

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2019-757

Topic # N162-092

Practical All Solid-State (PASS) Li-Ion Batteries (LIB)

Lynntech, Inc.

WHO

SYSCOM: NAVAIR

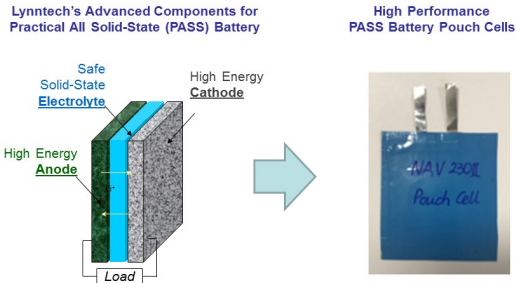
Sponsoring Program: PMA-265 F/A-18 Program Office

Transition Target: 28V Battery F/A-18, EA-18G

TPOC:
(301)342-5788

Other transition opportunities: MQ-4C Triton, MQ-8 Fire Scout, MQ-25A Stingray, ASW Sonobuoys

Notes: Wh/kg = Watt hour per kilogram (specific energy); W/kg = Watts per kilogram (specific power)



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WHAT

Operational Need and Improvement: Rechargeable batteries play a critical role in next generation aircraft. Naval aircraft currently use nickel-cadmium and lead-acid batteries to perform engine starts and provide emergency power. To improve energy and power density, the Navy is developing and transitioning lithium (Li)-ion chemistries for naval aircraft applications. Current Li-ion batteries utilize an electrolyte composed of flammable organic solvents. Under failure and abuse mechanisms, current Li-ion batteries can catch fire and/or explode. Battery fires and explosions can cause injury or death of aircrew and ground personnel and damage or even cause complete loss of the aircraft. Breakthrough battery technologies that offer the enhanced safety of an all solid state cell design and the higher specific energy and energy density of Li-ion battery chemistries are required for naval aircraft.

Specifications Required: Enhanced Safety, Specific Energy > 200 Wh/kg, Specific Power > 1500 W/kg at room temperature, Operating Temperature -40°C to +71°C, Exposure of up to +85°C, Self-Discharge < 5% per month, Service Life > 6 years, Cycle Life > 6000 cycles at 100% depth of discharge.

Technology Developed: Lynntech is developing practical all solid-state (PASS) batteries with solid electrolytes (SEs). These batteries offer enhanced safety and improved performance for military aircraft applications. Lynntech has significant experience in developing advanced batteries. Lynntech's PASS batteries utilize core-shell electrodes, and high conductivity SE which provides a clear competitive advantage based on its improved safety/abuse tolerance and cycle life in addition to competitive energy and power densities.

Warfighter Value: Practical all solid-state (PASS) lithium-ion battery (LIB) would provide both high energy and power with enhanced safety for naval aircraft applications. Other military applications include soldier power, communication systems, weapons systems, remote sensors, detection devices, and unmanned aerial vehicles (UAVs). Specific benefits for DoD include enhanced safety, extended duration missions, reduced weight, and improved capabilities.

WHEN

Contract Number: N68335-18-C-0230 **Ending on:** April 30, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Pouch Cell Design, Fab, Test	Low	10-20 cm2 pouch cell pass test	3-4	October 2019
Safety Evaluation of Pouch Cells	Low	Nail Penetrating, Short Circuit, Runaway Heat Tests	3-4	December 2019
Battery Design	Med	Design 28V Solid State Battery	4	April 2020
Battery Fabrication and Testing	Med	Fab/Test 28V Solid State Battery	5	October 2020

HOW

Projected Business Model: After completing a Phase II project, Lynntech plans to commercialize the technology by either (i) licensing the technology to a battery partner(s); or (ii) producing the components at Lynntech and selling the components to battery companies. The current business strategy is to sell or license to existing battery manufacturers since the base manufacturing processes are established and this will lower the required investment and provide an established customer base.

Company Objectives: Lynntech's objective for this project is to develop a 28V prototype all solid-state battery with high energy density and long cycle life and high safety that meets the Navy's requirements. Lynntech is a for-profit business and believes that if we properly meet the above objective, sales and profit will follow.

Potential Commercial Applications: Civilian applications include commercial aviation, electric and plug in hybrid electric vehicles, auxiliary power units, and consumer electronic devices.

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