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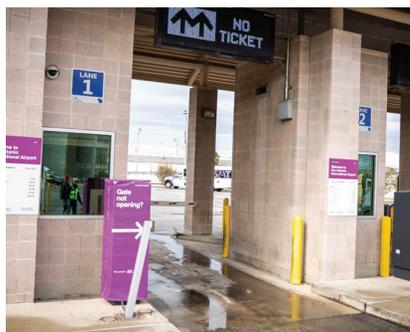
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One of the Best Airport Projects You'll Never See

Welcome to our January/February issue. There are a lot of great projects to read about, supported with amazing visuals. One that pops to mind is the Oculus at IAH (on the cover and Page 68). It's quite a sight to behold!

Having said that, we have another article that does not offer much in the way of a visual presence. It's a true behind-the-scenes wonder that involved a long lead time before the airport was ready to share it with our readers. This story (on Page 40) chronicles the cyberattack at SEA in August 2024.

Imagine if your airport had its website, e-mail, FIDS, BIDS, Wi-Fi and other crucial systems out for the count in the busy summer season! Also imagine that communications with passengers regarding flights that were still operating was limited to handwritten signs, face-to-face conversations and social media. And, that all off-line communications would take months to fully rebuild! It sounds more like the plot of a thriller movie than an article in a business-to-business publication. But painfully, it was the reality SEA experienced.

Thankfully, the airport was able to bring all of its systems back online. But the combination of time, inconvenience and money required to do so was painful.

There were a lot of lessons learned from this incident, which is something we tell our writers to search for when researching their stories. It's easy for airports to only talk about their successes. We're grateful that SEA decided to collaborate with us to produce this story together. Airport management and staff went through a lot during and after the cyberattack. We hope that you will learn from and appreciate their candor.

And don't miss our Industry Insider column by Mario Rodriguez at IND. (Page 82) Who would have thought that an airport is the perfect place to host a naturalization ceremony? It's a must-read. Check it out!

Cheers,

Paul



PAUL BOWERS, PUBLISHER

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Charlotte Douglas Int'l Finishes Transformational Terminal Lobby Expansion

BY JODI RICHARDS

 In September 2025, Charlotte Douglas International Airport (CLT) celebrated the completion of its Terminal Lobby Expansion, a \$608 million project designed to accommodate growing passenger demand and, at the same time, improve security, circulation and the overall customer experience.

“The Terminal Lobby Expansion is a transformational milestone for CLT,” says Chief Executive Haley Gentry. “This monumental effort represents years of planning, construction and commitment to improving the passenger experience...The

result is a modern, spacious lobby that reflects the dynamic growth of our region and positions us for the future.”

The Terminal Lobby Expansion is one piece of the North Carolina airport’s \$4 billion capital investment program, Destination CLT. It also includes concourse renovations, the expansion of concourses A and E, The Plaza Concessions Hub and a new fourth parallel runway.

Planning for the project began in 2008, with construction kicking off in 2019.

The original terminal was built in 1982 and designed to accommodate

approximately 2.8 million passengers per year. Passenger growth and changes to processing and security procedures, as well as normal wear and tear, left the facility constricted and outdated. In total, the recently completed expansion project increases the main terminal by 175,000 square feet and renovated another 191,000.

Key components include:

- five security checkpoints consolidated into three larger areas with 21 lanes, including 11 Automated Screening Lanes designed to process 600 more passengers per hour;



FACTS & FIGURES

Project: Terminal Lobby Expansion & Renovation

Location: Charlotte Douglas Int'l Airport, in NC

Scope: 175,000 sq. ft. of new space, 191,000 sq. ft. of renovated space

Key Components: 3 larger, more efficient TSA checkpoints; overhead & underground walkways between terminal & parking; 146,000 sq. ft. curbside glass canopy; 8 high-capacity baggage claim carousels; new escalators & elevators; central courtyard with seating, concessions and 11 major art installations, including Queen Charlotte statue; new central utility plant

Budget: \$608 million

Funding: Passenger facility charges; customer facility charges; general airport revenue bonds; airport cash

Construction: Dec. 2019–Sept. 2025

Architects: Gresham Smith; K2M Design

Construction Manager at Risk: Holder-Edison Foard-Leeper, a joint venture

Program Manager: TY Lin Int'l

Civil Engineering: Talbert, Bright & Ellington

Structural Engineering: Laurene, Rickher & Sorrell, A division of Britt, Peters & Associates

Mechanical, Electrical & Plumbing Engineering: NV5; AME Consulting Engineers

Special Systems Design & Engineering: Arora Engineers LLC

Baggage Handling System Engineering: BNP Associates

- eight new high-capacity baggage claim carousels;
- new escalators and elevators to improve vertical circulation between ticketing and baggage claim levels;
- a central meeter/greeter courtyard with seating, concessions and 11 major art installations, including an iconic Queen Charlotte statue;
- overhead and underground walkways connecting the terminal and parking facilities;
- a new central energy plant designed with future capacity in mind;

- 146,000-square-foot glass canopy to shield passengers curbside;
- increased circulation space in the main lobby; and
- a basement level primarily for mechanical, electrical and plumbing components.

When *Airport Improvement* first covered the Terminal Lobby Expansion project in our January/February 2023 edition, CLT was readying for what officials anticipated would be the most invasive portion of the project—renovating existing terminal spaces. In comparison,

The central courtyard includes new seating and a statue of Queen Charlotte that was relocated from elsewhere at the airport.



Gresham Smith
Genuine Ingenuity

Myrtle Beach International Airport
Concourse Expansion and Modernization

Chief Infrastructure Officer Jack Christine says the recently completed new construction wasn't easy, but it was a little more "controlled." For instance, customers walking through the area were largely unaware of the project thanks to connectors built through the construction zone. The renovation phases, which involved moving ticket counters, relocating security screening checkpoints and rebuilding baggage claim, were more impactful. "Once we got into the renovation phases, we were pretty much in everybody's business," jokes Christine.



JACK CHRISTINE

To further complicate this more invasive portion of project, passenger growth at CLT did not take a pause. Traffic at the North Carolina airport rebounded quickly and "faster than expected" following the COVID-19 pandemic, Christine says, bringing passenger volumes not forecasted until closer to 2030. In fact, American Airlines added 100 flights at CLT in 2024 alone. "That was to support the hub, but actually also added a lot of demand to the local traffic as well," he explains. "The whole airport facility was heavily burdened in the summer of '24 with the number of passengers we had moving through the facility."

American has since rolled back some of that capacity, but CLT is still seeing high passenger numbers—about 3% over 2023. "That's about where we ought to be," Christine comments.

Coping Mechanisms

Christine reports that despite the volume-related strains, the entire team for the lobby expansion project—from the contractor and

designers to the airport and its tenants—came together and did a really fantastic job trying to manage the chaos. “It was challenging,” he adds.

Especially challenging, was the phase that removed the former B Checkpoint to construct what is now known as Checkpoint 1. “That was the one point in the project where we lost a significant amount of capacity for the checkpoints,” he recalls. On top of that, this phase occurred over the busy summer months. “We worked closely with TSA, airlines and our Terminal Ops team to come up with mitigation strategies to make sure we had an adequate customer experience.”

The effort to manage wait times relied heavily on adding resources, including additional bomb-sniffing dogs for screening. Another key strategy was ensuring that checkpoints were fully staffed during peak times and the airlines had additional staff to assist customers with ticketing. “Our Terminal Ops team did a great job of managing the crowds and keeping everybody moving when it got really busy,” Christine says, noting that CLT never had reportable wait times of more than 40 minutes at the checkpoints. “[That] was really one of the key indicators for us as to whether we were successful or not.”

Maintaining uninterrupted technology services throughout construction and renovations was critical, and the design team included Arora Engineers to develop the integrated special systems design for the project’s security, operational and telecom elements. Examples include access control, passenger processing systems, security checkpoint design, and Electronic Video Information Display Systems, among others. The firm orchestrated phased, temporary and permanent system solutions to help CLT achieve its modernization goals without compromising day-to-day airport performance, notes Vice President, Special Systems Practice Lead Heath Kolman, P.E., RCDD. Close coordination with Gresham Smith, other design disciplines and stakeholders supported by detailed phasing strategies and ongoing technical coordination was instrumental in ensuring success, he adds.



HEATH KOLMAN

Phasing was a balancing act between the project schedule and passenger experience, agrees Tim Beecken, senior aviation architect with Gresham Smith. Determining how much space could be taken over for active construction without disrupting



TIM BEECKEN

flow through the terminal was like trying to thread a needle. “Passenger experience and their ability to comfortably navigate the space was always at the forefront of planning, scheduling and construction,” he adds.

Ben Goebel, a Gresham Smith principal, praises the project team for doing a good job solving problems and delivering on the intent of the design, but also taking a step back and considering how guests were moving through the facility while it was being built.



BEN GOEBEL

Naturally, the project team encountered some unexpected challenges. For instance, during demolition phases, there were rain leaders coming down into the center of the space where security equipment would be located. “That just wasn’t going to work,” Beecken quips. “It was a little extra work, but we were able to reroute them.”

Flexibility for the Future

Because of the project’s long horizon—planning/design, enabling work and more than five years of construction—CLT was especially conscious of “future-proofing” the design as much as possible. From how the facility was laid out to changes in ticketing and screening areas, the project is designed to accommodate ongoing developments in passenger processing. “We were trying to be a little generous with the space, knowing that the technology

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Five security checkpoints were consolidated into three larger areas to improve passenger flow.

was going to continue to evolve,” Christine says. “And it didn’t necessarily mean that the technology was going to get smaller.”

In addition to increasing the size of screening checkpoints to match passenger volume, designers made the ticketing area more flexible, with room for staffed check-in stations as well as self-check kiosks and baggage drops. Behind (and under) the scenes, space is roughed-in for when and if CLT airlines shift their passenger processing. “We tried to be forward-thinking as best we could and maintain a budget,” Christine says.

Art and Aesthetics

The crowning design element in the newly expanded and renovated terminal lobby is a 3,000-pound bronze sculpture of the city’s namesake, Queen Charlotte, wife of England’s King George III. Back in 1763, English settlers in the area named their county seat after Queen Charlotte. Today, a 15-foot-tall statue of her likeness mounted on a 30-foot pedestal creates the first and last impression for travelers at CLT.

The overall aesthetic for the recently completed terminal project takes cues from the city of Charlotte and larger mid-Piedmont Carolina region. The lobby blends open, modern design with the history of Charlotte. Architectural details include

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scalloped ceilings that echo the Piedmont hills, a gold ribbon paying homage to the area's gold rush history, and an oculus skylight that symbolizes Queen Charlotte's crown and fills the space with natural light. Doorframe gingham patterns reference the city's textile industry, while shades of blue honor local sports teams.

In partnership with the Arts and Science Council, eight artists were selected to create pieces for locations throughout Terminal 1, including subterranean walkways, arrival areas for international and domestic passengers, on the mezzanine and in select elevator areas.

The wide range of work includes sculptures, murals and terrazzo flooring.

Communicate and Celebrate

Given the length and complexity of the Terminal Lobby Expansion, CLT executed a concerted public information and marketing campaign to help keep guests and local residents engaged and "give them a little bit of hope that we were making progress," Christine explains. "We were very intentional about celebrating milestones and trying to prepare the customer for what was coming."

This became easier as the project progressed and new sections of the building opened, particularly Checkpoint 1. "That was a big one for us because that really gave us the footprint for what the checkpoints were going to look like in the main lobby area," Christine recalls.

"We renovated the airport's living room—their front door, really," Beecken remarks. "In doing so, it comes with some pains, but we embraced them."

For instance, temporary partitions were dressed up with seasonal decorations during the holidays and regional imagery other times of the year. Signage was kept current and clear, he adds.

Goebel notes that designers dedicated a lot of time providing accurate and appropriate signage to ensure safe pathways and flow—especially during the COVID pandemic. "Having that project team culture of focusing on the passenger first enabled us to weather that storm," he adds.

Leveraging social media and posting staff in the terminal to direct customers and answer questions were keys to the public

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A glass canopy and walkways connecting the terminal and parking facilities are major upgrades for guests.

information campaign. “It took a lot of effort to be deliberate about our communication and marketing strategies,” Christine notes.

Celebrating the milestones was impactful and inspiring to the project team as well as the general public. “Jack [Christine] and the airport were great about telling the project team that it’s OK to take a step back and appreciate just how transformative this has been,” says Beecken. “That was a big differentiator for the project team to maintain the enthusiasm, the passion.”

One particularly important milestone for CLT and its project team was receiving two Green Globe awards from the Green Building Initiative, which focuses on environmental sustainability, resilience and health and wellness. Beecken attributes the achievement to the efficient building envelope, materials selection, high-efficiency lighting and new central energy plant.

Phased Activation, Continuous Improvement

The airport’s internal activation team was aligned with the project manager from the very beginning of the Terminal Lobby Expansion and used experience from previous projects to develop and execute a successful activation in multiple segments during September 2025.

“Our activation team did a fantastic job minimizing disruption as we made transitions from old into new space,” says Christine. “They worked with the tenants, contractors and Operations team to make sure that as we were opening up segments of the building we had everything aligned as to what the resources needed to be for the tenants to be able to use the space.”

Having a solid execution plan was critical, but so was remaining flexible, nimble and “ready to change the plan at a moment’s notice,” he adds. “Having the plan was indispensable, but we had to know and realize that operational or construction challenges were going to augment that plan.”

Completing the Terminal Lobby Expansion isn’t the end for CLT. The airport is already in the middle of renovating Concourse D, with completion slated later this year. In addition, Concourse E renovations and airfield work that adds another parallel runway and associated taxiways are currently under construction and slated for completion in 2027. “We don’t take a breath here, we just keep on rolling,” Christine remarks.

“Everything is capacity-driven,” he adds. “Right now, we are on a good, steady growth path for the foreseeable future.” 

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Early Engagement Leads to On-Time, Under-Budget Delivery of New Baggage Handling System at San Diego Int'l

BY JENNIFER DAACK WOOLSON



For many industry-watchers, the most impressive aspect of the new \$95 million baggage handling system at San Diego International Airport (SAN) isn't the technology or massive scope of the project. It's the collaboration, transparency and strategic timing used to get the project to the finish line on time and under budget for the debut of the overall Terminal 1 renovation in September 2025.

Engineered by Introba and Vanderlande Industries Inc. in a collaborative Design-Assist arrangement, the new handling system includes conveyance for a Smart Curb check-in facility, main terminal ticketing, a baggage tunnel, six outbound makeup units, two transfer lines, nine inbound claim devices, and a Checked Baggage Inspection System equipped with seven explosives detection machines and a full Checked Baggage Resolution Area. Turner Construction, the construction contractor, and Introba were engaged early to support design-build integration.

Joshua Spoon from AECOM, who served as terminal building systems project manager on SAN's Airport Design and Construction team, says the goal was to deliver a highly efficient, TSA-compliant system with in-line screening, radio frequency identification bag tracking and built-in redundancy for resilience. But the limited footprint of the terminal required a creative solution. "SAN is a compact airport that maximizes its space, and this project introduced a completely new design approach," he says. Building a below-grade level for the system enabled efficient curb-to-plane operations and long-term flexibility.



JOSHUA SPOON

The benefits to passengers and operations are significant, Spoon says. Travelers will see a smoother curb-to-checkpoint experience thanks to faster automated sortation and more advanced

screening lanes. The system also ensures fully automated delivery of baggage to and from airlines, minimizing delays and missed flights by rerouting bags around problem areas when issues arise.

Enhanced security compliance and operational efficiency are key benefits, as demonstrated by the 99.7% tracking accuracy the system achieved during its TSA Integrated System Acceptance Test. Built-in adaptability and redundancy further stabilize operations, even during peak demand. Just as importantly, the design anticipates growth. Additional space for future claim devices, X-ray machines and expanded TSA capacity was included from the outset. As Spoon puts it, "This forward-thinking approach ensures the airport can meet increasing passenger volumes with minimal impact."

But seeing the project through had as many twists and turns as the nearly four miles of conveyor belts within the baggage handling system itself.



Overcoming Sticker Shock

Project Lead Mike Kessler, special systems senior manager for Turner Construction, recalls that members of his team knew early on that the job at SAN would be one of the largest baggage-handling projects they had undertaken in years, and they would need reliable numbers before moving forward.

But getting those numbers the usual way wasn't going to cut it.

"Traditionally, baggage companies don't like to give ROMs [rough order of magnitude figures]," Kessler explains. Still, Turner needed an early cost picture. So, in January 2021, as design work was getting underway with Introba, the team reached out to four major companies capable of handling a baggage handling system project of this size, including Vanderlande Industries.



MIKE KESSLER

Kessler provided them all with the same stripped-down equipment spreadsheet of specifications: no "special sauce," no proprietary tweaks—just a price for exactly what was in front of them. The goal was clarity, not competition.

The responses were a shock. Kessler says his "pre-COVID brain" was thinking the project would come in around \$105 million. Greg Wheeler, senior project manager with Introba at the time, had warned that supply-chain impacts were pushing costs higher, and he was right. All four companies returned estimates of \$140 million.

The team now had a problem—and a decision to make. Turner leadership had asked Kessler whether it was possible to pull 10% out of the cost.



GREG WHEELER

FACTS&FIGURES

Project: Baggage Handling System Upgrades

Location: San Diego Int'l Airport

Terminal: 1

Project Scope: Install new TSA-compliant handling system

Approx. Cost: \$95 million

Funding: Airport Authority bonds; passenger facility charges; TSA reimbursement through an Other Transaction Agreement

Completion Schedule: Phase 1, June 2025; Phase 2, 2027

Construction: Turner Construction

System Design: Introba

System Mechanicals: Vanderlande Industries

System Controls: Brock Solutions

Architecture: Gensler

Program Management: AECOM; ABMC

Key Components: In-line screening; RFID bag tracking; built-in redundancy for resilience; connects to Smart Curb check-in facility & main terminal ticketing; baggage tunnel; 6 outbound makeup units; 2 transfer lines; 9 inbound claim devices; Checked Baggage Inspection System equipped with seven explosives detection machines; full Checked Baggage Resolution Area

Equipment from SICK reads bar codes and validates the dimensions of each bag for security and sortation.



But he and Wheeler knew they'd need a fundamentally different approach to find \$14 million in reductions.

Instead of waiting to issue a traditional request for proposals, they chose to open up the estimating process, keeping all four industry players engaged as the design evolved and treating them as collaborators rather than future bidders.

What followed was an effort that spanned months and included an on-site Industry Day for each baggage handling system contractor. As the process continued, the project's collaborative tone deepened. Instead of basic information sessions, the events became a forum for real dialogue, with engineering teams from each candidate working side-by-side with Introba's designers as the plans matured. Importantly, critical questions about access, sequencing, staging and operational realities surfaced early.

Jonah Thompson, senior account executive with Vanderlande Industries, put in months of work on initial estimates and the company's final response to the eventual request for proposals. During the Industry Day for Vanderlande, he remembers asking, "Have you thought about laydown space? Will there be a spot for our team to embed with



JONAH THOMPSON

you? What are the rules of the road for doing work there?" These are not small questions. They influence cost, risk, safety and schedule; and getting answers to them eliminated many potential issues before drawings were even completed.

In retrospect, Kessler says there was significant value in involving the baggage handling system contractors when their expertise could still have the most impact. By the time the official request for proposals went out in September—about nine months after the first conversations—requests for more information were minimal and the scope was aligned. Armed with ample information about the project, one of the original four bidders bowed out, and the others were able to provide realistic, more finely tuned proposals.

The results spoke for themselves. On the final bid, all three remaining contractors were aligned at \$95 million, which was \$10 million under budget. "We attribute that to all the discussions and making sure that everybody understood the project scope as best as they possibly could," Kessler relates.

He says all of the bidders were strong candidates when the final interviews began, and Vanderlande ultimately secured the contract due to the depth, preparation and detailed phasing work in its final presentation. Proposing Brock Solutions for the system controls strengthened its appeal, he adds.

The \$95 million bid was \$85 million base plus \$10 million in add alternates that Turner and Introba identified as potential "need to have" items they wanted to give SAN the option of including.

The Value of Advance Notice

As the winning candidate, Vanderlande benefited from the intelligence it gathered during the longer-than-usual estimating process. "A lot of times, these bids come out of nowhere," Thompson remarks. That makes it incredibly difficult for firms to assemble the estimating, engineering and operational expertise required to produce a responsible bid—much less assemble the right team to execute it should they win.

"There are a lot of resources required to put a proper bid together, but also to be ready to hand it over to a project execution team," Thompson explains. "If the request is coming out of nowhere, then even if I can find a way to put a price to it, who am I handing it off to?"

Knowing the SAN project was on the horizon and what it would entail allowed Vanderlande to prepare more effectively. "Because this was a known entity for so long, it gave us the ability to plan and bring in quite a few of the people from our Operations side," says Doug Alewelt, Vanderlande's executive project manager. "We really got a head start on the project before we even knew it was our project to work on."



DOUG ALEWELT

That early clarity built trust, reduced redesigns and created an environment where problems could be solved early.

Introba was more than half finished with the design when Vanderlande was brought in. But unlike a traditional handoff, this was an overlapping transition—two organizations working in parallel toward the same finish line.

"We really got involved right after the 60%," Alewelt says. "That was a good point for us to come in and provide another set of eyes to make sure nothing was overlooked." Only minor adjustments

followed. “For the most part, I think we stayed pretty darn close to the original design.”

That vision—continuity instead of a full handoff—set the tone for the work that followed. When Vanderlande and Brock were fully engaged, the construction and installation phases included the same overlap.

The team members agree that what stood out most was what *didn't* happen. No turf battles. No drama. No silos.

For Wheeler, the significance of the transition was cultural as much as procedural. “With a lot of these contracts, issues are thrown over the wall, ‘Here you go.’ Then it’s back and forth 50 times,” he says. “I don’t think we had any of that. When we had any problems or issues, we worked them out. We didn’t throw things over the wall. This team tore the walls down.”

Noteworthy Teamwork

From the beginning, the project team—Introba, Turner, Vanderlande, Brock and the airport—established and embraced an unusually open, candid approach. Dan Vandevenne, business unit leader at Brock Solutions, describes it as everybody sitting on the same side of the table. That spirit made all the difference on a project of this size and complexity, he adds.

Even when challenges popped up—like a potential delay of drive deliveries—the team solved them quickly and collectively. “There was no showing up at meetings and pointing fingers at each other on this project,” Vandevenne says. “For as big and as complicated as this project was, there were just open, transparent conversations, evaluating different options.”

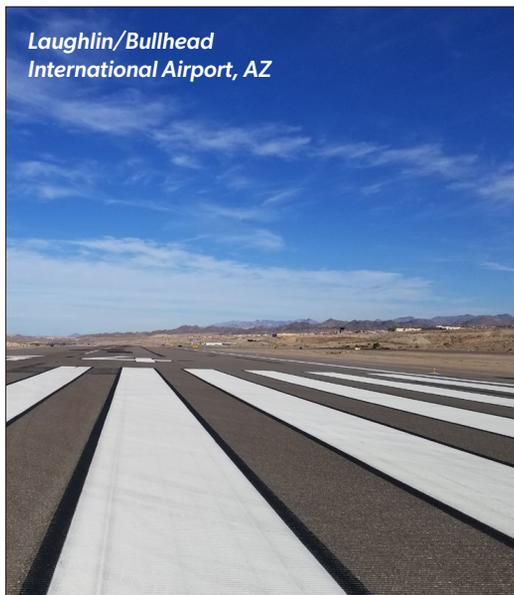
Integrating the baggage system into a dense structural and electrical environment was one of the project’s biggest challenges, Spoon says. As a result, contractors relied heavily on 3D building information modeling coordination, clash detection and joint field reviews to promptly resolve constraints.

“In-person field walks with the Airport Authority, contractor and designers during installation were critical for spotting potential problems,” Spoon says. “It’s critical to step away from the desk and walk the job site,” he emphasizes, adding that this allowed teams to catch issues early and solve them quickly.

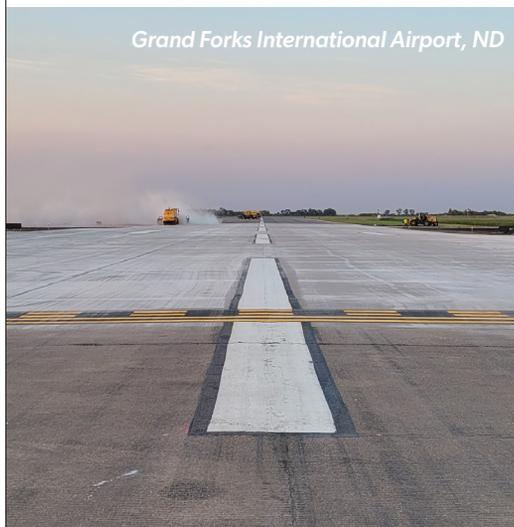
When problems surfaced, teams collaborated in real time to clear baggage-handling zones and keep installation on track—an approach that helped prevent delays and overruns.

Staying on schedule required disciplined coordination and constant transparency, Spoon notes. Bi-weekly team meetings helped keep stakeholders aligned, while commissioning dashboards helped the team track installation in real time and identify conflicts in advance.

To tackle the enormous task of commissioning and testing a system with nearly four miles of conveyor, the team broke the job into manageable pieces by setting detailed daily and weekly production targets. “How do you eat an elephant? One bite at a time,” Spoon quips.

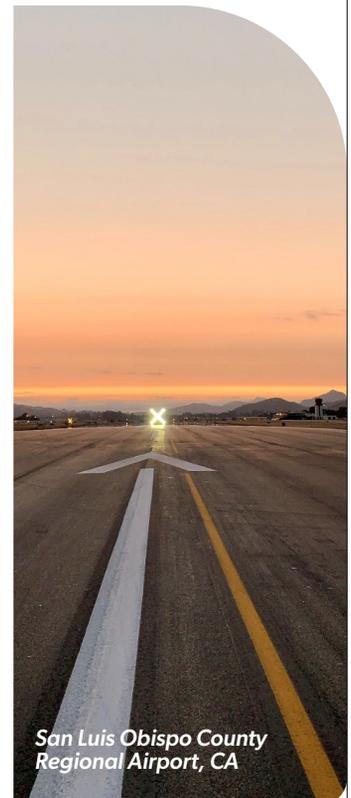


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Lofty Goals, Strong Performance

The team’s overall approach eventually coalesced into a simple, shared mantra: Zero punch list. Zero change orders.

The idea wasn’t perfection for its own sake. It was about being so aligned across design, installation and commissioning that no change orders would be required due to scope errors.

For Jaime Ontiveros, Introba’s manager of field operations who spent long days walking the site, the collaboration was more than a mantra—it was lived reality. Whenever he needed access to a section of the system, the teams responded immediately, whether that was Vanderlande helping with electricians and millwrights, or Brock lending its controls engineers to assist with troubleshooting. Punch list items moved fast. Many were resolved on the spot; others within a mere week.



JAIME ONTIVEROS

“I think the only challenge I had was what to eat for lunch that day,” Ontiveros jokes.

But in all seriousness, his most important role was staying ahead of other trades—spotting potential conflicts before they slowed installation. That led to one of the most impressive parts of the project.

In the end, the team came remarkably close to its goals. The few change orders that did appear were driven by outside factors, not the baggage-handling system.

“I’d say probably 85% of the obstructions that I found were actually part of the building mechanical, electrical and plumbing, or just another trade trying to get a shortcut across the conveyor,” Ontiveros reports.

Wheeler emphasizes how extraordinary that figure is. “Eighty-five percent of the issues we had were non-baggage related! On an almost \$100 million job, a 15% error rate is exemplary.” He credits the craftsmanship of the Brock and Vanderlande teams, as well as Ontiveros’ vigilance in the field, for the impressive execution of Introba’s design. “That really was a huge team effort.”

The collaborative groundwork and culture paid off in spades during one of the most important project milestones: full-system sortation testing. “We processed 800 bags with near-perfect accuracy—a critical achievement during TSA certification,” Spoon says.

Preparing for TSA’s Integrated Site Acceptance Testing required a rigorous commissioning plan and third-party oversight. “Every component—conveyors, motors, wiring and hardware—was inspected to confirm compliance with design standards and airport specifications,” Spoon explains.

The meticulous preparation resulted in smooth TSA testing with no major issues, clearing the way for the system to activate in time for the official Terminal 1 opening on Sept. 23, 2025.

Hitting the Sweet Spot

Looking back on the project, team members consistently comment on how unusual—and refreshing—the experience was. Challenges weren’t eliminated, but they were reframed. Problems were shared rather than siloed. What emerged wasn’t just a baggage system—it was also a blueprint for how collaboration could evolve for other airport projects.

Kessler says the lesson learned through this unique approach is simple but profound: “It’s not early engagement; it’s on-time engagement.”

Clearly, the team enjoyed achieving that balance.

“For this project, we hit the sweet spot,” Wheeler reflects.

Weighing in with the airport’s perspective, Spoon says the team’s success came from early stakeholder engagement, strong digital coordination, phased activation planning and a progressive design-build approach that kept everyone aligned throughout construction and allowed issues to be resolved before they became costly.

“We delivered the baggage handling system on time and on budget, with *zero impact* on opening day—a critical achievement given the high visibility of launching a new terminal,” Spoon emphasizes.

He notes that the system has exceeded expectations for airlines, the Airport Authority and SAN’s Operations and Maintenance teams, but ultimately brings it back to the passenger experience. “We are most proud of delivering a robust, efficient system that provides a world-class experience for travelers.” 

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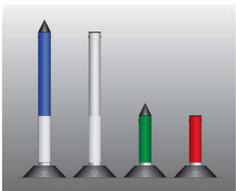
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San Antonio Int'l Outsources Parking Management, Adds Drive-in, Drive-out Ease for Customers

BY PAUL NOLAN

 The passenger experience is a hot topic for C-suite executives at airports large and small, urban and rural. Typically, the focus is on what happens inside the terminal, from the efficiency of check-in, baggage handling and security checkpoints to the quality of restaurants, shopping and other amenities.

However, savvy airport managers know that for many travelers, the beginning and end of each trip take place in a parking facility. What they encounter there—ease

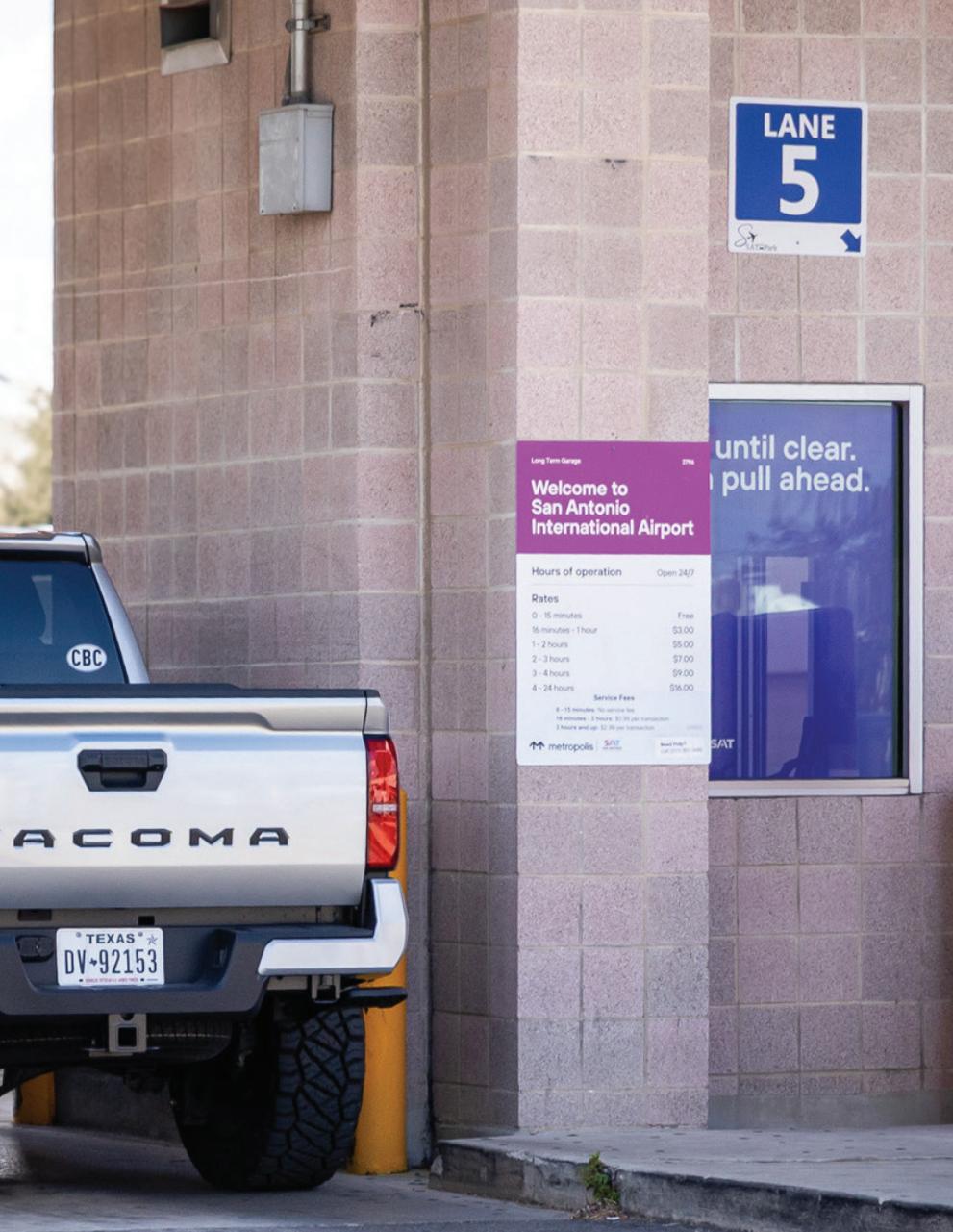
of entry/exit, cleanliness of the garage or lot, convenience and safety—can create a good impression or potentially sour their entire airport experience.

What's more, parking fees are a crucial source of non-aeronautical revenue for most airports, so creating an experience that's reliable and enticing is simply good business.

Executives at San Antonio International Airport (SAT) had all of this in mind when they shifted parking management away from the city and outsourced the function

to Metropolis Technologies, a California-based company with a proprietary app that provides what it calls checkout-free parking.

Vision, the system from Metropolis, leverages cloud-connected video cameras that read vehicle license plates and a software platform driven by artificial intelligence to enable customers using the company's app to skip the payment booth or self-service kiosk and pay for parking from the comfort of their own vehicle, or even while waiting at Baggage Claim.



FACTS&FIGURES

Project: App-Based Parking Payment

Location: San Antonio Int'l Airport, in TX

Strategy: Outsource parking services previously managed by the city to company with app-based system for payment

Objectives: Enhance customer experience; increase parking revenue; lower operating costs

Parking Services Provider: Metropolis Technologies

Cost to Airport: \$565,000/yr software as a service fee, with 3% annual escalator; \$282,000 fee for overall management of parking & ground transportation operations (1st year of 10-year contract, also with 3% annual increases); no upfront equipment costs

Cost to Customers: Per transaction fee of 99 cents-\$3.99, depending on length of stay & service level selected

New Features: Valet parking; space reservations; pricing based on demand; limo revenue management system

Timeline: Airport awarded contract in spring 2024; Metropolis began operating in June 2024, with no interruption to parking services; new drive-in, drive-out technology available for customers mid-November 2024

Projected Returns: Dynamic pricing, reservations, new revenue management system, new parking products & new shuttle management expected to boost parking revenue by \$67 million over next decade (not including recent changes to program for disabled veterans & customers with special military license plates)

“It was a big, bold bet,” says Jennifer Mills Pysher, assistant director, Commercial, at SAT.



JENNIFER MILLS PYSHER

She began overseeing all landside operations, including parking, shortly after the airport launched Metropolis Vision in mid-November 2024. Since then, more than 100,000 local travelers have registered to use the new parking platform.

A Welcomed Infusion of Technology

Prior to joining the SAT team five years ago, Mills Pysher worked for Uber, helping the rideshare company build and maintain partnerships with airports and other

businesses. She says experience working for and with technology companies gave her an appreciation of how aggressively and quickly many of them engineer solutions to challenges.

Metropolis was similarly responsive to the airport’s needs as they broke in the new parking system last year, she notes. For example, limos that move through the airport property using an automatic vehicle identification (AVI) card-based reader system encountered significant delays after the Vision parking system was deployed.

Last fall, SAT representatives explained the challenge to Metropolis and, within days, the company had devised a solution that was beta tested and is now fully operational for limousines. The airport is subsequently looking to use the

system for other transportation modes, such as cabs and hotel shuttles.

Ryan Rocha, assistant director of Operations at SAT, notes that the airport received approval to put the parking management contract out to bid in 2023. Metropolis started operations in June 2024, and airport guests began using the new drive-in, drive-out technology by mid-November 2024.



RYAN ROCHA

Notably, there were no upfront costs to SAT. Metropolis provided and installed new video cameras and new barrier gates, and also posted onsite “ambassadors” and valet staff with tablet computers and other handheld equipment. The airport paid an annual software as a service fee of \$565,000, as well as a fee of \$282,000 for management of overall parking and ground transportation operations (the first year of a 10-year agreement). Both fees include built-in 3% annual increases. Metropolis also collects a fee from customers for each parking transaction it processes.

The transition to a new parking system, which is now completely managed by Metropolis, coincided with the December 2024 groundbreaking for a third terminal—the centerpiece of the airport’s 20-year, \$2.5 billion strategic development program. The

new Terminal C is expected to open in the second quarter of 2028 at a cost of \$1.4 billion.

“The limousine solution was eye-opening,” Mills Pysher recalls. “We’ve gone from having no technology in our parking system to being light years ahead of everybody else. Our team is really embracing it. It ties into the larger development and modernization project. It brings new vision and new energy.”

No More City Management

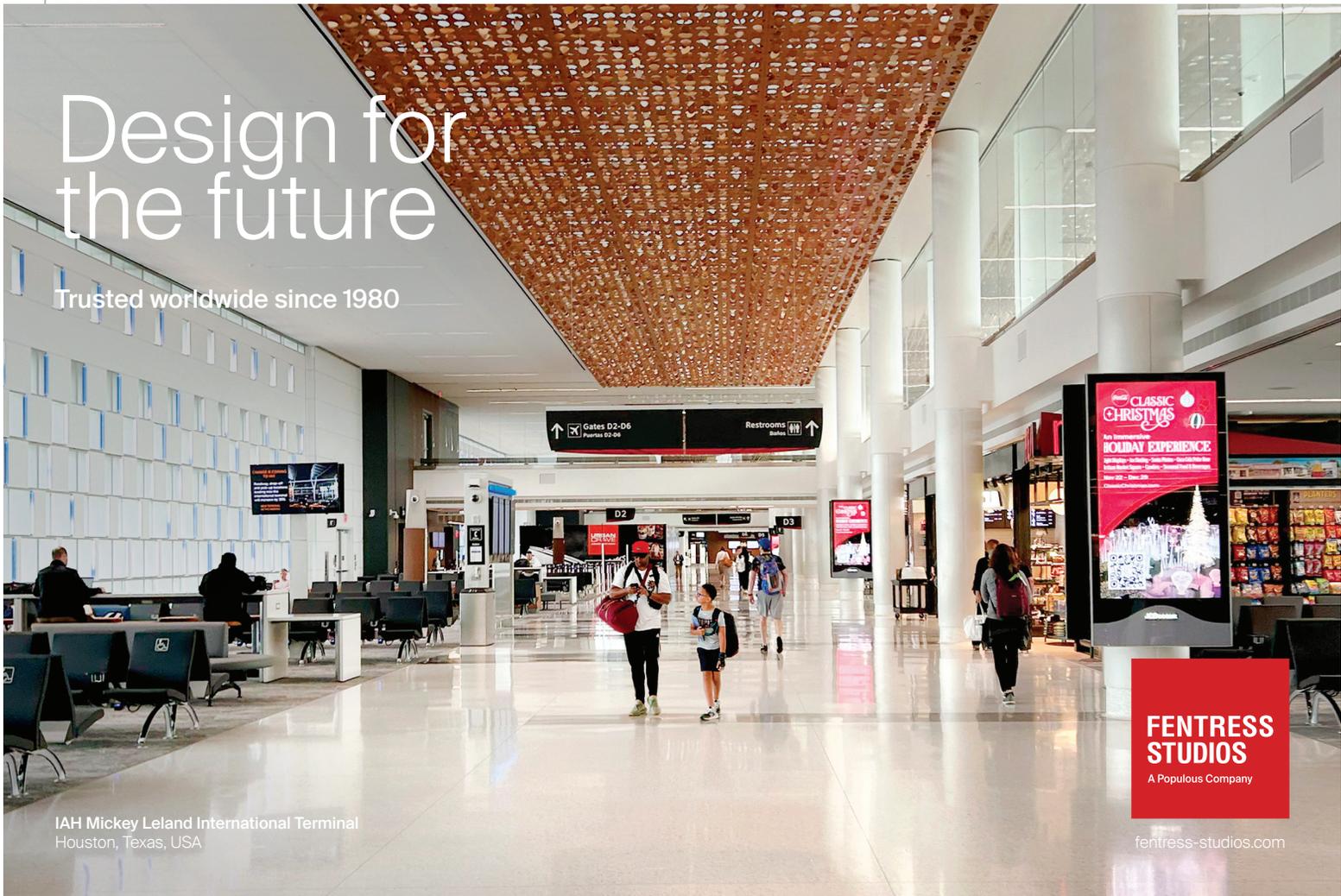
Currently, SAT has two parking garages and three surface lots, with a total of 10,000 spaces. Airport officials report that the airport reached 98% capacity in December 2024, and parking was essentially sold out over the 2025 Fourth of July weekend.

With annual passenger traffic reaching approximately 11 million in 2025, a project was approved to build another garage that will add 2,500 spaces. Slated to be completed in 2027, that project also includes a new ground transportation center for shuttle, taxi and rideshare services.

Rocha reports that parking accounts for 39% of SAT’s non-aeronautical revenue. The city had long overseen and staffed parking services at the airport, but a desire to shift from a traditional ticket-based system to a more modern, touchless

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pay system was the primary catalyst to outsource, he explains.

Additional goals were to increase profits and reduce operating and maintenance costs. In fiscal year 2023, parking fees generated \$31 million at SAT. Airport officials project that privatizing parking and shuttle operations could bring in an additional \$67 million over the next decade.

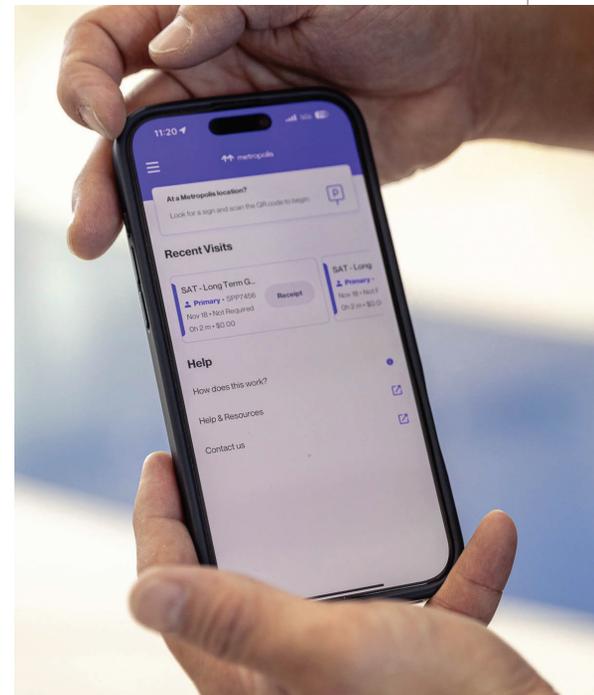
Previously, SAT was one of the last medium-hub airports to be managing its parking in-house, notes Rocha. When the contract to outsource parking management went to bid in 2023, Chicago-based SP+ Corporation emerged with the business. Metropolis Technologies was in the process of acquiring SP+ at the time the contract was awarded, which airport officials were aware of. The deal between SAT and SP+ was completed in April 2024.

Metropolis now employs all parking lot attendants at SAT (customers can still pay by cash if they prefer), as well as drivers for economy lot shuttles, valet parking staff and security personnel. A concierge service that allowed travelers to check bags at the valet service stand was initially offered but discontinued in early 2025 due to lack of use. Metropolis also provides shuttle service for airport workers who use a designated employee parking lot.

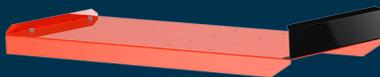
Jason Finch, president of West Airports at Metropolis, reports that the company employs more than 100 workers at SAT—from managers and administrative personnel to drivers, valet parkers, dispatchers, security guards and janitorial staff.



JASON FINCH



Airport guests can now pay for parking directly from their phones.



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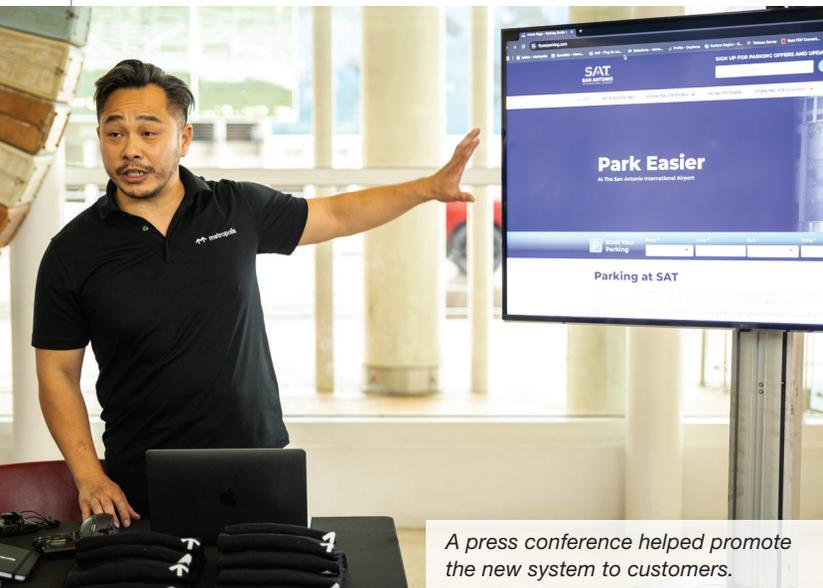


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A press conference helped promote the new system to customers.

The company was founded in 2017 and has become the largest garage network operator in the United States through a handful of acquisitions, he adds. Its technology is in use or being implemented at about 4,200 locations across North America. SAT was the first airport in the world to implement the Vision system, and six others have since added it.

Cameras at the entrances of SAT's parking lots photograph each vehicle, including their license plates. Customers do not need to pull a ticket when entering or pay with a credit card when exiting.

Prominent signage throughout each garage and surface lot notifies customers about the tech-forward parking system and encourages them to use a smartphone to scan a QR code that directs them to a registration website where they provide payment information. When customers exit, cameras record their vehicle information and match it with registration information on file. The corresponding customer is automatically charged, the gate lifts to allow exit, and notification of payment is sent immediately to the person's phone. Transaction fees collected by Metropolis range from 99 cents (for customers parking less than three hours) to \$3.99 (for those using valet services).

Registration is required only once and takes less than one minute, Rocha notes. On subsequent visits, the system automatically recognizes registered vehicles.

New Features, New Profit Potential

Previously, customers could not reserve parking at SAT. With the Metropolis system, travelers can have peace of mind that a space will be available on their departure day.

From the airport's perspective, the ability to adjust pricing based on usage analytics is a valuable new feature. If parking is in high demand, SAT can charge full rates in lots and garages. Conversely, when fewer travelers are parking, the airport can promote lower rates on its website and through

push notifications. The strategy is to entice travelers who might otherwise choose to get dropped off by a taxi, rideshare service or private vehicle to drive themselves and park at the airport instead.

An additional advantage of the Vision system is the vast amount of data it collects about customers, including postal ZIP codes. "I'm getting metrics in real time that are valuable in our marketing efforts," says Mills Pysher. "We can look at average transaction values, slice the data by different periods of time, and know where our customers are originating from."

Early analysis of the data shows the system's reservation capabilities have helped improve revenue per passenger by about 91 cents, she adds.

Rocha notes that Metropolis' AeroParker software platform has a strong track record of enhancing parking revenues at leading domestic and international airports. "The revenue growth potential at each airport is influenced by its unique competitive landscape, including on- and off-site capacity," he says. "At SAT, optimizing pricing strategies based on supply and demand dynamics will be essential in driving parking revenue."

According to Rocha, customer response to the new app has been positive, though some travelers say they prefer pulling a paper ticket and paying an employee. Although SAT has removed all of its ticket dispensers, customers can still pay their parking fees to a cashier.

The airport also recently evolved its parking program for disabled veterans and customers with special military license plates. Previously, SAT offered such guests free parking in all lots and garages, at a cost of \$11 million in fiscal year 2025. In response to an FAA audit, the airport was required to modify this program to ensure its cost was "de minimis," or, in essence, small enough to be insignificant. Metropolis engineered a web-app that allows SAT to offer disabled veterans and customers with special military license plates up to 30 days of free parking in economy lots, and discounted parking in garages. Additionally, the new system allows the airport to offer reservations in all of its facilities as well as provide automated validations, which reduced transaction times from four minutes to two seconds. "This greatly improved the customer experience for qualified service members," says Mills Pysher.

The new iteration launched on Nov. 1, 2025, and SAT had received more than 17,500 applications for the program by late December. "Customers are extremely happy with the changes to the program and the level of customer service they are receiving with the new technology," reports Mills Pysher.

For her, the beauty of the airport's high-tech parking system is that artificial intelligence continues to learn over time, meaning its capabilities have already increased and become even more accurate with each passing day.

"Move fast and break things," Mark Zuckerberg's motto from the early days of Facebook, doesn't seem to apply at SAT. "Move fast and solve challenges" seems more apropos. 

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Terminal 4 at JFK Int'l Completes Tech-Driven Transformation to Boost Capacity and Redefine the Passenger Experience

BY KRISTEN RINDFLEISCH

SAFE TRAVELS FROM YOUR FRIENDS AT T4



 Within a massive \$19 billion redevelopment program across John F. Kennedy International Airport (JFK), Terminal 4 (T4) stands out as one of the airport's busiest terminals and one of its most ambitious modernization efforts. The \$1.5 billion T4 project also highlights how technology and infrastructure can align to reshape the passenger experience.

Operated by the private entity JFK International Air Terminal LLC (JFKIAT), T4 has grown into a major global gateway since opening in 2001, when it served just 4 million passengers. The most recent redevelopment and transformation of T4, which commenced in late 2021, was well timed to accommodate the rebound in travel and

surge in passenger volume that followed the COVID-19 pandemic. As passenger traffic climbed, reaching nearly 28 million travelers in 2024, T4 needed to do more than add space and increase efficiency. The situation called for a comprehensive operational overhaul powered by data, automation and next-generation technology.

Beyond boosting capacity, the comprehensive redevelopment project reengineered operations to emphasize seamless, efficient and personalized travel in T4. The initiative was part of a roadmap the Port Authority of New York and New Jersey established to make all of its airports, including JFK, "world-class." JFKIAT Chief

FACTS&FIGURES

Project: Terminal Updates

Location: John F. Kennedy Int'l Airport, in NY

Terminal: 4

Terminal Operator: JFK Int'l Air Terminal LLC (JFKIAT)

Anchor Tenant: Delta Air Lines

Facility Expansion: 150,000 sq. ft.

Cost: \$1.5 billion

Funding: JFKIAT municipality bonds

Project Management: Delta; JFKIAT

Construction & Implementation:

Dec. 2021–Jan. 2023 with ongoing improvements through Dec. 2025

Key Technology Components: Gate efficiency & real-time visibility program; advanced passenger flow management system; tracking system for mobility carts; interactive waste-sorting assistant; cloud-based passenger processing technology, including self-service kiosks, common-use workstations, biometric integrations & shared-use auto bag drop units

Key Facility Upgrades: New lounges; 10 new aircraft parking positions; additional domestic baggage claim carousel; digital signage; modernized restrooms

Passenger Processing Technology: Amadeus

Advanced Passenger Flow Management System: Copenhagen Optimization

Mobility Cart Tracking System: Volan Technology

Interactive Waste-Sorting Assistant: Intuitive AI

Turnaround Gate Control Solution: Assaia

General Contractor: Delta Air Lines

Engineering: ARUP

Architect: Gensler

General Contractor for Wayfinding Upgrades; Project Management: Turner Construction

General Contractor for Restroom Renovations & Capital One Lounge; Project Management for Delta One Lounge: Holt Construction

General Contractor for Self-Service Bag Drops & Departures Kiosks; Holdroom Upgrades; LED Lighting in Retail & Concourses: VRH Construction

Electrical: GMA Electrical Corp.

Electrical: Unity Electric

Signage Fabrication: Going Signs; Signs & Decal Corp.

Key Benefits: Enhanced passenger experience; improved traffic flow; improved operating efficiency; increased capacity



PHOTO: JFKIAT

Executive Officer Roel Huinink notes that the T4 redevelopment was shaped by two primary drivers: meeting the airport's expectations to comply with Port Authority plans, and accommodating Delta Air Lines' evolving footprint at JFK. Both required repurposing space, updating processes and refining operations.

The T4 redevelopment was originally scoped as a \$3.8 billion program in 2019, and it centered on an expansion of capacity beyond Delta's consolidation at T4. However, the impacts of the COVID pandemic prompted Delta and the Port Authority to renegotiate the project scope, resulting in a \$1.5 billion program that began in late 2021. Given the required timelines, this was an extraordinary undertaking.



ROEL HUININK



The new Delta One Lounge is filled with Art Deco influences and the signature zigzag design of Italian fashion house Missoni.

The physical expansion was significant, driven largely by the consolidation of all domestic operations by Delta Air Lines into the terminal following the retirement of Terminal 2. Accommodating this shift required more gates, more capacity and more efficient operations. The first phase of redevelopment added 10 new narrowbody gates that opened in January 2023. “Basically, 14 months after we broke ground, we opened 10 new gates, which is pretty remarkable,” Huinink comments. Reduced construction work during the pandemic and close coordination between JFKIAT and Delta’s construction teams proved to be major advantages.

Beyond these gates, the project included an additional domestic baggage claim carousel and transformed regional jet areas to support mainline aircraft. The terminal grew by roughly 150,000 square feet, with improvements including an updated check-in hall, refreshed holdrooms, expanded curbside drop-off space, new digital signage and comprehensive restroom updates. These enhancements substantially increased capacity and improved flow for millions of Delta customers in T4.

While the physical upgrades laid essential groundwork, technology investments were instrumental to reshaping how

passengers move through the terminal and improving behind-the-scenes operations.

The Delta Factor

For Delta Air Lines, moving exclusively to T4 was not simply an infrastructure project but a strategic operational realignment. As the terminal’s anchor tenant, Delta led design and construction of the recent expansion/redevelopment (just as it did the previous two), while JFKIAT managed \$1.3 billion of the \$1.5 billion invested. “The primary factor driving this expansion within Terminal 4 was to streamline our operation and improve the customer experience via the efficiencies gained from operating within a single terminal,” explains Ryan Marzullo, Delta’s managing director of NY Design and Construction.



RYAN MARZULLO

Engineering work focused heavily on increasing the number of gates, supporting larger aircraft, optimizing connections and improving the baggage handling system. Delta’s operations required both speed and precision, particularly

during construction of the new narrowbody gates. Following an accelerated schedule, the project team constructed 10 new boarding gates in less than 14 months— a job Marzullo estimates would typically take nearly two years to complete. “Delta’s management team worked closely with [our] operational teams as well as with JFKIAT to develop, refine and ultimately finalize the complex phasing plans that allowed us to complete this program in record time,” he remarks.

The physical consolidation at T4 also laid the groundwork for Delta to expand its biometric and digital tools, including a system that dramatically reduces processing time for incoming checked baggage. “Touchless ID speeds up bag drop by 75%, reducing transactions to just 30 seconds on average (compared to two minutes for customers without Touchless ID),” explains Greg Forbes, Delta’s managing director of Airport Experience. “At security, enrolled customers clear checkpoints three times faster than standard TSA PreCheck, with automated ID verification cutting processing times to just 7 seconds (versus 25 seconds for PreCheck).” This new system reflects Delta’s broader goal to shift routine tasks away from agents so they can focus on hospitality and meaningful passenger engagement, Forbes notes.

Across the terminal, the carrier reinforced its commitment to elevated hospitality and delivering a premium, differentiated travel experience by adding a new Delta One Lounge between concourses A and B, and a second Sky Club in Concourse A. “These enhancements are not just physical upgrades. They’re a direct extension of our strategy to elevate every touchpoint of the customer journey,” comments Claude Roussel, vice president of Sky Clubs and Lounge Experience with Delta.



GREG FORBES



CLAUDE ROUSSEL

Tech-Driven Passenger Journey

The redevelopment did not stop with physical expansion. JFKIAT’s strategy placed equal emphasis on digital transformation, operational intelligence and a new standard of interconnected airport systems. Huinink emphasizes that technology was not an optional component of the redevelopment; it was essential to it. “We invested a lot... predominantly in quality and technology to make the passenger experience better,” he says.

From new self-service systems to dynamic forecasting and mobility tools, nearly every process a passenger touches was evaluated and reimaged. The result is an airport experience more aligned with current

customer expectations. “Good technology is technology that you don’t even perceive is there,” asserts Augusto Santos, senior vice president – Americas – AirOps with Amadeus, one of the key technology providers for the project. “It’s just transparent; it’s just natural, and that’s the type of experience that we want to give to our passengers through our technology.”



AUGUSTO SANTOS

Recognizing that confidence and clarity shape passenger perception, JFKIAT invested heavily in new digital signage, wayfinding and information systems throughout the terminal. LED displays along check-in rows help passengers understand where to go next and provide expected checkpoint wait times.

Additional digital totems developed with TSA provide information to help passengers prepare for screening, such as reminders about restrictions on liquids, removing shoes, taking laptops and other large electronics out of bags, what documents to present to security agents and estimated wait times. JFKIAT is also in the midst of adding kiosks throughout the terminal where passengers can find real-time flight information, ask questions or get assistance from a remote customer service representative. Huinink explains that improving wayfinding and reducing ambiguity or confusion will enhance the predictability of passenger movement and avoid congestion in the terminal.

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PHOTO: AMADEUS

Automated self-service bag drop units from Amadeus support multiple airlines.

A major component of the T4 modernization is the deployment of cloud-based passenger processing technology from Amadeus, including self-service kiosks for passengers, common-use workstations for airline personnel, biometric integrations and shared auto bag drop units. The goal was to make passenger processing faster, easier and more efficient for all 20+ airlines that operate in the terminal.

“On average, a passenger can do their checking and self-tagging at a kiosk in under a minute and the self-bag-drop under 43 seconds,” Santos reports. For a terminal that processes tens of thousands of travelers per day, even minor reductions in transaction time translate to major operational savings.

Because the Amadeus platform is fully cloud-based, it gives T4 the flexibility to scale and update systems without major hardware changes, ensuring consistency across multiple carriers while allowing airlines to tailor select elements. “Our goal is to work with our customers, their airlines and listen to the passengers to deliver a frictionless and personalized passenger experience,” Santos remarks.

The deployment of new auto bag-drop units has reshaped how passengers move through the terminal. Because each unit supports multiple airlines, T4 can maximize throughput without dedicating physical space to individual carriers. As passengers become more aware of this self-service option, these units will occupy more check-in space, allowing employees to focus on higher-value hospitality touchpoints rather than routine transactions like checking bags. For JFKIAT, this shift not only reduces congestion in the check-in hall but also aligns with its broader strategy of blending technology with human engagement to improve overall service.

The system was designed with accessibility in mind, offering multilingual support, intuitive interfaces and ADA-compliant layouts, with optional biometrics for airlines adopting face-match technology.

The Amadeus platform also improves operational visibility, notes Santos. Shared workstations and kiosks provide real-time data on equipment usage and transaction volumes, allowing managers to identify bottlenecks and reallocate resources before queues build. Integrated connections with airline Departure Control System hosts, TSA, border control and T4’s passenger-flow forecasting tools further support a smooth, predictable journey from curb to gate, he adds.

To better predict and manage surges, JFKIAT partnered with Copenhagen Optimization and Beonic on the deployment of an advanced passenger flow management system. The partnership began in 2018 with early deployments of Beonic’s computer-vision sensors paired with the Better Airport software to measure queue lengths and movement patterns. As the redevelopment progressed, JFKIAT expanded the platform into a comprehensive operational backbone for the terminal, explains Copenhagen Optimization Chief Executive Officer Kasper Hounsgaard.



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Better Airport ingests flight schedules, sensor data, airport operational database feeds, baggage information and real-time operational metrics to create what Hounsgaard describes as a real-time “digital twin” of the terminal. The system predicts how passengers will move through every major process—check-in, security, border control and baggage claim—and enables JFKIAT to anticipate needs and coordinate resources long before issues become visible to passengers.

According to Hounsgaard, terminals using Better Airport typically see a 30% to 50% reduction in peak wait times, a 10% to 15% reduction in unplanned staffing needs and a 15% to 25% increase in the ability to absorb growth within existing infrastructure. “Just as important, they gain a shared, data-driven view of ‘what will happen next,’ which leads to faster decisions and fewer surprises across stakeholders,” he comments.

During the COVID-19 pandemic recovery period, the platform proved particularly useful in managing social distancing, establishing predictable traffic flows and coordinating reopening processes, Hounsgaard adds. Today, it continues to support decision-making among airlines, TSA, Customs and Border Protection and terminal operations, allowing key partners to access the same underlying data to guide staffing and resource deployment.

Real-Time Cart Tracking

For passengers with reduced mobility, not knowing when an assistive cart will arrive can add unnecessary stress. JFKIAT is addressing that issue with a tech-driven tracking system from Volan Technology that integrates with Beonic’s analytics.

Volan Chief Executive Officer Michael Bettua explains that the company’s indoor micro-location technology uses a mesh network of wireless beacons to achieve continuous indoor tracking with 1- to 2-meter accuracy, and it doesn’t require GPS, Wi-Fi or cell signals. “The setup is incredibly simple,” Bettua notes. “Our team installed the entire system across Terminal 4 in about four hours, with zero impact on IT infrastructure.” The beacons plug into existing monitors, and the mesh network forms itself automatically. “Attaching tags to carts is about as easy as putting an E-ZPass transponder [for roadway tolls] on the windshield of your car,” he remarks.



MICHAEL BETTUA

Passengers now receive real-time information about availability, cart locations and estimated arrival times through digital displays

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Hospitality Training to Enhance the Art of Travel

The facility and technology components of the recent \$1.5 billion redevelopment program at Terminal 4 in John F. Kennedy International Airport (JFK) are complete, but a focus on elevating the passenger experience continues.

Roel Huinink, chief executive officer of the private terminal operator JFKIAT, emphasizes that employee engagement and service culture can shape the airport experience as much as the physical infrastructure. Combining “hardware” with “heartware” is how he puts it.

The strategy to do so, known as the T4 North Star initiative, addresses five fundamental components: employees, passengers, airlines, commercial offerings and terminal ambiance. Through this initiative, JFKIAT plans to bring the physical transformation of T4 to life by redefining its concessions options, elevating facility design elements and honing the customer service culture across the entire terminal.

JFKIAT is addressing the customer service aspect with a training program called the T4 State of Mind, which focuses on service excellence, innovation and community engagement. The curriculum aims to create a consistent hospitality standard across all partners operating within the terminal—airlines,



PHOTO: JFKIAT

government agencies, concessionaires, retailers and contractors. The program works to build a unified culture that supports positive passenger interactions through customer service training, shared expectations and visual identity elements.

“We’re building customer experiences powered by the T4 State of Mind, where pride, community and innovation unite—and that really aims to enhance the art of travel at T4,” Huinink remarks.

Thousands of employees wear T4-branded apparel and participate enthusiastically in community-building programs, he adds.



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at designated pickup points. “During high-congestion times, we’ve seen a 30% to 40% reduction in wait times,” Bettua reports. The system also provides T4 staff with analytics to optimize fleet distribution and staffing based on predicted patterns up to one month in advance. “That lets JFKIAT proactively manage its cart fleet and deliver a smoother, more dependable passenger experience,” Bettua comments.

Certifiably Green

On the sustainability front, T4 became the first pre-existing airport terminal in the United States to achieve LEED Platinum certification—a milestone that requires long-term commitment, operational discipline and continuous investment, says Huinink.

While some organizations achieve certification once, JFKIAT is actively pursuing recertification, which he says is more demanding because it requires meeting new goals and making ongoing improvements. “We keep investing in innovative initiatives,” Huinink says. “We’re pretty proud of having a holistic approach.” The terminal operator achieved LEED Platinum by working with its partners to meet ambitious targets for energy efficiency, greenhouse emission reduction, water conservation, waste management, indoor air quality and sustainable transportation.

Other recent sustainability efforts include purchasing Green-e® Renewable Energy Certificates as part of an immediate carbon reduction strategy and commitment to reaching net-zero carbon by 2050. Thanks to this investment and facility changes such as upgraded lighting, HVAC systems and building controls, T4 has reduced its carbon footprint by 16%. The terminal has also procured sustainable aviation fuel to help offset business travel emissions.

One of the most visible new sustainability features in the terminal is Oscar Sort, an interactive waste-sorting assistant from Intuitive AI. “By using computer vision, Oscar can recognize what a person is holding and instantly guide them to the correct bin—lifting recycling accuracy to as high as 96%,” says Hassan Murad, the company’s chief executive officer. “What’s happening at JFK Terminal 4 is a clear demonstration that visual, at-the-source guidance fundamentally changes how people sort waste; those small moments of clarity



HASSAN MURAD

add up to meaningful environmental impact.” The equipment also serves as a communication tool, displaying sustainability messages and retail promotions when not being used for sorting.

The new system has already delivered notable improvements at T4, including 71% contamination-free disposal (compared to about 30% across New York), a 95% accuracy rate for bottle recycling and a 65% improvement in overall recycling purity, Murad reports.

In particular, the Oscar unit improves sorting accuracy for items that often cause confusion, like food containers and food scraps. Correct disposal of food boxes now occurs at rates roughly

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The recent transformation of Terminal 4 is a key component of the \$19 billion redevelopment program at JFK Int'l.



twice the regional average, and accuracy for food-scrap sorting exceeds 90%, resulting in far cleaner waste streams, Murad notes.

JFKIAT's sorting machine is installed in a particularly active area and recorded more than 2 million interactions in 2025. "That includes over 40 hours of active engagement time—moments where travelers stop, look, learn and make an informed sorting decision," he explains. "Without Oscar, every one of those moments would have been a missed opportunity for education and behavior change."

AI-Optimized Apron Operations

With tens of millions of passengers moving through T4 annually, even minor delays can compound into operational challenges. To address this, JFKIAT partnered with Assaia to deploy ApronAI, a computer-vision system that analyzes video footage of the ramp to automatically detect and timestamp key events like fueling, catering, cleaning, boarding and baggage handling.

JFKIAT was among the first terminal operators in the United States to proactively invest in real-time turnaround oversight/management. A one-year pilot at select gates demonstrated measurable results, justifying expansion of the platform to all connected and remote gates. The subsequent results have been substantial for the terminal and its airline partners. "ApronAI

has helped reduce ground delays by an average of five minutes per flight, with the improvement in gate efficiency translating to an estimated \$40 million in annual savings potential," explains Assaia Chief Executive Officer Christiaan Hen.



CHRISTIAAN HEN

Beyond T4, Assaia's 2025 Turnaround Report found that AI-enabled operations delivered an average 25% reduction in departure delays and a 5% increase in gate efficiency, which allows one additional flight per day for every 20 gates, Hen says. With reliable, real-time visibility, operations can become more resilient, allowing airports to accommodate rising passenger demand and capacity constraints without necessarily requiring infrastructure expansion, he adds.

Assaia's Predicted Off-Block Time algorithm forecasts when an aircraft will be ready to depart based on real-time and historical turnaround data. "It accounts for multiple variables including aircraft type, weather, landing runway, ramp conditions and even passenger load to accurately predict when the gate will be free," Hen explains. "This enables more efficient gate assignment and helps reduce arrival holding times caused by unavailable stands."

Making Tech Work for You

For many, the recent T4 project illustrates how real-time location intelligence can reshape airport operations when built into redevelopment plans from the outset. Bettua, from Volan Technology, emphasizes that visibility of people and assets transforms both efficiency and decision-making. “The real win is that this technology enables you to do more with the same resources—or even to increase service, safety and security levels with fewer people. It gives your operations team superpowers,” he explains.

Houngaard, from Copenhagen Optimization, says that success depends on far more than software. “The main lesson is that technology alone is not enough—you need good data, clear governance and buy-in from all the key players,” he shares.

Murad, of Intuitive AI, encourages airports to see the commercial potential of interactive waste-sorting technologies like Oscar. “It’s far more than a sustainability upgrade; it’s a new revenue-generating consumer engagement channel inside the terminal,” he remarks. By engaging passengers when they naturally pause, airports can leverage a previously overlooked location for messaging and promotions.

Out on the ramp, deployment of Assaia technology demonstrates that sharing real-time data across all stakeholders leads to faster communication and improved turnaround performance. “The airports that see the strongest results are those that treat digital tools as part of their daily operation, not as an add-on,” Hen advises.

The strength of cloud-native technology lies in its ability to connect the entire airport ecosystem and support the passenger journey from start to finish, adds Santos, of Amadeus. He stresses the importance of securely integrating airlines, government agencies/authorities and airport teams on one scalable platform.

For Huinink, collaboration was a central principle to success of the T4 redevelopment. “In aviation and in airports, you shouldn’t think that you can do things alone,” he reflects. “Collaboration amongst all parties, airlines, business partners, stakeholders and the community is crucial.”

Design Updates for a New Experience

In addition to improving operational systems and technology, JFKIAT refreshed customer-facing spaces. Upgrades include new



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Restrooms throughout the terminal were modernized, and attendant staffing was increased.



art installations, additional lounges, more modern restrooms, and additional concessions—all crafted to showcase the culture of New York City.

Huinink was personally touched to see that some of the local artists selected to provide installations in the redeveloped spaces were immigrants just like himself, as T4 was likely their first entry point to the United States. “They really can take so much pride in seeing their work exposed here and having that connection,” he comments.

Although the terminal already had several credit card and other premium passenger lounges, the new Capital One Lounge is making its mark as the card network’s largest lounge in the United States and the first in any New York City airport. Developed with Capital One and TAV Operation Services, the 13,500-square-foot lounge combines signature New York food brands, modern design, local artwork and a wide array of traveler conveniences. Its opening in June 2025 marked the beginning of an updated concessions program that includes more than a dozen new dining and retail concepts. The food

and beverage additions feature iconic New York brands such as Ess-a-Bagel, Murray’s Cheese and TALEA Beer Co. New retail options include the introduction of Hudson Nonstop’s checkout-free technology.

Throughout the terminal, JFKIAT modernized restrooms with LED lighting upgrades and increased attendant staffing according to new Port Authority standards. “Clean restrooms are a massive driver for customer experience, so that has been a major focus,” Huinink stresses.

During the entire project, JFKIAT worked to ensure that local communities benefited directly from the redevelopment. For example, it worked closely with HMSHost to build joint ventures with local and diverse concession companies that include equity stakes in the terminal’s commercial offerings. “We are super proud that we found quite a lot of good partners in the community to bring into the terminal and not only with [Airport Concessions Disadvantaged Business Enterprises] but also on the construction side to really give us the opportunity to work with the small businesses and give them true access to the airport community,” Huinink remarks.

With the project closing out at \$1.5 billion, that purposeful outreach translated into approximately 40%. It also dovetails with the ongoing \$19 billion airport-wide modernization that includes an overhaul of roadways and the construction of two new terminals—1 and 6. Huinink sees T4 as an essential contributor supporting the broader vision to make JFK a world-class airport. He notes that the JFKIAT team has more than 25 years of history managing the terminal and takes pride in playing a significant role in helping position JFK for its next era of growth. ✈️



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Cyberattack Setbacks Lead to Process Refinements, Renewed Precautions at Seattle-Tacoma Int'l

BY CHRIS JONES

FACTS & FIGURES

Project: Cyberattack Recovery & Resilience Efforts

Location: Seattle-Tacoma Int'l Airport, in WA

Airport Owner: Port of Seattle

Timeframe: August 2024 – ongoing

Outside Support: Check Point Software Technologies; Mandiant; Microsoft

Post-Attack Changes: Adding Information Technology staff; expediting system improvement projects; implementing 24/7 Managed Detection & Response tools from Check Point Software Technologies; reemphasizing password updates & other user precautions; more rigorous data segmentation; renewed focus on tech contingency plans for all departments

2024 Passenger Volume: 52.64 million



There will be no celebratory ribbon cuttings, no glistening new physical edifice that commemorates their work overcoming an extremely disruptive operational crisis. But even without such fanfare, team members at the Port of Seattle still knowingly appreciate their organization's recent push to restore operations and empower future resilience at Seattle-Tacoma International Airport (SEA) after a crippling cyberattack that began in August 2024.

"We used the description 'Build Back Better,'" says Matt Breed, chief information officer for the Port of Seattle, which owns and operates SEA. "Our

focus was on rearchitecting while restoring, to make sure that this would not happen again by fixing the issues that caused us to get into what we got into."



MATT BREED

What the Port "got into" was one of the highest-profile cyberattacks in history. In the days that immediately followed, hordes of travelers at the nation's 12th-busiest passenger airport temporarily went without the convenience of printed baggage tags or check-in kiosks. There was no Wi-Fi service or digital information



displays to provide expected details on arrivals, departures or baggage claim carousel assignments.

Without the usual Wi-Fi service, travelers jumped onto SEA's distributed antenna systems while trying to use cellphones for internet access. That overwhelmed nearby cellular networks and forced the need for delivery of outside equipment to keep everyone connected.

Online reserved parking, the SEA Spot Saver security checkpoint virtual queue and the Port's website were knocked offline for travelers, and staff members were unable to access essential workplace systems such as email and network storage drives. Communicating with the public became arduous, and many passengers found themselves almost entirely reliant on printed signage or face-to-face interactions with staff to continue their journeys.

To make matters worse, Port leadership understood there was no quick fix available. Hackers had encrypted core data files and demanded a large ransom payment to secure their release. The Port was unwilling to meet those demands, but also knew rebooting the system would not be sufficient. A full rebuild was necessary—and that would take months to fully complete.

"It was an incredibly easy decision from an information security perspective, but not a business perspective," recalls Stephanie Warren, assistant director of Information Security for the Port. "There was activity on that server, and looking at how long they'd been in our backups, (the implication was) we were not bringing anything in that environment back.



STEPHANIE WARREN

"So we rebuilt the data center from scratch."

Along the way, tech-centric challenges unintentionally presented opportunities to highlight and further refine the Port's strategies for public communications and customer service. Can-do frontline workers who rose to the occasion now carry forward a legacy of service that coalesced right before travelers' eyes during the recovery phase.

Warning Signs

In the early hours of Friday, Aug. 23, 2024, Port cybersecurity staff members came across a single alert that raised red flags. The more they investigated, the more worrisome their steady discoveries became. A daylong review spilled over into early Saturday, and around 1 a.m., a staff member detected hackers working inside the Port's servers at that very moment.

28 AUG Departures

DEP	GATE	
KOREAN AIR	1:00	S-15
BRITISH	1:30	S-9
JAPAN AIRLINES	2:00	S-8
LUFTHANSA	2:15	S-11
ASIANA	2:20	S-12
AIR TAHITI	2:30	S-7
ICELANDAIR	3:00	S-4
VERGEN AT	4:30	S-9
QATAR	4:30	S-10
ANA	4:40	S-8
EMIRATES	5:15	S-6
COUDRA	5:20	S-15
TURKISH	6:40	

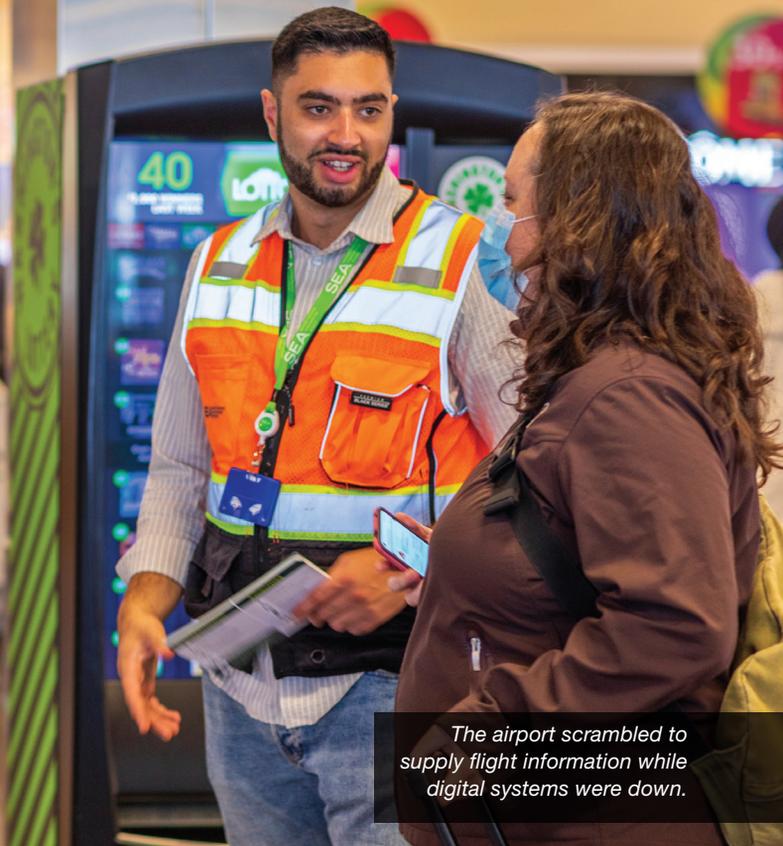
SPRINT
S-2

AIR CANADA
S-1A

WESTJET 1573
S-1

SUN COUNTRY
D-21

NO WI-FI / Lounge UPstairs



The airport scrambled to supply flight information while digital systems were down.

Warren describes the scene that followed as something out of a television drama, with colleagues bellowing, “I need this!” and issuing urgent orders to head off attackers who were later identified as members of Rhysida, a global cybercriminal network. “We were trying defensive maneuvers, and

it became very clear that they were beginning to add more bodies and seats to outnumber us,” she recalls. “They had people sitting at keyboards actively going back and forth with us.”

As the Port’s cybersecurity team realized the attackers weren’t just automated bots that could be fended off easily, it began methodically shutting down systems in a rapid-fire manner.

That process took less than an hour and was immediately followed by further triage assessments and alerts to Port leadership. But from that point forward, no data could move in or get out to staff, tenants or customers. The Port’s local network and auxiliary data center located across the state near Spokane were effectively transformed from two-way communication pathways into “digital islands,” Warren notes.

The Port’s overall information technology network relies on two common systems: operational technology, which monitors and controls automated devices, processes and infrastructure; and enterprise software, which supports primary business processes such as email, file sharing and other user-focused functions. An after-incident investigation revealed that Rhysida hackers penetrated the Port’s enterprise network months earlier via

a worker’s infected laptop, and from there proceeded to compromise the operational technology.

In retrospect, it appears the cybercriminals were patient and nimble. Details gathered suggest that the attack was originally planned for a week later, when more Port staff would be away over the extended Labor Day weekend. Instead, the hackers were rushed into action early when staff detected their digital presence on Aug. 23.

Without that pivotal catch, the situation could have been much, much worse for SEA and its users.

“We saw partial execution of the encryption,” Breed explains. “They should have shut our servers down and encrypted them right away. They didn’t do that.”

Fortunately, the attack’s effects were also limited in several important facets, most notably safety and security. Federal agencies such as the TSA, FAA and U.S. Customs and Border Protection were unscathed because each maintains its own proprietary systems at SEA.

The airport’s larger airlines—including Alaska and Delta, which together accounted for 76% of SEA passenger volume in 2024—were likewise less affected. They continued operating in a

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relatively normal manner using their own information technology networks and tools to process passengers and checked bags.

Still, Labor Day weekend was on the horizon—a peak for Seattle’s Alaskan cruise season and other end-of-summer trips through SEA—and many low-cost and international carriers were suddenly unable to access the airport’s common-use systems.

Puget Sound Principles

Let’s pause to address a common question: Why didn’t the Port simply pay Rhysida’s 100 Bitcoin ransom, which was equivalent to about \$6 million at the time?

The answer came down to principles and strategy.

Steve Metruck, executive director of the Port since February 2018, explains that meeting ransom demands from the cybercriminals was never an option because doing so would have violated the organization’s pledge to be a good steward of taxpayer dollars. For reference, Metruck has held public roles for more than four decades, including the rank of Rear Admiral before retiring from the U.S. Coast Guard years earlier.

In addition, Rhysida is known for frequently demanding second ransom payments after victims pay the first rounds. “It would have

been foolhardy,” says Breed. “We had very little confidence we were going to get our systems back cleanly (through payment).”

Yet even with the attackers shut out and effectively cast aside, the challenges at SEA remained formidable.

The path forward began by first determining *how* to recover. Using primary backups was impossible since hackers had sufficient time to compromise those systems. Some of the backup files had even been deleted altogether, including many from the Port’s auxiliary data center.

All available internal resources were marshalled to devise the best strategy. In addition, the Port turned to outside contacts at Microsoft, which is headquartered just a few miles from SEA, and Check Point Software Technologies, a global cyber security firm based in Tel Aviv. Their respective teams focused on finding and removing the hackers’ work. Google-owned Mandiant, a leader in dynamic cyber defense, threat intelligence and incident response services, also provided assistance in conjunction with Microsoft.

While SEA was still navigating the ripple effects of the attack, Breed recalls Microsoft Chief Executive Officer Satya Nadella indicating that it was a top priority for the company to support its hometown airport.

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Managing the Message

Technology troubles notwithstanding, determining what to say about the incident and when to say it added even more challenges.

Chris Guizlo, the Port's director of External Relations and Communications, was SEA's on-call media responder the weekend of the attack. Around 3 a.m. on Aug. 24, Guizlo was alerted that systems were down and passengers had no internet access. He quickly reported to the airport where things soon went from normal to "cascading" as more outbound flights couldn't access SEA's common-use systems.

Providing updates was initially difficult due to the lack of email service, internet access and other common tools. Guizlo and team could only use their cellphones to communicate, and the system they needed to operate was overloaded by customer use due to lack of onsite Wi-Fi.

But there was one ace in the hole: Social Media Program Manager Abbey Lampert was logged into the Port's and SEA's social media channels from her home, where she had functional Wi-Fi.

"We used that as our vehicle to get our updates out," Guizlo explains, adding that local media had previously been trained to check the



CHRIS GUIZLO



ABBEY LAMPERT

airport's X (nè Twitter) feed for information during big events. As cell service allowed, staff relayed information to Lampert, which she then posted on SEA's social platforms for the general public.

Prior training on the National Incident Management System (NIMS) made the Port's communications crew comfortable working closely with the event's incident commander using an Emergency Operations Center setup. The team's first-day messaging focused on the customer impact, noting which airlines were or were not affected, providing information about TSA checkpoint lines and affirming that shops and restaurants were still open.

The situation became more critical on Sunday due to a heavier schedule of international arrivals. These carriers, which use common-use systems, had lost their ability to electronically check in passengers or to print tags for checked baggage. Delays ensued immediately.

Aviation Managing Director Lance Lyttle, then SEA's top official, held a press conference that afternoon alongside local TSA and Customs and Border Protection leaders. Each stressed that safety and security were not compromised by the incident and acknowledged that there would be temporary inconveniences.

"That took down the temperature quite a bit," Guizlo recalls.

Still, he and his communications team walked a fine line over the next few days. They needed to provide travelers with important information without sparking speculation into what had caused SEA's problems. Admitting there was a cyberattack prematurely would have affected the ongoing investigation, and perhaps encouraged other bad actors to strike similarly, Breed explains.

It wasn't until Sept. 13—nearly three weeks later—that the Port publicly confirmed an intense examination had concluded the outages were "consistent with a cyberattack."

"People (then) gave us a little bit of understanding because they've seen that happen to other organizations," says Guizlo of the eventual public acknowledgement.

Where to Start?

Prioritizing functions was paramount during the recovery effort, with longer-term items being set aside for operational needs, as directed by executive management. Although the Port had continuity of operations plans (COOPs) already in place, implementing them revealed some big surprises.

Printers emerged as an unexpected core need, particularly to create signage for travelers while most of the digital displays were not functional. "Being able to print was huge, and the fact that the organization was so dependent on that was shocking, in retrospect," Breed notes.

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AVIATION

Limited access to anticipated response tools was another shortcoming. Because the Port's active directory was dumped, most staff couldn't access Microsoft 365 or other everyday applications. Nearly 2,500 workstations were upgraded to Windows 11 after they were encrypted. Software was painstakingly reset with new passwords and logins, requiring significant time to coordinate between information technology staff and affected employees.

Once the decision to rebuild the data center was made, Port staff used available hardware that had been previously purchased for other upcoming projects. Coupled with new orders facilitated by trusted reseller World Wide Technology, a new data center began to rise from the ashes. An outside data infrastructure company provided further support through its storage and cloud-based tools.

There was a near-daily balancing act, however, as immediate operational needs conflicted with informational technology security. Despite that, Warren says stakeholders remained incredibly collaborative to ensure no system came back online prematurely.

"It was a constant back and forth of finding new information and then figuring out how we can bring something back safely," she says. "From a (security) perspective, I was 'Burn it to the ground and rebuild,' even though I know that was never really an option."

Good fortune reared its beautiful head once again thanks to a Port server engineer who, before the attack, was preparing to run tests on new file server hardware. In the course of that work, she had placed weekly copies of data in a legacy location that was unknown to and remained uncompromised by Rhysida.

"That was where we ultimately recovered our saved data," Warren says.

Even so, that stroke of luck revealed a shortcoming that needed to be corrected going forward. Those copied files, Breed notes, never should have existed in a legacy location outside of the Port's newer cloud-based SharePoint systems that remained protected from the hackers' breach attempts.

"It became very apparent that a lot more people were using that legacy file share than we had estimated," he says. Campaigns strongly encouraging Port staff onto the cloud are now continually emphasized to help lessen the likelihood of future data vulnerabilities.

Turning the Tide

Port leaders report that SEA received strong support from its airlines and internal stakeholders, with most frustrations stemming from uncertainty about when tech systems would come back online. Despite disruptions to vital processing systems, the airport experienced some delays but no flight cancellations.

"I'm amazed that we kept chugging along," Breed says.

Staff hand wrote baggage tags Aug. 24 to 25, and then used generic printed tags until the Port could access uncompromised backup files to restore its normal processes. Once achieved, that crucial milestone also re-enabled common-use carriers to check in passengers electronically.

Public communications duties were divided into three functional areas. Guizlo served as the overall lead, with Media Relations Manager Perry Cooper handling press inquiries, and Lampert leading the social push. They all recognized the power of imagery and tasked any staffer with a smart phone to capture and send them videos and still photos.

If an employee spotted a blacked-out display, for example, that imagery was shared via social media. The same applied as travelers were observed waiting in long lines at baggage claim, or when staff offered directions with hand-written signs.

"I needed those pictures to tell that story for media, as well as for the public," Guizlo explains. "We can say it over and over again, but being able to see it is a different story."

Guizlo credits trust between his team and Port leadership, which set up basic guardrails but otherwise did not interfere with efforts to provide transparency. This allowed them to fend off rumors and address issues before they grew into crises.

Since many members of the Communications team have journalism backgrounds, they were able to anticipate which



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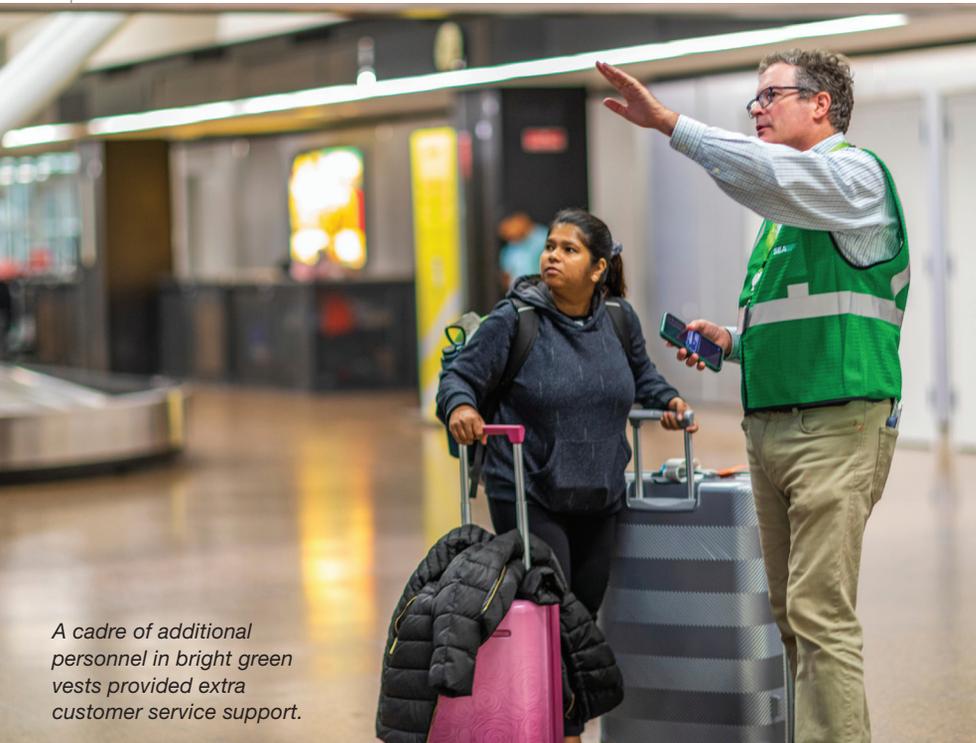
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A cadre of additional personnel in bright green vests provided extra customer service support.

questions were likely coming and determine how best to answer them. Cooper also repeatedly took time to walk members of the press around the airport for first-hand understanding.

“I told (leadership) we needed to be posting updates twice a day,” Guizlo says. This approach built what he calls an “amazingly effective strategy” for public confidence.

Green Cavalry

Just when it was needed, help began pouring in from unexpected places. Port staff from facilities across the region, including seaports, volunteered in large numbers to assist air travelers. Julie Collins, director of Customer Experience and Brand at SEA, deftly dubbed these eager helpers the “Team in Green” after the bright vests they wore while providing key customer support with a friendly smile, even when directing guests to the nearest restrooms over and over again.

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“It was honestly one of the biggest morale boosters internally because they felt like they could help, even if they couldn’t do their regular jobs,” recalls Guizlo.

By Wednesday, Aug. 28, processes in the terminal had normalized enough that the Communications team could shift from assuaging fears over disruptions to addressing the upcoming Labor Day passenger surge. Issuing travel tips during that period is an annual tradition, but SEA took a different approach in 2024 by having staff members share the information in social media videos.

Showing the faces of those who had worked so hard to lend assistance humanized the Port’s challenges in a favorable manner, Guizlo explains. It also boosted morale among employees who felt their extra efforts were being appreciated and highlighted. The videos reinforced the message that most flights and services at SEA were no longer affected by the cyberattack. “It was really getting into the nitty, gritty details of who’s going to be impacted by what,” Lampert says.

As systems came back, each win was widely shared and celebrated. Local social media influencers even got into the act unprompted, praising Port staff for working so hard to keep travelers informed and moving with few interruptions.

“Being able to show people that we’re here, we’re listening, we’re trying to get you the information we can give you just shows

them that we’re understanding and we get it,” Lampert says. “That went a long, long way with all of our customers.”

Lessons Learned—and Shared

Now more than a year later, Warren says there is only one absolute takeaway from the attack: Airports will never be 100% immune to vulnerabilities, no matter how hard they try.

But that doesn’t mean organizations should stand by idly while hackers across the globe scheme new and innovative ways to crack their defenses. Breed likes to remind his industry peers that the damage caused by cyberattacks outnumbers by “orders of magnitude” how little is spent on cybersecurity. To flip that script, SEA is increasing its information technology staff and expediting system improvements rather than “kicking the can.”

Among the positive changes prompted by the 2024 attack, Breed cites the addition of 24/7 Managed Detection and Response tools.

“I.T. departments are often understaffed and...changes can be disruptive and difficult to complete. But there’s no tolerance for cutting corners anymore,” he reflects. The Port quickly completed two to three years of previously stalled projects in the aftermath of the attack because it became imperative that those improvements no longer be delayed, he adds.



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Counter personnel used manual workarounds to continue processing passengers.



There were also cultural changes such as reminding colleagues why cybersecurity training, however annoying it may be—is, in fact, necessary.

“There is a balance between security and operations, but now the pendulum has swung much more toward the security side,” Breed comments. “It’s something we have to remain focused on for the long term. It’s a continuous arms race with these threat actors.”

Working with Microsoft and others, the Port has become much more rigid about segmenting data to make it more difficult for hackers to jump from one network area to another. Users are now denied direct access to servers and must pass through virtual private networks that determine who is accessing the system, and from where.

Well-exercised contingency plans are the new standard across *all* Port departments, Warren reports. Some units performed well, while others less so, in 2024. Going forward, the goal is for each unit to create and understand its own unique resiliency plans for any type of disruption. This includes diligent efforts to prioritize tasks and identify mission-essential needs—even for easily overlooked details such as printers.

“When you talk about cyber, people automatically respond, ‘That doesn’t involve me. I don’t deal with computers,’” Warren says. “But it does, because any technology disruption means an operational disruption.”

Those who suggest the Port’s policies left it vulnerable to an attack are mistaken, Breed adds. Instead, he cites a convergence of circumstances that began with an infected device and software tools that failed to remove all bad files. Rather than being wiped 100% clean, that laptop was somehow reconnected to the network where hackers were then able to spread beyond that device, largely unnoticed. Among Breed’s key takeaways: Don’t just assume your defenses are working as planned and never overlook the small stuff.

“A lot of the triggers that were seen were (initially) seen as individual events that we had already cleaned up,” he explains. “The big picture did not emerge until this full attack.”

As airport functions normalized, Lampert recalls realizing that the Port’s communications strategy also couldn’t simply snap back into pre-attack work patterns. “You can’t just pretend everything’s OK; we had to answer the elephant in the room,” she comments.

Restoring the Port’s website in time for Thanksgiving travel was a key priority that took several more weeks. During that time, messaging temporarily continued over longform blog entries on LinkedIn and Facebook. These often featured interviews with employees to further highlight SEA’s well-received “Team in Green” theme.

“To the public, things were better at the airport. But our systems were still affected internally,” Lampert describes. “It wasn’t a black and white switch. There was that really good gray area before we could pivot.”

As 2024 fades further into memory, Port representatives hope sharing their experiences will assist other airports and organizations to avoid similar predicaments. “We wanted our sad story to be a lesson instead of others having their own sad stories,” Warren remarks. “Airports are now forming a united front to make us stronger as an industry.”

To that end, Breed was recently contacted by staff from two other airports who said they had warded off cyberattacks thanks in part to lessons SEA had shared.

“(Transparency) helps us get stronger as an industry,” he concludes. ✈️

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Detroit Metro Begins Implementing Electric Ground Support Equipment

BY MICHELLE GARDNER



The adage “time is money” rings painfully true about ramp operations. Aircraft engines idling while pilots wait for open gates, passengers waiting to board or deplane, and ramp personnel waiting to service aircraft all cost money.

Prior to the advent of electric- and battery-powered ground support equipment, all of this wait time added up to dollars disguised as fossil fuel fumes.

Detroit Metropolitan Wayne County Airport (DTW) in Michigan is nearing the end of a multi-year, \$13 million project to replace its diesel-powered ground power units (GPUs) and pre-conditioned air (PCA) units with low-emission electric alternatives. This eco-upgrade—part of the airport’s long-term development plan—is designed to reduce emissions and fuel consumption by eliminating trucks that fuel ground support equipment. And while all ground support equipment can eliminate the need for fuel-burning aircraft to run their auxiliary power units (APUs) to power electrical systems, air conditioning and pressurization, DTW’s new electric versions do it with a cleaner environmental twist. In turn, less noise and fumes on the ramp will create a healthier work environment for ramp workers.

But, this type of improvement initiative requires time and money.

Keen to Go Green

A decade ago, DTW’s operator, the Wayne County Airport Authority, worked with utility provider DTE Energy and the Electric Power Research Institute to perform an audit on existing ground support equipment that could be electrified. In its “Zero Emissions Roadmap” presented in 2020, the Airport Authority officially encouraged airlines to consider switching to all-electric or battery-powered PCA and GPU equipment and offered partnerships for grant assistance. However, this strategy hinged on funding and cooperation from the airlines. The 2020 report also included information about the DTE Rebate program, a public funding tool the Airport Authority previously used and plans to continue using to improve energy efficiency for new construction and major renovations.

In late 2021, DTE Energy announced a \$7 billion, five-year investment in the electric grid for southeast Michigan, where DTW is located. Its goal is to prepare for demands by consumers and businesses for more electrification of current and developing technologies as well as increasingly severe weather trends.

A few years ago, Alberto Rocha, sales director for the Americas at ITW GSE, had the unenviable task of telling the Airport Authority that its aging fleet of the company’s ground



support equipment was no longer sustainable. Rocha explained that the 15- to 20-year-old equipment was obsolete and very difficult to support because many components were no longer available, the refrigerant was not EPA-compliant, and, importantly, none of the units had sufficient capacity for new aircraft.



ALBERTO ROCHA

- Rocha highlights the many benefits of battery-powered PCAs and GPUs, also known as eGSE, as well as the point-of-use all-electric equipment DTW ultimately chose to purchase and install: all-electric units connect to the main grid of the airport;
- reduced emissions and fuel consumption from fuel trucks and on-aircraft auxiliary power units;

- greater EPA compliance;
- the opportunity to standardize equipment at all gates to ease training and use for ramp workers;
- increased safety thanks to fewer people, carts and vehicles on the ramp;
- a healthier work environment with reduced emissions and noise for ramp workers; and
- a more comfortable experience for passengers boarding and deboarding aircraft.

To realize those benefits, however, DTW needed funding for an extensive transition to electric equipment.

Kelly Tally, director of Facilities, Design and Planning for the



KELLY TALLY

FACTS&FIGURES

Project: Implementing Point-of-Use Electric Ground Support Equipment

Location: Detroit Metropolitan Wayne County Airport, in MI

Installation Site: McNamara Terminal Concourse A

Key Components: Updating electrical infrastructure; replacing 61 pre-conditioned air & ground power units

Airport Operator: Wayne County Airport Authority

Est. Project Cost: \$13 million

Funding: 75% FAA Voluntary Airport Low Emission (VALE) grants; 25% airport bonds

Timeline: 2022-present (completion expected Feb. 2026)

Electric Ground Support Equipment

Supplier: ITW GSE

Design Consultant: Mead & Hunt

Design Subconsultant: AERO Systems Engineering

Prime General Contractors: AERO BridgeWorks Inc.; Bayview Electric Company LLC

Electrical Contractor: Bayview Electric Company LLC

Key Benefits: Reduced emissions & fuel consumption from eliminating fuel trucks & need for on-aircraft auxiliary power units; consistent equipment at all gates simplifies training & use for ramp staff; enhanced safety due to fewer people, carts & vehicles on ramp; healthier environment for ramp personnel due to lower emissions & noise levels

Airport Authority, recalls that many of DTW's airline tenants were interested in switching to electric ground support equipment, but the airport did not have the infrastructure to do so quickly.

While researching funding sources, Tally and her team found an FAA category for priority projects called Emissions and Energy Improvements and the Voluntary Airport Low Emissions (VALE) program. They applied for and received \$6.5 million in fiscal year 2023, and \$6.2 million in fiscal year 2024 to purchase and install new, all-electric ground support equipment for 61 gates at the McNamara Terminal, which is used exclusively by Delta Air Lines and its partners. These VALE grants covered 75% of the project cost, with the 25% required local match coming from airport bonds.

The federal funding provided money fairly quickly to update electrical infrastructure and purchase the new PCAs and GPUs, and the grant criteria narrowed the scope of equipment providers.

"When we wrote the performance specs, we really wanted vendors to hit certain capacities because we've got 120-ton [PCA] units, which are very large, and there are only two or three companies that make these larger-sized units for wide-body bridges," says Tally, adding that ITW GSE, which ultimately won the business, is "well-known and on the forefront of eGSE."

The timing was right for transitioning to electric ground support equipment because ITW GSE was discontinuing its diesel-powered PCA and GPU models the airport had operated for years. In addition, the new, fully-electric 3500 series PCA units include a feature that automatically detects what type of aircraft is being serviced and delivers precise airflow tailored specifically for it—rather than using average values based on aircraft category. According to the company, this increases cooling efficiency by more than 50%, which improves passenger comfort while minimizing energy waste.

The airport's new PCA units and solid-state 400Hz GPUs are fully compatible with ITW GSE's EcoGate system, which allows the GPUs to share power with PCA units and other connected equipment through Intelligent Power Management to optimize gate power usage without overloading existing infrastructure.

With deliveries of the new equipment in 2023 and 2024, DTW became first U.S. airport to receive ITW GSE's new 3500 series PCAs and 2400 series GPUs. All 122 units were earmarked for Concourse A in the McNamara Terminal, but that's apparently just the beginning.

Rocha reports that DTW has a very aggressive plan to replace all of its boarding bridges in both terminals, and the ITW GSE



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factory in Florida has dramatically increased production to outfit them with electric ground support equipment. Because it takes longer to build boarding bridges than PCA units and GPUs, the airport purchased and installed its new units on existing boarding bridges, and will reinstall them on the new bridges as they arrive.

Rebuilding Infrastructure

The electrical infrastructure in McNamara Terminal, which was two decades old, required a major update to accommodate the power needed to service more wide-body aircraft.

Tally explains that the upgrades, which began in 2023, involved more than just replacing old wires. Because the new electric equipment is more robust, the airport needed to upsize its breakers, conduits and wiring. It also switched to larger disconnects—high-capacity switches located close to the equipment they serve that allow operators to safely control circuits carrying large amounts of electrical power. Mountings for PCA units were upgraded, and some of the new units were mounted above or below jet bridges to create more ramp space.

ITW GSE's EcoGate system connects the equipment through Intelligent Power Management hosted in the 3500 PCA units, which constantly monitors consumption and allocates power

dynamically to ensure the GPUs always have the necessary amount of power without exceeding a gate's capacity. Even so, the airport was still able to install 45-ton PCA units with the limited existing infrastructure. "They [DTW] did not have to spend millions running new cables or even building a new substation to supply power to these gates," says Rocha.

"We have our own power distribution center here," adds Tally. "So everything is readily available and that made it really nice." Each of the airport's terminals, McNamara and Evans, has its own Metro Energy center operated and managed by DTE Vantage. The center for McNamara provides 17 MW backup electric power.

Making the Swap

The Airport Authority and its project partners plotted a schedule to install the new ground support equipment: one day to remove the old equipment, pull the old conduit and wire, and then mount the new unit and run new conduit wire; and one day for commissioning with the ITW GSE team. "We would work with our Delta Operations team and close two bridges at a time for no more than three days," Tally recounts.

Weekly meetings helped identify and plan for the extensive project. Participants included the Airport Authority's project management team, its designers, construction management staff,



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AERO BridgeWorks Inc. was the prime general contractor for the project.



stakeholders and Operations staff along with AERO BridgeWorks Inc., which served as a prime general contractor and performed several installations. When the airport elected to upsize some of its GPUs and PCA units to accommodate larger aircraft, these meetings were crucial for making the upgrades without impacting the project schedule.

From August 2023 to February 2024, AERO BridgeWorks installed 23 new GPUs and 23 PCA units in Concourse A of the McNamara Terminal, which stretches for nearly a full mile, making it the longest airport concourse in the U.S. and the second-longest in the world.

In May 2025, the company began installing the remaining 38 PCA units and 38 GPUs, with completion expected in February 2026.

Commonality Breeds Familiarity

Training ramp personnel on the new equipment is easier as all the units for Concourse A are now the same. Additionally, the new units produce lower emissions and less noise. With fewer workers and carts on the ramp, service activities are logically safer and more efficient, which can lead to quicker turnaround times.

Rocha explains that installing the same equipment with the same control panel adds to the efficiency because once personnel know how to use one control panel, they can operate ancillary products.

Tally adds that this commonality of equipment facilitates on-time departures and arrivals, which is key. “The GSE teams on the ground really like the new units as they’re much more streamlined, with fewer buttons, and easier to use,” says Tally. “ITW has given us great training and we have their onsite, third-party commissioning team that is local. If there are ever any issues, they are deployed within the same day, which is great.”

By the Numbers

So, what are the specific financial and environmental impacts of DTW’s recent conversion?

According to the DTE Rebate team, the airport’s rebate will come in 2026 with an estimated savings of \$100,000. Tally highlights the projected reduction of criteria pollutant emissions, including more than 126.6 tons of nitrogen oxides, 21 tons of volatile organic compounds, 306.9 tons of carbon dioxide and 26.8 tons of particulate matter, over the 20-year lifespan of the electric units.

“What also saves a lot of money is that Delta does not have to run their APUs on the planes, which is a huge savings of hundreds of thousands of dollars,” she adds.

As of October 2023—when DTW was just getting started with its electric ground support transition—VALE grants have funded 141 projects at 58 airports. In total, these projects are expected to reduce ozone emissions by 1,768 tons per year for the next five years, which is the equivalent to removing 98,700 cars and trucks off the road each year.

It’s Time

Tally notes that DTW and the Airport Authority are always looking for ways to keep customers happy and comfortable throughout their airport experience.

A champion of further ramp electrification, she says, “I think that’s really the way to go. It makes the environment cleaner, it enhances the passenger experience and that’s really what we’re here for is to ensure a smooth transition from when you park your car, check in, to when you get on that bridge—that’s really the portal to leave the terminal, so we really want to have a good feel for when you leave.”

Given the environmental benefits and potential to reduce wait times for ground support staff, passengers and airlines alike, it seems now is the time for more ramp electrification at DTW. ✈️



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After Devastating Tornado, Crawford County Airport Rises from the Rubble Better Than Ever

BY KEN WYSOCKY

FACTS & FIGURES

Projects: New Terminal & Hangars

Location: Crawford County Airport, in Palestine, IL

Catalyst: Tornado leveled previous facilities in 2023

Rebuilding Period: March 2023-Oct. 2024

NEW TERMINAL/HANGAR

Cost: \$5.6 million

Funding: FAA; IL Dept. of Transportation

Size: 7,331 sq. ft. terminal, 2,550 sq. ft. hangar

Amenities: 2-story, vaulted-roof concourse/atrium; pilot lounge; flight planning room; public lounge; offices; bathrooms; kitchenette; communications room; "hardened" storm shelter room

Construction: Oct. 2024-Oct. 2025

Engineering Consultant: Hanson Professional Services Inc.

Architect: White & Borgognoni Architects

General Contractor: K. Wohlman Construction Inc.

Wall & Roof Panels: Dimensional Metals Inc.

Key Benefit: Larger, more modern facilities

NEW HANGARS

Type: 10 T hangars; box hangars for 10 aircraft; 1 corporate/maintenance hangar

Cost: About \$2.1 million

Funding: Property insurance settlement

Pre-engineered Hangars: R & M Steel Co.

On-Site Contractor: Dyer Family Fabrication

Construction: Sept. 2023- April 2024 for T & box hangars; April-July 2024 for stand-alone corporate hangar

Benefits: Newer, significantly improved facilities; better aircraft traffic flow on apron



Just before 9 p.m. on March 31, 2023, tiny Crawford County Airport (RSV) stood just like it always had since it was established as an auxiliary military airfield in 1943.

But minutes later, the 432-acre general aviation facility in southeastern Illinois literally ceased to exist.

A powerful tornado, rated EF-3 on the Enhanced Fujita scale of zero to five, barreled through the area and leveled the facilities at RSV. Two rows of airport-owned T hangars, two corporate hangars and a small office building that served as a lounge for pilots were reduced to twisted piles of rubble. In addition, 19 small airplanes and several airport vehicles were demolished.

"Everything was gone," says Vicki May, a member of the Crawford County Airport Authority board of directors. "To see this airport, where we've spent so much time with friends, totally destroyed was pretty staggering."



VICKI MAY

The Piper Warrior she and her husband had owned for 25 years was among the airplanes that were destroyed. "It was like a death in the family," May recalls.

Although there was no official estimate, the storm easily caused millions of dollars in damage—a devastating loss for the small, close-knit town of Palestine, near the Indiana border. With about 200 operations per month, RSV provides a vital transportation link for businesses and medical facilities in the area and also serves as a social hub for local aviation enthusiasts, May explains.

The airport resumed full function by the end of 2024, complete with an eye-catching \$5.6 million terminal designed by White & Borgognoni Architects. And to top it all off, the Illinois Department of Transportation named RSV the state's 2024 Small General Aviation Airport of the Year.

The story of how the small airport went from a debris-strewn airfield with only its two runways left intact to an award-winner just 20 months later is a testament to the power of resiliency, teamwork and community spirit.

Timing is Everything

There's obviously no good time for a tornado to hit, especially a brute like the one that destroyed RSV and extensively damaged nearby communities. The destructive storm packed winds up to 165 miles per hour, traveled nearly 41 miles in 21 minutes and measured a little more



than half a mile wide, according to the National Weather Service.

But the tornado's timing was fortuitous in one respect: The FAA had recently announced \$5 billion of funding available to airports nationwide for terminal improvements.

"While the tornado was devastating to the community, the federal funding opportunity emerged at just the right time and positioned us to rebuild efficiently and create long-term improvements for the airport and the community," says Jeff Olson, aviation discipline manager at Hanson Professional Services Inc., the airport's engineering firm for about 25 years. "A new terminal at RSV was a perfect application for those funds."



JEFF OLSON

Because everything at the airport was levelled, the project team could redesign facilities and improve convenience for pilots, Olson adds

"If there was one silver lining behind those buildings disappearing overnight, it was the opportunity to take a really fresh look at where buildings should go in order to improve on what was there before," he

explains. "We had a clean slate to build off of the existing aprons."

May and other Airport Authority board members eventually saw the upside, too. "We weren't in love with how the office, some of the hangars and the fuel tank were positioned," she relates. "So since we had a blank slate, we decided to reconfigure things to make it easier for planes to get around the apron."

But there was a catch: To qualify for the federal funding, RSV had to submit a revised Airport Layout Plan reflecting the new facility configurations. Hanson and Airport Authority members developed a new plan, aided by an \$80,000 planning grant from the Illinois Department of Transportation.

The new layout included a row of nesting T hangars (10 in all) and a row of box hangars for 10 airplanes where two rows of T hangars once stood. A new corporate/maintenance hangar was added on the north side of the terminal apron. And the terminal, which is attached to another new hangar, was located about 100 feet away from the apron and further north. Moving the terminal from its previous location in the middle of the apron improves the flow of aircraft, Olson explains.

In addition, a fuel tank that was in an awkward location was moved to provide easier access for pilots.

Funding Win

After the new Airport Layout Plan was completed, the team worked feverishly to submit a funding application by October—a process that included obtaining environmental approvals and developing a conceptual terminal design to establish a cost estimate.

"We did it all in four months... approximately three times faster than it normally would take," Olson recalls. "There were a lot of moving pieces; it was all very fast-paced.

"But we had the FAA district office in Chicago and state of Illinois in our corner," he continues. "Both were very influential in getting our application prepared and cheerleading for Crawford County. We held weekly coordination meetings with them to make sure all the required reviews got done."

Even so, the odds of receiving funding were against RSV because the program was primarily aimed at larger airports. But Olson knew the rural Illinois airport had a very compelling storyline.

"It really pulled at people's heartstrings," he says.

Olson's instincts were correct, and the funding application was approved in October 2023. The airport received \$3.8 million through the FAA's Terminal Project Fund, with the remaining \$1.8 million for the new terminal and an attached 2,550-square-foot hangar coming from the FAA Airport Improvement Program and the state of Illinois.

Step-by-Step Comeback

In the meantime, the Airport Authority, community volunteers and a contractor worked for several months clearing mounds of debris from the airfield. Large metal pieces were cut up and removed, trash was collected and put into dumpsters, and a local township used rubble from destroyed concrete blocks for riprap.



The new terminal has a barrel-roof design and metal panels to complement agricultural buildings in the area.

“A lot of the material was recycled, so we felt pretty good about that,” May remarks.

The runways opened in about one week, but only for daytime operations because the airfield lights were still out. The airport also bought a small temporary building for pilots to use.

Step by step, RSV rebuilt its facilities and returned to business as usual. Electricity was restored after about three months, and airfield lighting was reestablished.

Rows of new T hangars and box hangars were finished in April 2024. The new corporate/maintenance hangar was completed in July 2024, which allowed fixed-base operations to resume. Construction of the terminal and attached hangar began in October 2024 and wrapped up in October 2025.

Every project, from construction of new hangars to the installation of a wind sock and beacon, was a celebrated milestone, May reflects.

Significant Upgrades

The “shining star” of the rebuilt airport, as Olson puts it, is the new terminal. The 7,331-square-foot facility represents a vast improvement over the previous terminal, which was a

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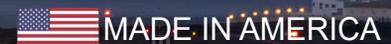
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small concrete block building (also attached to a hangar), with basic offices, a small kitchen, a pilots' lounge, bathrooms and a conference room.

The new terminal features graceful curved roof sections, including a dramatic vaulted barrel roof towering above a two-story concourse/atrium that runs through the middle of the building. Two rows of 10 clerestory windows—each window 5 feet long and 3 feet tall—are located high above on the north and south sides of the atrium and flood it with natural light.

"We wanted to maximize natural light as much as we could," says Nick Williams, the project's lead architect. "Since it's an aviation building, we basically wanted to connect it to the sky. All of that natural light creates a welcome and transparent environment that contrasts sharply with the solidity of the building's metal envelope."



NICK WILLIAMS

Williams explains that he was drawn to a distinctive barrel-roof design because the curves introduce a sense of motion and lift, as well as evoke the aerodynamic profile of an aircraft wing.

The building features a structural steel frame covered with coated, rust-proof metal wall and roof panels made by

Dimensional Metals Inc. The roof panels are 12 inches wide, 1 inch thick and vary in length from about 26 to 39 feet.

"The panels clip onto the frame and interlock with each other, so there are no exposed fasteners penetrating the protective panels," Williams says.

The vertical wall panels, which are 12 inches wide, 1 inch thick and up to 15 feet long also are secured to the building's steel frame with concealed fasteners.

"The metal panels evoke a familiar agricultural feeling compatible with structures that dot the surrounding countryside, such as machine sheds and barns," Williams shares. "They provide extra durability while maintaining a visual dialogue with the rural landscape around the airport."

Public Access

The terminal offers many amenities, including a pilots' lounge, a flight planning room, a lounge area for public use, offices, large bathrooms, a kitchenette, showers for pilots and a communications room. It also features a storage room that is "hardened" with a concrete ceiling and walls to provide shelter during severe weather.

Including as much public access as possible was a chief design consideration, because federal funding only covered the cost of

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The tornado destroyed 19 airplanes as well as rows of hangars and the small office that previously served as a pilot lounge.



areas that are open 24 hours a day to the public.

“So when we got into wants versus needs, we had to maximize eligibility for federal funding,” Olson explains. “We were able to make the building 86% eligible for federal funds, which is a pretty high benchmark. That’s a very good

percentage, probably about 10 points higher than normal.”

The building also includes solar panels designed to generate enough electricity to supply all of the power the building will need.

Affordability, ease of maintenance and an aviation-themed aesthetic drove the

interior design. For example, the main concourse floor was finished with dyed-and-polished concrete that requires very little maintenance, and the colors and patterns evoke clouds in the sky.

It Takes a Village

For Olson, rebuilding an airport—even a small one—in about 19 months was a notably gratifying, rewarding and unique project.

“It was a feel-good success story for everyone involved it,” he reflects. “It shows what can happen when everyone works together. We had such wonderful coordination and cooperation with all agencies from goal line to goal line.

“It was an incredible project to be a part of,” he continues. “The resiliency of the Airport Authority was amazing. They never blinked. We matched each other’s energy throughout the project, which is a large part of why it was successful.”

May expresses deep gratitude for support from the FAA, Illinois Department of Transportation and local community. “Everyone bent over backward to help us,” she says.

The Airport Authority board of directors, Crawford County Board and other local agencies also deserve a lot of credit, May adds. “I’ve been on a lot of boards and this is one of the best and hardest-working ones. We had a lot of debates, but it was always healthy debate.

“And Hanson did just a super job,” she remarks. “They worked diligently to pull everything together and get everything done in time to submit the grant.”

Nonetheless, while May is thrilled with the improved airport facilities, she still has mixed emotions when remembering what transpired that grim day in March 2023.

“We do have a wonderful new airport, but I think it’s up for debate whether it was worth what everyone had to go through,” she says. “People suffered tremendous losses.

“We all love the new airport,” May continues. “But it all took a tremendous personal toll on a lot of people—there was a lot of heartbreak. But at least in the end, something good came out of it.” 

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Oshawa Executive Takes Proactive Steps to Reduce Noise

BY MIKE SCHWANZ

FACTS & FIGURES

Project: Runway Improvements

Location: Oshawa Executive Airport, in Ontario

Runway: 12-30

Scope: Lengthening both ends of runway; adding 1 new taxiway & extending another; adding blast deflectors & acoustic fencing

Cost: \$6.6 million

Funding: City of Oshawa

Airport Manager: Total Aviation & Airport Solutions

Engineering Consultant: HM Aero

Chief Contractor: Brennan Paving & Construction

Airfield Electrical Engineering: Gibbings Consulting

Municipal Engineering Support: civilGO Engineering

Geotechnical Engineering: PNU Engineering

Blast Deflectors: Blast Deflectors Inc.

Acoustic Fencing: Groundbreaking Foundations Inc.

Noise Wall Panels: Silentium Noise Barrier

Design & Construction: Early Sept. to mid-Oct. 2025

Key Benefits: Improved airfield safety; noise reductions; ability to accommodate larger aircraft



Being one of the busiest general aviation airports in Canada is both a blessing and a curse for Oshawa Executive Airport (YOO) in Ontario. With a healthy customer base and about 100,000 aircraft operations per year, the city-owned facility is considered to be a success. But the active traffic often puts airport officials at odds with nearby residents concerned about the associated noise.

“Oshawa has 14,000 residents who live within 2 kilometers of the airport,” explains Airport Manager Stephen Wilcox. “We are sensitive to their situation, and we want to be a good neighbor. So in the last year, we have really stepped up our efforts to reduce noise levels from aircraft operations.”



STEPHEN WILCOX

The airport's long-term goals cover several areas:

- Reducing overall noise levels,
- Reducing the frequency of flights,
- Modifying based aircraft, and
- Changing the height and altitude of departing aircraft

The last point was the focus of a recently completed construction project that extended the length of YOO's main runway (12-30) from 4,250 feet to 5,057 feet. The northwest Runway 12 end received the most attention, because many of the homes that directly border the airfield are located under the departure path for that runway. More space was added at the end of Runway 12 so planes taking off from it can get in the air faster.

To obtain the greatest benefit, the airport lengthened the runway at both ends, and used displaced thresholds to allow for appropriate obstacle protection according to Transport Canada standards.



benefit is that there are fewer birds on the threshold because there is no grass full of bugs for them to eat.”

The change is also designed to have a positive impact on noise. “With this extra space, a G500 jet or even a small plane taking off from Runway 12 will be 50 stories higher as it lifts off, resulting in a significant noise reduction,” Wilcox explains.

In addition to adding a taxiway that connects with the new departure areas at the 12 end, the airport also extended existing Taxiway B by 250 feet at the 12 end. “This helped because planes now do not need to turn around and go backward to get to the end of that runway,” Wilcox explains.

At the Runway 30 end, YOO added 357 feet of pavement and extended the taxiway 607 feet. The normal 200 feet of flat grass threshold was moved back to accommodate these changes.

For initial planning, detailed design, tender preparation, contract administration and eventual construction oversight, the airport hired HM Aero, an engineering consultant based in Ottawa, ON, that has worked with YOO since 2019. But this project was different. The firm started the design process in January 2025, and everything (including construction) had to be completed in just 10 months.

“We employed our detailed knowledge of airport standards and recommended practices in Canada and internationally to optimize the runway as much as possible, so that aircraft could get in the air faster when taking off, resulting in them being at a higher altitude flying over homes,” says HM Aero President Adam Martin.



ADAM MARTIN

“We were grateful for the opportunity to bring our niche planning and engineering skills to this assignment,” he adds.

“At the Runway 12 end, we added pavement, allowing for a runway starter extension supporting Runway 12—the first of its kind in Canada,” Wilcox details.

This starter extension is unique because typically, there is a large, flat grassy area before the end of a runway. Depending on an airport’s certification, it is either a runway strip or runway end safety area. Either way, the purpose is to provide a flat area in case an airplane lands short before the runway, or lands long and runs off the end of the runway. But when aircraft are taking off, these grassy areas serve no purpose. “We paved the big flat grass area to allow a pilot to use it for takeoff, thus increasing the runway takeoff length,” Wilcox explains. “If an airplane lands short, the pilot is now landing on pavement, not grass. And if an airplane trying to land touches down long, the pilot now may overrun the runway onto pavement instead of grass. The other

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Extending the end of Runway 12 allows departing planes to get in the air faster and helps decrease noise for nearby homes.

“The challenges presented by the site constraints and the requirement to maintain aircraft operations enabled us to think outside of the box, and it was a pleasure to work with a client that was informed and engaged throughout the entire process.”

Preparation Pays Off

Another key element was getting approval from Transport Canada for the runway improvements, and, more immediately, plans to shorten the runway from 4,250 feet to 3,200 during construction. “This was a substantial reduction that required careful planning and analysis,” Martin remarks. “Besides being significantly shortened, the open and closed sections of the shortened runway were changed several times. “Communication was essential for this project,” he adds, “and we worked closely with the airport and the air traffic services provider—NAV Canada.”

Before construction started, the airport held meetings with tenants and other stakeholders. Although the presentations were informal, they were very important, stresses Wilcox. “In the past, local



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residents had strongly opposed any sort of runway expansion. They were worried that any new project would just increase aircraft noise,” he explains. “So for this new project, we really had to show how this expanded runway would actually cut down on the noise, especially from aircraft taking off.”

Materials and drawings supplied by HM Aero helped airport management obtain support for the concept, and the project was approved by various government entities. The city of Oshawa finalized a \$6.6 million budget, and construction was scheduled from early September to mid-October—a period that traditionally has the most cooperative weather for outdoor work.

Some tenants were temporarily inconvenienced during construction, namely those operating larger corporate jets or military aircraft that need all 4,250 feet of the runway for safe operations. However, the construction period was minimized to the best extent possible, the weather cooperated, and construction was finished on schedule in October 2025.

Noise Barriers and Blast Deflectors

Beyond lengthening the runway to get aircraft and their associated noise in the air faster and higher, YOO also installed noise barriers at the tip of Runway 30 and along its connecting taxiway.

The fencing, from Groundbreaking Foundations Inc., interrupts sound waves generated by aircraft on the ground. Project designers selected the product for its ability to reduce ground noise by 5 to 10 decibels as well as its general aesthetic appeal.

The sound barrier system uses galvanized steel posts and reflective rigid polyvinyl chloride (RPVC) sound wall panels that meet ASTM E90 sound transmission loss requirements.

The acoustic wall covers 1,290 feet and is constructed from 150-mm-high RPVC panels with integrated steel accessory panels inserted within the PVC section. Because the components are lightweight and modular, installers could hand-stack panels to reach the required wall height of 10.5 feet.

The noise wall panels are a Silentium Noise Barrier product designed to meet all applicable industry codes and standards for noise barriers, including fire testing, physical outdoor weathering, accelerated weather testing, impact resistance and wind load resistance of up to 48 pounds per square foot.

Two stands of blast deflectors were installed about 200 feet from the tip of Runway 30 and in the taxiway shoulder area, primarily to protect the acoustic fencing from aircraft exhaust and debris kicked up during taxi, takeoff and landing. The deflectors

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Structures from Blast Deflectors Inc. protect new acoustic fencing from engine exhaust and the debris it stirs up.



have a nominal height of 12 feet. One measures about 156 linear feet; the other, 168 linear feet.

Blast Deflectors Inc. supplied the structures with rush delivery to accommodate the project's short construction schedule. The company also sent a field representative to support Brennan Paving and Construction during installation.

"We worked closely with the contractor, and the deflectors were installed on one side of a taxiway and at the end of the runway within a week," reports Blanca Rocha Becerra, international business development coordinator for Blast Deflectors Inc. "We also provided a stamped foundation design that specified the required concrete thickness and reinforcing. This ensured the contractor would pour a foundation that met local code requirements and properly supported the deflector under jet blast loads."



BLANCA ROCHA BECERRA

Positive Impact

The extended and improved runway only has been open for a few months, but Wilcox has already received encouraging feedback from airport tenants and the general public.

"The expanded runway has improved safety," he adds. "We are only five miles from Lake Ontario, so we are affected by bad weather. In winter, pilots of all aircraft will have more room to land and take off in bad conditions."

The recent improvements are especially crucial for pilots on medical missions. "Aircraft specializing in organ transport use our airport frequently," Wilcox continues. "We have socialized medicine here in Canada, and the government likes to move patients around, if necessary. So in bad weather, our lengthened runway will give such planes more of a safety net."

The longer runway will also benefit transient traffic and many YOO tenants. "General Motors, for example, has a plant here in Oshawa, and they use Runway 12-30 often to transport just-in-time parts and engineering expertise," Wilcox explains. "The expanded runway should give them more flexibility in the types of corporate aircraft they can use. And in 2026, we hope our longer runway may attract some new clients as well."

A watershed moment for YOO occurred this past October, shortly after the improved runway reopened, when Prime Minister Mark Carney flew in for a meeting on a Challenger 600. "That would not been possible before this project was completed," Wilcox reflects. ✈️

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New Display at Bush Intercontinental Offers Visitors a Glimpse into Houston

BY KRISTEN RINDFLEISCH



FACTS & FIGURES

Project: Digital Video Display

Location: George Bush Intercontinental, in Houston

Name: The Oculus

Size: 93 ft. x 16 ft.; 226.5 ft. linear span; about 1,955 sq. ft. of active LED surface

Resolution: 34,584 x 1,416 pixels (about 49 million total)

Planning, Design & Construction: 2021–2025

Key Components: Real-time interactivity via dual LIDAR sensors; 6 synchronized video playback servers; dynamic brightness & content scheduling; integrated generative Unreal Engine content

Technology Integrator: Ford Audio-Video Systems

Owner's Authorized Representative: Burns Engineering

Architectural Designer: HOK

Creative Design & Content

Production: Gentilhomme

LED Manufacturer: Nanolumens

Content Management & Playback

Systems: Smart Monkeys; AV Stumpf Pixera

Monitoring & Control: Smart Monkeys ISSAC / Nanolumens NanoSuite / Pixera media players

Key Benefits: Enhances passenger experience; celebrates Houston's identity; supports terminal flow; accessible to general public



In a world where many people navigate life with their heads down and eyes trained on their own cellphones, George Bush Intercontinental Airport (IAH) is prompting visitors in Terminal E to look up for a shared digital experience called the Oculus. An enormous ring of light and multimedia motion that hovers between the ticketing and baggage claim levels in the new International Central Processor encourages visitors to stop and watch sweeping waves of color and graphics. Those who are really paying attention may notice that the visual presentation responds to their movement; however, few will consider the years of planning, coordination and experimentation that made IAH's new landmark possible.

Leaders at Houston Airports emphasize that the stunning display unveiled in fall 2025 and other digital systems such as self-service processing kiosks are more than new infrastructure. "The new international terminal at George Bush Intercontinental Airport (IAH) represents the future of global air travel—where technology, efficiency and design come together to create a seamless passenger experience," remarks Director Jim Szczesniak. "The new IAH International Central Processor will be a centerpiece of that experience. Its architecture and



JIM SZCZESNIAK



immersive digital design will form a beautiful jewel box that delights and inspires wonder from both levels.”

What appears to be a single, continuous display is actually an intricate orchestration of architecture, electronics, software and creative content designed to welcome visitors and celebrate the city itself. “This is about connecting Houston to the world and the world to Houston in a way that drives economic growth and reflects the innovation that defines our city,” Szczesniak notes.

To help bring the Oculus to life, Houston Airports hired Burns Engineering as its Owner’s Authorized Representative. While Burns provided

technical oversight from early planning through final commissioning, Nanolumens engineered and manufactured the custom LED display. Ford Audio-Video Systems (Ford AV) managed the complex systems integration and coordinated the technology that drives the array, and Gentilhomme Studio led creative design and content production.

From Concept to Reality

When Houston Airports first explored adding a large-scale digital feature at IAH, the goal extended beyond simple aesthetics. The team wanted to create an experience that would connect travelers to the identity of Houston in a way that felt seamless. “The earliest discussions

focused on their vision for the digital experience so we could understand how to bring and maintain stakeholder involvement through the multi-year process,” recalls Matthew Meier, project manager with Burns Engineering.



MATTHEW MEIER

In addition to coordinating project designers, engineers and creative teams, the firm also validated the structural design from HOK: a cantilevered, angled fascia strong enough to support the massive media system yet still integrate into the terminal’s clean existing architectural lines. Burns personnel worked closely with HOK’s architectural team and Nanolumens’ engineering specialists to confirm load paths, materials and attachment points that balanced strength with the architectural effect envisioned by Houston Airports.

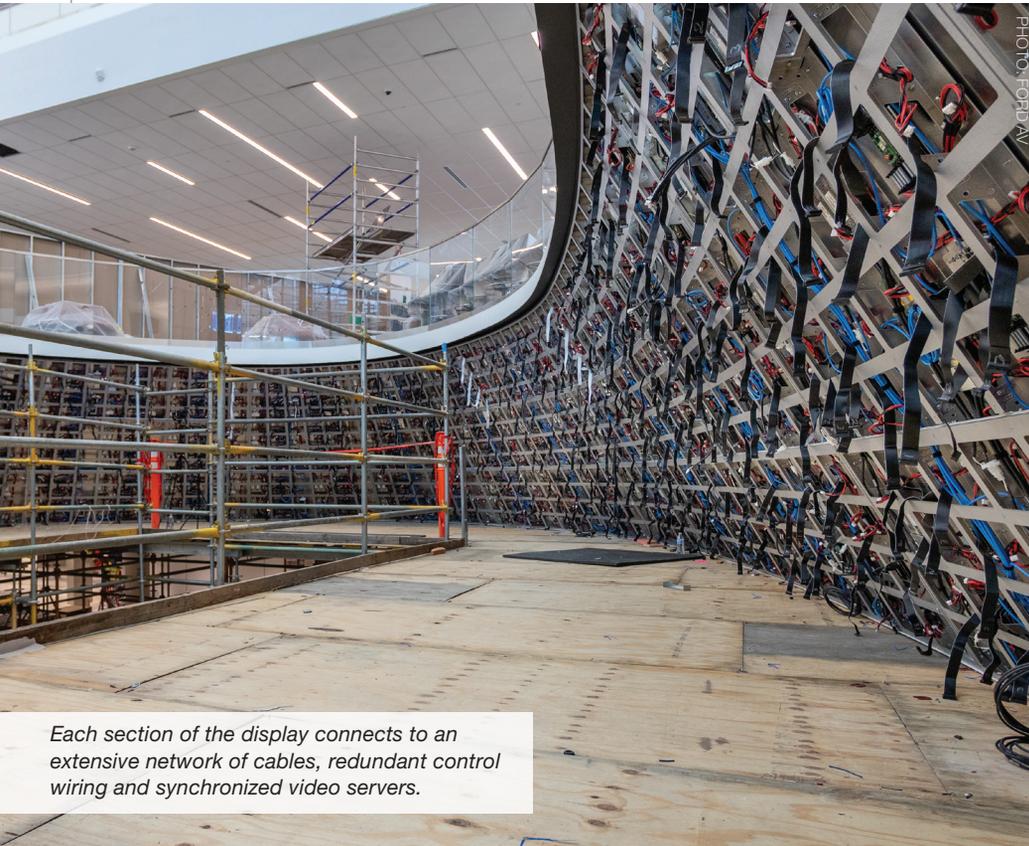
Although travelers might think IAH’s new digital display is just another big, splashy LED wall, it is significantly different from most. Unlike flat or cylindrical displays common in sports stadiums and arenas, the Oculus is a tilted oval that is narrower at the top than the base—like a truncated cone. “The most complex part is it’s actually tilted down,” explains Mitch Warren, senior design engineer with Ford AV. “The video surface is not perpendicular to the floor.”



MITCH WARREN

The distinct shape and geometry include continuous curves along multiple axes, which presented considerable challenges for project partners. “Nanolumens had to custom manufacture all these trapezoidal LED panels that don’t exist anywhere else in the world,” Warren notes. No two panels are identical, but together, they form a structure that provides a truly unique visual experience.

In fact, the Special Projects Group at Nanolumens spent years developing the technical framework that made the display possible. “Nanolumens’ R&D



Each section of the display connects to an extensive network of cables, redundant control wiring and synchronized video servers.

and Mechanical Engineering teams worked to develop the custom componentry required to match the design intent,” explains Todd Alan Green, the company’s global director of Airports and Transportation.



TODD ALAN GREEN

Due to the complexity, Nanolumens designed both the video surface and its supporting mount as a unified system with a frame to match precisely with the terminal’s steel and structure. “It really had to be exact,” Warren notes. With such tight tolerance requirements, crews had to make small, precise adjustments—working just a few feet at a time—continuing this process until the entire perimeter was aligned.

Each of those adjustments supported an underlying design that was entirely custom. The Oculus consists of eight distinct arc sections built from 36 types of custom polygonal LED tiles. “In total, Nanolumens created nine unique Nixel Series LED frame shapes and fabricated 84 discrete LED frames to achieve the continuous, sculptural form of the

Oculus,” explains Dan Rossborough, director of the Special Projects Group with Nanolumens.



DAN ROSSBOROUGH

Long-term durability was a core design requirement, and the system includes both passive and active cooling for stable operation in Houston’s hot, humid climate. “Nanolumens’ modular Nixel system allows for front-serviceable access, meaning individual panels can be replaced or serviced without disrupting the surrounding structure,” says Green. “Combined with remote system monitoring through NanoSuite, this design ensures minimal downtime and proactive maintenance.”

Measuring 93 feet long and 16 feet tall, the Oculus spans more than 226 linear feet with a surface area of roughly 1,955 square feet and a resolution of 34,584 by 1,416 pixels—nearly 49 million in total. “The pixel pitch ranges from 2.0 millimeters to 1.4 millimeters, enabling exceptionally high visual detail,” says Green.

Early plans called for 4K video, but as the design advanced, engineers realized that the extreme width and relatively short height of the Oculus required a non-standard resolution. “There were a number of design changes and technical challenges that we had to work through to make that a reality, because most video processing equipment can’t handle non-standard resolutions. So we had to rework the infrastructure,” Warren explains.

The environment within the International Central Processor required fine-tuning regarding light and contrast. Though partly sheltered from direct sun, the Oculus sits in a naturally bright area. Light sensors and content variations allow IAH to balance brightness for daytime and evening conditions and keep imagery vibrant but comfortable to the eye.

Building, Testing and Validation

Burns Engineering built multi-stage commissioning into the project plans. “Stepwise, parallel testing was included as part of the procurement process,” Meier explains. “This provided checkpoints to ensure specific display, content management and content elements were tracking and providing feedback with each other.” A highly collaborative process among engineering, integration and creative teams sharing constant feedback helped confirm that system components operated precisely as intended.

Prior to installation, every component was prototyped and tested in multiple environments. Gentilhomme used the LED environment in its Montreal studio to fine-tune color calibration and server synchronization, ensuring the content pipeline aligned with the physical display. “The way content

is designed affects pixel mapping, the type of servers, synchronization—everything,” explains Gentilhomme Chief Executive Officer and Executive Creative Director Thibaut Duverneix. “People think content is just video, but it’s way more than that. It’s infrastructure, engineering and workflow.”



THIBAUT DUVERNEIX

To validate the design and function before fabrication, Nanolumens constructed a full-scale factory mockup at its headquarters in Georgia. This allowed Houston Airport System, Ford AV and other key project partners to verify visual performance, geometry and structural alignment. Once approved, the mockup was disassembled, shipped and reassembled at Ford AV's Houston facility for further review — confirming structural fit, color accuracy and display performance well before final assembly.

Each LED tile was then factory-calibrated and color-matched to ensure uniformity across the entire surface. Long-term consistency is managed through the Nanolumens NanoSuite monitoring and management platform, which provides real-time diagnostics, remote oversight and continuous color-uniformity control. The electronics operate through AV Stumpfl's Pixera media servers and Smart Monkeys' ISSAC platform, integrated with NanoSuite for scheduling, monitoring and performance management.

Once the structure was set in place at the airport, Ford AV began what the team called "skinning the Oculus" — installing small LED tiles, each roughly one foot square, across nearly 2,000 square feet of surface area, with multiple performance checks throughout the process. "It wasn't like you finish building and then see if it works,"

Warren remarks. "We built a section, tested it, built another, tested again. It was a continuous process to make sure every module, cable and signal path performed exactly as expected."

Behind the scenes, each section of the display connects to an extensive network with hundreds of power and data cables, redundant control wiring and six synchronized video servers. Any misalignment — even by a fraction of a second — could cause visible seams, so Ford AV coordinated with Nanolumens, Smart Monkeys and AV Stumpfl Pixera to create smooth playback across the entire curved surface.

Once the system was operational, Ford AV, Nanolumens and AV Stumpfl Pixera trained Houston Airports personnel on daily use and scheduling. Because of the system's sophisticated nature, IAH has a six-year maintenance and support contract with Ford AV for ongoing, preventative maintenance checks and on-call response for technical issues.

Through the Looking Glass

While engineers focused on ensuring the Oculus would function properly, Gentilhomme developed what passengers and the general public would see. "The idea was to create a piece that's about

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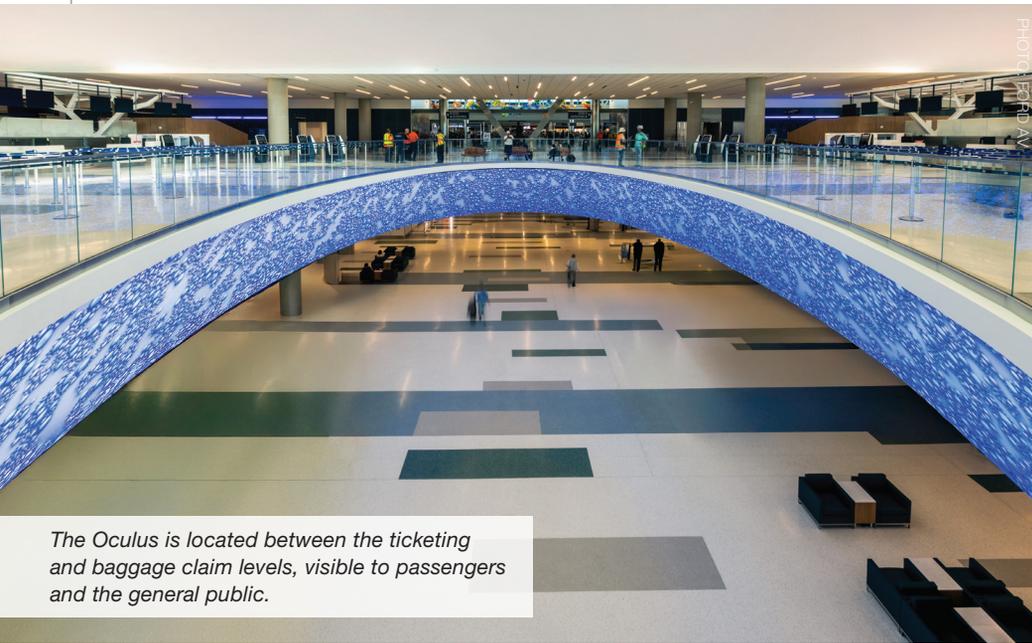
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From early planning to commissioning, Burns is proud
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immersive digital installation — the Oculus — to life.



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The Oculus at IAH Airport | Image courtesy of Ford AV



The Oculus is located between the ticketing and baggage claim levels, visible to passengers and the general public.

place-making and identity and part of the architecture, but also to create dynamic content that will adapt to the building and the surrounding conditions,” explains Duverneix, who led the conceptualization, production and integration of visual content.

The studio’s mantra for the project was “Vision is in the air—the Oculus as a looking glass into the past, present and future of Houston.”

Gentilhomme produced 29 original pieces of content, totaling 135 minutes of video. The collection ranges from computer-generated and mixed-media compositions to cinematic live-action scenes. Sequences include artistic murals literally erupting with color, flowing video of local landscapes and images that convey Houston’s pivotal role in space exploration.

Compelling form and content notwithstanding, interactivity is what really sets the Oculus apart from digital installations at other airports. Two LIDAR sensors mounted on opposite sides continuously scan the floor below and generate a live movement tracking of people under the Oculus, including their individual positions and heights. That data drives real-time effects through Unreal Engine, using Gentilhomme’s in-house Unreal plugin, which are then rendered simultaneously across the six Pixera servers.

One of the interactive scenes propels visitors into imagery that looks like a pool of marbles. “As you walk by, you become a giant ball, and that ball pushes the other balls,” Duverneix describes. “It creates this playful physics moment where everybody can engage.” Gentilhomme designers intentionally kept the level of interactivity subtle to prevent crowding or bottlenecks beneath the display.

Other generative scenes respond to local temperature, weather data, seasons and light levels, allowing the display to evolve organically with the current environment. “It’s passive content that is ambient but that’s going to react with external data,” Duverneix explains.

This deep level of customization makes the Oculus truly one of a kind, he emphasizes. “It’s very elegant,” Duverneix adds. “The way it’s been integrated within the architecture works very well. I think it’s going to set a new standard in place making in entertainment and transportation hubs.”

Local Inspiration

The visual content highlights the culture, geography and spirit of Houston. Aerial drone footage captures the downtown skyline in sweeping 360-degree motion. Other sequences explore logistics hubs at the port, birds flocking in the region’s expansive skies, and fields of bluebonnets (the state flower).

Gentilhomme worked with several local artists to create time-lapse video of blank walls being transformed into a colorful mural, ultimately for digital presentation. “That one is kind of interesting because we wanted a one-to-one ratio [with the dimensions of the Oculus],” Duverneix shares. “So, we had to find a place that would be big enough to do that.” Over four days, local artists Anat Ronen, Floyd Mendoza, Jessica Rice, GONZO247, Lee One and the artist named Black created a single continuous mural on the walls of an unused tunnel at the airport. “It was crazy, but it’s a lot of fun,” Duverneix remarks.

To incorporate the performing arts, Gentilhomme collaborated with Vitacca Ballet of Houston. A choreographed performance looks like it occurred in front of the Gerald D. Hines Waterwall, a well-known local fountain. But the project team actually filmed dancers in an extended reality studio and then merged that footage with video of the Waterwall that was shot on location.

Another key sequence pays homage to Houston’s aerospace legacy through computer-generated imagery depicting the evolution of space exploration. That content was created in coordination with NASA.

Public Access

Notably, the Oculus is located on the landside of Terminal E. For Warren, that public exposure is exciting because most of Ford AV’s other airport installations are behind TSA checkpoints, and many of its other complex projects are in private facilities. “Anybody that wants to see and experience the Oculus can just show up,” he says. “You don’t need to spend a bunch of money—you can just show up and come see how cool it is.”

Because the new display is visible to all arriving and departing passengers as well as the general public, inclusivity was essential. Duverneix notes that content was intentionally designed to avoid quick flickers or abrupt cuts that could trigger those with photosensitivity. “When you treat content as a piece of architecture, you’re trying to make people forget or not even recognize that it’s a screen,” he says.

Content was also designed with slow, fluid motion to suit the Oculus' large scale and prevent motion sickness or disorientation for viewers moving beneath the low, curved structure. The LIDAR system was arranged to recognize people of varying heights, including those in wheelchairs, so all visitors can enjoy the interactive elements.

A Learning Experience

Although Nanolumens has delivered many custom and architecturally integrated LED systems throughout the world, Green considers the one at IAH among the firm's most distinctive installations. "Only a few projects share the geometric and engineering sophistication of the Oculus," he remarks.

Not surprisingly, Green counsels airports considering similar installations to engage promptly with their display manufacturer during design and planning. "Early collaboration ensures that structural, power and content requirements are properly integrated into the architectural concept," he says. "Mockups and proof-of-concept testing are invaluable for aligning expectations and validating designs before fabrication."

As part of the owner's representative leadership, Meier says the success at IAH hinged on maintaining focus and vision from the

very beginning. "Start by thinking big and creating a strong vision," he advises. "There are bound to be various challenges in any large terminal project, let alone one with an intricate immersive display feature seamlessly integrated between two floors."

Meier also credits consistent engagement and collaboration from Houston Airports throughout the multi-year effort. "Their dedication and commitment were crucial for the successful execution of the Oculus," he notes.

Ford AV's Warren emphasizes the importance of thorough long-range planning. "With a project this size and this complex, everybody that was involved learned a lot," he remarks. "It literally took a complete team of subject matter experts from many different disciplines all working together as one cohesive unit to make it happen."

Duverneix, from Gentilhomme, says the process used to create the Oculus can provide a model for other airports. "The mistake is to start those projects from an infrastructure point of view," he cautions. "You have to start with a vision. People might think that content is paint—'We build it, and at the end we put some content in it.' Content is not paint. It *is* the project. You have to start there." 

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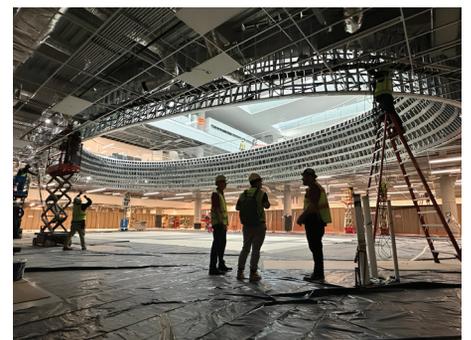
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"Nothing like this had been done before in an airport space – the size, the shape, the complexity was going to present a big challenge."

– Darryl, CTO, Houston Airports



New System Consolidates Facility and Energy Management at San Francisco Int'l

BY ANDREW TELLIOHNN

FACTS&FIGURES

Project: Energy Management Control System

Location: San Francisco Int'l Airport

System Provider: Mitsubishi Electric Iconics Digital Solutions Inc.

Project Cost: \$41.9 million

Timeline: Planning began in 2018, paused during COVID pandemic & resumed 2022; skeleton system for majority of campus installed mid-2024; further implementation is ongoing

Design-build Contractor: Suffolk Construction

Design Partner: WSP

Building Management System Consolidation

Tech: Iconics

Partnering Consultant: OrgMetrics LLC

Key Benefits: Consolidating previously disparate facility management systems in 100+ buildings; comprehensive remote monitoring & data analytics; more ability to identify ways to conserve energy & reduce maintenance costs; improved lifecycle management of assets



There are more than 100 buildings and 2,200 electric meters throughout the vast expanse of San Francisco International Airport (SFO), plus additional meters measuring natural gas and water consumption. Many have their own building management systems that “speak different languages” than other systems across the campus.

The energy-conscious airport had several ways to measure the efficiency of its heating, ventilation, air conditioning and other systems; but the process wasn't easy or efficient. And SFO is boldly aiming for Net Zero energy consumption by 2030.

Because buildings were constructed during different eras and governed by equipment installed by different companies, management required multiple systems, passwords and computers, not to mention personnel with great memories.

If, for example, an alarm went off signaling a space was too hot, too cold or

not getting enough air, the airport would use an HVAC integrator to force more air to the area to meet its need. But staff would have to use one computer to reset the alarm and then access another dedicated to the specific building's operations to execute changes to solve the problem, explains SFO Project Manager Raniel Camacho.



RANIEL CAMACHO

“It was very difficult and inefficient for our Operations staff to maintain the system and maintain comfort for our passengers,” he says. “In a lot of cases, to try to minimize those alarms or discomfort to passengers, we just threw it on full blast. We were using a ton of energy.”

A Better Way

So how does an airport improve a system that sometimes requires stationary

engineers across sprawling facilities to log into six different systems to find a problem—not only having to remember what computer houses the controls for a given building, but also what the passwords are and how to access the proper software?

The answer for SFO was installing an Energy Management Control System in conjunction with Iconics Digital Solutions Inc. to manage resource use across the campus. The new system is able to collect data from water, gas, thermal and electric meters, building management systems and other relevant sources. The system's ability to analyze data and control existing disparate building management systems was a major attraction for SFO executives and Facilities personnel alike.

It solved the forementioned problem “by consolidating all the controls into a single platform, with a consistent look and feel so operators need only to use a single computer,” Camacho says.

The \$41.9 million project to implement the new system began seven years ago, when more than a dozen stakeholders met to establish goals about retrofitting all of the airport's buildings onto a single Energy Management Control System.

The COVID-19 pandemic paused the project for about 18 months and forced a significant revision of its initial mission. But in early 2022, the partners resumed planning, this time focused on one core initial goal: improving automation and function of the fire/life safety system in the International Terminal Building, because the existing components were obsolete.

“You could not replace something if it is obsolete” recalls John McKernan, senior vice president of Operations with Suffolk Construction, the design-build contractor for the Energy Management Control System project. “They would have to evacuate. It was a big deal.”

By mid-2024, SFO, Suffolk Construction, design partner WSP and



JOHN MCKERNAN

their trade partners delivered a preliminary Energy Management Control System that was retrofitted into the International Terminal, Terminal 2, the newest part of Terminal 1, the air traffic control tower and half of Terminal 3.

A second phase of the project is underway to update additional buildings, including the rest of SFO's terminal complex. The airport also intends to continue adding other components, such as the electrical, gas and water meters, that were not removed due to the pandemic-related downsizing.

In addition, SFO is investing in air quality sensors inside and outside buildings to begin incorporating diagnostics there.

“We reduced the scope to just build a skeleton,” Camacho says. “It's there now. The plan is to continue to build upon the skeleton to beef it up. There's still a huge lift, but we're chopping away at it.”

All new construction also will be added to the Energy Management Control System. This will allow airport personnel to check energy efficiency and other performance metrics from a single device, anywhere on airport grounds.

“We want to invest in and sustain high-performance assets,” emphasizes Amy Nagengast, energy program manager at SFO. “We're really trying to extend and expand value from capital project investments.”



AMY NAGENGAST

Camacho describes it this way: “It was about being smarter with how we're operating and how much we're spending in our utility bills.”

Environmental Leadership

By stepping up to Net Zero energy and carbon accounting goals, SFO is among world leaders in sustainable and environmentally friendly practices.

“No other airport on the planet would do this,” McKernan asserts. “It would be the first one to achieve this kind of level of energy management.”

The airport has increased its efficiency in recent years by replacing outdated equipment. For example, it underwent an investment-grade audit and identified several big projects, such as installing new chillers in the Central Plant for cooling terminals and other facilities.

But it was difficult to measure the impact, notes Nagengast. Data was hard to come by, and what was available didn't provide an “apples-to-apples” comparison.

“It's hard to manage what you don't monitor,” adds Gareth Ashley, vice president of Aviation Technology with WSP. “In order to meet energy goals, you have to know about energy consumption, and you have to know where that energy and other resources are used.”



GARETH ASHLEY

For years, Facilities personnel at SFO had requested a system that would allow them to manage mechanical equipment from a single location. Now they have it.

“A lot of times we were firefighting,” Camacho recalls. “We were being very reactive instead of being proactive. It was something Facilities wanted for a while. We just needed to figure out how to build it, how to contract it, how to see what we wanted.”

Initial Impacts, Future Improvements

The airport has already begun benefiting from the Energy Management Control System and the benefits will increase as the remainder of its buildings and systems are incorporated.

“I want to make sure additional assets get integrated,” Nagengast says. “The value comes from bringing disparate data sources together, tracking their performance and responding as needed.”

In the meantime, the airport has already used its Energy Management Control System platform to help reduce energy consumption, potentially extend the longevity of assets, and improve operational efficiency.

A new system is helping the airport manage energy resources across more than 100 buildings.



“I think it’s an ongoing investment as we look to leverage those smart pieces of equipment,” says Nagengast, adding that different users seeking specific insights can create dashboards that will show specifically what they want.

Hurdles to Clear

Naturally, the project did not come without significant challenges. Across SFO’s campus, the terminals have the largest impact on energy use. But Johnson Controls, Delta, Honeywell and other companies had used different building management system technology installed at different times, with different languages, to operate in different buildings.

“The International Terminal, for example, was completed around 2000, and that was before the big sustainability push and design attention wasn’t given to making those systems accessible,” Ashley recounts. “So, a lot of building management systems are proprietary. They use their own cabling, their own protocols. It was a closed system.”

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Various companies posted personnel on-site to manage the technology. But those systems had to be updated to connect with the Energy Management Control System to provide usable data.

“It was quite a lofty goal,” says Ashley.

But SFO and its partners installed the Iconics' smart airport system into which all of the information from building management systems will feed. It also creates a way to retrofit existing buildings and incorporate new construction into the system.

“You're still going to have two base platforms, whether that's Honeywell or Johnson Controls, but both of those feed into the Iconics system,” McKernan explains. “The benefit is huge. It gives you one platform to monitor. It gives you flexibility in terms of scaling systems to meet it. The screens are easy to understand. It's modern technology. You can use your handheld device for its numerous benefits. Anytime you do something like this, there's huge benefits in terms of the return on investment ”

Another challenge that arose during construction was intermittent system interactions between the International Terminal Building and the air traffic control tower or the airport director's office. Resolving the issue took detailed consultation between several entities to ensure information security and the ability to maintain service while construction continued.

“It's great if you can just turn it off,” McKernan says. “But SFO is one of the busiest airports in the world—it has to function 24/7—and we are essentially taking out an entire system that operates everything and replacing it without impacting the operations of that facility. That's the difficult part that takes very close coordination and patience and understanding of how you're cutting things over and implementing your new systems.

“Everyone was nervous when we were monkeying around with that,” he adds.

Results

In addition to creating immediate returns by lowering energy and maintenance costs, the new Energy Management Control System has shed light on a number of systems that were at or nearing the end of their useful life. This, in turn, prompted new capital work, including select life safety systems.

While SFO does not yet have a specific figure for how much it has saved using the Energy Management Control System, industry estimates suggest that building retrocommissioning can decrease operations

and maintenance costs 5% to 15% over time. At SFO, that could translate into savings of up to \$2.5 million annually.

“You could be spending a lot of money repairing something when you can just cut the cord and put something new in there,” McKernan says. “It changes the whole dynamic with maintenance and energy-saving efficiencies.”

With funding secured to expand the Energy Management Control System even further, the next phase of work will focus on improving the passenger experience.

“We want to make sure planes take off on time so their turnaround time can be quick at the gate,” Nagengast says. “This next phase is aiming to connect those key gate assets for use by many end users.” 



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Partnering, with a Capital P

Planning and implementing an Energy Management Control System at San Francisco International Airport (SFO) was a complex project that spanned seven years and involved a diverse group of entities.

One factor many stakeholders cited to explain its success was Partnering, a formal engagement process that requires all stakeholders to meet regularly—first to plan the project in detail, then to update each other and resolve issues as they make ongoing progress.

Suffolk Construction, the design-build contractor for the project, was one of many key participants. “I would call it instrumental,” says John McKernan, the firm’s senior vice president of Operations. “We were on a regular cadence of facilitated partnering and it just emphasized and underscored the importance of communication and understanding what everyone’s priorities were. That enabled all of us, especially us [Suffolk], to focus on the priorities and goals of the project.”

The process was facilitated by Rob Reaugh, president of OrgMetrics LLC, who has worked in the field of conflict



ROB REAUGH

resolution since 2007 with a focus on construction dispute prevention and resolution since 2011. SFO has been a steady client for years and uses his Partnering services on most major projects.

On this project, the airport estimates it saved nearly \$2.4 million due to the benefits of Partnering, and the associated service costs were less than 1% of the total project budget.

Reaugh acts as neutral consultant, promoting collaboration between the airport and other stakeholders to ensure teams work well together. The overriding goal is to enhance the delivery of construction projects.

“Because the EMCS was so technical in nature and the scope had to pivot a fair amount, we had to adapt the Partnering along the way to ensure that everybody really understood what the project was and what it wasn’t,” he says. “Partnering offered a forum and a way for the leadership team to steer and to make sure the core group delivering the project and in the weeds every day had the resources or a decision they needed.”

All project participants initially met every month, later every other month, and then as needed. The meetings helped create one set of goals regarding safety, schedule, budget, quality, sustainability and how the teams would work together.

“Part of the discipline is teasing out what the risks are and what the issues are that are in need of support,” Reaugh says.

For instance, fire safety components in the International Terminal Building were a particular focus. “In this project in particular, we had to develop a high level of candor and transparency with the fire marshal,” Reaugh explains. So, it was common for the fire marshal to meet regularly with the design/build team to review plans.

Because the project pivoted several times, making sure the entire team understood the new scope was an ongoing topic/goal.

Representatives from Johnson Controls and Honeywell were part of the team because their building systems were being upgraded. And Partnering allowed the airport to be one of many interested parties rather than the overseer talking at its project partners.

“It’s absolutely intentional and it’s an important aspect of transparent leadership,” Reaugh says. “It’s kind of a profound act.”

He considers SFO an industry leader for adapting the system, but his company has also worked with other airports, including Norman Y. Mineta San Jose International, San Diego International, Oakland San Francisco Bay Airport and Kansas City International, among others.

The recent project at SFO garnered a John L. Martin Silver Award, Buildings/Public Infrastructure category, from the International Partnering Institute. ✈️

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Technicolor Tribute

Birmingham-Shuttlesworth International Airport (BHM) uses a long mural that stretches 66 feet along a corridor in Concourse B to honor its namesake. *Fred S.* features a life-size image of the late Reverend Fred Shuttlesworth, a pivotal leader who helped propel Birmingham, AL, into the national spotlight during the Civil Rights Movement in the 1950s and '60s.

Brooklyn-based artist Rico Gatson spent two weeks on site painting colorful rays radiating from a giant black and white photo of Shuttlesworth to create the graphic, high-contrast piece. An earlier iteration of Gatson's creation was exhibited at the Birmingham Museum of Art, but a civic organization called Leadership Birmingham arranged a permanent home for it at BHM.

"We wanted to do something inside the terminal that would serve as a lasting tribute to this great man," explains Ashby Pate, chairman of the Birmingham Airport Authority Board and member of the 2023 Leadership Birmingham class who spearheaded the project. "We're thrilled that travelers and visitors to our great city will be able to draw inspiration from the artwork."

Several of Shuttlesworth's family members and dozens of political leaders, clergy members, activists and local residents attended the emotion-filled unveiling at the airport. Patricia Shuttlesworth Massengill, one of his three children who came, expressed gratitude and commented about the serious expression on her father's face in the mural: "It looks just like



him," said the 80+-year-old. "I always told him, 'Dad, you need to smile' and he would say, 'I'm concentrating on the Lord's work and what I can do for mankind.'"

Some of his most famous work included coordinating boycotts and sponsoring federal lawsuits to end segregation. He also helped organize the Selma to Montgomery marches as part of a voting rights campaign.

Fred S. works in concert with another exhibit about Shuttlesworth that is located on the pre-security lower level of the terminal. Designed by the Birmingham Civil Rights Institute, it uses photos and large informational panels to memorialize the man Martin Luther King, Jr. once described as "the most courageous civil rights fighter in the South." ✈️



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A Gateway to Belonging: Why Naturalization Ceremonies Matter at Airports

Each year, more than 10.5 million people pass through the Indianapolis International Airport (IND). They come from every corner of the globe, each with a story, a purpose, a destination. But on Oct. 9, 2025, our airport became more than a waypoint; it became a place where journeys culminated in citizenship, where 95 individuals from 42 nations stood together and became Americans.

This was our second annual naturalization ceremony, and it was nothing short of extraordinary. Held pre-security in Civic Plaza, the heart of our terminal, the event was filled with spirit and profound emotion. The IND Honor Guard, including members of our public safety team and local TSA, presented the colors. The Ben Davis High School Premiers show choir lifted their voices for the National Anthem. The Honorable M. Kendra Klump, magistrate judge of the U.S. District Court for the Southern District of Indiana, presided with grace and dignity. And as the Oath of Citizenship was administered, the air was filled with pride, hope and the quiet power of belonging.

The idea to host a naturalization ceremony at IND was first brought to life by Bill Stinson, our former senior director of Public Affairs. Bill was a dedicated airport employee, a beloved figure in our community and a passionate advocate for civic engagement. His deep respect for the immigrant journey and his belief in the airport's role as a community connector inspired the inaugural ceremony in 2024, which was presided over by his wife, the Honorable Jane E. Magnus-Stinson. After retiring in August 2024, Bill passed away unexpectedly in April 2025. His vision lives on, not only in the ceremony itself, but in the people who carry it forward.

Megan Carrico, our current senior director of Public Affairs and one of Bill's mentees, now leads the team that organizes this event with care and

purpose. Under her leadership, the Public Affairs team has aligned the ceremony with our broader customer service and community engagement strategies, ensuring it reflects IND's commitment to hospitality, inclusion and civic pride. Each year, as we welcome new citizens, we reaffirm our belief that airports can be powerful platforms for belonging.

Why host a naturalization ceremony here at the airport? Because airports are more than infrastructure. They are symbols of movement, of connection, of possibility. They are where people arrive, depart, reunite and begin anew. What better place to mark the beginning of American citizenship than in a space that embodies the very spirit of transition and transformation?

As a first-generation Cuban American myself, I know what it means to come to this country with hope, to work hard, and to build a life rooted in opportunity. That journey is why this ceremony resonates so deeply with me. It is not just a celebration of citizenship; it is a celebration of resilience, of belonging and of the promise that America still holds for people around the world.

At IND, we believe in being more than a gateway to destinations, we strive to be a gateway to community. That is why we partnered with local representatives from the U.S. District Court and U.S. Citizenship and Immigration Services to make this event possible. That is why we gave each participant a handwritten welcome note from our staff. Because citizenship is not just a legal status, it is a welcome, a handshake, a promise.

And for many of our own employees, who come from all over the world, this ceremony is deeply personal. It is a moment where they see themselves reflected in the heart of the airport they help operate every day. It sends a clear message: IND is a place that honors heritage and celebrates



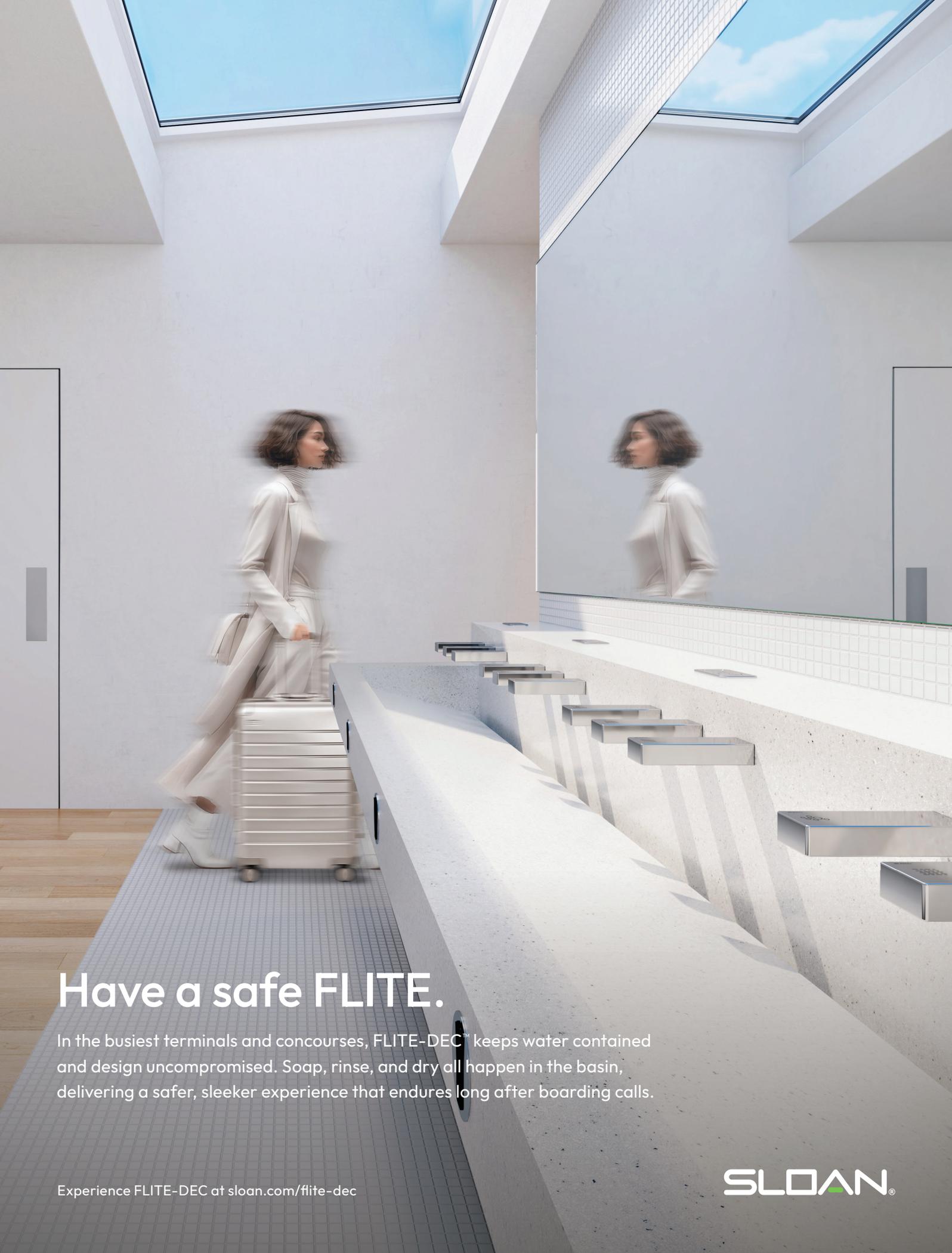
Mario Rodriguez is executive director and chief executive officer of Indianapolis International Airport (IND). Under his leadership, IND has experienced record-breaking growth and has consistently earned recognition as one of North America's best airports. Community involvement and civic engagement have been hallmarks of the 30+ years Rodriguez has held leadership roles at airports across the globe.

the diverse journeys that make up our team and our community.

Airports across the country have the opportunity to become civic spaces, places where democracy is not just protected but practiced. Hosting a naturalization ceremony is not a logistical challenge; it is a moral opportunity. It is a chance to show that we, as transportation leaders, understand the human stories behind every boarding pass. It is a chance to remind travelers and employees alike that the American dream is alive, and that it begins in places like ours.

To the 95 new citizens who stood proudly at IND this October, welcome home. Your journey has enriched our community, and your presence strengthens our nation. To our community partners, young learners and staff who made the day unforgettable, thank you. And to my colleagues at airports across the country, I invite you to consider what it would mean to open your doors not just to passengers, but to neighbors.

At IND, we are proud to be a place where the American story continues to unfold. Because at the heart of our mission is a commitment to making people's lives better, and this event is one powerful way we live that out—by building a stronger, more inclusive community for everyone we serve. ✈️

A woman in a white suit is walking in a modern, brightly lit airport terminal. She is pushing a white rolling suitcase. The terminal features large skylights and a long, sleek, white sink with multiple basins. The woman's reflection is visible in a large mirror on the wall. The overall atmosphere is clean, bright, and modern.

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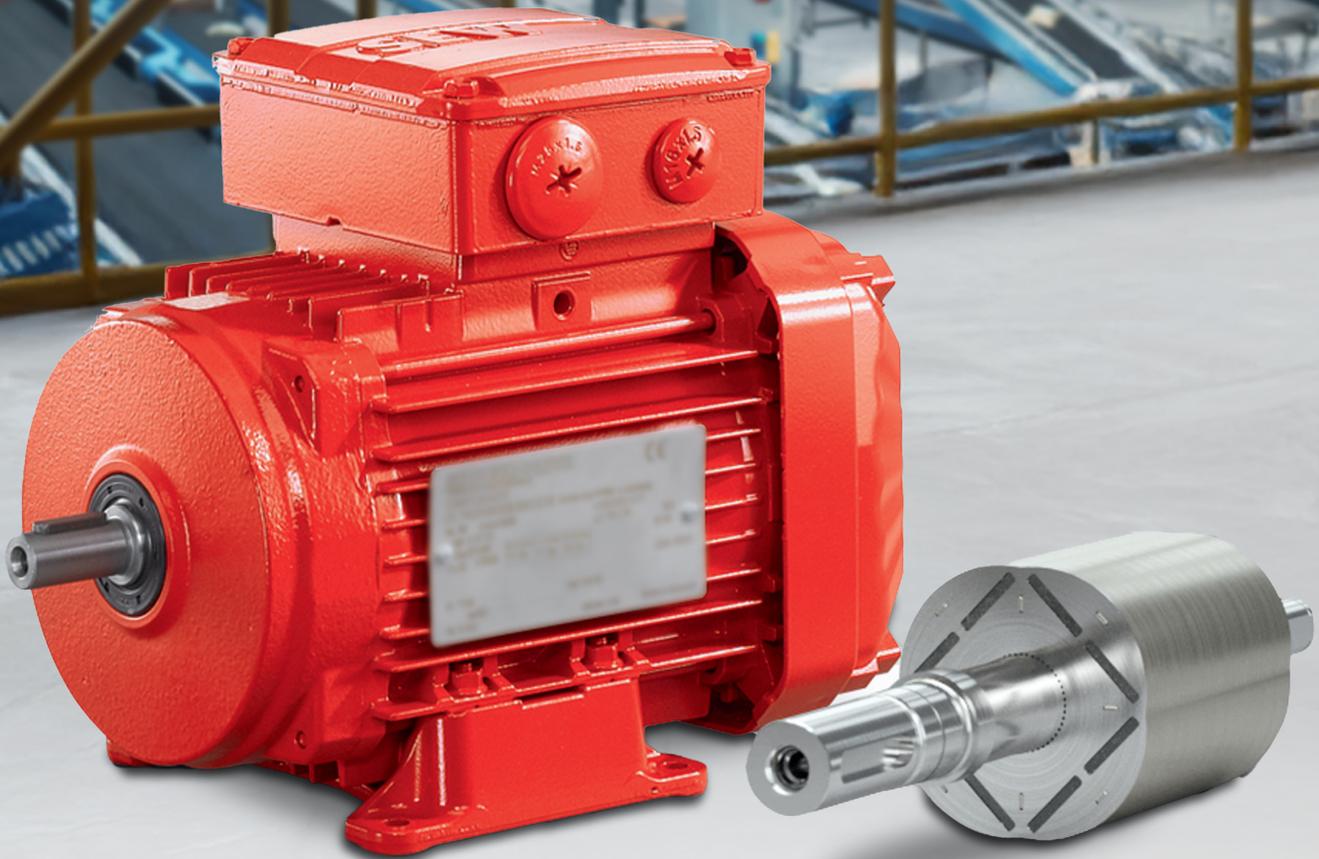
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