

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-265 F/A-18 Hornet/Super Hornet

Transition Target: Infrared Search and Track (IRST) Sensor Pod

TPOC: (301) 342-0470

Other Transition Opportunities: Any program that utilizes conical windows and domes and/or optical components using expensive materials such as Germanium will benefit from this technology. The cost saving methodologies developed under this contract are not specific to the domes we have been focusing on and are rather adaptable to many others.

Notes: Since receiving our first SBIR grant, OptiPro has grown from less than 15 employees to more than 90 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 reinvested in the company to increase technological improvement and commercialization of technologies. MRL Readiness Level was used in the Milestone Assessment table (TRL Column).



<https://media.defense.gov/2020/Aug/17/2002478346/-1/-1/0/200816-N-FQ453-1012.JPG> & 2022 Copyright OptiPro

WHAT

Operational Need and Improvement: In the last 20 years, significant strides have been made in new growth methods for near-net shapes (e.g., edge-defined film-fed growth), treatments (e.g., anti-erosion coatings), and materials (e.g., ceramics, spinels) for use in mid-wave (MW) and short-wave (SW) infrared (IR) windows and domes. During the same period, almost no investment has been made to expand the availability of materials for LWIR use, and the number of available U.S. suppliers for relevant processes and coatings has dwindled. A single LWIR germanium dome for military applications can cost over \$200K, can take up to one year to produce, and may require post-processing and/or coatings and treatments from foreign vendors.

Specifications Required: Innovative sources and methods are sought for new materials, growth techniques, and/or treatments to enable production of multi-spectral (MWIR through LWIR) windows and domes to 10 inches across, with strength and optical properties equal to or exceeding those made of germanium. Produce and provide antireflection coatings, and characterize the optical performance of five hemispherical domes of a to be specified diameter less than 8 inches. Demonstrate (1) optical transmission greater than 70% in both the mid-wave and long-wave optical bands, with optical transmission loss and wavefront error less than or equal to that observed, and (2) scratch and rain erosion resilience equal to or greater than that observed, for 0.25-inch-thick germanium slabs of the same thickness. Ensure that domes exhibit transmission to temperatures of 120°C and 12 microns, with target per unit cost of below \$50K and production lead time less than 5 months.

Technology Developed: Cost-effective germanium dome manufacturing: Utilizing OptiPro 5-axis Ultrasonic optical grinding machines, the method of scoop-grinding effectively removes large pieces of material when creating dome blanks. These pieces are then recycled for up to 50% of the material purchase price. Once scoop-ground, the domes are then processed using a combination of OptiPro's UltraForm Finishing (UFF) and CNC High Speed Polishing machines to achieve the desired irregularity and surface roughness.

Warfighter Value: Would provide an order- of-magnitude reduction in production time and cost for windows and/or domes suited for long-wave infrared windows and domes.

WHEN

Contract Number: N68335-21-C-0173 **Ending on:** Jan 05, 2023

| Milestone | Risk Level | Measure of Success | Ending TRL | Date |
|---|------------|--------------------|------------|--------------|
| Procure Silicon & Germanium Material and Scooping Tools | Low | 10/10 | 2 | 2nd QTR FY21 |
| Install and Integrate Advanced Filtration Systems | Low | 10/10 | 6 | 3rd QTR FY21 |
| Scoop-Grinding of 9" Silicon Domes | Medium | 10/10 | 5 | 4th QTR FY21 |
| Scoop-Grinding of 9" Germanium Domes | High | 10/10 | 6 | 2nd QTR FY22 |
| OptiSonic & UFF Grinding Process Development | Low | 8/10 | 5 | 2nd QTR FY22 |

HOW

Projected Business Model: OptiPro Systems, located in the greater Rochester (NY) area, has been providing precision machine tools and Mastercam software for New York state manufacturing companies for more than 40 years. OptiPro was founded on the principles of sales integrity combined with unprecedented service and support. Maintaining this business model allowed OptiPro to become a world leader in designing and manufacturing innovative grinding, polishing, and metrology machines 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 manufactures and sells our machines at our facility in Ontario, NY. Typical lead time to build these platforms is 16-20 weeks.

Company Objectives: OptiPro will be looking to provide insight on the latest developments with OptiSonic, high speed polishing, and UFF 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: Successful technology development would have applications in commercial photonics and thermal analyses. This technology will have applications in any dual-band infrared remote sensing application.
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