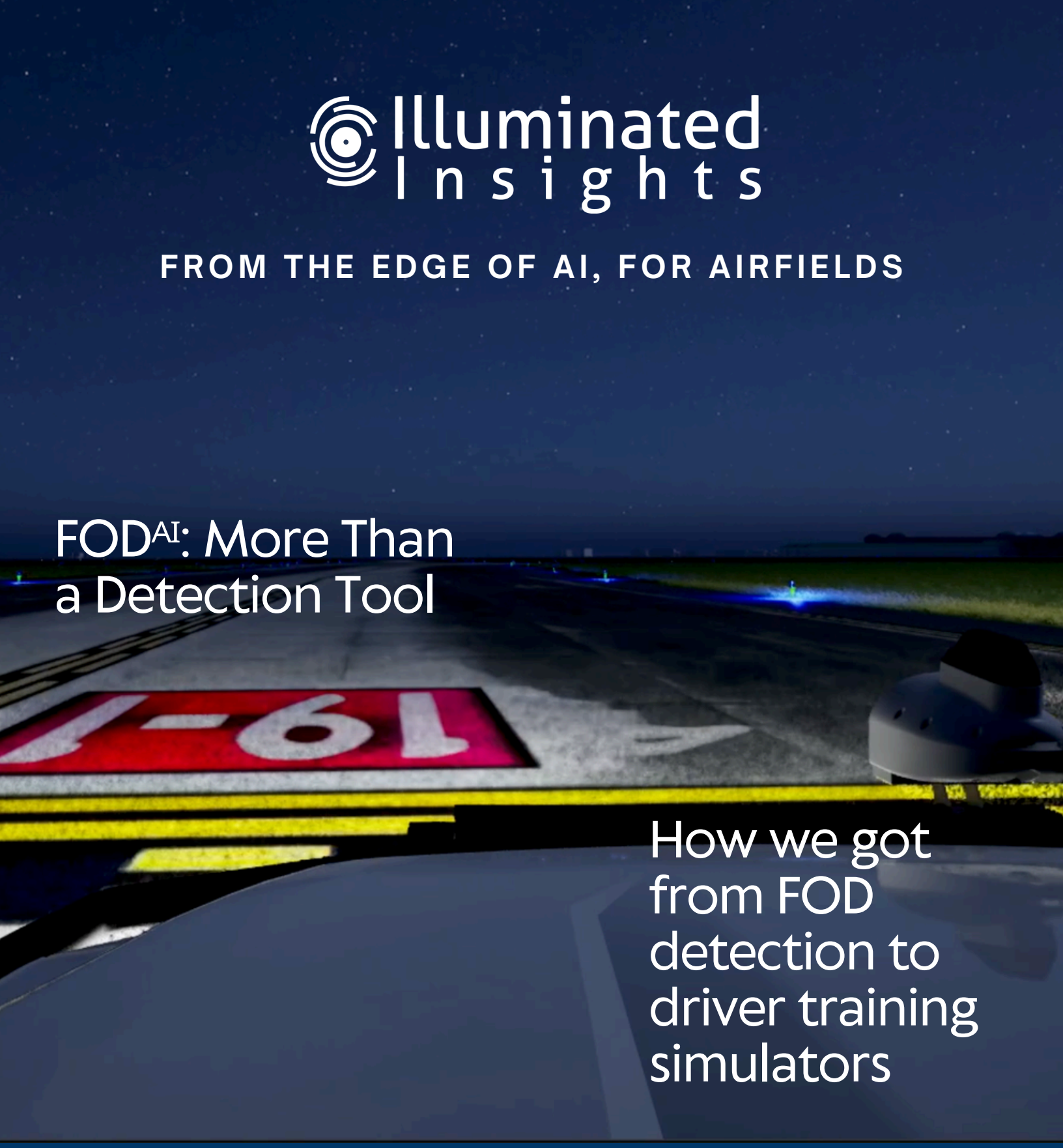
Illuminated Insights

FROM THE EDGE OF AI, FOR AIRFIELDS

FOD^{AI}: More Than a Detection Tool



How we got from FOD detection to driver training simulators

ILLUMINEX AI GRADUATES FROM CREATIVE DESTRUCTION LABS

EDGEGUARD LAUNCH

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Just as crews are looking forward to some well-earned vacation time and a chance to enjoy summer with family and friends, many airports are already turning their attention to something less seasonal: planning and budgeting for the next winter operations season. It may be hard to think about snow in July, but anyone responsible for keeping an airfield open knows that winter has a way of arriving faster than expected. We hope this issue makes the summer reading list as you prepare for the seasons ahead.

Message from Brian Freed, CEO

We continue to expand deployments across both major hub airports and a growing number of regional and municipal operations. A key part of that growth has been making AI-enabled tools accessible through a pricing model that scales with the operational needs of each airport. Whether it's a major hub or a GA airport, the value of capturing and structuring operational sensor data during routine airfield inspections is proving useful across a growing number of operational use cases.

There weren't many weeks this spring when our team wasn't somewhere on the tradeshow circuit, and there's a good chance we crossed paths along the way. One stop was the NEC/AAAE Snow Symposium in Buffalo, where we introduced EdgeGuard, a new tool designed to improve operator awareness around airside boundaries during snow removal, grass cutting, and maintenance activities. Judging by the conversations we had, reducing the cost and frustration of damaged edge lights continues to resonate with operators. And while it may seem strange to talk about snow in July, now is also the time when winter budgets are taking shape. Snow season has a habit of showing up sooner than expected, so if SnowPro^{AI} and EdgeGuard are part of your winter plans, now is probably the right time to make sure you inquire about placing an order.

The trade show circuit also gave us the opportunity to demonstrate our new airfield driver safety training simulator. Built on high-fidelity 3D representations of any airfield, the simulator is generating strong interest as airports look for practical, affordable ways to improve driver training without relying entirely on live airfield access or expensive legacy systems. We have more details on that in this issue.

Looking ahead to the second half of 2026, we'll continue doing what we enjoy most: working alongside airports to solve practical problems and turning new ideas into useful tools. In the meantime, I hope everyone gets a chance to recharge, enjoy some time with family and friends, and maybe even forget about snow for a few weeks. It'll be back soon enough.

InspectEx

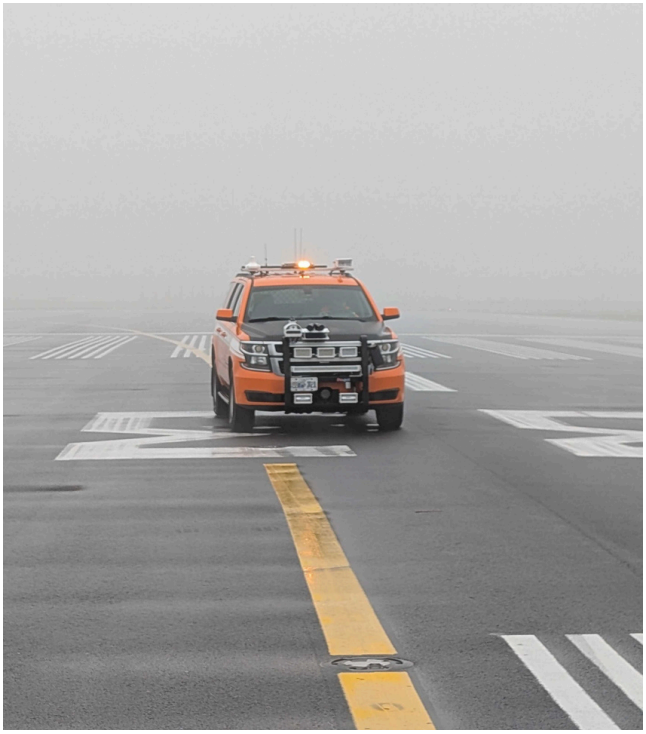
Turning Routine Airfield Inspections into Operational Intelligence

Every day, airport operations teams spend hours on the airfield performing routine inspections, resolving and documenting discrepancies and observations across the airside environment.

Some of this information such as identification of FOD is acted on in the moment (frequently with no written record), and only a small portion of visible observations are captured in a structured way due to time constraints and operational limitations. As a result, data is silo'd in human memories, where it is quickly forgotten rather than efficiently shared across teams and retained as part of a long-term operational record.

That raises an important question: what is the operational value of the available data that is not captured and logged digitally during those routine inspections?

InspectEx was designed around the idea that routine operational activity can become a valuable source of digital operational intelligence. Over time, thoseinspections become more than individual observations. They begin to form a living operational record of the airfield itself, one that can support faster decision-making, trend analysis, predictive maintenance, and more efficient operations.



That operational data foundation now supports a growing ecosystem of AI-powered applications including FOD[AI] for foreign object debris detection, SnowPro[AI] for winter operations support, EdgeGuard for mobile situational awareness, and this fall's launch of Surface[AI] for pavement and crack analysis.

Rather than deploying disconnected technologies for individual operational tasks, InspectEx enables airports to scale AI-powered capabilities through a unified platform smoothly integrated into existing workflows.

The result is not simply FOD detection, but the creation of a rich operational dataset in an environment where structured, actionable data has historically been scarce.

AI-Powered Driver Training: High-Fidelity Airfield Simulation at a Fraction of the Cost

Airfield vehicle training has always existed in a difficult balance between safety, realism, and cost.

Live training on active airfields is expensive, operationally disruptive, and constrained by strict safety requirements. Traditional simulation systems attempt to solve this, but rely heavily on manually built airfield models, each runway, sign, lighting system, and surface condition constructed piece by piece. That process is slow, expensive, and difficult to keep aligned with real-world changes.

In practice, high-fidelity training has largely been limited to major hubs with the budget to justify that level of manual effort.

The underlying constraint is data, and in this case, data is tightly coupled to how environments are built in the first place.

Why simulation has been expensive
Creating a usable airfield simulation is not just a software problem. It is a reconstruction problem.

Every element of the environment, geometry, markings, lighting, signage, surface conditions must be manually modelled or repeatedly updated to reflect real-world changes. Even when photogrammetry or scan data is used, it still requires significant manual correction and integration before it becomes simulation-ready.

This is why traditional systems are expensive: they don’t scale with the airport, they scale with manual labor.

Breaking the dependency on manual modeling
To reduce this bottleneck, modern systems take a different approach.

We start by addressing the upstream problem: data scarcity. Airfield environments are difficult to capture comprehensively due to operational constraints, access limitations, and safety requirements.

To overcome this, synthetic data is used to bootstrap early model training in controlled environments. This allows systems to function before large-scale real-world datasets exist. But the real shift happens when the system is deployed into operational inspection workflows.

From inspection to continuous environment capture
Once in operation, airfield inspection systems begin capturing structured, high-fidelity data as part of their normal workflow.

This is where the model changes fundamentally.

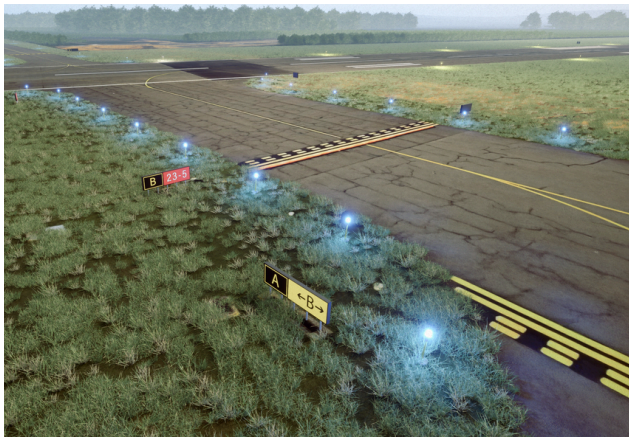
Instead of building environments manually, the system begins to accumulate real operational representations of the airfield over time, lighting conditions, surface variation, object placement, and spatial structure under real conditions.

This captured data becomes the foundation for a continuously evolving digital twin.

Why this is faster and cheaper
The key difference is what gets replaced.

This approach replaces that with continuous
operational capture + synthetic data:

- Synthetic data solves the cold-start problem
- Real inspection data provides continuous updates
- Digital twins evolve from operational reality rather than manual modelling
- Simulation environments are derived, not constructed



This removes the need to rebuild environments from scratch or maintain them through large manual update cycles. Instead, they evolve as a byproduct of normal airport operations.

That is what makes it faster and significantly more cost-efficient.

From digital twin to driver training

As these digital representations mature, they extend naturally into simulation environments for training.

Built in Unreal Engine, these environments support realistic ground vehicle dynamics, spatial constraints, and operational conditions specific to airfield operations.

Airfield vehicles, plows, sweepers, inspection and maintenance equipment, operate in tightly constrained environments defined by runway proximity, signage, lighting systems, and active aircraft movement. Training must reflect those constraints directly.

Vehicle behaviour is modelled accordingly, including braking distance, turning response, traction variation, and surface conditions.

Environmental realism across operational conditions

Training scenarios can be configured across the full range of airport environments:

- Rain and reduced traction surfaces
- Fog and low-visibility operations
- Night operations with variable lighting
- Clear conditions for baseline training

These can be layered with operational activity to simulate real workload conditions, reinforcing decision-making under pressure rather than isolated procedural tasks.

Built on Unreal Engine for scalability
The platform is built on Unreal Engine, enabling high-fidelity rendering, physically based simulation, and scalable environment development.

Key capabilities include:

- Multi-user training environments
- High-density airfield rendering
- Advanced lighting and visibility simulation

This foundation ensures the system evolves alongside operational requirements rather than becoming a static simulation asset.

The result is a system that reduces cost, improves realism, and scales across airports of all sizes.

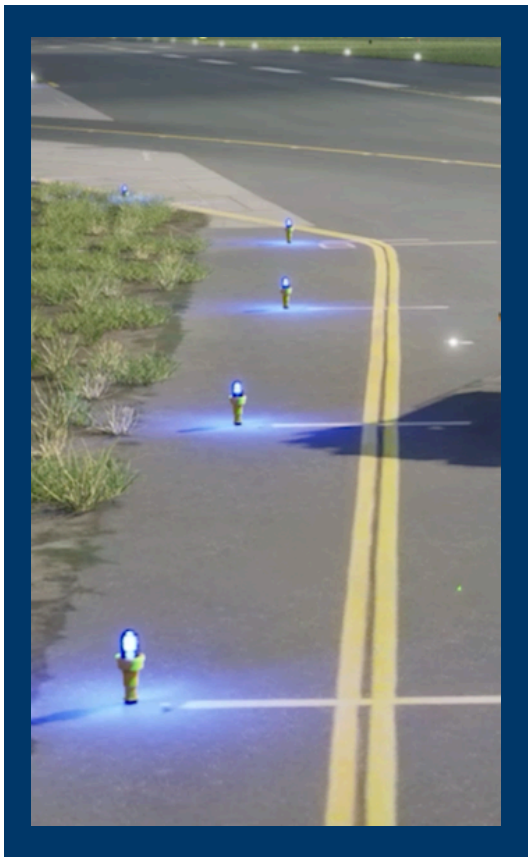
In-Cab Awareness at the Edge of Maintenance Equipment Operations

Maintenance (winter or summer) operations exposes one of the most persistent challenges in airfield management: the loss of reliable visual reference at runway boundaries during low-visibility conditions.

In the winter, snow accumulation routinely obscures edge lighting. Runway edges lose definition. Even experienced operators are left working within shifting spatial assumptions, often under time pressure and limited situational clarity.

Across many airports, this gap is managed through training, procedural discipline, and communication. But the operating environment itself remains unchanged.

Introduced at this year's NEC/AAAE Snow Symposium in Buffalo, EdgeGuard is an in-cab awareness and alert system designed for snowplows, blowers, and mowing equipment operating on active airfields.



The system does not rely on new ground infrastructure or modifications to runway systems. Instead, it uses precise GPS positioning paired with a pre-configured digital hazard map of the airfield, including runway geometry and edge light placement.

As a vehicle moves through the environment, its position is continuously evaluated against these boundaries.

When predefined proximity thresholds are reached, the operator receives escalating audio and visual alerts inside the cab.

The intent is to shift awareness closer to the point of decision, rather than introducing additional interpretation layers or external dependencies.

In practice, the system behaves differently depending on the equipment in use.

Plows operate with an effective width that extends beyond the vehicle body, defined by blade position and lateral variability. EdgeGuard accounts for this operational envelope when determining proximity to runway edges and lighting.

Blowers introduce a different constraint set, particularly in conditions where edge lights may be fully or partially buried. A forward-looking alert window based on movement helps maintain awareness of upcoming boundary proximity in reduced visibility.

Mowers operate primarily around runway centerline separation, requiring consistent maintenance of standoff distance across long, repetitive passes. The system reinforces these thresholds with direct in-cab alerts when limits are approached.

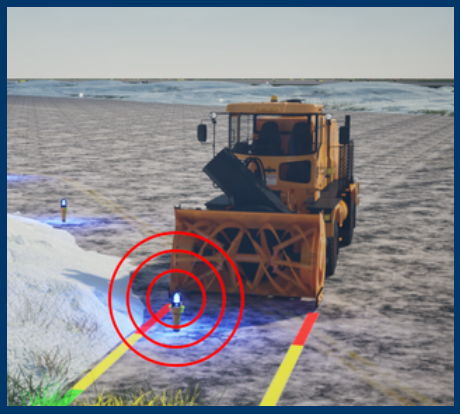
Deployment is straightforward by design. The system is installed directly into existing vehicles using a rugged in-cab unit, GPS antenna, and mounting hardware. Airfield mapping is configured in advance using customer-supplied geometry data.

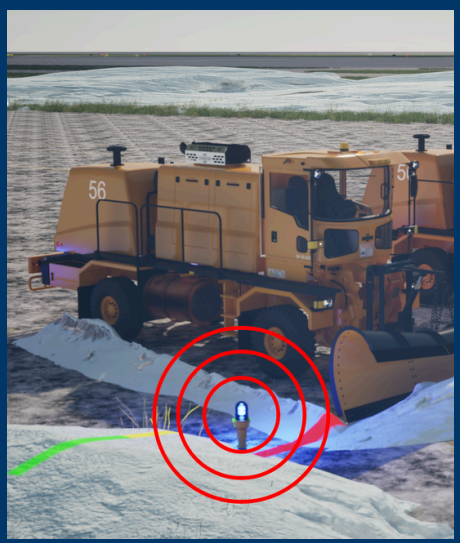
No runway infrastructure is required. No procedural changes are introduced. The system operates within existing maintenance workflows.

Processing occurs onboard the vehicle, allowing operation in low-connectivity environments. Cellular connectivity is used for updates and configuration but not required for core functionality.

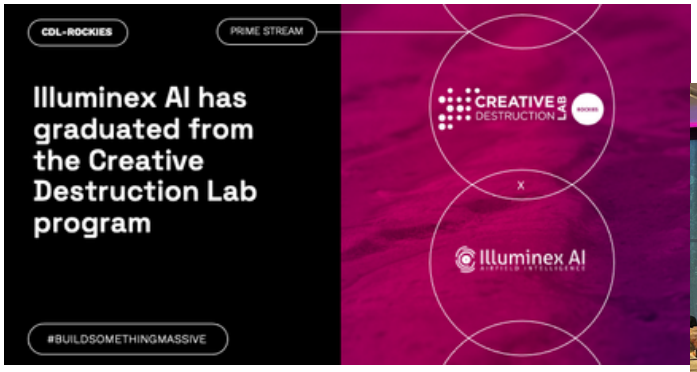
As winter operations become increasingly complex, with tighter schedules, variable weather patterns, and higher expectations for consistency, attention across the industry continues to shift toward tools that improve situational awareness without increasing operational burden.

EdgeGuard reflects that direction: awareness delivered at the edge of the runway, inside the cab where decisions are made.





Illuminex AI has graduated from the Creative Destruction Lab (CDL) Rockies Prime Stream, a highly selective program supporting science- and technology-based ventures through structured mentorship from leading entrepreneurs, investors, and technical experts.



The CDL program is focused on milestone-based progress, where companies are challenged to refine technical direction, validate commercial outcomes, and demonstrate measurable execution over a defined cycle.

Illuminex AI was awarded a coveted presentation slot on the MainStage at the CDL Super Session in Toronto this year, a highly selective honor granted to only a small number of top graduating companies from the cohort. This recognition provided an opportunity to present before more than 1,000 investors, mentors, industry leaders, and peers, significantly boosting visibility and credibility for the company's $3M CAD fundraising efforts.
Illuminex AI (CDL-Rockies Prime) - CDL Super Session 2026

"Participating in Creative Destruction Lab has been an invaluable experience for our team," said Brian Freed, Chief Executive Officer of Illuminex AI. "The mentorship and objective-driven structure helped us sharpen our strategy and accelerate execution."

"Creative Destruction Lab challenged us to think bigger and move faster," said Craig Metcalfe, Co-founder and CPO. "This recognition reflects the dedication of our team and the strong collaboration we've built with airport partners."

As aviation infrastructure continues to modernize, there is increasing focus on systems that generate operational intelligence from existing activity, rather than relying on entirely new inspection or data collection frameworks.

EdgeGuard for Mowing inspired by a customer.

Illuminex AI has installed EdgeGuard on mowers to support grass cutting operations, not for edge lights, but to help maintain safe distance from the runway.

As mowing crews are required to maintain a defined offset from active runways, based on runway safety area requirements and local operating procedures, in practice, that boundary isn't always easy to judge consistently over long distances.

Too close creates risk. Too far leaves uncut areas and rework.

For this customer, EdgeGuard provides real-time awareness of position relative to defined boundaries, helping their operators maintain a consistent offset during mowing operations.

A simple shift in thinking, driven by the user, and a powerful way to extend value beyond winter.

What other maintenance operation could EdgeGuard apply at your airport?

Look for Us at:

Fortbrand Services Booth
NEC/AAAE Annual Conference
August 8 - 11, Pittsburg, PA

AAAE Ops & Tech Conference
August 24 - 27, Oklahoma City

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