

# 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.

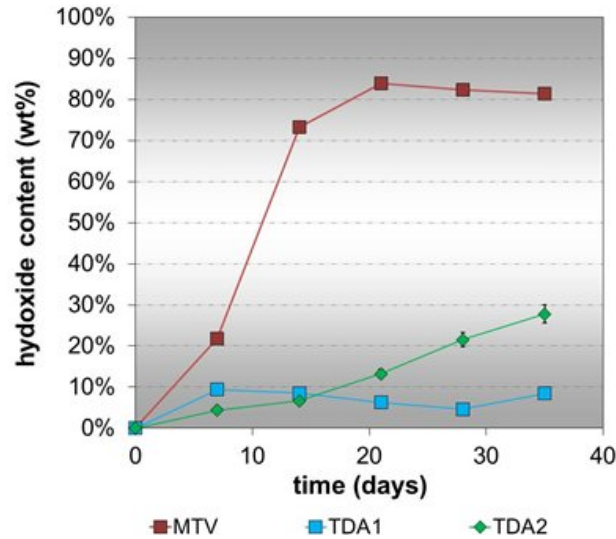


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## WHAT

**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.

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