Illuminated Insights

FROM THE EDGE OF AI, FOR AIRFIELDS



Deployment From the Equator to the Arctic

Surface AI Development Update

TRANSPORT CANADA
INNOVATION SOLUTIONS CANADA PROJECT

AI HUMAN-CENTRIC DESIGN

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BUDGETING FOR 2027

“How much should I budget for AI?”

As we move from winter ops into spring, the conversation shifts from survival to strategy and 2027 budget priorities. AI has moved from novelty to an unavoidable force that touches every person and airport function. This raises real questions: Will AI take my job? Is it safe and secure? Is early adoption or late adoption best for my organization? And how does AI investment translate into measurable ROI for my airfield? If these are on your mind, I would love to talk, share our insights and experience, and discuss our design philosophy.



Message from Brian Freed, CEO

Turning to the business update, the past quarter gave us the opportunity to deploy our platform into diverse geographic regions. We tested our scalability, ease of deployment, and ability to operate in extreme conditions.

At a major airport in the equatorial region of Asia, FOD^{AI} is being piloted to help airside teams monitor foreign object debris across their gates and ramps. In the Arctic conditions of Nunavut, SnowPro^{AI} is supporting winter operations, providing accurate, geolocated snowbank measurements. These deployments have reinforced our design philosophy: AI is most effective when it respects the existing workflows, expertise, and judgment of the professionals using it every day. Human-centric design remains at the heart of how we develop and deploy our systems.

We announced our FOD^{AI} pilot program in January and demand is already outpacing our forecast. We are procuring additional systems and growing the team. We just posted for a Field Solutions Deployment Engineer, so if you know someone solid who would thrive in the airfield environment, send them our way.

We are also making good progress on our OVIN Surface^{AI} project with the Ontario Vehicle Innovation Network and the Greater Toronto Airports Authority. This collaboration is advancing our InspectEx platform with new models focused on airfield surface conditions including Surface AI for asphalt and concrete analysis.

Meanwhile, our FOD^{AI} Premium system is advancing through testing under the Innovation Solutions Canada Testing Stream, with support from Transport Canada. This program gives us a full 12-month window to evaluate the system in live operational environments and shows how AI can complement human inspections to strengthen runway and taxiway safety.

We are also pleased to announce a new relationship with 1200.aero. This collaboration brings together airfield technologies and gives airports a more integrated way to access a broader ecosystem of digital tools as they move toward airfield intelligence.

From the corporate side, Illuminex AI was accepted into Creative Destruction Lab's 2025-26 cohort. We just wrapped round three of five, and it's already sharpening our focus in ways that will strengthen the company for the long term. Building on the success of our pre-seed raise, we are now targeting a seed round to raise an additional $3M. The funds will accelerate development of new detectors and help scale the business to meet the strong demand for our solutions.

Thank you to all the airport teams, partners, and innovators who continue to share their insights and experiences with us. Your engagement is directly shaping the next generation of airfield intelligence.

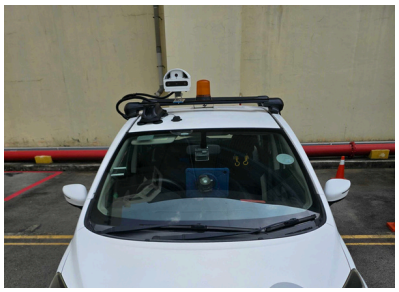
We're just getting started.

InspectEx

From the Equator to the Arctic

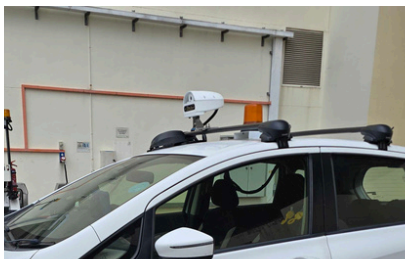


In January we deployed two systems spanning from the equator to the Arctic circle putting both the durability and ease of our deployment to the test.



FOD^{AI} is deployed in a pilot program with an engineering firm focused on monitoring debris in gate and ramp areas. These zones are among the most active parts of the airfield, where aircraft turnarounds happen quickly and a wide range of vehicles and equipment operate in close proximity to aircraft.

Even small debris can pose a risk to engines, tires, and ground personnel, making constant awareness critical.



The program is exploring how AI-assisted detection can support inspectors by providing additional visibility into debris conditions during normal operations.The goal is to complement existing ramp inspection procedures and help teams maintain enhanced operating environments without disrupting established workflows.

In northern Canada, SnowPro^{AI} is being tested in the demanding winter environment of Cambridge Bay, Nunavut, nearly 200 miles north of the Arctic Circle. Arctic operations present unique challenges for any new technology, including extreme temperatures, limited communications infrastructure, and remote operational conditions. Ensuring that systems remain reliable in these environments is essential for practical deployment.



Despite these challenges, this deployment is demonstrating the rugged ability to capture geolocated snowbank measurements, while crews perform normal winter maintenance operations, in the most extreme conditions.

The experience is providing us with valuable insights into how AI-enabled sensing can operate even in regions where connectivity and infrastructure are limited, helping airfield teams record conditions and advance efficiency in winter operations.



Written by Brian Freed, CEO

Airfield Intelligence:

Embracing AI on the airfield will play a key role in the pursuit of the intelligent airfield and take FOD detection and proactive maintenance to the next level.

At Illuminex AI, we aspire to build more than just a couple of AI-based detectors, we are building the for the future of airfield intelligence, one that leverages AI and automation, deployed with real-world practicality to deliver enhanced safety and maintenance while maintaining operational continuity and human judgement

Our flagship FOD^{AI} solution, along with the broader InspectEx platform, embodies five core design principles that, far from being abstract ideals, are deliberate choices shaped by collaboration with airfield operators, from bustling hubs to remote general aviation fields.

The goal is simple: deliver AI that educates, augments, and empowers rather than complicates or disrupts. These principles guide every decision we make, ensuring technology serves the unique demands of airfield operations.

In an industry where downtime costs thousands per minute and human lives depend on split-second judgment, the right design philosophy makes all the difference. Here's how we approach it and why it matters for every airfield.

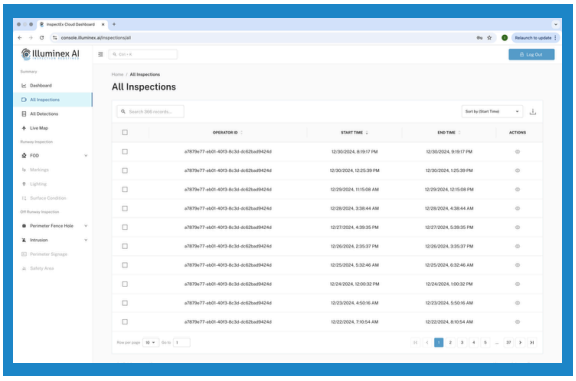
HUMAN-CENTRIC DESIGN: AI AS A FORCE MULTIPLIER, NEVER A REPLACEMENT

In the active operations area of any airfield, there is no substitute for human judgment. Technical inspectors, and ground crews bring contextual awareness, experience, and accountability that no algorithm can fully replicate. We ascribe to the belief that technology bends to the will of its maker, hence our design philosophy centers on augmentation and support and reject the notion that AI should displace humans in core airfield operations.

Our 'detectors' do not issue autonomous commands or seize control of critical decisions; they equip human operators with superior insight. The system highlights potential issues, provides high-resolution

context, and lets the trained professional make the final call. This approach preserves safety, maintains accountability, and builds trust.

When AI acts as a reliable co-pilot rather than an autopilot, adoption accelerates, and outcomes improve. Human-centric design is not a limitation; it is the foundation of responsible airfield intelligence.



GEOAI: CONTEXT-AWARE INTELLIGENCE BEYOND SIMPLE COMPUTER VISION

Many AI vision systems analyze pixels in isolation, delivering detections without spatial or temporal understanding.

Airfields, however, demand more. Every square foot is georeferenced, every movement has trajectory implications, and every detection must answer four critical questions: What is it? Where exactly is it? When did it appear? And if it is moving, where is it headed?

Our GeoAI architecture fuses computer vision with precise detection positioning and real-time mapping through the fusion of GPS, Point Cloud, and IMU data into the computer vision data flow.

This is not ‘bolt-on’ geolocation that tells you the location of a vehicle, it is foundational to our entire platform to support precise temporal and geo-referenced data specific to each logged detection.

As a result, our detections are not vague alerts but pinpointed, geo-tagged insights overlaid directly onto the airfield’s operational map.

Inspectors see the object’s exact coordinates and size, enabling immediate informed response. This level of intelligence transforms raw data into actionable knowledge, reducing search time, minimising exposure in the AOA, and preventing small issues from becoming major disruptions.

EASE OF USE: SEAMLESS INTEGRATION AND MINIMAL OPERATIONAL DISRUPTION

Airfields run on tightly defined standard operating procedures. The cost of change (training, workflow redesign, regulatory approval) can far more costly than the technology purchase.

Consider these two scenarios: during a routine inspection, a system flags potential FOD; the inspector reviews the provided image on an in-vehicle screen, resolves it in seconds, and continues without any unplanned disruption. Operations proceed without a ripple, no alerts to the AOC or ATC.

> GeoAI is what elevates detection from ‘interesting’ to Airfield Intelligence capable of delivering heatmaps, and predictive decision support.

Contrast this to a fully automated approach which can trigger electronic alerts that require human dispatch, resulting in potential runway closures. These are particularly painful for false detections. AC 150/5220-24 provides allowance for 1–3x daily false alarms for automated FOD detection systems, which can lead to significant operational costs from unplanned and un-necessary closures. Our human-in-the-loop validation occurs at the point and time of detection and integrates directly into current SOPs, empowering rather than potentially interrupting operations.

MOBILE SOLUTIONS FOR LOWER COST AND HIGHER RESILIENCE

Installing fixed sensors along runways, taxiways, and aprons complete with power, networking, and frangible bases can easily exceed a million dollars in capital expenses per runway.

Then come the ongoing realities of airfield life: snowplows, drifts, and routine maintenance that can damage or obscure fixed sensors.

We chose a different path. Our solutions such as FOD^{AI} are fully mobile, mounted on standard airfield inspection vehicles. A single sensor array, leveraging GeoAI and edge processing, covers the entire airfield during normal inspection routes.

No fixed infrastructure. No massive upfront CAPEX. No vulnerability to ploughs or snow accumulation. The system travels with the very teams already responsible for routine inspections, delivering continuous, high-fidelity coverage without adding new airfield assets to maintain or protect.



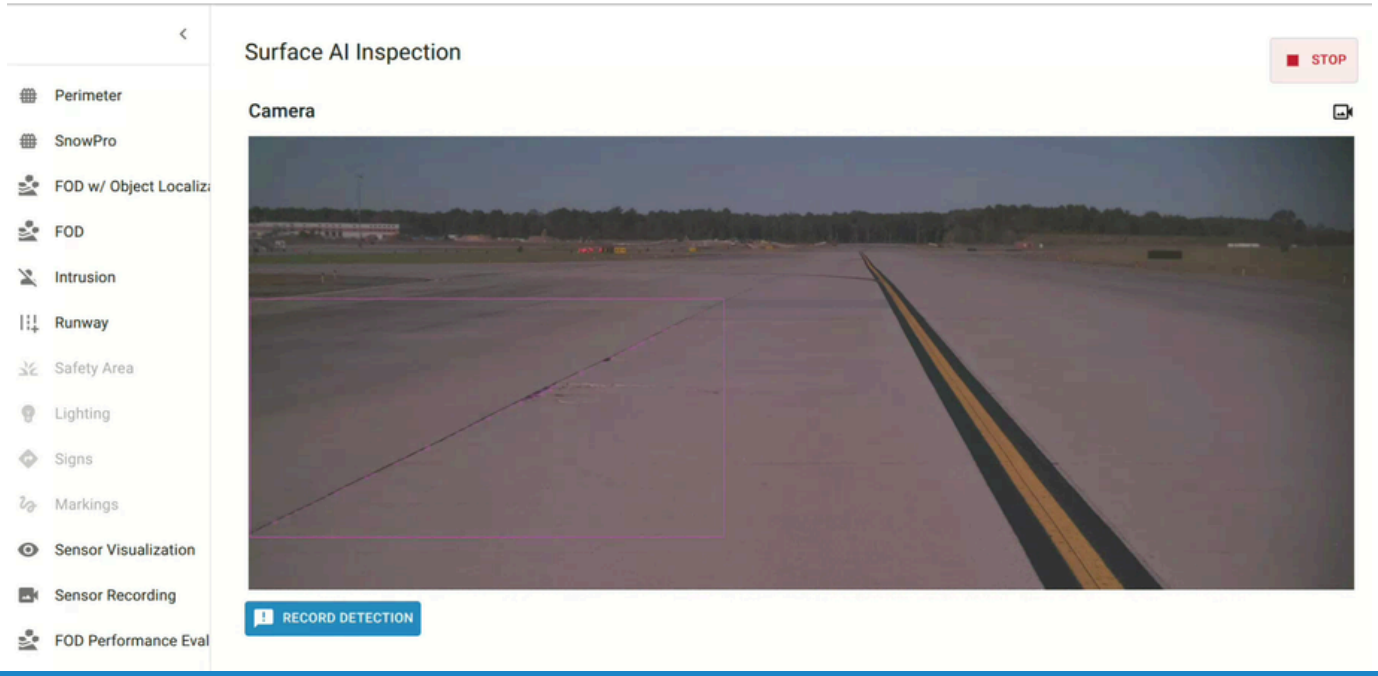
AIRFIELD INTELLIGENCE FOR EVERY AIRPORT, NOT JUST THE LARGEST HUBS

Too often, cutting-edge aviation technology emerges from the innovation labs of major hubs, organizations with dedicated teams and budgets in the tens of millions, yielding solutions with cost and scale that effectively sidelines small airports. We designed our platform to scale both ways. Small airports receive the same core capabilities, GeoAI, mobile deployment at price points suited to limited budgets and staffing.

Diverse testing sites including Morristown Municipal Airport and Cambridge Bay Airport alongside hubs like Savannah/Hilton Head International Airport and Toronto Pearson International Airport forced resilience, affordability, and simplicity into every layer, ensuring intelligence that truly serves all airports.

"Morristown Municipal Airport is grateful to Illuminex AI for allowing us to partner with them on the development of FOD^{AI}. The solution has the potential to bring a huge benefit to airfield operational safety and provide real time data on airfield infrastructure." Darren S. Large, A.A.E., ACE, Director, Facilities & Operations at DM AIRPORTS LTD

These five principles: human-centric design, GeoAI, ease of use, CAPEX avoidance, and democratization form the philosophical and technical foundation of Illuminex AI's airfield intelligence. These foundations should be considered, not just for our solutions, but for every airfield technology decision. While the relevance may seem subtle now, the choices made will prove decisive in delivering ROI positive, resilient, human-empowered operations for years to come.



Real-time Surface Intelligence

Written by Sean Buchanan,
Machine Learning Engineer

PCI scores provide a snapshot of runway and taxiway conditions, but they only tell you a snap shot in time, not how fast cracks and other defects are growing. By the time traditional inspections are complete, small problems can become costly repairs or operational risks. SurfaceAI is being developed to bridge that gap, turning routine inspections into actionable insights so operators can see trends over time and prioritize maintenance before minor issues escalate.

Detecting and tracking cracks is deceptively difficult. Many are just millimeters wide. Capturing them from a moving vehicle and tracking them across multiple inspections is an even greater challenge. SurfaceAI is being designed to tackle this problem, helping operators turn raw inspection data into a timeline of pavement health.

The challenge is multi-layered. Reliable crack detection requires multiple systems working together: high-resolution cameras to capture surface details, motion-corrected positioning to locate each defect precisely on the airfield, and computing systems that make sense of all the data. Integrating these elements into a product that can start inspecting on day one without disrupting operations is a significant engineering feat.

SurfaceAI, supported by an Ontario Vehicle Innovation Network (OVIN) grant in collaboration with the GTAA, to drive a profound change in airfield surface maintenance by allowing operations to economically identify those defects that show the greatest rate of change over a short period of time (e.g. 30, 60, 90 days) vs the current standard PCI scoring which typically cost $0.02-$0.03 per square foot and occurs only once every one to three years.

With high-frequency actionable data, SurfaceAI will deliver a significant ROI by extending the useful life of the most critical airport asset, airfield surfaces, the runways and taxiways that define an airport.

Step 1: Crack Detection
The first step is recognizing the cracks themselves. Surface^{AI} is trained on a combination of real inspection data and digitally generated examples. Human review helps refine the models in real-world conditions, a process known as human-in-the-loop refinement. This ensures that every defect can be reliably detected and measured. Currently, we are completing the initial training phase and beginning iterative refinement to make the system robust across diverse inspection scenarios.

Step 2: Mapping Defects
Once cracks are detected, the next challenge is locating them precisely on the airfield so that changes can be tracked over time. This enables operators to monitor which cracks are growing fastest and to prioritize maintenance effectively. The system transforms inspection data into actionable information, rather than leaving teams to compare photos or rely on memory.

Step 3: Tracking Growth
Detection and mapping alone aren't enough. Surface^{AI} is being designed to translate data into clear insights: the airfield is visualized in tiles showing severity, alerts highlight areas of concern, and metrics show how defects are evolving across inspections. This gives teams a timeline of pavement health, allowing maintenance decisions to be proactive rather than reactive.

Progress and Outlook

The path from raw inspection data to actionable structural intelligence is challenging, but progress is steady. Initial detection models are performing well on test data, and human-in-the-loop refinement is underway. Mapping and visualization tools are being developed so operators can see trends over multiple inspections. Early results suggest Surface^{AI} can provide a level of insight beyond traditional inspections and PCI alone.

Ultimately, Surface^{AI} aims to move from simply seeing cracks to truly understanding them. By combining detection, precise location, and growth tracking, it provides a timeline of structural health that supports predictive maintenance, reduces costs, improves efficiency, and enhances safety. Built on the InspectEx platform alongside FOD^{AI}, Surface^{AI} is part of a modular system that will eventually extend to other inspection needs, giving operators a unified view of their airfield and the confidence to act before minor defects become major problems.





The Innovation Solutions Canada (ISC) Testing Stream connects Canadian innovators with federal departments to test and evaluate new technologies in operational settings. It's an opportunity for the Canadian government to learn how emerging solutions perform, providing insights that go far beyond lab tests or beta programs. For FOD^{AI} Premium, the ISC program brings this opportunity to life at Toronto Pearson International Airport, one of the busiest airfields in the country. The system is being evaluated against TC5520, giving airfield team and regulators a clear view of how AI performs in a live, high-demand operational environment.

Transport Canada's involvement is a key part of the program. Their role is not just observational, they are helping assess how AI can complement human inspections, providing a benchmark for safety, consistency, and operational efficiency. The evaluation compares traditional inspections carried out by human crews with inspections assisted by FOD^{AI} Premium, highlighting differences in debris detection, situational awareness, and decision-making. This approach ensures that the testing produces practical, grounded insights about how AI can integrate into everyday airfield operations.

The value of the ISC Testing Stream goes beyond measuring technology performance. By embedding the system in a live operational environment and engaging Transport Canada, the program provides actionable learning for airports, regulators, and innovators alike. It demonstrates how AI can support human teams, helping them operate with greater confidence and consistency while maintaining the rigorous safety standards that all airports require. It also provides regulators with evidence-based data on the practical impact of AI-assisted inspections, helping guide potential policy and operational recommendations in the future.

The program will wrap up in November 2026, and we look forward to sharing the results and lessons learned. We're confident the findings will show how AI can enhance human expertise, improve runway safety, and provide a roadmap for smarter, safer, and more resilient airfield operations in Canada and beyond..

Innovation, Science and Economic Development Canada

Transport Canada

Budgeting For FOD^{AI}

This time of year, one of the most common questions we're asked is: "How much should I budget for AI?"

If you're planning ahead for 2027, or looking to utilize remaining budget in 2026, here's a simple overview of pricing for our standard FOD^{AI} system. These tiered estimates are based on airport size and are designed to support your planning.

Standard FOD^{AI} – Single Vehicle Deployment
(Includes all required hardware + 12-month subscription, suitable for runways, taxiways, ramps, and service roads)

- Large Hub: $100,000
- Medium Hub: $65,000
- Small / non-Hub: $45,000
- GA Airports: $35,000

Excludes applicable taxes, tariffs, and onsite installation.

FOD^{AI} empowers your team with:
- Advanced sensor fusion for accurate detection
- Real-time alerts
- Automatic logging for actionable insights
- Seamless integration into your existing inspection processes

If you'd like help aligning this with your 2027 budget or exploring options to deploy with remaining 2026 funds, contact us: sales@illuminex.ai

Illuminex AI solutions are also available through Fortbrand Services, Sourcewell, and AWS Marketplace.

FOD^{AI} Pilot Program Update

Since launching the FOD^{AI} pilot program in January, demand has exceeded our initial expectations, reflecting strong interest from airports looking to operationalize AI on the airfield. With funding support, we are able to increase our deployment capacity, accelerating the pace at which we bring systems online and enabling faster deployment for airports already committed to our six-week pilot program.

As we scale, we are expanding our field team and focusing on ensuring each system is integrated into every airport's existing workflows, supporting airfield teams without adding complexity. This next phase allows us to move quickly while maintaining a strong focus on reliability and real-world performance in active operational environments.

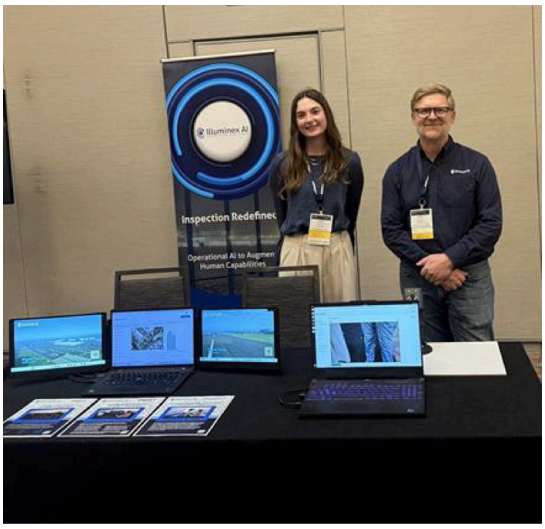
Look for Us at:

Fortbrand Services Booth
NEC/AAAE Snow Symposium
April 24 - 29, Buffalo, New York

AAAE 98th Annual National Conference
May 3-5, LA, California

IAAE FOAM Conference
May 4-6, St.John's, Newfoundland

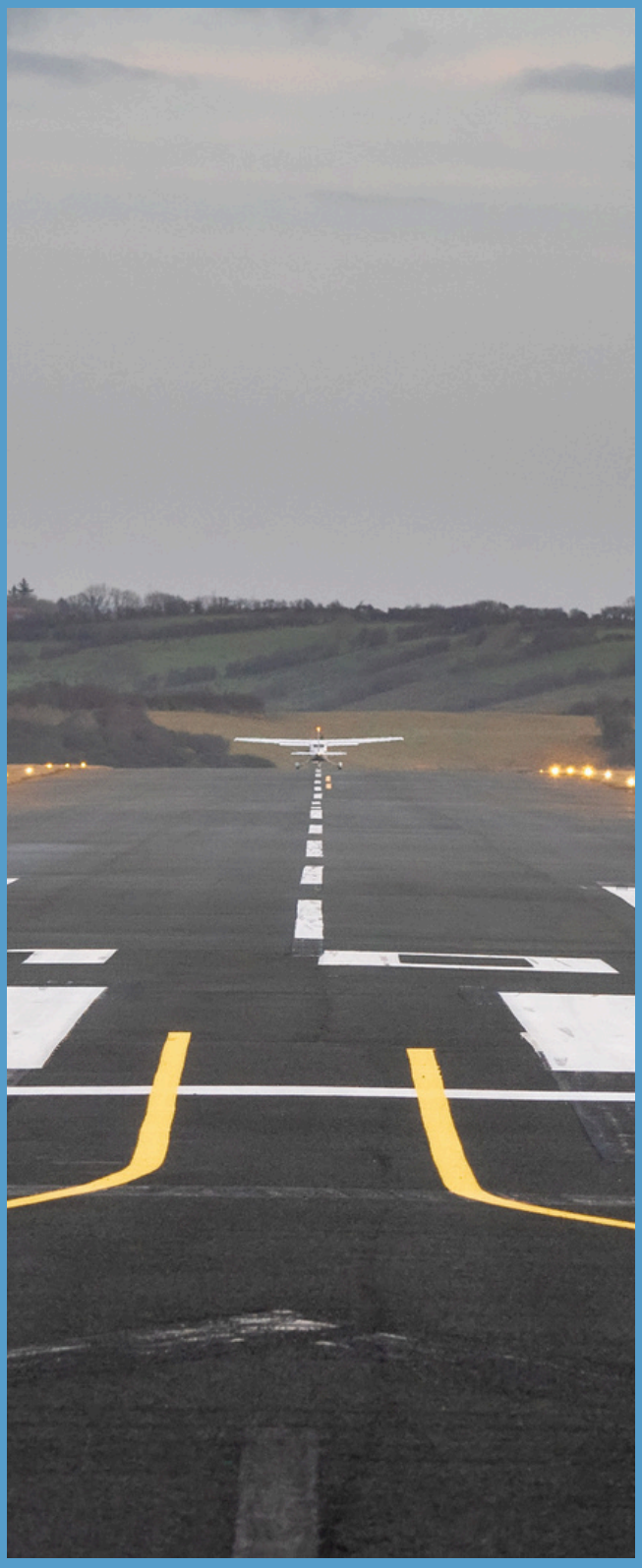
IAAE/SCC Airports of Americas Conference
May 31 - June 3, Fort Lauderdale, Florida



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