

Topic: N132-124

OptiPro Systems LLC

Corrective Optics Manufacturing for Aerodynamic Infrared Domes and Conformal Sensor Windows

Future infrared and electro-optical sensor domes and windows with aerodynamic and conformal shapes require corrective optics to counter the optical distortion produced by said shapes. To increase the optical precision and reduce the cost and time for manufacturing OptiPro developed Radial In-Feed Grinding that reduced cycle time by 60%, PROSurf freeform CAM software that uses 3D figure data to optimize a dwell map, reducing form error, and Bridger Photonics new optical probe used on UltraSurf showed potential to achieve interferometric-level accuracies.

Defense customers and prime contractors will be able to integrate OptiPro's eSX grinding, UltraForm Finishing (UFF), and UltraSurf non-contact metrology, along with our other platforms onto their manufacturing floors to fabricate precision optics and advanced ceramics.

Technology Category Alignment:

EO/IR Components for sensing, transmission and communication

Sensors, Electronics and Photonics

Electro-Optical/Infrared (EO/IR)

Radio Frequency Weapons (RFW)

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SYSCOM: NSMA

Contract: N68936-15-C-0009

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68936-15-C-0009

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2017-679

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WHO

SYSCOM: NSMA

Sponsoring Program: PMA 259 AIM-9X

Transition Target: AIM-9X

TPOC:
(760)939-1649

Other transition opportunities:
Any military platforms that require corrective optics for aerodynamic infrared domes and conformal sensor windows.

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: Future infrared and electro-optical sensor domes and windows with aerodynamic and conformal shapes require corrective optics to counter the optical distortion produced by said shapes. In order for Defense customers and prime contractors to cost-effectively produce visibly opaque, infrared-transparent optical corrector elements, it is necessary to further enhance grinding, polishing and measuring processes using OptiPro's eSX, UltraForm Finishing (UFF) and UltraSurf platforms, respectively.

Specifications Required: To be able to manufacture freeform corrective optics to sub-micron tolerances.

Technology Developed: OptiPro's existing manufacturing platforms include its eSX grinding, UltraForm Finishing (UFF), and UltraSurf non-contact surface profilometer, which will be used for grinding, polishing, and measuring the corrector arch. Work to be performed in this Phase II effort will encompass identifying areas in the manufacturing process that will require development to produce a robust process. This will include FEA analysis and development of part fixtures, tool path development, multi-axis figure correction tool path development, and polishing experiments for the selected optical materials.

Warfighter Value: To increase the optical precision and reduce the cost and time for manufacturing, OptiPro developed Radial In-Feed Grinding that reduced cycle time by 60%, PROSurf freeform CAM software that uses 3D figure data to optimize a dwell map for reducing form error, and added Bridger Photonics new optical probe on the UltraSurf, which showed potential to attain interferometric-level accuracies. Defense customers and prime contractors will be able to integrate OptiPro's eSX grinding, UltraForm Finishing (UFF), and UltraSurf non-contact metrology, along with our other platforms onto their manufacturing floors to fabricate precision optics and advanced ceramics.

WHEN

Contract Number: N68936-15-C-0009 **Ending on:** October 16, 2017

| Milestone | Risk Level | Measure of Success | Ending TRL | Date |
|---|------------|--|------------|--------------|
| Develop Computed Aided Manufacturing software to create tool paths for complex optical shapes | Med | Perform metrology based corrective tool paths that can create sub-micron accurate surfaces | 6 | May 2016 |
| Optimize UFF and UltraSonic grinding processes | Low | Efficiently remove material to create desired surface to specification | 6 | April 2017 |
| Develop UltraSurf metrology for measuring complex optical shapes | Low | Measure and analyze data to sub micron accuracies | 6 | January 2017 |
| Demonstrate manufacturing of a corrector arch | Med | Demonstrate >0.5 nm 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, 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 OptiSonic and UFF 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, 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.

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