

# Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2016-770

Topic # N14A-T006

Development of a Safer Lithium-ion (Li-ion) Battery for Naval Aircraft Applications Through Thermal Management Design  
EIC Laboratories, Inc.

## WHO

**SYSCOM:** NAVAIR

**Sponsoring Program:** PMA-265  
F/A-18 and EA-18G Program Office

**Transition Target:** F/A-18 E/F  
Super Hornet aircraft

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

### Other transition opportunities:

Other aircraft and unmanned aerial vehicles (UAVs) with a 28V sealed lead acid battery (SLAB) replacement need.

**Notes:** Performance specifications of EIC Laboratories (EIC) Safe Li-ion 28V battery as compared to the current Sealed Lead Acid (SLAB) battery currently used on the F/A-18 Super Hornet. EIC's battery comes with a liquid crystal display (LCD) display for State of Charge indication and battery data output.



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## WHAT

**Operational Need and Improvement:** In large aircraft batteries, there are a large number of risks in battery engineering, especially due to the power requirements aircraft's demand. Catastrophic failure by aircraft damage, fire damage, and battery explosion is one risk that has turned into an issue for aircraft Li-ion batteries. Aircraft Li-ion batteries are operated in extreme environmental conditions. Adverse operating conditions can result in thermal runaway conditions due to failed cells and thereby limit the life expectancy of aircraft Li-ion batteries. The key to avoiding these kinds of failures is to develop novel thermal management technologies such as passive techniques (advanced insulation), active techniques (heat pipes, working fluids), and light-weight structured materials.

**Specifications Required:** Due to the extreme operating temperature conditions of aircraft, currently used Sealed Lead Acid Battery (SLAB)'s cycle life is significantly reduced. The goal is to design an integrated battery pack system concept to develop a fully functional battery product. The integrated battery pack system should be designed in such a way that the proposed advanced thermal management technologies can support individual cell temperature monitoring and help prevent single cell thermal runaway conditions as well as limit/eliminate thermal failure propagation leading to cell/battery fratricide.

**Technology Developed:** In comparison with older lead-acid and nickel-cadmium batteries, Li-ion batteries offer significant advantages: decreased weight and increased capacity. EIC Laboratories (EIC) is developing safe, large-format aircraft Li-ion batteries where thermal propagation of an overheated cell to neighboring cells is prevented by integrating novel thermal management technologies.

**Warfighter Value:** The developed technology is safe and lightweight Li-ion 28V aircraft batteries which will increase battery operating cycle life, minimize battery maintenance cost, enhance battery performance and reduce battery weight over currently used batteries by more than half.

## WHEN

**Contract Number:** N68335-15-C-0401 **Ending on:** September 29, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Design Safe 28V Li-ion Battery	Med	Battery testing at EIC	5	August 2016
Battery optimization through Thermal Modeling and Simulation	Med	Thermal modeling at National Renewable Energy Laboratory (NREL)	5	September 2016
Fabration and testing of 1st Generation Li-ion Battery	Med	Battery testing at NAVAIR	6	November 2016
Production of Safe Li-ion battery for delivery	Med	Battery testing at NAVAIR	7	June 2017

## HOW

**Projected Business Model:** EIC Laboratories' business model is to convert the results of our sponsored and internal research and development programs into new products and processes that form the basis for profitable business ventures. Commercialization of technology through in-house manufacturing and licensing is a key part of the strategic plan at EIC. EIC will develop and deliver 28V Safe Li-Ion batteries for the Navy to do initial performance qualification testing.

**Company Objectives:** EIC will develop and design the 28V Li-Ion battery as a drop-in battery for the Navy to replace currently used SLAB batteries on the FA-18E/F aircraft. The battery will be a drop-in battery to replace for currently used SLAB battery and will be maintenance free. EIC is currently manufacturing 28V/26Ah lithium ion battery as the primary Aircraft battery and also the M-134 Mini-Gun for the Army 160th Special Operations Aircraft fleet. The goal is to replace the current sealed lead acid battery in the Army Special Operations Aviation (ARSOA) fleet with minimal impact to the existing aircraft and Mini-Gun system. EIC will be the prime and will do business directly with Navy.

**Potential Commercial Applications:** Batteries are used extensively in vehicles and advanced aircraft electrical systems, in munitions and guns, and in drones and robotic vehicles as well as providing energy storage for expeditionary units and for a wide variety of weapons systems. With success in developing safe Li-ion battery systems, a big part of the commercial aircraft battery market could be taken over by the lithium-ion battery technology.

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