Circle

Optics 360° Pulse

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Read more

Modernizing Airspace Security with 360-degree C-UAS Awareness

Circle Optics is modernizing airspace security with Pegasus, the world's first stitch-free, 360-degree panoramic imaging system for airspace security. Our technology provides unmatched clarity and situational awareness, eliminating the blind spots and high costs associated with traditional C-UAS solutions. Pegasus is designed for real-time detection and tracking of airborne threats, ensuring reliable performance in the most demanding environments.

Complete Spatial Awareness
360° EO/IR sensors provides awareness to detect and track drone swarms without blind spots.

Rapid & Flexible Deployment
Lightweight, portable nodes secure a site in minutes for fixed, or mobile operations.

Scalable Networked Defense
Plug-and-play sensors create a shared, 360° common air picture across a scalable network.

Affordable, High-Fidelity Detection
A cost-effective alternative to radar that reduces false alarms and delivers 2.5x more pixels on target than alternative optical systems.

Complete Spatial Awareness

Pegasus provides a persistent, 360° view of the surrounding airspace in both electro-optical and infrared. This stitch-free, gimbal-free system eliminates the blind spots inherent in gimballed turrets and the delays of stitched camera feeds, alowing operators to instantly visualize every incoming drone vector.

Rapid & Flexible Deployment

Secure any location against UAS threats with unparalleled speed. The lightweight, 7 lb. backpack-deployable Pegasus node can be set up by a single operator in under five minutes. Other deployment configurations include fixed-site mounts for 24/7 survei lance, and vehicle mounts.

Scalable Networked Defense

Individual Pegasus nodes are designed to work together, creating a unified and resilient sensor network. These plug-and play nodes seamlessly share tracking data and cues across units, forming a comprehensive common air picture. This system can augment existing radar data with visual information to differentiate drones from other objects or replace radar entirely.

Affordable, High-Fidelity Detection

Pegasus provides a cost-effective alternative to expensive radar and turret systems, delivering persistent C-UAS capabilities at an attritable cost. This high-fidelity performance is achieved through a 96% optical fill-factor, which enables longer-range detection by putting 2.5x more pixels on a target than alternate optical systems.

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These quotes and features were extracted from conversations and blogs that were included in our 2025 social media strategy. These pages represent only a sliver of a sliver of our activities and engagement with brilliant engineers and visionary leaders across aerospace, imaging and immersive technology verticals.

Jennifer Sertl,
Editor 360 Pulse Publication

The Growing Drone Threat to Critical Infrastructure

by Zak Niazi

Drones Are Expanding the Battlefield

When most people picture drones being used as weapons, their minds go straight to the war in Ukraine. Small quadcopters dropping improvised explosives on soldiers in trenches have become one of the defining images of modern conflict. But as alarming as that is, it's not the only way drones are shaping warfare. Militaries are increasingly turning drones against critical infrastructure, and it's a troubling development for those of us concerned about security closer to home. Drones are not just weapons for battlefields; they are tools that can disrupt everyday life on a massive scale.

Russia's drone attacks on Ukraine's energy grid have become a central part of its strategy. These are not one-off strikes, but sustained campaigns designed to maximize disruption. In one assault, Russia launched nearly 200 drones in a coordinated wave. Rolling blackouts across multiple regions have resulted in widespread disruption to heating and water systems, placing enormous pressure on civilian resilience during the dead of winter. A similar story has unfolded in the Middle East, where Houthi forces have repeatedly targeted Saudi Arabia's oil and gas infrastructure. Refineries, pipelines, and export terminals have all been hit by drones, causing billions of dollars in damage and shaking global markets. What we are seeing is not random experimentation—it is a deliberate use of drones to destabilize societies by striking at the infrastructure that keeps them running.

A Growing Domestic Vulnerability

Several developments make this risk particularly pressing. First, commercial drones are cheap, accessible, and capable. You don't need military-grade equipment to cause major problems—modifying a $500 drone to carry a small explosive can be enough to disrupt operations at a critical facility. Second, swarming tactics are becoming more common. Instead of having a single drone to intercept, defenders face dozens or even hundreds coming from multiple directions, which is designed to overwhelm traditional defenses. Third, drones are increasingly autonomous. They can be pre-programmed to fly long distances, coordinate with other drones, and strike targets simultaneously. Attackers no longer need to be physically nearby, and defenders may have little warning before multiple sites are hit at once.

The parallel to September 11 is difficult to avoid. On that day, terrorists hijacked multiple airplanes and struck multiple cities before the nation could react. A future drone attack could follow a similar pattern, with hundreds of explosive-fitted drones quietly positioned in garages and warehouses across the country and pre-programmed to launch simultaneously toward their targets. The scale of such an attack is hard to overstate—and yet the technical barrier to carrying it out is far lower than hijacking an airliner.

Recognizing this danger, agencies like the Department of Homeland Security, Department of Energy, and the Federal Aviation Administration are all expanding programs to detect and counter unmanned aerial systems around critical infrastructure. New legislation proposes giving airports, utilities, and even local agencies more authority to deploy counter-UAS solutions. The market is responding too. Counter-drone systems today are worth about $1 billion globally, but analysts expect that number to grow to more than $10 billion by 2030. Critical infrastructure, along with defense and public safety, is expected to be one of the fastest-growing areas.

But there's a sobering reality behind those numbers. Even as investment increases, detection capabilities have not kept pace with the threat. In an interview earlier this year, General Gregory Guillot, head of NORAD and NORTHCOM, admitted, "the threat got ahead of our ability to detect and track the threat." If the U.S. military—with its enormous budgets and sophisticated systems—struggles to detect drone swarms, what chance does a regional utility or a local airport have?

Closing the Detection Gap

The core problem lies in the nature of the threat itself. Drones are small—sometimes only six inches across. They can approach from any direction and often fly low to avoid radar. In urban environments, radar systems are already strained by interference and congestion. Even when a radar system spots something unusual, operators still need visual confirmation to know whether the blip is a bird or a drone before deciding how to respond. That confirmation typically comes from cameras, but cameras have limitations too. Long-range gimballed optics can track a target miles away, but they only look in one direction. When facing a swarm, they are like a game of whack-a-mole: point the camera at one drone, and dozens more slip through elsewhere.

For years, the "holy grail" has been persistent, 360-degree visual coverage—eyes in every direction, all the time, with enough clarity to distinguish a drone from background clutter. Achieving this has proven difficult. Single wide-angle cameras suffer from distortion when stretched across an entire spherical field of view. Multi-camera systems introduce parallax errors, creating double images and gaps where seams don't align correctly. These technical challenges mean most facilities still rely on partial, directional coverage that leaves them vulnerable.

This is where innovation becomes critical. At Circle Optics, we've been working to solve exactly this problem with our Pegasus system. Pegasus offers true 360-degree coverage in both electro-optical and infrared spectrums without distortion or parallax issues. That means no blind spots, no double images—just seamless, persistent monitoring in every direction. Importantly, it does so at ranges that matter. Pegasus can detect and track drones from over a kilometer away, giving operators crucial time to respond, and can also provide visual recognition at several hundred meters. For higher-threat environments, Pegasus Pro extends that detection range to over two kilometers, even for small drones only a foot across.

Perhaps just as important as capability is cost. Traditional gimballed optics can cost upward of $1 million dollars per system, placing them out of reach for most non-military operators. Pegasus comes in at a fraction of that price, making it a realistic option for airports, utilities, data centers, and other critical facilities that desperately need protection but cannot afford military-grade budgets.

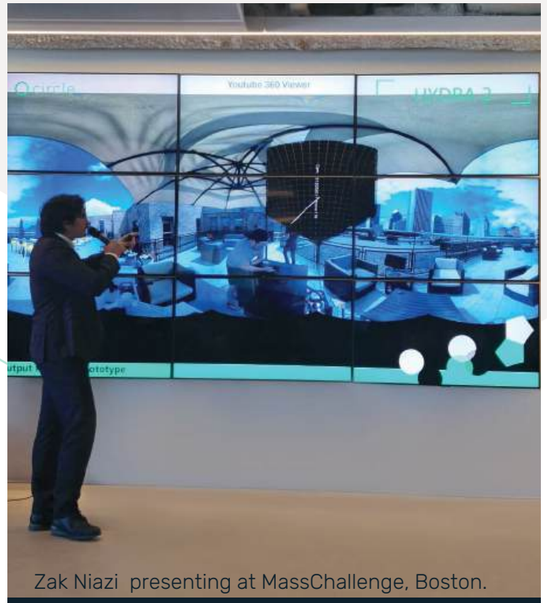
Of course, no single system can solve the problem on its own. Drone defense requires a layered approach. Early detection systems like Pegasus provide the persistent "eyes" needed to spot incoming threats.

Radar and radio-frequency sensors add additional tracking and classification. Finally, mitigation tools—whether signal jammers, directed energy, or physical interceptors— neutralize the drones before they reach their targets. Each element is necessary, but without reliable detection across all directions, the rest of the chain is compromised.

Looking ahead, the need for robust detection and defense will only grow. Drone technology is advancing rapidly, with longer ranges, heavier payloads, and greater autonomy. The barriers to entry are shrinking, and the pool of potential adversaries is expanding. In such an environment, staying ahead of the threat is not optional—it's essential.

The challenge is daunting, but it is also solvable. The same qualities that make drones disruptive—their speed of innovation, their accessibility, their adaptability—are also qualities that drive innovation in defense. By developing systems that are smarter, more persistent, and more affordable, we can close the gap between threat and response.

Ultimately, this is not just about protecting infrastructure. It is about protecting the resilience of society itself. Energy grids, transportation hubs, communication networks, and data centers are the backbone of modern life. A successful drone attack on any one of them could cause cascading effects, disrupting everything from hospitals to supply chains. Building effective defenses now ensures that when—not if—a major drone attack is attempted, we will have the tools in place to detect it early and respond decisively.



Zak Niazi presenting at MassChallenge, Boston.

At Circle Optics, we believe Pegasus represents a critical enabling piece of that puzzle. By giving operators the ability to see in every direction, all the time, with the acuity needed to track multiple threats simultaneously, we help level the playing field.

Our goal is simple: to ensure that when the day comes, society is not blindsided by a capability that outpaced our defenses. The threat is real and growing—but with the right tools, so is our ability to meet it.

Building Situational Intelligence: Where Pegasus Stands Today

by Ian Gauger

At Circle Optics, we've always believed that the future of autonomy will depend on panoramic vision—true situational intelligence delivered in real time, without compromises in fidelity, stitching, or latency.

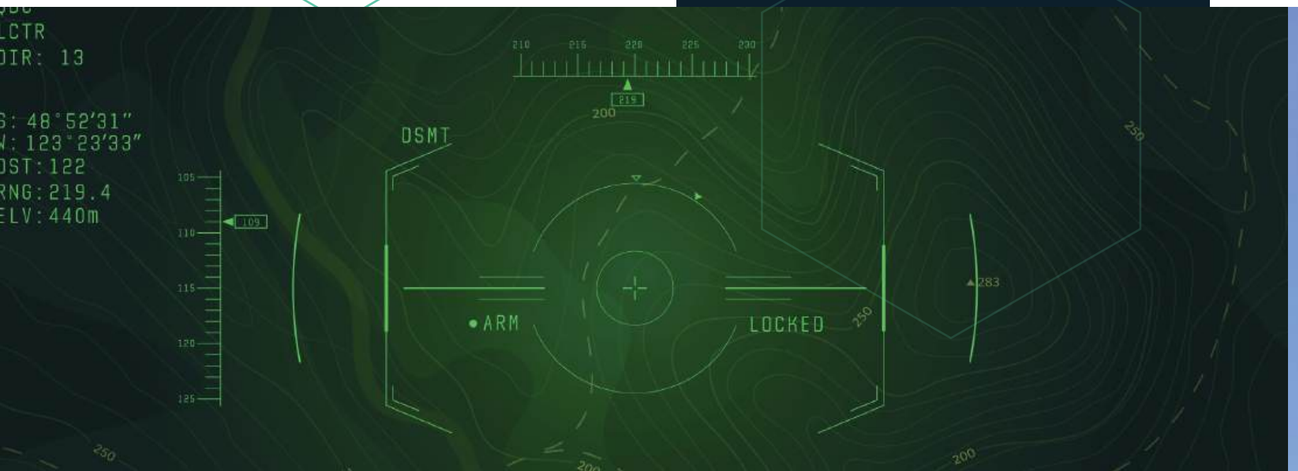
Over the last several years, we've taken that belief from theory to reality. Today, our Pegasus system is no longer a lab prototype—it's a fully functional, field-tested platform with demonstrated performance, a clear development roadmap, and a growing number of partners interested in what comes next.

A Platform Built for Real-Time Autonomy

Pegasus is a compact, multi-camera system designed for Class 2 and 3 UAVs. Its core innovation lies in how it captures and processes panoramic imagery. Unlike traditional multi-camera systems that require post-processed software stitching for latency, parallax distortion, and image artifacts, Pegasus performs a real-time, optical-level image assembly.

This is not just an engineering achievement—it's an operational breakthrough. The result is an annular field-of-view (40° vertical, 180—360° horizontal) with low-latency video output that is immediately usable by onboard GPUs for detect-and-avoid (DAA) or optical navigation at the edge.

We've demonstrated that Pegasus can detect and track a Cessna-sized object at approximately 1.8 nautical miles. Its larger sibling, Pegasus Pro, extends that range to 3.6 nautical miles. Both systems are passive, high-fidelity, and designed with low-SWaP constraints in mind, making them viable for both airborne and ground-based use cases.



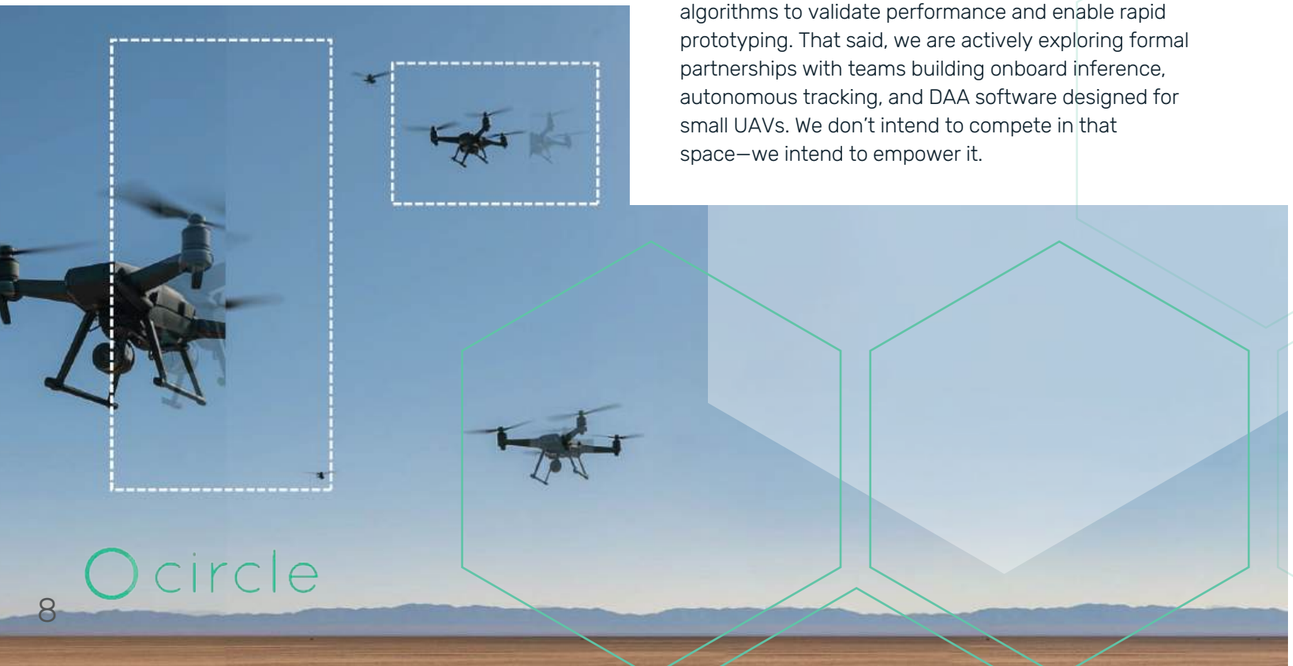
Why Optical Matters Now

Radar has long been the standard for DAA, and for good reason. It provides long-range awareness, all-weather capability, and excellent signal return under ideal conditions. But radar has limitations—especially in small UAV operations or sensitive defense applications.

Radar systems emit detectable energy, require substantial power, and often lack the resolution to distinguish fine-grained differences between targets. Is it a bird or a drone? Is the drone friendly or a threat? Within a swarm of drones, do any have an identifiable payload such as an explosive device? In many cases, radar alone can't tell you.

Optical systems, particularly panoramic ones like Pegasus, solve this problem. By delivering pixel-rich, passive imagery, our platform enables real-time object classification, multi-object tracking, and swarm identification—essential capabilities in an era when autonomy, counter-UAS, and layered sensing are converging.

What we've built is not a replacement for radar. It's a complementary asset that enhances overall system intelligence. In many missions, optical sensing is the only way to achieve the level of discernment and tactical context that decision-makers now require.



Our Current Technical Focus

Today, we're focused on three core development tracks:

1. System Weight Reduction
We've made significant strides in reducing the physical footprint of Pegasus. Current weight is approximately 3.5 kg, with near-term optimization expected to bring that down further. This makes the system deployable on a wider range of Group 2 UAVs.

2. Production Optimization
Our current Pegasus units are built as precision prototypes. Every component—especially optics—has been custom-fabricated using diamond-turned elements. This ensures unmatched clarity but comes at a cost. A single Pegasus unit is currently cost prohibitive for most customers due to the materials and labor required. With Series A funding, we are prepared to move into scaled production, adding tooling, sourcing specialized technicians, and streamlining assembly. At scale, we anticipate a significant reduction in unit costs, placing Pegasus dynamically alongside radar systems. At scale, we expect unit costs to fall into the $25–$35K range, positioning us competitively.

3. Software Partnerships & Integration
Circle Optics is a hardware-first company. We build the platform. But we know our value multiplies when paired with best-in-class software. We're currently testing Pegasus using standard YOLO object detection algorithms to validate performance and enable rapid prototyping. That said, we are actively exploring formal partnerships with teams building onboard inference, autonomous tracking, and DAA software designed for small UAVs. We don't intend to compete in that space—we intend to empower it.

Expanding to Ground and Class 1 Use Cases

While Pegasus was originally designed for airborne detect-and-avoid, its application is broader than we initially imagined. We're seeing growing interest in ground-based deployments—particularly pole-mounted systems for drone traffic monitoring, base perimeter awareness, and multi-sensor fusion.

We're also investing in our next major evolution: a Class 1 drone-compatible system that uses the same underlying optics but with drastically reduced weight and power requirements. This version will extend our platform's applicability across both commercial and tactical use cases.

Whether airborne or fixed, the mission remains the same: deliver wide-area optical intelligence without compromise.

Bringing Pegasus to Market

We are currently in conversations with several organizations—government agencies, primes, and system integrators—interested in participating in paid pilot programs to test Pegasus in real-world settings. These pilots serve multiple functions: validating operational requirements, informing integration workflows, and identifying performance metrics that matter to end-users.

We're approaching this stage with discipline. We're not offering free demos. Each engagement is designed to be mutually beneficial with a clear goal, timeline, and feedback loop. We're open to flexible commercial structures, including interim sales, milestone-based integrations, and co-development models aligned with government grants or customer funding.

The ideal partner at this stage is one who:

- Needs panoramic vision for DAA, surveillance, or perimeter security;
- Has an existing software stack or integration roadmap;
- Is prepared to co-invest time and technical resources;
- Is focused on deployment—not just experimentation.

As of August 2025, Circle Optics is operating from a strong foundation. Our core technology is mature. Our engineering processes are repeatable. Our strategic direction is aligned with current defense and aerospace trends—particularly the growing need for passive, wide-area situational intelligence.

With the right partners, we are ready to scale.
The next six to 12 months will be about demonstrating reliability, building integration playbooks, and securing the capital needed to scale manufacturing. Our goals are straightforward:

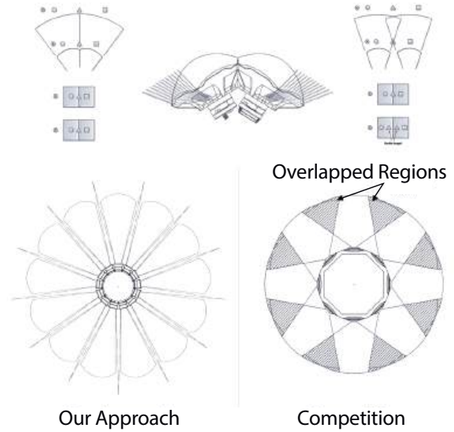
- Reduce cost per unit.
- Expand production capacity.
- Secure long-term software alliances.
- Deliver value to users in real operational environments.

We believe that optical systems like Pegasus will be central to the future of autonomy. And we're committed to ensuring that the future is powered by precision, clarity, and trust.

If you're interested in seeing Pegasus in action or discussing how it might integrate into your platform, let's talk.

A fundamental breakthrough in

Circle Optics' patented technology aligns multiple fields of view at the level of the optic, physically eliminating parallax distortion before the image is even created.



Employee Spotlight:

Phil McMillen, Director of Operations

When you meet Phil McMillen, Director of Operations at Circle Optics, one of the first things you notice is the steady blend of technical depth and operational discipline that defines his leadership. With more than three decades in imaging and advanced technology, McMillen's career began at Eastman Kodak, where he learned the rigor of systems integration, risk management, and delivering at scale.

That foundation carried him to IMAX, where he led high-stakes projects—including a $30 million laser projection program—and worked alongside Andy Kurtz, who would later recruit him to Circle Optics.

When the Circle Optics team began forming in 2019, Chief Operating Officer Ian Gauger recalls that there was no hesitation in bringing McMillen on board:
"Phil was one of our first employees when we started to form the team in 2019. He has been invaluable in a project management role and I am excited to see him apply his skills and abilities in his new role as Director of Operations."

McMillen joined not for scale or stability, but for the chance to help shape something bold from the ground up. He quickly became a cornerstone of the company's operational backbone, applying the discipline he honed at Kodak and IMAX to the fast-moving, collaborative world of a startup.

"What drew me to Circle Optics was the opportunity to make a direct impact. In a smaller team, every voice matters and every decision has weight. It's not about hierarchy—it's about building something together."

Clarifying the Director of Operations Role

For six years, McMillen served as Circle Optics' Senior Project Manager, guiding the delivery of prototypes that would become the Hydra and Pegasus camera system lines. His promotion to Director of Operations in 2025 formalized the breadth of responsibility he had already been carrying.

In his current role, McMillen oversees high-level project management, procurement, and the critical task of aligning Circle Optics with certification standards across aerospace and defense. These certifications, from cybersecurity to quality management, aren't just boxes to check—they're the trust signals that allow Circle Optics to compete for contracts with primes and agencies.

His approach to vendors is equally deliberate. While large-scale suppliers are often geared toward volume manufacturing, Circle Optics requires flexibility for prototype development. McMillen never overpromises, but instead emphasizes honesty and partnership.

"Operations is where ambition meets discipline. My role is to make sure the incredible technology our engineers develop can stand up to industry requirements, vendor expectations, and customer trust."

It's a philosophy that reflects both his big-company experience and his appreciation for the transparency that startup culture demands.

Mentorship, Gaps, and Guiding Growth

Beyond his operational expertise, McMillen is known for his mentorship. Colleagues often turn to him not only for process clarity but also for perspective. His own reflection on what has carried him through a long career is the ability to identify gaps—in systems, in processes, and in people's growth.

This, he argues, is one of the most valuable skills for young professionals to cultivate. Project management is never a straight path; it's about anticipating what's missing, asking the right questions, and mobilizing teams around solutions.

"Stay adaptable, ask questions, and learn how to identify the gaps. Projects rarely go exactly as planned. What matters is how you respond, how you communicate, and how you bring people with you through the process."
For McMillen, Circle Optics provides an ideal environment to model this kind of leadership. In a small, agile team, mentoring isn't confined to formal programs; it happens in real time, in the flow of problem-solving, in hallway conversations, and in design sessions where everyone contributes.

By anchoring his leadership in both structure and humanity, McMillen ensures Circle Optics builds groundbreaking technology and shapes the next generation of project leaders.

Closing Reflection

From Kodak to IMAX to Circle Optics, Phil McMillen's career reflects both depth and adaptability. His story is one of bridging ambition with discipline, technology with people, and vision with operational reality.

As Director of Operations, McMillen ensures that Circle Optics' imaging innovations can stand up to the exacting standards of aerospace and defense. As a mentor, he teaches others to see what's missing and build toward what's possible.

In a company built on situational intelligence, McMillen himself embodies the principle: clarity in complexity, and the wisdom to transform gaps into growth.

Forging the Future:
Berkshire Innovation Center

What does it take to catalyze the next era of optics, advanced sensing, and human-centric innovation? Sometimes, it requires stepping outside a home ecosystem and immersing in a new one. On June 24, 2025, members of the Circle Optics team traveled from Greater Rochester to Pittsfield, Massachusetts, to visit the Berkshire Innovation Center (BIC) and EMA Advanced Optics Lab—and what they discovered was more than synergy; it was resonance.

About Berkshire Innovation Center

Located in Pittsfield, Massachusetts, the Berkshire Innovation Center serves as a dynamic hub for advanced manufacturing, life sciences, and aerospace innovation. Supporting over 30 member organizations—including regional manufacturers, universities, and national partners—BIC provides access to CNC machining, metrology, 3D printing, cleanroom facilities, and collaborative lab and conference space. As seen in the ecosystem image below, BIC fosters a vibrant community of public and private sector leaders committed to accelerating applied research, commercialization, and workforce development across the Northeast.

Among the specialized resources housed within BIC is Electro Magnetic Applications Inc. (EMA), a commercially independent space simulation laboratory that tests aerospace technologies under extreme conditions. Their facility includes a vacuum chamber to replicate the space environment, thermal cycling capabilities, and radiation simulation using electron guns. These assets are critical for validating space-bound imaging systems under high-stakes mission parameters. Robert Smith, Lab Technician II, shared detailed insight into their protocols and capacity to accommodate accelerated timelines for private-sector innovation. It's rare to find such a resource that isn't gated by government backlogs or institutional red tape. For companies like Circle Optics, which develop real-time, precise imaging solutions for aerospace, EMA offers exactly the kind of responsive, high-integrity environment needed to scale.

Just next door, the Berkshire Innovation Center provides critical infrastructure for applied R&D, prototyping, and advanced manufacturing collaboration. With over 30 member organizations spanning precision manufacturing, aerospace, defense, biotech, and materials science, BIC plays a catalytic role in bridging innovation and production. The facility is equipped with CNC machines, metrology labs, 3D printers, cleanroom capabilities, and conference areas designed for cross-disciplinary collaboration. For Circle Optics and other Luminate alumni, BIC represents an operational testbed with a regional foothold for scaling, iteration, and industry benchmarking across the Northeast corridor. For Circle Optics and the broader Luminate Accelerator community, BIC serves as a strategic partner that understands the arc of innovation from concept to commercial readiness.

During their visit, Circle Optics engaged in an in-depth dialogue with Dennis Rebelo, Ph.D., whose contributions to the conversation transcended the technical realm. Dr. Rebelo shared insights from his decades of research on integral psychological profiling, which aims to help individuals and teams discover their core operating styles and how these patterns affect leadership, collaboration, and adaptability in uncertain environments. Dr. Rebelo emphasized, "There is no technical innovation without a psychological evolution. What we build externally is always shaped by what we believe internally."

Creating a partnership

Rochester is home to over 300 optics and photonics manufacturers within a 90-mile radius, including the University of Rochester's Institute of Optics, RIT's Carlson Imaging Center, and the globally recognized Luminate Accelerator. With headquarters here, Circle Optics recognized the potential for cross-regional collaboration with BIC and EMA.

"Access to BIC's advanced prototyping environment gives Rochester startups a practical advantage—they can design locally and validate regionally. That kind of agility strengthens the entire innovation pipeline," says Ian Gauger, Board Advisor for Startup Innovation.

Luminate companies seeking robust testing and scalable infrastructure could benefit from EMA's advanced capabilities and BIC's development ecosystem. In turn, Circle Optics and its partners could bring value to Berkshire's emerging optics and photonics cluster. Ian Gauger continues, "We're designing more than products—we're designing adaptive systems that can thrive in complexity. The Berkshire partnership offers the kind of ecosystemic thinking that scaling companies require."

The Circle Optics team came away with a renewed appreciation for regional specialization and shared-use innovation infrastructure. From stress-testing next-gen lens systems at EMA Labs to refining product design at BIC, the Northeast innovation corridor holds untapped potential for accelerating space and sensing technology development. As Circle Optics continues to scale, the team remains committed to a vision where optics help not only to see better, but to understand better.

The BIC Community

Berkshire Innovation Center

Five Key Insights from Dr. Dennis Rebelo on Narrative Identity and Innovation

Dr. Dennis Rebelo, Chief Learning Officer at the Berkshire Innovation Center, recently joined Circle Optics' 360° Pulse podcast with our Vice President of Marketing, Jennifer Sertl. As the creator of the Peak Storytelling™ Model, Dr. Rebelo shared how narrative identity fuels innovation. As his framework shows, the way we make meaning of our experiences directly shapes how we lead, collaborate, and invent.

The Peak Storytelling™ Model helps individuals organize life experiences into cohesive narratives, creating what Dr. Rebelo calls narrative coherence—a capacity increasingly vital in today's rapidly evolving organizations. Applied across different domains, from athletes and executives to veterans and students, the model enables people to transform lived experiences into stories that guide growth, resilience, and impact.

1. Storytelling enhances situational awareness

Just as Circle Optics' panoramic imaging systems deliver real-time awareness on the battlefield or in simulation environments, narrative coherence provides internal clarity under pressure. When individuals understand their own life trajectory, they operate with reduced cognitive noise and sharper decision-making. This coherence becomes essential in complex, fast-moving environments.

2. Narrative integration accelerates team scaling

Startups don't scale on product alone—they scale through people who understand how their contributions align with a shared mission. The Peak Storytelling™ Model helps team members integrate their unique experiences, speeding up alignment and reducing friction during onboarding and growth. This becomes a force multiplier for organizations moving from prototype to production.

3. Identity work builds innovation capacity

When individuals are encouraged to reflect on their peak experiences, they activate what Dr. Rebelo calls "narrative agency." This isn't just self-awareness—it's about expanding one's imaginative range. Teams with strong internal narratives are more likely to problem-solve creatively and approach challenges with confidence, resilience, and originality.

4. Culture needs structure to scale

Values and culture can't rely on charisma or legacy alone—they need to be operationalized. Dr. Rebelo's framework provides a way to codify culture through storytelling, enabling organizations to grow without losing coherence. As Circle Optics continues to expand government and commercial partnerships, this structured human layer becomes as important as any technical spec. (Read more about Circle Optics' culture—built on innovation, know-how, and synergy—on our [Team Culture page].)

5. Reflective practice elevates technical leadership

Engineers and system architects are rarely invited into narrative work, yet they stand to gain the most. STEM professionals often operate with exceptional analytical precision—but once they understand the why behind their journey, they lead with a deeper sense of conviction. That shift has the power to transform technical output into human-centered innovation.

The episode reaffirmed a central truth: technology may be built in the lab, but it is shaped by how people think, feel, and act together. At Circle Optics, we are investing in both breakthrough optics and breakthrough human systems. That dual lens enables us to not only deliver next-generation imaging but to also lead the field in bringing innovation to life.

Circle Optics in Focus: Mechanical Team

At Circle Optics, our mission is to deliver situational intelligence for a safer, more immersive world. Through our patent-stitch-free non-parallax panoramic imaging systems, we help defense, aerospace, and robotics professionals enhance how they perceive and respond to complex environments.

As we begin our commercialization journey—with 18 employees, interns, consultants, and 23 patents pending—the spotlight is shifting not only toward our founders and leadership, but d the people behind the lenses and mechanisms. In this feature, we highlight the mechanical team: the engineers and technicians whose day-to-day efforts bring Pegasus, Hydra, and future systems to life.

Their voices remind us that engineering breakthroughs don't happen in isolation. They happen when precision, iteration, and hands-on troubleshooting come together in service of reliability and performance.

Carlos Terrero: Precision, Constraint and Breakthroughs

Senior Mechanical Engineer Carlos Terrero has been with Circle Optics for three years. He often leads conversations about what differentiates the company's imaging systems not just in optics, but in the mechanical integrity underpinning calibration, alignment, and repeatability.

"In the Pegasus system, we have multiple channels that must be precisely oriented relative to each other. We employ exact constraint methodologies so that when you remove and replace a channel, it returns to the same position every time. This makes the system more robust against thermal and vibration effects and lifts the burden off software calibration—a real breakthrough in how we build cameras."

For Terrero, mechanical excellence comes down to precision. With multiple lenses working together, even the smallest misalignment can compromise the system. By applying exact constraint methods, the mechanical team ensures that components remain stable, repeatable, and less sensitive to environmental stresses. This practical approach strengthens the integrity of the Pegasus platform and reduces the amount of corrective work required by software.

He explains that these methods essentially make the hardware itself do more of the work. Instead of relying on software patches after the fact, the system is designed to hold its alignment from the outset. That reliability becomes a key advantage for customers who need confidence that the imaging system will perform consistently in the field.

Terrero's perspective reflects the depth of experience he brings to Circle Optics. His focus on repeatability and robustness lays the foundation for designs that both achieve first light and maintain performance through real-world conditions.

Bob Stanchus: Iterative Prototyping and Elegant Solutions

As a complement to Terrero, Senior Mechanical Engineer Bob Stanchus was part of our initial engineering team that laid the groundwork for how multiple cameras relate to each other in mechanical space. His systematic approach and wide breadth of experience with the many manufacturing processes available gives him a leg up on getting to novel solutions to those engineering challenges.

"We've been learning to work in stages rather than trying to build the entire product in one shot. By breadboarding parts of the system and using 3D printing for fixtures and even some final components, we can test and refine earlier. The result is a more elegant solution that, at first glance, looks simple—but when you look deeper into the mechanics, you see how much complexity is built into that simplicity."

Stanchus' approach is rooted in risk reduction. By prototyping modules first, the team can evaluate performance, uncover hidden issues, and refine designs before committing to a full build. This not only saves time and resources but also accelerates the feedback loop across engineering disciplines.

3D printing has become an especially valuable tool in this process. For fixtures and prototypes, additive manufacturing provides the speed and flexibility to

iterate quickly, experiment with geometries, and test new ideas without waiting on long lead times. In some cases, printed parts have even found their way into final assemblies, demonstrating both the practicality and durability of the approach.

Stanchus notes that what may appear straightforward on the outside is often the product of countless refinements. To him, elegance in engineering comes not from hiding complexity, but from refining it until the solution feels natural. His iterative mindset ensures Circle Optics doesn't just invent groundbreaking systems, but also develops them in a way that can be manufactured and trusted.

Together, Terrero and Stanchus establish a rhythm: one emphasizing precision, the other iteration. Their combined expertise creates a strong backbone for the company's mechanical capabilities.

Matthew Brophy: A New Voice from the Technician's Bench

Building on the foundation set by Terrero and Stanchus, Opto-Mechanical Technician Matthew Brophy brings a fresh, hands-on perspective. Brophy joined Circle Optics with more than two decades of experience in optics, yet he emphasizes that the work here is unlike anything he has encountered before.

"What excites me about this work is that I've never seen lenses or imaging systems like these before. Every setup is custom, and it requires troubleshooting, communication, and problem-solving on a daily basis. I don't want to be on an assembly line doing the same thing every day.Here, every challenge is different, and that makes the work both demanding and deeply interesting."

Brophy's reflections capture the essence of Circle Optics' startup culture: innovation is constant, and no task is routine. His role blends technician precision with engineering curiosity. He is responsible not just for assembly, but for diagnosing issues, adjusting alignments, and collaborating across optical and software teams to ensure systems are performing as intended.

He is candid about the challenges of balancing hands-on work with the demands of documentation:
"I'm spending probably 80 plus, or closer to 90% of my time away from the computer, so I don't always have as much time to do the documentation. I try to squeeze in windows of time in the morning or between tasks to start laying that out, then circle back to it later."

Brophy understands that documentation is essential for repeatability and for supporting the larger team. His willingness to adapt and develop processes that capture what happens at the bench strengthens Circle Optic's ability to transition prototypes into reliable products.

He also recognizes the importance of communication across disciplines. Handing off mechanical assemblies to the software team requires clear updates, precise timing, and a willingness to articulate what works and what still needs adjustment. In that sense, Brophy serves as a bridge—connecting the mechanics of assembly to the software tools that will ultimately drive the imaging systems.

Collaboration in Motion: Building Reliability Together

While each member of the mechanical team brings a distinct focus, their work is deeply interconnected. Terrero's exact constraints provide the stable backbone; Stanchus' prototyping strategies validate that backbone through iterative testing; and Brophy's troubleshooting ensures that real-world builds align with design intent.

This interplay is what makes the team effective. When Terrero designs for precision, Brophy validates whether that stability holds up under the stresses of assembly and testing. When Stanchus experiments with a new prototype approach, Brophy provides feedback on usability and manufacturability. Each perspective strengthens the others, and together they form the mechanical core of Circle Optics' innovation engine.

Their collaboration also highlights the company's broader philosophy: engineering is not a solitary pursuit, but a team sport. Mechanical solutions feed into optical designs, which in turn demand software adaptability. The success of Circle Optics depends on each of these disciplines working in sync—something the mechanical team demonstrates every day.

Left to right: Mitchell Baller, Grace Annese, David Krauthamer, Peter Stubler, Steve Feller, Dr. Anjali Jogeshwar

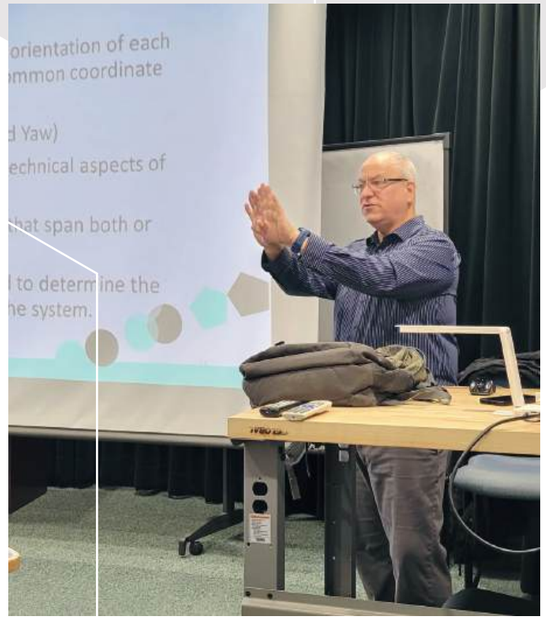
Circle Optics in Focus: Software Team

Circle Optics is pioneering a transformation in panoramic imaging. The company's patented hardware eliminates stitching and parallax—the long-standing barriers to real-time, wide-field vision. Yet, as the team itself emphasizes, hardware is only half the story. What makes Circle Optics truly distinct is the software: the algorithms, synchronization, rendering, and computation that transform photons into actionable situational intelligence.

Behind these breakthroughs is a group of engineers whose expertise spans imaging science, low-level computer systems, color fidelity, and parallel computation. Together, they are building software that doesn't just process images—it delivers trust in every pixel.

"We are not just writing code. We are designing systems that turn complex arrays of cameras into a seamless, trustworthy vision of reality, "

Peter Stubler,
Principal Imaging Scientist



Peter Stubler giving a lecture at Chester F. Carlson Center for Imaging Science

Peter Stubler,
Principal Imaging Scientist

Building on a Lifetime of Imaging

For Peter Stubler, Principal Imaging Scientist, the journey began with a family camera in middle school. That spark grew into decades at Kodak Research Labs and ultimately to leading Circle Optics' software vision.

"We're not just writing code," Stubler says. "We're designing systems that turn complex arrays of cameras into a seamless, trustworthy vision of reality."

Stubler's career offers continuity in a field that has shifted from analog to digital to immersive. At Circle Optics, he ensures that the software architecture scales with the demands of modern defense, aerospace, and simulation—bridging the elegant physics of the hardware with the immediacy of user needs.

Steve Feller,
Senior Software Engineer

From Hardware to Algorithms

If Stubler brings the perspective of image science, Steve Feller, Senior Software Engineer, approaches the problem from the other end of hardware drivers and low-level computation. His fascination began as an undergraduate tasked with writing an interface for a new camera. That project launched a career focused on how pixels are captured and delivered.

"Pete and I come at these problems from completely different directions," Feller reflects. "But that's what makes the collaboration work. I focus on how pixels are collected and delivered. He focuses on how they're processed and aligned. Together, we make the system whole."

Feller describes Circle Optics' advantage in plain terms: "Other systems can merge camera feeds, but the seams are visible, the timing is off, and the geometry doesn't hold up. Our technology allows multiple cameras to appear as one, producing both high-resolution and geometrically accurate imagery in real time."

For him, situational intelligence is Circle Optics' competitive edge. "Our systems allow operators to detect what's out there and apply algorithms efficiently. That's a huge advantage in contexts like beyond-line-of-sight flight or drone countermeasures."

Dr. Anjali Jogeshwar,
Senior Computer Vision Engineer

Precision Meets Perception

Dr. Anjali Jogeshwar, Senior Computer Vision Engineer, bridges deep theory and applied problem-solving. Her work focuses on calibration routines, data pipelines, and adaptability across conditions.

"We aren't just processing images," she explains. "We're ensuring that every pixel aligns with reality: no distortions, no parallax, no lag."

For Jogeshwar, the challenge is scale. "A proof of concept can run beautifully in the lab. But scaling that to real-world environments where lighting, motion, and environmental factors constantly shift requires adaptability at the algorithmic level."

Her emphasis is intellectual integrity: "When an operator makes a choice based on what they see through our system, they can trust it's accurate. That trust is everything."

Mitchell Baller,
Senior Computer Vision Engineer

Designing for Usability

If Jogeshwar focuses on fidelity, Mitchell Baller, Senior Computer Vision Engineer, translates that fidelity into the language of usability.

As a Senior Computer Vision Engineer, he bridges the technical demands of computer vision algorithms with the practical implementation details. "Our secret sauce at Circle Optics enables us to capture a ton of pixels," Baller notes, "Doing a 3D reconstruction, one of our biggest problems is managing all of that data."

Baller emphasizes unique challenges of a 360-degree camera system: "The operator is inherently in the shot. We capture a full spherical view, so if someone is wheeling the camera system around, you're in the shot."

Grace Annese,
Software Engineer

David Krauthamer,
Software Engineer

Rendering Reality

For Grace Annese, Software Engineer, imaging science is the intersection of art, physics, and math. With early interests in filmmaking, she now brings her talents to ensuring fidelity in panoramic systems.

"Visual fidelity means accurate data," Annese explains. "It's about trust: knowing that what you see is what is actually there."

She stresses the importance of the imaging chain: "With smartphones, you just press a button and get an image. But in truth, there's a whole chain from photons entering the lens to sensors, processing, and rendering. Every step matters if you want accuracy."

Annese also highlights the consequence of poor fidelity: "In immersive environments, artifacts stand out. A stitching error or a dead pixel pulls you out of the experience completely. Instead of being transported, you're reminded that it's artificial."

Computation at Speed

Where Annese brings artistry, David Krauthamer, Computer Engineer, brings efficiency. His expertise lies in high-performance computing to ensure algorithms run at speed.

"Image processing is a massively parallel problem," Krauthamer says. "That's a huge part of what makes it so fun. It's incredibly satisfying to see order of magnitude increases in speed from the right algorithmic changes. My mantra is simple: make the thing go fast."

He imagines a future where training footage can be captured and instantly rendered in VR. "You could record someone operating equipment and later have a trainee put on a headset and practice without any risk of injury. This exact technology is something I would have loved to have in college when training my peers on how to operate the equipment in the on-campus maker space."

Krauthamer also explains Circle Optics' efficiency in saving data. "Less overlap means less redundant data, and less data overall means fewer pixels to process and faster algorithms. It's more efficient from start to finish."

Seeing What Matters

The collective work of the team converges in situational intelligence—the ability to detect, interpret, and respond in real time across near, mid, and far fields. Circle Optics' low-parallax design minimizes redundancy, reduces error, and enables tracking without distortion.

"Our systems are designed to remove those problems," Annese explains. "If there's an overlap, it's very small. That means no discrepancy in where an object is, whether it's close, mid-range, or far away."

Feller underscores the human impact: "Situational awareness means understanding what's around you completely. Our systems make that possible, whether you're flying a drone, securing a perimeter, or training in a simulation."

Across their diverse paths—image science, hardware drivers, computation, visual fidelity—Circle Optics' software engineers are united by a single principle: trust.

Trust that what is captured reflects reality.
Trust that the system will perform under pressure.
Trust that operators can act with clarity and confidence.

As Stubler concludes, "Without software, the hardware is inert. The glass can capture the light, but the software translates it into insight. That's where the value lies—turning photons into trust."

By blending precision with usability, artistry with speed, and hardware with software, the Circle Optics team is not just eliminating stitching—they are enabling people to see what matters.

Pegasus system testing left to right: Bob Stanchus, Grace Annese, Steve Feller, and Imagine Aerial's Founder & CEO Gavin Snyder

Empire State Chapter of the Association for Uncrewed Vehicle Systems International (AUVSI) chapter serves as a hub for networking, collaboration, and knowledge sharing among industry leaders, researchers, and policymakers. Membership provides access to the latest industry developments, regulatory updates, and technological advancements. It also opens doors to exclusive events, workshops, and conferences that focus on the future of unmanned systems across various sectors, including aerial drones, ground robotics, and maritime systems.

Furthermore, the AUVSI Empire State Chapter advocates for the growth and development of the unmanned systems industry in New York, providing a collective voice on legislative and regulatory matters.

Joining the chapter not only enhances professional development and business opportunities but also contributes to shaping the strategic direction of this rapidly evolving industry within the state and beyond.

Chapter Leadership

Kara Jones
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