Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2017-677

Topic # N132-122
High Precision Conformal Sensor Window
OptiPro Systems LLC

WHO

SYSCOM: NSMA

Sponsoring Program: PMA-268

Transition Target: MQ-25 Stingray

TPOC:
(760)939-1649

Other transition opportunities: Any military platform housing conformal sensor windows with a requirement for visible (not just infrared) optical tolerances.

Notes: Since receiving our first SBIR grant, OptiPro has grown from less than 15 employees to more than 80 today. Through the SBIR program, OptiPro has developed new machines and processes which are commercialized in sales to Prime contractors, small to medium sized optics manufacturers, and exported around the world. All profits earned since receiving our first SBIR grant have been re-invested in the company to increase technological improvement and commercialization of technologies.

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WHAT

Operational Need and Improvement: To manufacture conformal optical windows to protect aircraft electro-optical sensors, OptiPro developed the eSX 5-axis grinding machine, UltraForm Finishing (UFF) sub-aperture polishing process, UltraSmooth Finishing (USF) mid-to-large aperture polishing process, and UltraSurf non-contact metrology system. Refining these existing processes will allow Defense companies and prime contractors to manufacture optically precise conformal windows cost-effectively.

Specifications Required: To be able to manufacture conformal sensor windows to sub-micron optical tolerances.

Technology Developed: In this Phase II effort, we will focus on demonstrating and improving upon existing OptiPro manufacturing and metrology technologies in order to make optically precise conformal windows. Development will focus primarily on two main areas: First, the cost-effective grinding and polishing of conformal surfaces utilizing OptiPro's eSX grinding, UltraSmooth Finishing (USF), and UltraForm Finishing (UFF) polishing processes. Our plan is to build upon previous work that demonstrated the feasibility of conformal polishing with figure correction and will focus on speeding up those existing processes. The second area of research will be to continually improve the accuracy of the UltraSurf metrology system. During this Phase II effort, we would collaborate with the University of North Carolina Charlotte (UNCC) to investigate ways to improve the system accuracy and simplify the metrology process for conformal optics.

Warfighter Value: UFF is capable of polishing the surface of conformal windows to precision levels with high removal rates while USF tools proved to be effective in rapidly polishing conformal windows with minimal grain decoration; the UFF and USF processes have been integrated into our newly developed freeform optics manufacturing software, PROSurf. These technologies, along with OptiPro's eSX grinding and UltraSurf will allow companies to efficiently produce conformal windows

WHEN

Contract Number: N68936-15-C-0008 **Ending on:** October 16, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Develop conformal window manufacturing process	Med	Can manufacture complex optical shaped windows in hard optical ceramic materials efficiently and to designed specifications	6	December 2016
Develop conformal window metrology process	Med	Can measure as well as analyze data to sub-micron accuracies	6	April 2017
Manufacture a spinel conformal window	Med	Demonstration part that is less than 0.5 um rms figure error as measured by UltraSurf 5X with minimal to no grain highlighting	6	July 2017

HOW

Projected Business Model: OptiPro Systems has 35 years of experience developing and manufacturing precision optical fabrication machines and metrology systems. We are a global leader in designing and building computer controlled grinding, polishing, and measuring equipment for the precision optics and advanced ceramics industries. Our Advanced Process Development (APD) department focuses on fabrication solutions for precision optics. These solutions are designed to yield parts that can be manufactured from a variety of commercially available materials including optical glasses, ceramics, crystals, and alloys.

OptiPro will be manufacturing and selling eSX, UFF, USF and UltraSurf platforms at our facility in Ontario, NY. Because of the investment required to manufacture each unit, we will begin building each system immediately after the purchase order is received. Typical lead time to build the eSX, UFF and USF platforms is 16-20 weeks, while UltraSurf is currently 24-32 weeks.

Company Objectives: OptiPro will be looking to provide insight on the latest developments with eSX, UFF, USF and UltraSurf technologies, as well as other technology advancements being driven by the SBIR program. By continuously advancing our technology, OptiPro will be the leader in providing solutions for Defense companies and prime contractors that will enable cost-effective production of components with defense applications.

Potential Commercial Applications: Companies in the precision optics and advanced hard ceramics industries can benefit from OptiPro's manufacturing and metrology equipment. Components that are able to be produced with OptiPro technology serve a variety of applications, including aerospace, automotive, medical, and consumer electronics; processes developed for conformal window manufacturing have potential to reduce the cost and widen the scope of manufacturing precision aspheric optics

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