

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2019-861

Topic # N16A-T006

Novel, High-Efficiency, Light-weight, Flexible Solar Cells as Electrical Power

Generation Source

MicroLink Devices

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-263

Transition Target: Small UAS Platforms including Puma and Raven Platforms. Enhanced solar wings will enable energy generation during operation thereby increasing flight endurance.

TPOC:

Other transition opportunities: High Altitude, Long Endurance Solar UAS Platforms such as the Airbus Zephyr for Persistent ISR; Energy Source to Extend Operational Lifetime of Sonobouy; Mobile Power for Warfighter



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WHAT

Operational Need and Improvement: The Navy has a growing fleet of small unmanned aerial system (UAS) vehicles that enable tactical intelligence, surveillance and reconnaissance (ISR) capabilities not possible before, and a need to extend mission lengths of these battery-powered platforms is apparent. PMA-263 desires capability for high-efficiency solar cells enabling a reliable power generation source for naval aviation applications.

Specifications Required: The Navy desires a capability for high power conversion efficiency and stability using solar cells based on novel materials and an innovative device design to create a reliable power generation source for naval aviation applications.

Technology Developed: MicroLink Devices will integrate its high-efficiency, lightweight, and flexible solar sheets to the Puma UAS to significantly extend the flight endurance. MicroLink's inverted metamorphic (IMM) multi-junction epitaxial lift-off (ELO) solar cell technology is the basis for manufacturing an advanced thin-film solar sheet technology that can produce enough power to sustain flight. MicroLink will apply volume production techniques to solar cell and module manufacture for scale up and cost reduction, enabling the production of cells with >30% 1- sun AM1.5 efficiency in a volume production environment and demonstrate a pathway of reducing cell cost to <\$100/Watt. An advanced wing will be designed for the Puma UAS and integrated with the solar cell array modules to generate >130 W, potentially increasing flight times to >8 hours.

Warfighter Value: The ability to produce an ultra-lightweight, high-efficiency ELO solar cell arrays in a cost-effective manner will enable widespread adoption of this technology for terrestrial and space missions with higher energy requirements than can be met with today's solar cell technology. Leveraging the technology developed in this effort, other UAV platforms can be augmented with ELO-based solar sheet modules for longer flight endurance and greater mission capability. There is also great interest in using this solar cell technology in high altitude, long endurance (HALE) applications where a large UAV will operate at high altitudes above the clouds for weeks at a time solely by solar energy that is stored on onboard batteries to allow for continuous flight, even at night. The endurance and utility of both of these UAV platforms will be extended. This provides constant, real-time ISR data for the warfighter enabling better informed decision making and response execution.

WHEN

Contract Number: N68335-18-C-0157 **Ending on:** April 2, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Complete Design of Replacement Solar Puma Wing	Low	Design Completed	4	March 2019
Manufacture of First Solar Puma Wing	Med	Completion of First Solar Wing	4	September 2019
Develop High Volume Ohmic Screen Printing	Med	Process Compatible with Current Manufacturing Methods	6	September 2019
Incorporate Laser Dicing for Cell Isolation	Med	Incorporate Process into Production	6	September 2019
Develop Robotic Interconnect Welding	Med	Demonstrate Automated Process	6	March 2020
Flight Testing of Solar Puma Wing	Med	Completion of Flight Testing of Solar Wing on Puma Platform	6	March 2020

HOW

Projected Business Model: MicroLink plans to commercialize the technology by manufacturing solar cell arrays in-house and partnering with Applied Composites Engineering (ACE) in the assembly of the solar wing. MicroLink possesses the required tools to grow, fabricate, and assemble the solar cells into flexible solar sheets. Further investments will be made for additional equipment to scale up production output. ACE currently manufactures OEM replacement UAV wings, and can readily incorporate the integration of these advanced solar arrays into their production line in order to output solar enhanced UAV wings. MicroLink will also produce solar cell arrays for other markets that include HALE UAVs, satellites, and mobile power packs.

Company Objectives: MicroLink Devices' core business is the design and manufacture of III-V epitaxial material used in cellular phones and other wireless devices, and the design and manufacture of solar cells and solar sheets for a variety of applications, including unmanned aerial vehicles (UAVs), spacecraft, and terrestrial collectors. MicroLink is dedicated to producing quality products to meet customer needs. MicroLink is an ISO 9001-certified company.

Potential Commercial Applications: - Solar Wings for Small Electric UAVs.

- High Altitude Long Endurance Stratospheric UAVs
- Satellites
- Personal Mobile Power Generation Systems
- Sonobouys
- Electric Vehicles / Automobiles

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