

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2017-676

Topic # N132-121

Aerodynamic Dome Manufacturing Cost Reduction

OptiPro Systems LLC

WHO

SYSCOM: NSMA

Sponsoring Program: PMA 259
AIM-9X

Transition Target: AIM-9X

TPOC:
(760)939-1649

Other transition opportunities:
Any optical guided missile that can benefit from improvements in aerodynamic performance.

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: Despite the increase in overall system performance of low drag infrared dome systems, the capability to robustly and cost effectively manufacture them is one of the main hindrances to their adoption. In order for Defense customers and prime contractors to efficiently produce aerodynamically shaped domes, high performance CNC optical grinding, polishing, and metrology equipment is necessary.

Specifications Required: To be able to manufacture ogive domes to sub-micron tolerances.

Technology Developed: OptiSonic ultrasonic grinding technology, driven by advanced IntelliSonic software showed a 50% reduction in grinding force leading to improved material removal. UltraForm Finishing (UFF) is a patented deterministic sub-aperture polishing process. UltraSurf is the only commercially available technology that can measure surface irregularity, transmitted wavefront, thickness, wedge, tilt, and decenter for ogive shaped domes. All of these technologies enable the production of complex shaped ogive components to optical tolerances from a hard ceramic material such as polycrystalline alumina (PCA). OptiPro will reduce the cost of robust low drag infrared dome manufacturing techniques by focusing on equipment specialization and process refinement.

Warfighter Value: Modern optical designs can deviate from the traditional spherical and aspherical shapes in order to maximize overall system performance. For the case of missile domes this overall system performance can include other factors aside from optical performance such as aerodynamic drag, time to target and damage sustained from environmental conditions. To account for these factors, the traditional spherically shaped dome is replaced by a bullet like ogive shape. Typically these systems will utilize hard ceramics materials such as polycrystalline alumina (PCA).

WHEN

Contract Number: N68936-15-C-0014 **Ending on:** August 12, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Develop ogive manufacturing process	Med	Can repeatably manufacture ogive domes to specifications in a variety of materials	5	December 2016
Develop and build ogive-specific manufacturing platforms	Med	Optimized grinding and polishing machine that can cost-effectively manufacture ogive domes	6	December 2017
Refine ogive metrology	Low	Can qualify accuracy of metrology to near interferometric tolerances	6	July 2018
Demonstrate dome manufacturing capability	Med	Can make ogive domes in various materials and sizes to specified tolerances in a timely manner	6	November 2018

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 OptiSonic, 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 OptiSonic, 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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