR fiber components that will allow for the high output power to be coupled into an optical fiber. Current MWIR optical fibers can only handle $<$ 1 W of output power.

Warfighter Value: 100 W output in this wavelength regime represents well over an order of magnitude power improvement on what is commercially available currently. Additionally laser IRCM systems provide significantly greater jam/signal ratio over currently fielded countermeasure systems. Forward Photonics' laser provides greater engagement range, greater target specificity, has an inexhaustible capacity and could provide cost savings due to its integrated fiber coupling over other lasers systems.

WHEN

Contract Number: N68335-17-C-0147 **Ending on:** December 20, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Cooling System Designed	Low	Integrated with laser system with adequate cooling	4	July 2018
Fiber Coupling	Med	Able to handle output power with minimal reflection loss	4	September 2018
Laser Assembled	Low	100 W Output Power with High Beam Quality	5	November 2018

HOW

Projected Business Model: Our goal is to design and manufacture the lasers, which will be used by Prime contractors in their laser propagation systems.

Company Objectives: Forward Photonics is looking to expand awareness of the utility of WBC lasers for defense and commercial uses. Such lasers offer high brightness output, an order of magnitude or higher brightness that can be achieved with non WBC direct diode systems. Direct diode systems offer some of the highest efficiency, lowest cost lasers available. Forward Photonics is eager to speak with laser integrators for both defense and commercial laser systems for defense platforms and materials processing.

Potential Commercial Applications: Potential commercial applications for MWIR high brightness WBC lasers are numerous and include , spectroscopy, advanced materials processing of plastics, glass, and carbon fiber composites.

Contact: Mike Cruz, Vice President
mikecruz@forwardphotonics.com

9782245488

Topic: N152-121

Forward Photonics LLC

Compact Air-cooled Laser Modulate-able Source (CALMS)

Forward Photonics is developing the Compact Air-cooled Laser Modulate-able Source (CALMS). This is a 3 W laser with wavelength < 400 nm. The design is compact and fully modulate-able up to 10 kHz. High powered ultraviolet (UV) operation is challenging for direct diode lasers, as the GaN diode technology is not as mature as for other materials. This power level at this wavelength is enabled by the proprietary wavelength beam combination (WBC) technology that allows for the combination of a number of individual GaN laser diodes into a single high brightness output beam. Forward Photonics specializes in high brightness direct diode laser systems.

Technology Category Alignment:

EO/IR Components for sensing, transmission and communication

Broadband/Multispectral Components and Systems

Survivability

High Energy Lasers (HEL)

Contact:

Dr. Jeff Shattuck

jeffshattuck@forwardphotonics.com

(617) 372-6929

<http://www.forwardphotonics.com>

SYSCOM: ONR

Contract: N68335-17-C-0292

Booth: 919

Room: Club Room North

Presenting: Apr 10th at 3:40 PM

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0292

Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.

ONR Approval #43-4388-18

Topic # N152-121

Compact Air-cooled Laser Modulate-able Source (CALMS)

Forward Photonics LLC

WHO

SYSCOM: ONR

Sponsoring Program: PMA272
ATAPS PE 064272N

Transition Target: TAIRCM

TPOC:

Mr. Kevin Leonard
kevin.r.leonard@navy.mil

Other transition opportunities:

Notes: 3 Band UV Laser Concept Design



Image Provided by Forward Photonics LLC, 2018

WHAT

Operational Need and Improvement: Compact UV laser sources are not currently available with high output power and flexible pulsing requirements.

Specifications Required: Output power > 3 W

3 or more lines in the UVA band

Quick switching between waveforms (DC through 10 kHz)

100 micron core fiber output

System size < 75 cubic inches

Air-cooled

Technology Developed: Forward Photonics' proprietary technology of wavelength beam combining (WBC) effectively solves the poor beam quality problems of direct diode lasers and is a truly scalable approach. This allows for the combination of hundreds of lower power lasers into a single output that has the beam quality identical to one of the emitters itself. Forward Photonics is able to leverage the small size and large energy density of diode bars using WBC to construct a compact UV laser system with a nearly diffraction limited output at a power level of 3-10 W. With the inherent scalability of WBC, this laser can readily be increased to power levels of >100 W in the future.

Warfighter Value: Higher power and higher brightness lasers affords critical defense applications that have longer distance propagation and higher power on target.

WHEN

Contract Number: N68335-17-C-0292 **Ending on:** June 18, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
First Growth UV Material Characterized	Med	Lasing Achieved with Good output power	3	2nd QTR FY18
TO Can Risk Reduction Module Tested	Med	WBC Achieved	3	3rd QTR FY18
AWG Experiments Completed	High	WBC achieved on chip level scale	2	2nd QTR FY19
Second Growth UV Material Characterized	Low	Facet generation solved with competitive output power	4	2nd QTR FY19
Final Module Characterized	Low	Deliverable meets program specs	4	3rd QTR FY19

HOW

Projected Business Model: Our goal is to design and manufacture the lasers, which will be used by Prime contractors in their laser propagation systems.

Company Objectives: Forward Photonics is looking to expand awareness of the utility of WBC lasers for defense and commercial uses. Such lasers offer high brightness output, an order of magnitude or higher brightness that can be achieved with non WBC direct diode systems. Direct diode systems offer some of the highest efficiency, lowest cost lasers available. Forward Photonics is eager to speak with laser integrators for both defense and commercial laser systems for defense platforms and materials processing.

Potential Commercial Applications: Potential commercial applications for UV high brightness WBC lasers are numerous and include micromachining, spectroscopy, metal cutting and welding, and lithography.

Contact: Dr. Jeff Shattuck, Project Manager and Scientist
jeffshattuck@forwardphotonics.com 6173726929