



The [Defense Business Accelerator, or DBX, Microelectronics Challenge](#) aims to revolutionize how the Department of Defense (DoD) drives the development of dual-use technology, which can be used for both civilian and military applications. (Learn more about the challenge following the story.)

DBX Awardee Story: Momentum Optics Peers into The Future

A dizzying array of products rely on glass optics, from satellites that the National Aeronautics and Space Administration (NASA) launches into space and endoscopes used by medical practitioners around the world, to quantum computing applications that could revolutionize day-to-day life and next-generation, energy-based weapons to improve our national defenses. But while the need for optical components may have grown tremendously, there have been far fewer advancements in how they're manufactured.

Most producers still rely primarily on rotary-based techniques to cut or polish the glass, placing restrictions on custom designs. As a result, most off-the-shelf optics have a symmetric shape. Meanwhile, custom optics can take as long as two months to build. And they're expensive, often in the thousands of dollars per component. It's why so many companies end up re-designing their products to accommodate what's commercially available, often at the sacrifice of end performance.

That significantly impacts innovation. It's why [Momentum Optics](#) co-founder Jeremy Goeckeritz set out to find a faster and cheaper way for businesses to get the exact components they need. The company is pioneering a novel way to manufacture free-form optics that promises to deliver a transformative improvement in cost, production timelines and precision over current methods.

"We can make optics in any kind of shape that you can imagine, which is incredibly challenging with today's tools," said Goeckeritz. "With our technique, you don't have to change your design and sacrifice performance to buy off-the-shelf. Instead, you can have us manufacture the exact optic you need in the quantities you want to enable your future product."

Armed with decades of experience in the semiconductor industry, as well as a doctoral degree in electrical and computer engineering with a dissertation in optics, Goeckeritz had the expertise needed to build this next-generation production system. But advanced manufacturing is expensive. And while Momentum Optics had enough early backing to get a proof-of-concept assembled, the company needed more funding to build a factory floor-ready machine.

On the advice of an advisor, Goeckeritz applied for the DBX Award. Along with [seven other companies](#), Momentum Optics won \$1.675 million, enough to push the company to its next phase of growth. And unlike other funding mechanisms, DBX is streamlined with the flexibility needed to align funding with business needs. That made it easier for Goeckeritz and his team to quickly get started on building a working prototype. And now, they're able to leverage the award to help secure additional funding.

"It was much easier than I thought it was going to be. And it was faster than anything else I've used," said Goeckeritz. "Prior to DBX, investors looked at us as a pretty high-risk venture. It's been a catalyst for us moving forward. An investor can see there's clearly a use case for this technology, and a clear path towards a return on investment."

Broad Appeal

Momentum Optics had two early backers: The National Science Foundation (NSF) and NASA. And while the use cases differ, the interest by both agencies signals the wide appeal of this new optics manufacturing technique.

For the NSF, the broad applications of this technology was incredibly exciting. A company building a quantum computing application, for example, might need the optical surface to be within hundreds of nanometers of a certain target. To build smaller, more lightweight virtual reality headsets, manufacturers need to decrease the size and weight of the components. Next-generation direct energy weapons need optics that can withstand huge amounts of power, a big investment area for the U.S. military. And for NASA, launching a satellite into orbit is expensive – even a small one, or what is commonly referred to as a cubesat. The fewer optics used and the lighter they are, the cheaper it is to launch.

In all of these use cases, traditional manufacturing techniques fall short. Legacy methods struggle to provide the same precision, particularly for freeform optics, and cost-per-performance as the new approach that Momentum Optics is working on, according to Goeckeritz. Instead of a rotary polishing tool, the company relies on a laser-based, non-contact method to shape the glass. That significantly expands the design possibilities, while also cutting down how long it takes to manufacture the components. There's also less impact to the glass, leading to more polished optics that also have a very high laser damage threshold.

"You have nanometer precision sensors, with non-visible lasers and caustic chemical agents, all combined into one machine to make optics. It's incredibly challenging. But it's groundbreaking technology," said Goeckeritz.

The impact of Momentum Optics' new technology will be felt across both the private and public sectors. It has the potential to improve existing products, while also helping to unleash a new wave of innovation that won't be hampered by design limitations. And now, with DBX's help, Momentum Optics is able to seize that opportunity.

“DBX came around at the perfect time for us,” said Goeckeritz. “Now, we can more confidently transition from proof of concept to commercial viability, and ultimately transform how optics are manufactured.”

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What is the DBX Microelectronics Challenge?

The challenge was created by the DoD Manufacturing Capability Expansion and Investment Prioritization (MCEIP) office and is administered by the U.S. Partnership for Assured Electronics (USPAE). It provides monetary awards intended to help accelerate the commercialization of vital, next-generation capabilities that also have defense applications. With the additional funding from a DBX Award, companies can get the resources needed to overcome critical manufacturing or technology development hurdles to reach full-scale production more quickly.

With the DBX Award, DoD and USPAE are helping companies build a sustainable business to ensure the supply of essential hardware for both commercial and defense needs.

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