

Department of the Navy SBIR/STTR Transition Program

Distribution Statement A: Approved for public release, distribution is unlimited JSF15-1155

Topic # N08-115

Rugged and Durable Fiber Optic Replacement

Linden Photonics Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: Joint Strike Fighter (JSF)

Transition Target: Joint Strike Fighter (JSF)

TPOC:
(301)995-4426

Other transition opportunities:
Navy platforms with MIL-PRF-85045/31 requirement



120919-O-GR159-007 PATUXENT RIVER, Md. (Sept. 19, 2012), F-35B Joint Strike Fighter (JSF), (U.S. Navy photo courtesy of Lockheed Martin by Michael Jackson/Released)

WHAT

Operational Need and Improvement: Fiber optic networks in aircraft are becoming a reality; however, aviation requirements such as shock, vibration, thermodynamic, and fleet maintenance make this technology deployment extremely challenging. A fiber based backplane fabric serves as a basic foundation for the mission computer intercommunication paths. This type of fiber interconnect is subjected to tight bending and is currently very fragile and requires meticulous handling by the board designers. Improved cables are needed that are thin yet strong, hermetic, non-kink, radhard, and easy to terminate.

Specifications Required: AVNOC™ will be applied to both digital (1 to 10 Gb/s) and analog (to 20 GHz) fiber optic systems, including both fixed wavelength (i.e., 850 nm, 1300 nm, 1550 nm) and multiwavelength (i.e., wavelength division multiplex (WDM)). The fiber optic devices must be capable of both 2.5 and 10 Gb/s data transmission in an avionic representative 50, 62.5 and 100 micron graded index multimode core and 9 micron mode field diameter single-mode fiber optic cable plant environment (i.e., -55 to +165 °C ambient operational temperature range, 100 meter long transmission distance). Optical cables must meet new specification MIL-PRF-85045/31. Currently there is no cable qualified to this specification.

Technology Developed: Linden has developed patented technology consisting of extruded hermetic Liquid Crystal Polymer (LCP) on COTS optical fibers. LCP provides hermeticity, strength, chemical resistance and is radhard. The LCP is overlaid, for example, with fluoropolymers for high temperature, low density polymers for buoyancy, high flexibility polymer for non-kink cable. Linden has sold 2000 km of cables to 60 different customers. Linden's goal is to insert this technology into F-35 and Navy platforms.

Warfighter Value: AVNOC™ would provide a versatile Optical cable for a number of photonic network-centric military avionic network applications.

WHEN

Contract Number: N68335-14-C-0327 **Ending on:** September 30, 2016

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Qualify optical fiber to MIL-PRF-49291/11,12	Low	Fiber qualified and placed in QPL by DLA for MIL-PRF-49291/11,12.	8	January 2016
Qualify Linden AVNOC optical cable to MIL-PRF-85045/31	Low	Cable qualified and placed in QPL by DLA. Linden listed as supplier	8	September 2016
Initiate process to insert AVNOC into JSF platform	High	Lockheed funds transition to AVNOC with internal Affordability Initiative Funds	7	April 2017

HOW

Projected Business Model: Linden currently sells the liquid crystal polymer coated cable directly and has the approved testing facilities to qualify optical cable. However, Linden's technology could be marketed and sold by any number of fiber optic cable manufacturers.

Company Objectives: Develop new cable and pass qualification tests with low weight, low cost, simpler cable design, for stem-to-stern applications. Linden would like to meet with military and commercial space Primes, DoD Program Offices and NASA to discuss insertion of AVNOC™ into DoD programs and space applications.

Potential Commercial Applications: Remote installation of fiber optic cable for border security around critical facilities such as airports, power plants and nuclear facilities among others as well as fiber optics deployed in harbors to protect our valuable ports of entry where installations are expensive, difficult and often done remotely and if a fiber breaks this results in expensive down time. Other applications include RAD (Radiation) Hard patch cords for the use of the cable in satellites, tethers or fiber optic links for DoD underwater ROVs (remotely operated vehicles) and fiber optic cable installation into next generation/legacy US Army ground vehicles.

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