

# Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2017-753

Topic # N152-093

Innovative, High-Energy, High Power, Light-Weight Battery Storage Systems Based on Li-air, Li-sulfur (Li-S) chemistries

TDA Research, Inc.

## WHO

**SYSCOM:** NAVAIR

**Sponsoring Program:** PMA 234  
Airborne Electronic Attack and Next  
Generation Jammer

**Transition Target:** F/A-18E/F, F-35  
etc.

**TPOC:**  
(301)342-0365

**Other transition opportunities:**



Photo courtesy of U.S. Navy 051125-N-7241L-004.jpg

**Notes:** Meeting the energy demands of Naval aircraft is a formidable challenge which requires looking beyond current Lithium-ion (Li-ion) batteries. Li-S batteries using TDA's advanced materials can meet these demands significantly increasing mission capabilities.

## WHAT

### Operational Need and Improvement:

Develop and demonstrate reliable Lithium-sulfur (Li-S) battery technologies that have the potential to produce higher energy, increased power densities, and improved cycle life for Naval aircraft applications.

### Specifications Required:

- Develop 28V (Volt) DC (Direct Current) / 270 VDC electrical energy storage devices based on emerging Li-S chemistry
- Demonstrate a minimum specific energy in the range 400 – 800 Wh/kg for Li-S cells.
- Significantly improve on the low specific energy and poor cycling efficiency of current Li-S cells
- Demonstrate low self-discharge (< 5% per month) and long calendar life (4-7 years' service life)
- Demonstrate good cycle life (> 2000 cycles at 100% Depth of discharge (DOD))

### Technology Developed:

- TDA's cutting edge research makes possible the production of Li-S batteries with twice the specific energy of lithium-ion batteries overcoming the limitations of current cathode materials.
- Prototype cells using TDA cathodes show high specific energy densities and long cycle life. Our goal is to develop Li-S batteries based on our superior cathode materials.

### Warfighter Value:

- Increase energy storage to 28V (Volt) DC (Direct Current) / 270 VDC
- Reduced SWaP allows for longer flight time
- Aircraft can carry larger payload
- Keep up with changing power demands for future aircraft
- 2-fold increase over Li-ion batteries

## WHEN

**Contract Number:** N68335-17-C-0202 **Ending on:** March 27, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Lab Scale Production of Cathode Materials	High	Cathode Materials Demonstrated High Capacity and Stability	3	January 2017
Produce Cathode Materials	Med	Scale-up Cathode Material to 1kg	4	January 2018
Complete Cell Testing	Med	Cell Meets Requirements	4	June 2018
Complete Battery Testing	Med	Battery Produces 28V	5	March 2019

## HOW

### Projected Business Model:

TDA will manufacture the cathode materials and supply to battery manufacturers at an initial annual production rate of 100 kg/year. TDA has the production capacity to support this annual production requirement.

### Company Objectives:

TDA is actively improving its cathode compositions and scaling-up production so that battery manufacturers can use our electrode carbons in defense and commercial applications.

### Potential Commercial Applications:

Li-S batteries are a next generation of rechargeable batteries, with over twice the run-time of Li-ion batteries. They will be a direct replacement for Li-ion batteries currently used in both military and civilian electronic devices.

TDA Research will commercialize their Li-S battery electrode technology and leverage the advantages of scalable production process to develop a cost-effective manufacturing process for technology transition to various system integrations, for both DOD and civilian applications.

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