

Topic: N152-093

TDA Research, Inc.

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

Naval aircraft currently rely on lithium-ion batteries, but as energy demands continue to increase, there is a need for even higher energy density batteries. TDA Research develops aerospace and military hardware as well as manufactures advanced materials and currently is developing novel cathode materials for Lithium-Sulfur (Li-S) batteries. Our cutting edge research shows Li-S batteries offer the promise of twice the specific energy of lithium-ion batteries, but because of limitations with the cathode material, the cycle life is too low. 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 cathode materials and when successful, the Navy could replace lithium-ion batteries with Li-S batteries, significantly improving SWaP constraints.

Technology Category Alignment:

Electronic Materials

Aircraft Propulsion, Power and Thermal

Energy storage

Power and Energy

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SYSCOM: NAVAIR

Contract: N68335-17-C-0202

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0202

Department of the Navy SBIR/STTR Transition Program

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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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