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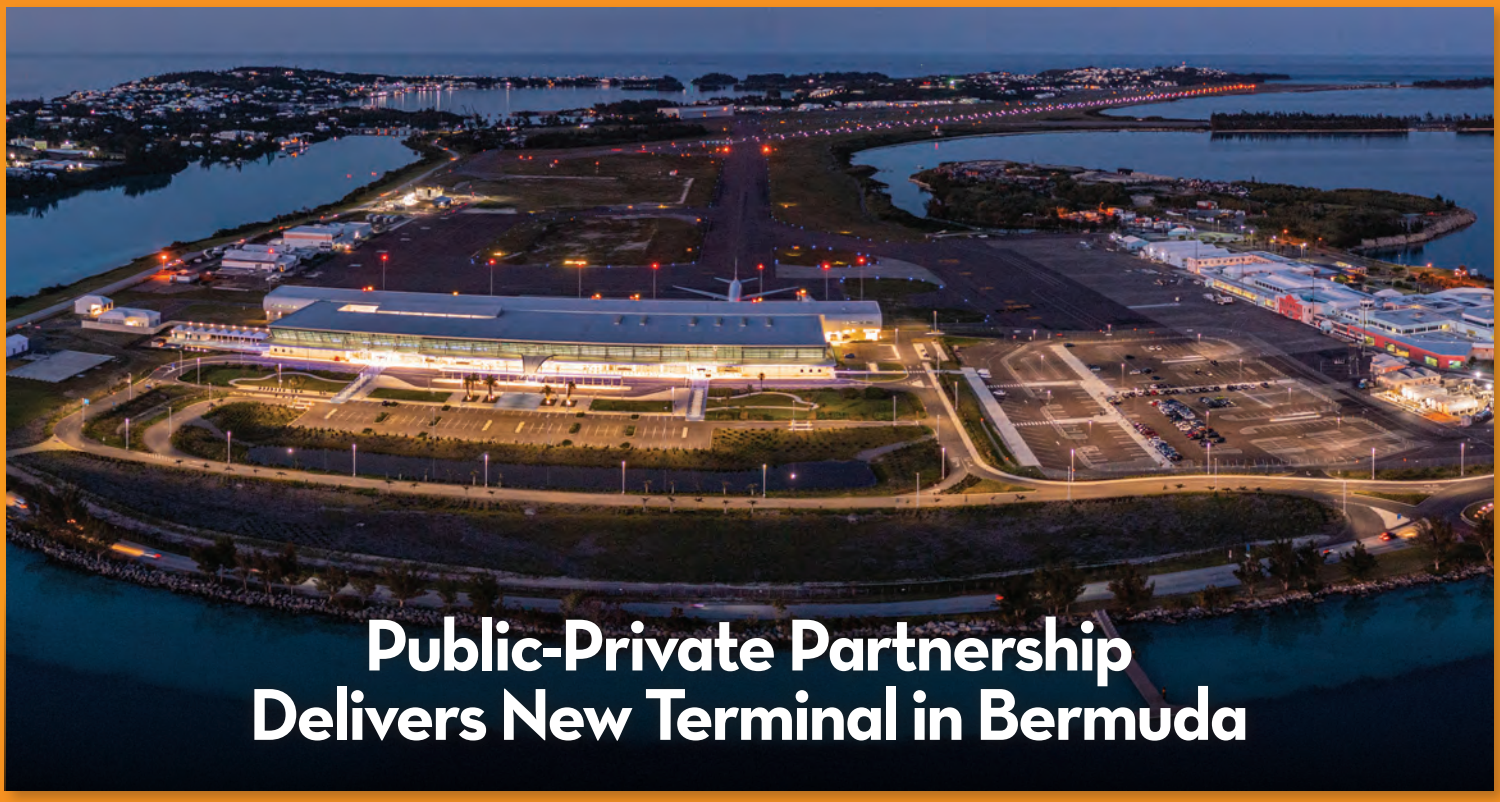

Public-Private Partnership Delivers New Terminal in Bermuda

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Dallas Love Field, Myrtle Beach Int'l Debut Contactless Retail

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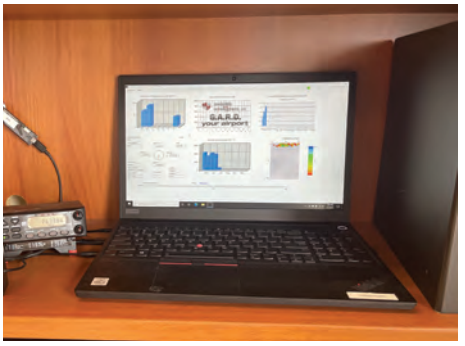

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The Show & Tell of Airport Project Work

Getting Back on Track

Let it be said that we are a resilient industry, people. Those so-called experts who predicted that the post-pandemic traffic recovery would be measured in years, not months, missed the mark.

Yes, the COVID-19 crisis was tragic. But its impact to our industry is temporary, with the long-term trajectory of passenger growth uninterrupted.

So what have we learned from this recent experience?

1. Aviation continues its unmistakable upward long-term growth.
2. Innovation is born in times of crisis.
3. Models for airport design predicated on social distancing requirements were a waste of time and money.
4. Airports that continued to prepare for growth during the pandemic are being rewarded. The temporary hiatus of passenger traffic afforded teams to complete projects faster and at lower costs. These airports are now better prepared for the resurgent traffic and associated revenue that comes with it.
5. Airports that shelved projects due to a predicted long-term slump are now literally paying for their lack of activity in the form of higher prices, labor shortages and extended completion dates.

PAUL BOWERS, PUBLISHER

Throughout the pandemic, *Airport Improvement* magazine has highlighted airports and project teams that prepared for the return of passengers that we are experiencing today. Fortunately, there was a plethora of them to choose from. Thank you for sharing your stories.

I also want to thank our advertisers who had the courage and vision to see the path forward for our airports, as well as their own businesses, by investing in our industry.

I'm excited for all of us and welcome what the future will bring.

Cheers!

Paul

Public-Private Partnership Delivers New Terminal in Bermuda

BY JODI RICHARDS

L.F. Wade International Airport (BDA) is passengers' gateway to the iconic pink sand beaches of Bermuda. With an economy heavily rooted in tourism, this overseas territory of the United Kingdom and its airport have struggled since early 2020 because of COVID-19. However, in December 2020, a new $400 million terminal opened to welcome travelers to the Atlantic island. This major capital investment, built through a public-private partnership, positions the airport and the island for better years ahead.

Lester Nelson, chief executive officer of the Bermuda Airport Authority, explains that BDA's old terminal building dated back to the 1940s. It was augmented in a piecemeal fashion, with expansions and renovations completed over the years, but not in a well-planned, purposeful manner. In 2008, the government's Airport Master Plan process determined that the existing terminal required significant investment to improve or replace it.


LESTER NELSON

Pre-pandemic, BDA served just less than 1 million passengers each year, with peak travel between April and November. In addition to being outdated and undersized, BDA's former terminal was dark, with low ceilings and no passenger boarding bridges. "It was just a very dated design and past its useful life," Nelson relates.

Following the Great Recession, the Bermuda government, which owns and at the time operated the airport, struggled to pin down the financial resources needed to fund a sizable capital improvement program, and reached out to the national government for help. Canadian Commercial Corporation, a public-private sector arm of the Canadian government with the express mandate of identifying business development opportunities around the world, served as a conduit between Aecon Concessions and the government of Bermuda.

Aecon and the Canadian Commercial Corporation presented the Bermuda government with a proposal that included financing to develop a new terminal building for the airport under a public-private partnership. Aecon assumed the role of prime contractor and established a special-purpose company, Bermuda Skyport Corporation Limited, to oversee the development of the new terminal and ultimately operate BDA under a 30-year lease agreement.

Building Bermuda

As planning for improvements kicked off, the review team explored another option for redeveloping the old terminal building that would have allowed the use of some existing infrastructure, including the ramp area. However, the cost of renovating and maintaining the aging infrastructure outweighed any savings. "So we landed that it was best to build an entirely new terminal with all new supporting infrastructure, water, sewage and all the services," Nelson explains. "We have this 288,000-square-foot new terminal, but with ongoing maintenance costs and cap-X, it will be actually less than what it would have been with the old infrastructure."

At an elevation of just 11 feet above sea level, the old terminal building was prone to flooding from storm surges. Nelson notes that sometimes, waves of water would push through the front doors and cause significant damage. To protect against future storm surge, the site of the new terminal and apron was raised roughly 1 meter with fill from a 5,000-square-meter borrow pit.

Built slightly northwest of the old terminal, the new terminal is 288,000 square feet with six gates, tall ceilings and much more light than its predecessor. Nelson notes that the new terminal also has sense of place in the design and aesthetics that did not exist in the previous facility, plus updated technology and passenger amenities such as boarding bridges, self-check-in technology and all-new concessions.

AARON ADDERLEY

Aaron Adderley, president of Bermuda Skyport Corporation Limited, notes that swing gates provide operational flexibility that didn't exist in the old terminal. Depending on traffic, BDA's six gates can swing to service any combination of flights. "That flexibility affords us the opportunity to go out and aggressively pursue new air service and not be hamstrung by the limitations we have with regard to gate availability due to the presence of U.S. Preclearance," Adderley explains.

DAVID SCOTT

As one of the largest projects ever for the small 20-square-mile island, there was a lot of community interest and involvement with the project. "I think that was one of the more interesting aspects of this design," notes David Scott, managing principal for Scott Associates Architects, Inc.

Scott and his team were charged with designing a facility that was uniquely Bermudian, functional, flexible and environmentally sustainable, with an aim of Gold LEED certification from the U.S. Green

FACTS&FIGURES

Project: New Terminal

Location: L.F. Wade Int'l Airport

Size: 288,000 sq. ft.

Cost: $400 million

Airport Owner: Bermuda Government

Airport Operator: Bermuda Skyport Corp. Ltd.

Architect: Scott Associates Architects Inc.

Construction: Aecon Concessions

Mechanical: Update Contracting, Bermuda Airport Ltd.

Fuel Hydrant System: Phoenix Petroleum; Raposo Welding Services Ltd.

Fire Alarm & Sprinkler Systems: Air Care Bermuda; Troy Life Safety Ltd.

Chilled Water, Plumbing & Refrigeration Systems: BAC Group of Companies

Ventilation Systems: Keen Ltd.

Electrical Systems: Update Contracting, Bermuda Airport Ltd.

Electrical Distribution: Noesis Energy Solutions/ Options Electrical

Information Technology: SITA; Switchworx

Baggage Handling Systems: Glidepath Systems Ltd.; Koba Industries Ltd.

The terminal's steeply sloping west wall resembles a cresting wave.

Building Council. To meet those goals, the design team immersed itself in the history and architecture of the country to ensure that the look and feel of the new terminal properly represented the region and conveyed a sense of place. The colors, materials and décor incorporate the local flora and fauna for which Bermuda is known.

While existing ancillary airport buildings have traditional Bermudian sloping roof angles, the new terminal features a steeply sloping 45-degree west wall that resembles a cresting wave. Scott notes that beyond its attractive form, the 45-degree wall also serves an environmental function because it does not heat up from the sun until late in the afternoon. "So we accomplished two things—an aesthetic punch in terms of the cresting wave imagery, and we save a lot on our heat load and energy usage," he explains.

Airside, the curved form of the departures concourse echoes the curved form of an aircraft. Light and open spaces provide an airy ambiance, and walls are styled to represent coral reefs for a nautical theme. Stylized kites suspended in the arrivals space welcome and intuitively lead passengers to the Customs and Immigration areas, bag claim and the arrivals hall. On the departures side, birds unique to the island guide passengers to their gates.

The terrazzo floor pattern is influenced by the curves and colors of the beach and triangle imagery. (You knew there had to be some subtle reference to the lore and mystery of the Bermuda Triangle.) To further reinforce lasting local imagery for arriving and departing passengers alike, large photographic displays tell the history of Bermuda.

Adderley reports that the new terminal improves the overall energy efficiency at BDA. Modern infrastructure systems and technology allow the airport to reduce its carbon footprint. And the new terminal was landscaped with approximately 27,000 square meters of native plants with a high carbon dioxide absorption rate to offset the airport's carbon footprint. And that borrow pit? It was turned into an artificial lake and surrounded with mangrove trees, known for their ability to absorb carbon dioxide.

Scott remarks that in addition to being beautiful, the new terminal is designed to be functional and flexible. As passenger flow and operational needs evolve, spaces can be shuffled around because none of the interior walls are load bearing.

Building in Bermuda

Designing and constructing a new terminal on the small island presented multiple challenges. First, the island itself is the rim of a volcano in the middle of the Atlantic, subject to seismic activity and hurricanes. With no natural water, the site of the airport includes 100 feet of fill dredged

from the ocean during World War II. “Those were just some of the challenges we had before we even got to designing the building,” says Scott.

Most, if not all, of the construction materials for the project had to be imported, which posed multiple challenges, including greater expense. Typically, there is a 25% duty on all imported construction goods to the island, but under special arrangements with the government, this duty was waived on all construction goods for BDA’s terminal project. While that eased some of the financial challenge, navigating 65-foot piles from the shipping yard through narrow and winding roads to the airport posed logistic challenges and required special care and consideration, says Aecon Project Director Conor Smyth.

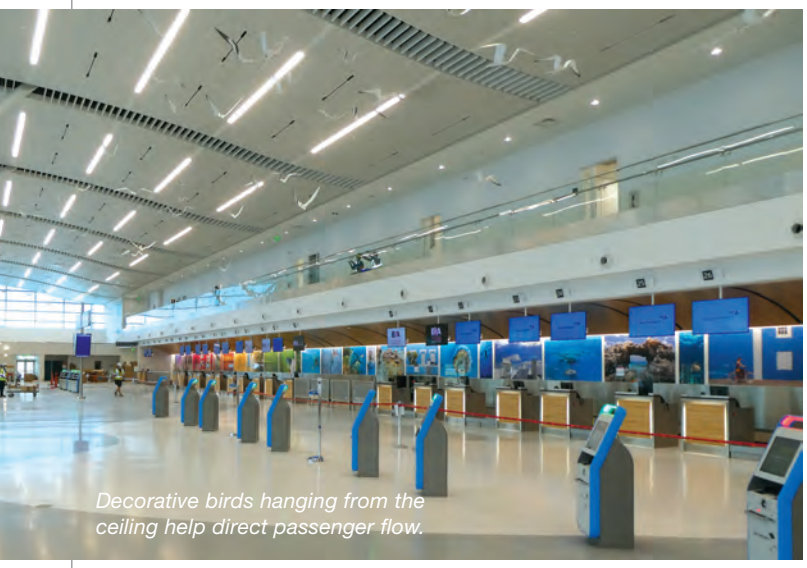
Because the airport is located in a hurricane-prone region, its new terminal is designed to sustain winds up to 175 miles per hour. During the course of construction, Bermuda experienced Hurricane Umberto in 2019 and, roughly one year later, Hurricane Paulette. “That was the first test of the hurricane rating of the building,” quips Smyth.

With no source of municipal water at BDA, project designers included a 750,000-liter underground water tank that stores water collected from the roof. While much of the water is for fire suppression, some is allocated to potable water for drinking and food preparation. A dedicated on-airport sewage plant treats all wastewater, using captured solids for fertilizer and the remaining grey water for use in plumbing and landscape irrigation.

Smyth notes that the project was delivered successfully, just months behind schedule, despite a fairly aggressive construction schedule, COVID-related challenges and new sanitization and social distancing requirements.

For instance, an island-wide lockdown at the onset of the pandemic in March 2020 effectively shuttered work on the terminal project for about one month. Moreover, roughly half of the workers were not from Bermuda and opted to return home in the early, uncertain days. As a result, the project had to be completely remobilized once restrictions were lifted. While the project was originally scheduled for substantial completion in May 2020, unusual delays pushed the critical milestone back to September 2020. “That is not bad in the scheme of things,” Nelson notes. “This project was on budget and the quality is on spec.”

An unexpected benefit of the pandemic was a “soft opening” of sorts. The terminal was scheduled to open to passengers in mid-July of 2020—which would have been peak travel season for BDA—but instead opened Dec. 9, 2020. With traffic volume down 75% from 2019 levels, this allowed the airport to work out possible kinks without much impact to passengers and operations.



Decorative birds hanging from the ceiling help direct passenger flow.

A True Partnership

Under the public-private partnership agreement, a feature called retained government services leaves the Bermuda Airport Authority responsible for some aspects of airport operations, including air traffic control services, aviation and public weather services, maintenance of navigational aids and aircraft rescue/firefighting services. This was done to make the arrangement more financially feasible for the private partners, Nelson explains.

The airport authority also regulates fees the operator charges to tenants and passengers, and also works with Skyport on air service development. "It's a true partnership," he adds.

At the end of the 30-year lease term, all property reverts back to the Bermudian government. Ideally, the private sector firm will achieve or exceed its desired profit, lenders will be repaid and the government will benefit from increased use of the facility in terms of tourism revenue. And, Bermuda Airport Authority will receive a terminal building that has been properly maintained.

Moving Forward

Now that the terminal is complete, the biggest challenge is waiting for passenger traffic to return to normal, as the pandemic has proved to be financially burdensome for Bermuda's government. The public-private partnership agreement includes a minimum regulated revenue guarantee, which holds the Bermuda Airport Authority responsible for payments to the private developer if passenger numbers do not meet a specified threshold.

Adderley explains that the public-private partnership agreement includes a minimum revenue guarantee because investors need assurances when it comes to volatile industries such as tourism. "Essentially the lenders wanted to have some sense of security," he explains. "Of course, no one anticipated the extraordinary shock event that is COVID, and there have been some payments to protect the lenders. But we're optimistic that by the time the end of the year rolls around, we will be inching our way closer toward financial self-sustainability."

In 2020, Bermuda Airport Authority paid the developer $20 million under the minimum revenue guarantee. "We thought 2021 would be a year of recovery, but it could be 2022," says Nelson.

As the airport operator, one of Bermuda Skyport's primary objectives is to enhance commercial opportunities within BDA, specifically in regard to retail and food and beverage offerings. As Adderley puts it, the company wants to "create an enhanced passenger experience in this world-class terminal building… centered around a commercially viable approach."

Skyport is also committed to identifying and attracting new air service, he adds. "Obviously, COVID has knocked us back a bit," says Adderley. "But it has also introduced some opportunities that otherwise would not have presented." Most notably, British

Passengers who check out of their hotels at noon but don't depart until evening appreciate the new putting green.

Airways is now in a position to offer service between BDA and London's Heathrow Airport (LHR), because other airlines have reduced flights in and out of LHR.

"At the heart of the business model is the traffic forecast," says Nelson, noting that the terminal is designed to meet the forecasted traffic through 2025. Beyond that, there is room for an expansion with extra gates, if they are needed.

The Hudson Nonstop store at DAL allows customers to select and charge items to credit cards without interacting with a cashier.

Dallas Love Field, Myrtle Beach Int'l Debut Contactless Retail

BY NICOLE NELSON

Despite increasing vaccination rates and decreasing new cases of COVID-19 in the U.S., Mark Duebner realizes that pandemic fears persist, and that a portion of the traveling public remains reluctant to resume once commonplace practices such as shopping.

MARK DUEBNER

"Some folks may be nervous about going into a newsstand and handling items or interacting with a cashier," reasons the Dallas Love Field (DAL) airport director. "And, until recently, they were opting not to buy."

To quell concerns among this tentative customer base, DAL partnered with Dufry-owned Hudson to open its first digital retail concession, powered by Just Walk Out technology from online giant Amazon. The contactless Hudson Nonstop store opened post-security near Gate 10 in February under a joint venture agreement with disadvantaged business enterprise partners Multiplex Inc. and REGALi Inc.

Same Stock, New Strategy

The tech-forward venture provides DAL with the "right concept at the right time," says Duebner. Customers enter the 500-square-foot linear store with the swipe or tap of a credit card, select their items, and then exit the store. Amazon's aptly named Just Walk Out technology automatically detects when products are taken from or returned to store shelves and keeps track of them in virtual carts. When customers are done shopping, they simply leave the store without standing in line for a clerk to ring up their purchases. Shortly after leaving Hudson Nonstop, customers are charged for their purchases on the credit card they used to enter the store. Itemized receipts are available by email through an opt-in sign up at a kiosk within the DAL store.

Inventory at DAL's innovative concession option includes familiar Hudson fare: grab-and-go food items, beverages and snacks, travel electronics, personal protective equipment, health and beauty products, etc. Being located in Dallas, Hudson Nonstop also sells Texas-themed merchandise.

"This retail concept gives passengers the option of a cashierless environment to pick up what they need, walk out and really avoid contact," Duebner explains. "Fingers crossed, all indications are that it is going to be a good addition to our retail lineup."

After monitoring the new store for a handful of months, Duebner reports that sales have been strong and are not coming at the expense of the airport's other more traditional retail locations. "So, to us, it points to the fact that we are serving a segment of our customer base that we weren't serving previously," he remarks.

Hudson Executive Vice President and Chief Operating Officer Brian Quinn notes that the company determined DAL's strong digital infrastructure and high volume passenger flow would make it an ideal location for a walk-through store.

BRIAN QUINN

"Amazon's Just Walk Out technology perfectly complements our existing digital footprint, as it allows us to provide travelers

Items such as electronics and sunglasses are available 24/7 from vending machines at MYR.

with yet another innovative solution for contactless retailing without sacrificing a personalized customer experience," he explains.

21st Century Vending

Hudson Nonstop stores are just one part of an overarching digital transformation the airport retailer is currently executing. For the first time ever, the company is also offering automated retail stocked with specialty retail brands. Quinn notes that both new formats are designed to adapt to changing retail trends; meet shoppers' increased expectations for convenience, safety and speed; and enhance the travel experience.

Myrtle Beach International (MYR) is the first to debut Hudson's new automated retail option. In March, the South Carolina airport opened a compact multi-brand vending machine cluster stocked with electronics, eyewear and skincare items.

"It really gives people the option for touchless, contactless, 24/7 retail," explains MYR Assistant Director of Airports Judi Olmstead.


JUDI OLMSTEAD

Hudson initially contacted MYR about its new unstaffed option in spring 2020. Olmstead says that the vending unit's small, non-traditional footprint and bountiful lineup of popular brands such as Brookstone, Apple, Beats, Revo and Plexaderm made it an attractive option for the coastal airport. Multiple payment options, ADA-compliant access and antimicrobial safety shields were other appealing features, she adds.

About one year after Hudson pitched its new option to MYR, the airport installed the 90-square-foot unit in a prominent location on Concourse A. The project team specifically positioned the vending cluster where employees at a nearby Hudson store can provide assistance and answer customers' questions.

Hudson's Quinn likens MYR's new automated retail to a miniature shopping mall. "The machines feature easy-to-use interactive touchscreens that allow travelers to browse merchandise images and extensive product information," he explains.

The March opening, just before the summer vacation season, aligned well with the anticipated return of leisure travel to the area, he adds.

"Our Myrtle Beach automated retail unit has been operational for a relatively short time, so sales there are currently a very small part of our business," Quinn reports. "However, we expect revenue for automated retail overall to increase as we roll out additional units and travel continues to rebound into the summer months."

Hudson recently announced that its second Nonstop store will open at Chicago Midway International Airport in mid-2021. "We will also roll out automated retail at Chicago Midway and San Jose this summer," Quinn adds. "And those units will offer a variety of other brands."

Future automated retail locations are slated to offer an array of new selections including skincare from The Art of Shaving; Sony and Belkin electronics; toy brands Kikkerland Design and LEGO; lifestyle accessories from Happy Socks and 47 Brand; and Maui Jim eyewear.

FACTS&FIGURES

Project: Digital Retail

Strategy: Provide contactless shopping for customers who want more convenience, safety & speed

Dallas Love Field

Location: Dallas Love Field

Format: Hudson Nonstop store

Size: 500 sq. ft.

Hours: 5 a.m.-9 p.m.

How It Works: Customers swipe a credit card to enter, select items from shelves & receive charge on selected credit card after exiting the store

Inventory: Grab & go food; beverages & snack items; small electronics; personal protective equipment; health & beauty products; Texas-theme merchandise

Concessionaire: Hudson, a wholly owned subsidiary of Dufry

Disadvantaged Business Enterprise Partners: Multiplex Inc.; REGALi Inc.

Technology: Just Walk Out technology, from Amazon

Grand Opening: Feb. 2021

Initial Assessment: Airport reports strong sales, not at the expense of other traditional retailers

myrtle beach INTERNATIONAL AIRPORT

Location: Myrtle Beach (SC) Int'l Airport

Format: Multi-brand Vending Cluster

Size: 90 sq. ft.

Hours: 24/7

Brands Offered: Brookstone; Apple; Beats; Revo; Plexaderm

Concessionaire: Hudson, a wholly owned subsidiary of Dufry

Grand Opening: March 2021

Initial Assessment: Airport values the unit's product range & ability to offer customers contactless retail around the clock

Nashville Int'l Increases Parking Capacity to Match Passenger Growth

BY PAUL NOLAN

Few U.S. cities have experienced a more pronounced growth spurt than Nashville, TN. The country music mecca rebounded robustly after the 2008-09 recession, gaining nearly 300,000 jobs between 2010 and early 2020, an almost 40% increase. During the same period, Nashville also became one of the hottest tourist destinations in the country, and passenger growth at Nashville International Airport® (BNA®) followed suit.

In 2019, BNA handled 18.3 million travelers—a 14.2% increase over the previous year and the airport's seventh straight year of notable passenger growth. Throughout that stretch, the airport experienced a growing need for additional parking, and it was clear more space was needed.

In 2016, the Metropolitan Nashville Airport Authority, which owns and operates BNA, approved an airport-wide expansion program called BNA Vision that includes plans to construct three connected parking garages with approximately 7,000 total parking spaces. This would add to the other available options, such as surface lots and valet.

Steady Progression

The first of the new garages, named Terminal Garage 2, provided 2,200 additional parking spaces when it opened in December 2018. The second facility, Terminal Garage 1, added 2,800 more spaces and came online in two stages. The first four levels opened in June 2020, and the remaining two levels opened in February 2021. The third garage is scheduled to open in late 2023, with 1,800 more parking spaces and a Hilton-branded hotel on its footprint.

While adding capacity, BNA also added extra features and services for customers. Terminal Garage 1 features a pedestrian plaza with seating, a children's play area, green space, a dog park and public art. "We are the front door to the city, so we want the

The pedestrian plaza includes a dog park and a children's play area.

entire travel experience to be exceptional," explains Traci Holton, vice president, chief engineer and deputy chief operating officer at BNA.

TRACI HOLTON

Terminal Garage 1 also includes a new 64,000-square-foot airport administration building, which houses personnel who used to be located in the main terminal building.

Increasing parking capacity and adding other facilities required BNA to tackle a series of projects, all on an aggressive schedule. Terminal Garage 2 had to be built first so the airport's existing parking garage could be torn down to make room for Terminal Garage 1 and the administration building and plaza that sit on top of it.

"All of the projects were sequentially important," Holton explains. "One couldn't happen until the other did. All of those pieces and parts were like a puzzle that we had to figure out. So far, we're doing that and staying on schedule. Schedule is big around here."

For example, the new administrative office building atop Terminal Garage 1 had to be completed so the old offices on the fourth floor of the main terminal building could be demolished to make way for a bridge that connects the garages to the main terminal.

JEFF BANTA

Messer Construction Co., lead construction manager for the Terminal Garage 1 and 3 projects, developed a schedule for Terminal Garage 1 that was even more aggressive than the one Metropolitan Nashville Airport Authority had presented. Jeff Banta, the company's operations vice president who has worked on several BNA projects over the past decade, notes that building the 1.5 million-square-foot structure in less than 18 months took a lot of proactive planning and outstanding partners. Banta characterizes Charter Construction as "the best concrete company in Nashville to deliver this job at that pace."

"We were pouring 33,000 square feet of new parking deck per week the year we were building the structure," he reports.

Country-Style Rock

Another challenge the design and construction teams faced was rock throughout the garage's footprint and near the terminal building. While most people

FACTS&FIGURES

Project: New Parking Garage & Administrative Building

Location: Nashville Int'l Airport

Facility: Terminal Garage 1

Cost: $183 million

Funding: General airport revenue bonds

Size: 1.5 million sq. ft.; 6 stories; more than 2,800 parking spaces

Notable Components: Covered parking on all levels (canopy on top floor); pedestrian plaza with green space, dog park & public art; new valet center; electric vehicle charging stations; tire inflation station; vehicle locator kiosk; dynamic exterior lighting that can be programmed for various colors & themes; airport administration building on top level

Green Features: Recycling receptacles; energy-efficient lighting that dims when no motion is detected; cistern that collects rainwater for landscape irrigation; Parksmart Bronze & LEED Silver certifications expected

Project Architect: Moody Nolan

Construction Lead: Messer Construction Co.

Concrete Trade Partner: Charter Construction

Special Systems & IT Services Design: Arora Engineers Inc.

Structural Engineers: EMC Engineers; Logan Patri Engineering

Mechanical/Electrical Engineer: IC Thomasson Assoc.

Automated Guidance System: Park Assist

Key Benefit: Additional parking capacity to keep pace with passenger growth

Suspended seating near the green space of the pedestrian plaza provides a quiet, shaded area for travelers.

MICHAEL BURRISS

know of Nashville as "Music City," those in the construction business call it "Rock City," because of the solid limestone strata beneath most of the metro area.

"We found out the rock was shallow on one end of the terminal and extra deep on the other end," says Michael Burriss, associate principal with Moody Nolan, a design build lead on the project. "It's common in Middle Tennessee, but they spent a lot of time excavating rock so they could get foundations and footings in there."

"There's bedrock under pretty much any project in Nashville," adds Banta. "At one point, we had 12 or 15 hoe rams out there hammering rock to get down to subgrade."

Green Features & Tech

Terminal Garage 1 was designed and built utilizing Parksmart, a rating system designed to advance sustainable mobility through smarter parking structure design and operation. Sustainable elements of Terminal Garage 1 include recycling receptacles, energy-efficient lighting programmed to dim when no motion is detected, a 50,000-gallon cistern used to harvest rainwater for landscape irrigation, and an emphasis on using regional labor and regionally sourced materials.

When Terminal Garage 2 earned Parksmart Bronze certification in August 2019, it became the first parking structure in Tennessee to achieve that distinction. Airport officials expect to receive Parksmart Bronze certification for Terminal Garage 1 in the coming months; LEED Silver certification for the administration building is also pending.

On the technology front, both of the new garages include Park Assist, an automated system that uses sensors and lights to guide drivers to rows with open parking spaces. The facilities also have kiosks that help customers who forget where they parked. The kiosks tie into the structures' closed-circuit television (CCTV) systems, which read and record license plate information as vehicles enter. Customers who can't locate their vehicles simply type their license plate number into a kiosk for assistance.

JASON SHEVRIN

SHEEBA MONEY

"The parking garage has nearly 100% CCTV coverage, which is unique. It's a great element for the airport to maintain safety and security," says Jason Shevrin, chief compliance officer for Arora Engineers Inc., which provided design services for the projects' special systems and IT services.

Sheeba Money, the company's special systems designer, notes that BNA also equipped the boardroom and conference rooms in its new administration building with state-of-

the-art audio visual systems, and made sure that the facility's Wi-Fi reached to the outdoor plaza area so staff can stay connected even when outside the building.

Burriss emphasizes that increasing BNA's overall parking capacity was—and continues to be—multiple types of projects combined into one.

More to Come

And there is much more in the works. Additional BNA Vision projects include a renovated and expanded terminal with a total of 24 TSA screening lanes, dramatic airfield views and a concessions marketplace; a new international arrivals facility; and a satellite concourse and terminal apron expansion.

The growth of Music City shows no signs of stopping, and its airport is humming along in unison.

The new six-story garage was built in 18 months and opened in two stages.

Extensive Cargo Growth at Cincinnati Int'l Boosts Revenues, Diversifies Business Base

BY KEN WYSOCKY

FACTS&FIGURES

Projects: Cargo Facilities

Location: Cincinnati/Northern Kentucky Int'l Airport

2020 Cargo Volume: 1.5 million tons

Ranking: 7th-largest cargo airport in North America

Cargo Carriers: 9

2020 Passenger Volume: Nearly 3.62 million passengers

Primary Cargo Tenants: DHL; Amazon Air; FedEx

Private Investment in Cargo Facilities: $2+ billion from roughly 2016 through 2022

Airport Costs: About $5 million for infrastructure improvements

Manholes/Catch Basins/Drain Trench Covers: EJ

Primary Developers: Aeroterm; Dermody Properties; Paul Hemmer Companies; Lynxs Group; Van Trust Real Estate LLC

Annual Regional Economic Impact: $6.8 billion

Direct/Indirect Employment Impact: more than 47,000 jobs

Key Benefits: Revenue growth; diversified business base; profitable use of ample vacant land; spin-off economic developments that create more jobs & regional growth

Cincinnati/Northern Kentucky International Airport (CVG) suffered a significant financial blow a little more than a decade ago when Delta Air Lines dropped the airport as one of its primary hubs. But in true make-lemonade-out-of-lemons fashion, airport leadership charted a new course, based on a simple premise: A multi-legged stool is more stable than one with a single leg.

CANDACE McGRAW

"We needed to diversify our revenue stream," explains Candace McGraw, who was hired as CVG's chief executive officer in 2011. "We had all of our eggs in one basket, so we had to assess what things we had going for us that we could use to buoy our financial situation."

That comprehensive re-assessment led to an impressive renaissance, with McGraw and the Kenton County Airport Board transforming CVG into a powerhouse cargo hub. After five consecutive years of record-breaking cargo growth, CVG is now the seventh-largest cargo airport in North America. By 2026, tenants and carriers will have invested more than $2 billion in cargo-related projects there since about 2016.

Last year, CVG handled 1.5 million tons of cargo, a 13.4%% increase compared to 2019. And it's off to a strong start for 2021, with cargo shipments for the first two months totaling 252,509 tons, a 38% jump compared to the same period last year. From a longer-term perspective, airport officials report that cargo shipments from March 2016 to March 2021 rose fully 84%.

Soon, the airport will be home to two global air cargo hubs—one already in operation by incumbent DHL and another scheduled to open later this year by Amazon Air. DHL employs about 4,600 people at its cargo facility, one of its three global "super hubs," and has invested $380 million in facilities on the south side of the CVG campus.

Amazon's global cargo hub represents one facet of about $1.5 billion the giant company plans to invest at CVG through 2026. The 3-mile-long building will be the company's largest cargo facility in the United States, occupying a 650-acre parcel on the south side of the airport. Amazon also has an option to lease another 450 acres for future expansion, McGraw notes.

CVG
CINCINNATI/NORTHERN KENTUCKY
INTERNATIONAL AIRPORT

Notably, the flurry of development at CVG was funded by various tenant companies, without any airport or government subsidies. The only major cost incurred by CVG during the last five or so years was about $5 million in infrastructure improvements, such as utility work, paid for with general airport revenue.

Location, Land & Infrastructure

Several things stood out when airport officials evaluated their assets and business opportunities about a decade ago. One was location: The airport stands at an opportune central intersection of the global supply chain network.

But perhaps the most valuable asset was available land—about 4,000 undeveloped acres, primarily on the south and west sides of the airport and conveniently located adjacent to the airfield.

The airport also has four runways (three parallel runways and one crosswind), well-maintained infrastructure, easy access to major highways (CVG is girdled on three sides by two interstate freeways) and a large local labor pool.

McGraw points out another less tangible, but equally valuable, asset: a business-oriented mindset. “We move at the speed of business,” she explains. “We run the airport like the business it is. Private companies want to move ahead quickly on things when they see the need, so I feel our job is to enable them to move as quickly as possible.

“Our board of directors is made up of wise business leaders, and they allow us to operate like a business,” she adds. Case in point: The Amazon deal was approved in just two board meetings.


ALEXI LACHAMBRE

The airport’s nimble operating philosophy wins it points with prospective and current tenants. “We really believe in CVG,” says Alexi Lachambre, vice president of development and investments at Aeroterm, an airport real estate developer that recently completed its first project at CVG. “It has a great location, includes

The airport is leveraging thousands of acres of previously undeveloped land to expand cargo operations.

some of the largest players in the cargo industry and offers great infrastructure. And the airport authority is very committed to a cargo-growth strategy.

"CVG is a very good business partner for us, and it's an airport where we want to have more exposure," he adds. "We believe the market and demand will keep growing there."

Jeff Billingsley, vice president and general manager of DHL's hub at CVG, notes that the airport's location is ideal, because it's within a one-hour flight of 60% of the U.S. population.

"CVG is not only ideal from a weather perspective, but the tri-state area of Ohio, Kentucky and Indiana has been a great place to find talented, dependable and hard-working people that can support our operation," Billingsley said in a prepared statement. "CVG and the Kenton County Airport Board have been great partners for DHL, and we look forward to continued growth and expansion over the coming years."

Domino Effect

DHL was an early catalyst for CVG's strategic shift. The cargo company was already operating a facility there when it approached airport officials in the late 1990s about expanding its operations.

Now, DHL operates 114 daily arrivals and departures, occupies 194 acres of land, manages 6.4 million square feet of ramp area, utilizes 67 parking gates, employs 4,800 people, clears 3.8 million import shipments per month and handles an average 295,701 pieces of cargo per night, according to the latest report from CVG.

"We worked hand in glove with DHL to make their expansion happen," says McGraw. "And as cargo operations grew, so did the need for aircraft maintenance; and we had land to accommodate that, too. So we attracted a variety of different tenants both within the fence and outside the fence to keep more revenue flowing in on a regular basis."

The momentum accelerated even more in 2016, when Amazon approached CVG about building its cargo facility. The move was as unexpected as it was game-changing, McGraw notes.

"We were just trying to diversify our revenue base," she says. "Who could've foreseen Amazon wanting to build a cargo hub here? It was like landing the great white whale."

The influx of cargo operations naturally enhances overall airport revenue. Although McGraw says it's difficult to pinpoint exactly how much revenue has grown over the years due to landing fees, ground leases, etc., she describes the uptick as substantial.

"The increases in cargo shipments help the passenger carriers grow, too, because the increase in landing-weight fees reduces their landing fees," she adds. "It's a very synergistic relationship."

Development Begets Development

Amazon broke ground on its facility in 2019. And just as a major initiative in a city can spur further investments around it, other developers soon wanted in at CVG, too.

In 2020, airport real estate developer Lynxs Group completed a 103,000-square-foot, $19 million maintenance hangar for FEAM Aero that is designed to handle wide-body cargo planes. The new facility is located just across a taxi lane from the Amazon development and the DHL facility.

On the north side of the airport, Aeroterm recently finished a single-story, 54,000-square-foot terminal support building. The facility can accommodate another 100,000 square feet of expansion, which Aeroterm plans to build out in stages.

According to the airport, FedEx will occupy part of the LEED-certified building. Other portions will be used for ground service operations and as a common-use cargo facility.

"We also built 75,000 square feet of ramps with charging stations for electric vehicles," Lachambre adds. "The airport is pushing for carbon-neutrality, which includes replacing older ground service cargo equipment with electric-powered vehicles."

The new Aeroterm building enabled CVG to move several ground-service operators from a functionally obsolete building

that will be demolished to make way for an aviation and corporate hangar development. In addition, two former terminal facilities were cleared to make way for a new rental car facility, located adjacent to the main terminal and scheduled to open in fall 2021.

The existing rental car service centers will be developed into cargo support functions after the rental car facility is operational.

The More, the Merrier

From 2016 to 2021, other developers have built about six additional facilities at CVG. Tenants include Bosch Automotive, Wayfair, DB Schenker and GE Aviation. Atlas Air and its subsidiaries, which are major contractors for DHL and Amazon, recently established a $34 million operations center adjacent to the airport to support existing business and future growth.

McGraw foresees that development trend continuing.

"Our goal is to capitalize on all this cargo growth for the greater good of the airport and the community," she remarks. A five-year strategic plan details what McGraw calls "hangar row," located on approximately 85 acres of land located just south of the east-west crosswind runway and north of the Amazon cargo center.

"This development could include maintenance hangars, avionic shops—possibly even a facility to train airplane mechanics," she says. "We could build a whole economy around us by leveraging this cargo opportunity.

"It's not just about planes coming in and out, but building an ecosystem around it to benefit the community," McGraw qualifies. "Right now, it's just a vision. But as part of our five-year plan, we'll will it into existence."

CVG wants to attract businesses that make products companies like DHL and Amazon ship. More specifically, it wants to identify and attract companies that will be producing what McGraw calls "goods of the future." She plans to draw those companies to the airport or the region, where they can manufacture goods and benefit from real-time delivery supported by CVG and its tenants.

More Than Just an Airport

McGraw's interest in developing a mini-economy built around CVG underscores her belief that airports should serve as catalysts for economic development in their respective cities and regions.

From all indications, CVG is doing its part. A study compiled by two local universities estimated the airport's regional economic impact in 2018 at $6.8 billion. Furthermore, the airport supports approximately 47,000 jobs, directly and indirectly, including more than 14,000 badged employees at the airport. Beyond nine cargo carriers, CVG has 11 passenger airlines and tour operators.

But the economic impact of its cargo facility expansions reaches far beyond the airport. Take EJ, for instance, a company based in Michigan that makes covers for infrastructure such as drainage trenches, manholes and catch basins.

LEE VELDBOOM

EJ recently supplied 16,092 feet of trench drainage grates, more than 400 manholes of various sizes and 300 catch basins for sewer lines at CVG, reports Lee Veldboom, the company's technical sales engineering manager.

"That's a very significant volume of products," says Veldboom. "We offer a dedicated product line for airports because of the load rating requirements. Some airplanes weigh upwards of 700,000 pounds, so you need components designed to handle that kind of weight."

Ambitious Vision

So what's the takeaway for other airports, based on CVG's experience with cargo operations?

"I tell my colleagues to look at the assets they have and figure out if there's something they can leverage," McGraw advises. "We're blessed with 7,500 acres

Aeroterm recently built a 54,000-square-foot building on the north side of the airport and plans to expand the facility in stages.

of land, but each airport has to dig in and find out if there is something it can do to avoid putting all its eggs in one basket.

"We benefited a lot from being a Delta hub," she continues. "But without it, we've emerged as a much more financially stable airport in the long run, because we've diversified our carrier base and now have different lines of businesses that didn't exist before.

"In fact, we fared okay during the pandemic because we largely recession-proofed our business."

In the next five or so years, McGraw foresees transforming the region's business climate while elevating and redefining the role the airport can play in that development.

For example, consider the airport's Strategic Workforce Collaborative, a program established in 2018 that brings together local educational institutions and more than 70 airport employers. Its primary goal is to help create meaningful employment opportunities and training programs to develop job-ready workers to fill them.

One result is the CVG Job Portal, which serves as a one-stop shop for candidates interested in working for or at the airport.

"I know our vision sounds bold," McGraw acknowledges. "People always ask me, 'Are you sure you want to say that publicly?' But if you don't try, you'll never get where you want to go. And we have a great team in place here at CVG.

"The time is ripe to seize these opportunities," she concludes. "We can't afford to waste them."

Mitigating the Negative Effects of Firefighting Foam is Personal for Nantucket Memorial

BY RONNIE WENDT

Amid all the turmoil that COVID-19 has wrought, the only public airport on the small island of Nantucket, MA, is taking on a big issue: potential environmental contamination associated with common components in FAA-mandated firefighting foam.

The compounds at issue are per- or poly-fluoroalkyl substances (PFAS). And even as air travel around the globe ground to a snail's pace, Nantucket Memorial Airport (ACK) tackled the thorny environmental issues surrounding them head on.

So far, ACK has spent an estimated $2 million on various remediation measures and plans to invest another $6 million in longer-term measures over the next six years. That's a sizable undertaking for a municipally owned facility that logged about 70,000 operations and 128,000 enplanements in its 2018/19 fiscal year. Given the pervasive nature of firefighting foam containing PFAS, airports of all sizes throughout the world will likely face PFAS-related projects and expenses of their own.

Continuing its history of environmental action, Massachusetts enacted one of the most stringent PFAS regulations in the United States last year while the coronavirus pandemic raged. New state regulations for drinking water set the combined limit for six specific PFAS chemicals at 20 parts per trillion, compared to the federal health advisory level of 70 parts per trillion.

Massachusetts legislators cited serious health impacts associated with PFAS exposure as the primary reason for setting more cautious limits. Scientific studies link exposure to reduced fertility and low birth rates, liver and kidney damage, thyroid disease, elevated cholesterol and other troubling health issues. Research also suggests PFAS exposures can suppress the immune systems of children.

Pandemic or not, airport officials in Nantucket felt they needed to address the issue immediately. "A lot of credit goes to our airport commission for realizing very quickly that we needed a long-term solution," says ACK Assistant Manager Noah Karberg.

FACTS&FIGURES

Project: Managing Environmental Impacts of Firefighting Foam

Location: Nantucket (MA) Memorial Airport

Volume: Nearly 128,000 enplanements & almost 70,000 operations in fiscal year 2018/19; 2nd busiest airport in Massachusetts

Compounds of Concern: Per- or poly-fluoroalkyl substances (PFAS), a component of FAA-mandated aqueous film-forming foam (AFFF)

Costs to Date: $2 million to provide point-of-entry treatment systems, soil testing & bottled water for nearby residents

In-Process Costs: $6 million for soil remediation & water main extension project

Proactive Steps Taken: Discontinued using AFFF for onsite training; purchased new equipment to test & calibrate foam dispensing equipment with no AFFF discharge; developed & implemented strategic testing plan for soil & water; sampled airport sites in question & water/wells of residential neighbors; supplied bottled water, installed point-of-entry treatment systems & tested water for nearby residents; initiated projects to extend water main & remediate affected soil; established website to maintain open communication with public, stakeholders, regulators & aviation industry

Consultant: McFarland-Johnson Inc.

Licensed Environmental Site Professional: Weston Solutions

Test Equipment for Foam-Dispensing Vehicles: ECOLOGIC, from E-ONE

Website Outlining Airport Efforts: www.ack-pfas.com

Because Nantucket is an island accessible only by air service, boat or ferry, the possibility of soil contamination—from firefighting foam or any other source—is a critical concern for the 10,000 residents who rely on private or local wells as their primary source of water.

NOAH KARBERG

"This is a small island, and the affected homeowners are our neighbors and our friends," says Karberg. "Mitigating PFAS is very personal to us."

The airport acted quickly by initiating soil and well testing, and provided bottled water to residents while waiting for results. Later, water filtration systems were installed at affected homes and specialists were hired to work on longer-term solutions. ACK also invested in new equipment. The ECOLOGIC cart from E-ONE allows its emergency response crews to test firefighting foam without environmental impacts.

An ECOLOGIC cart from E-ONE allows crews to test equipment without discharging aqueous film-forming foam.

Currently, the airport is extending a water main to bring clean municipal water to homes with PFAS-contaminated wells.

A Widespread Concern

PFAS contamination is potentially an issue at every commercial service airport, because emergency response teams use aqueous film-forming foam (AFFF), an FAA-mandated firefighting material that contains PFAS.

The FAA requires Part 139-certified airports to have AFFF on hand and on fire apparatus, ready to discharge in an emergency. The industry recognizes PFAS-based AFFF products for their superior performance in extinguishing petroleum fires.

There are three broad categories for AFFF use: during emergencies to suppress and extinguish fires, for equipment calibration to ensure trucks discharge foam in the correct concentration, and during live fire training exercises. Though many states now ban AFFF discharge for training, airport response teams still use it to fight fires and for testing equipment. ACK eliminated the need to discharge AFFF during testing with its ECOLOGIC cart.

When dispersed for any reason, PFAS can penetrate the ground, reach water wells, and be carried into nearby creeks and streams by rain. In 2019, the Environmental Working Group found more than 1,500 drinking-water systems across the U.S. that were contaminated with PFAS, affecting over 110 million Americans. On the flip side, some industry consultants feel that the public is "clamoring for remediation solutions well ahead of the science." This leaves some airports in a confusing, uncomfortable position.

Driven by stricter state regulations and a strong sense of local accountability, ACK hired Weston Solutions, a licensed environmental and infrastructure support consultant based in West Chester, PA, for site management. After they were knee-deep in the project, airport officials felt that the complicated PFAS issue required more support than Weston Solutions could provide alone. So ACK hired McFarland-Johnson to oversee and manage the overall sampling and mitigation program, freeing Weston Solutions to focus on the science, data collection and sampling.

RICH LASDIN

"The airport realized this complex process requires a consulting firm that understands airports to manage remediation," says Rich Lasdin, senior project manager for McFarland-Johnson. "We are helping them manage how the process will impact the airport, airport operations, active construction projects, airspace and other items that go along with working at an airport."

Knocking on Doors & Hiring Plumbers

With a bigger team in place, the focus turned to water testing. To date, Weston Solutions has collected more than 300 water samples from local water wells and monitoring wells.

Test results indicated that some wells south of the airport had PFAS levels well over allowable concentrations set by the Massachusetts Department of Environmental Protection. Weston Solutions then sampled sites west of the airport and found less PFAS contamination. "But we found some," notes Karberg. "And we've been responding to affected households with bottled water and water service provisions."

Testing took longer than normal due to the pandemic. Collecting water samples proved difficult, because many houses in Nantucket are vacation homes, and the owners were not traveling to the island per the advice of health officials. Other homeowners were reluctant to let workers in to collect samples. "Sometimes, it took eight months to get permission to access a home, just to get a sample," explains Karberg. "Eventually, we sampled 100% of the homes adjacent to the airport."

Results ranged from no detectable PFAS to more than 1,000 parts per trillion. The airport took immediate action by providing bottled water to 65 homeowners whose drinking water tested at over 20 parts per trillion.

It also hired plumbers to install point-of-entry treatment (POET) systems at 19 affected homes. "POET systems are pre-filter systems that attach to the water service at the entrance to a home," Karberg explains. "The filter exchange medium treats the house's entire water system."

Georgie Nugent, regional director of environmental services for McFarland-Johnson, notes that adding POET systems and supplying Nantucket


GEORGIE NUGENT

residents with bottled water were not simple tasks. "We helped the airport abide by state procurement laws and secured the right products and systems as expediently as possible," says Nugent. "It's been a logistical challenge getting things done because the island lies 30 miles off the coast."

McFarland-Johnson coordinated with the Massachusetts Attorney General's office, partnered with legal counsel, and even picked up the phone to order systems and line up plumbers. The company also posted a full-time employee at ACK to assist on site.

Although airport leaders are relieved to have bottled water and POET systems in place, they consider both to be temporary fixes. Longer-term plans include bringing treated municipal water to affected homes by extending an existing water main and remediating the impacted soil and groundwater.

"We hope to start construction soon," Karberg said in April, noting that the project is above and beyond the usual response.

"Most airports provide bottled water and some initiate POET installations, but I know of very few that have started water main construction," he remarks. "The water main will cost us $3 to $4 million. But in the long run, it will be more cost-effective. It's also easier than winterizing and maintaining POET systems and conducting repeat testing."

Granular Public Education

Karberg and his staff are feeling the full weight of the PFAS issue. "This is a complicated situation, and initially residents were very scared," he relates. "They saw the contamination as a violation of trust. They feared the contaminated drinking water would impair their health. It's something they never worried about before."

The airport responded with transparency, hosting a series of public meetings to educate and inform. It also launched a website (www.ack-pfas.com), designed by McFarland Johnson, to keep communication channels open.

"Going out to educate and inform, and show our progress, has gone a long way in easing public fears," Karberg reports. "It shows our commitment to doing the right thing."

Speaking from a consultant's perspective, Lasdin explains that calming fears requires transparency. "The website lets the airport get the message out and own the message to be proactive versus reactive," he says.

The airport has spent about $2 million on the PFAS issue, including point-of-entry water treatment systems (shown left) for some nearby homes and a remediation system (shown right).

Once again, the pandemic presented additional challenges. When Nantucket limited access to the island, ACK responded by hosting virtual public meetings. "We made sure that every person on a Zoom meeting could comment and ask questions to abide by Massachusetts public meeting laws," Lasdin notes. "We then met with people individually to answer questions specific to their situations."

The public education process began by inviting all residents to open informational meetings. Then, the project team moved to smaller virtual gatherings, with a maximum of five or six homeowners. Eventually, airport officials made in-person visits to meet with individual homeowners.

McFarland Johnson helped the airport with messaging and planning on a detailed level. "We need to work with homeowners if the water main will run through their front lawn, or we have to tear up plantings, or patch their driveways," Lasdin explains. "We are calling them and saying, 'Let's talk about what this project means to you.'"

Water Main Project Moves Forward

The airport is extending a municipal water main two miles from the nearest connection point to affected residents. The work is scheduled to begin in July and take four months to complete.

Designing the water main required ACK to meet strict environmental laws, this time involving the protection of threatened and endangered species. Early in design, McFarland Johnson had to move the initial path of the proposed water main extension because it impacted Sandplain Blue-eyed Grass, a threatened and endangered species. Then, PFAS was detected in soil samples collected in the vicinity of the new proposed path, and engineers had to move the path again. The current plan takes the water main under the approach of the airport's primary runway safety area.

"We had a lot of discussions about the type of construction we could use," Lasdin relates. "Eventually, we agreed to directional drill across the protected areas of the runway to avoid closure as we constructed the water main." Direct drilling allows crews to tunnel beneath the surface to install the water main without disruption.

Workers use a direct-push drilling rig to collect samples of soil and groundwater in areas where aqueous film-forming foam has been used.

PHOTO: WESTON SOLUTIONS

With that decision made, the airport had to contact homeowners and rental management firms to discuss the impending project. "Phasing is a big challenge," emphasizes Lasdin. "There is no other way to run this water main. It has to run along a one-lane dirt road to residences, and the road has protected habitat on both sides. We have developed a solution that meets these needs."

Dirty Dirt

Beyond the wildlife and water issues, airport officials will eventually have to deal with PFAS-contaminated soil. And exporting it to a landfill that accepts contaminated material isn't a likely option.

"Right now, we don't know the volume of soil we are dealing with, but we'd be talking about potentially hundreds of millions of dollars to move contaminated soil off the island by ferry," Karberg explains. "I don't know what the solution will be right now, but I know it won't involve trucking soil off the island. We will need to do an onsite engineering treatment."

After further soil testing assesses the extent of contamination, ACK will move forward dealing with the site. "Other airports are using various types of remediation, including cap in place," notes Lasdin. "We are working with the state to determine how we will handle contaminated soil."

While some questions still remain, one thing is a given—ACK will continue to go above and beyond to protect its fellow residents.

"Nantucket Memorial Airport, like all airports in Massachusetts, is getting held to some pretty large financial expenditures to clean up the situation," says Lasdin. "But they are doing the right thing. They are cleaning it up and standing behind their responsibilities."

For more information about how other airports are dealing with the PFAS issue, check out the July/August 2019 and October 2019 issues of *Airport Improvement* magazine.

FACTS&FIGURES

Project: Extending & Widening Main Runway

Location: Detroit Lakes-Becker County Airport, MN

Scope: Airport added 700 ft. of length & 25 ft. of width to primary runway; extended partial parallel taxiway to full length

Other Ancillary Projects: Upgraded perimeter fence, airfield lighting & navigational aids; added new approach lighting system; relocated & upgraded AWOS; fixed existing safety issues on both ends of main runway

Approximate Cost: $25 million

Environmental Costs: About 15% of project budget, including $700,000 to buy credits from the MN Board of Water & Soil Resources for filling in wetlands to extend runway

Funding Sources: FAA 90%; State 5%; City 2.5%; County 2.5%

Timeline: Planning & design 2015-2017; construction Oct. 2017- spring 2021; runway closure June & July 2020

Engineering Consultant: Mead & Hunt

Main Contractor: Hough

Electrical Subcontractor: Moorhead Electric

Fencing Contractor: Century Fence

Gates & Posts: Stephens Pipe & Steel

FBO: Detroit Lakes Aviation

Airfield Management Fee: $2,500/month to FBO, plus hourly costs for snow removal ($17.50/hr.) & mowing ($12.50/hr.)

Annual Hangar Income: $140,000

Project Benefits: Longer, wider runway will help draw more jet traffic; upgraded lighting is designed to reduce energy costs; new perimeter fence will help reduce wildlife hazards

Detroit Lakes County Airport Expands Main Runway to Attract More Jet Traffic

BY MIKE SCHWANZ

Turning perception into reality can be tricky, especially when it involves multimillion-dollar budgets.

The decision-makers who oversee Detroit Lakes-Becker County Airport (DTL) in northwestern Minnesota faced this classic challenge when building support and securing funds for an approximately $25 million runway expansion and airfield renovation.

"We are in the middle of our state's lakes region," explains City Administrator Kelcey Klemm, who serves as the main point person on airport issues for the city of Detroit Lakes. "A lot of people have summer homes here, and tourism is a big part of our area's economy. But to entice even more visitors, we knew we had to expand the length of our primary runway so we could attract more private and business jet operations."


KELCEY KLEMM

At 4,500 feet long and 75 feet wide, Runway 13-31 was simply too short and narrow to support most jet traffic. Having only a partial parallel taxiway was another issue.

The location of a U.S. highway to the north, and a city road to the south, were major safety zone violations. In addition, the local FBO caters to turbine aircraft, and it had potential customers who wanted to use DTL but could not, due to the runway length.

After many years of discussion, various stakeholders agreed to a plan that extended the runway to 5,200 feet, widened it to 100 feet and provided a full parallel taxiway.

To make the airfield improvements a reality, Klemm needed some help. DTL does not have a full-time airport director, so Klemm and his staff plan and secure estimates for projects. A five-person airport commission then reviews their recommendations. "We are not an airport authority; the airport is governed by the airport commission," specifies Commission Chairman Mark Hagen. "The commission operates under a joint operating agreement between the city of Detroit Lakes and Becker County. Since the airport is located within the city limits, the city is charged with operating the airport. The city administrator sits in on all of our meetings. We have worked well together."


MARK HAGEN

Hagen, who has been on the airport commission since 1992, says that extending the main runway was first discussed more than 20 years ago. Many proposals were introduced but eventually died, due to a lack of consensus among commission members. "This idea was stalled for several years, due to the 'purpose and need' section of the environmental assessment process," he explains. "The project was bounced around in many meetings, but no decisions were being made by the agencies involved."

Hagen credits Andy Peak, a new official at the FAA district office in Minneapolis, as being instrumental with organizing a process to either get the project completed, or end the discussion. That prodded the airport to act.

In 2015, DTL hired aviation consultant Mead & Hunt to provide the experienced help needed to navigate the many hurdles associated with a project of this complexity. "City and county officials, airport commission members and people from my team regrouped, and proposed a new path to move forward," says Bryan Page, an engineering manager and aviation principal with the company. "We received positive reviews of the new plan, and had excellent collaboration from both the FAA and the Minnesota Department of Transportation Office of Aeronautics, among other agencies."


BRYAN PAGE

To secure FAA funding, the airport had to demonstrate the purpose and need for the runway project. The key was proving that there was enough potential corporate and private aircraft traffic to warrant an extension. Specifically, DTL had to show that there would be at least 900 more jet operations per year. To do so, the project team secured statements from several private and commercial airplane owners indicating that they would use the airport more often if it had a longer runway. "It is a major issue for a GA airport without scheduled commercial operations to prove the need for a runway expansion," states Hagen. "You have to go out and find users who have not flown to that airport previously, and get them to write a letter that they will use the airport if it is expanded. This would be similar to building a hotel, and having the bank asking for potential guests' names during the loan process. In my opinion, this is not the best method of determining the need for an airport project.

We also proved that several models of longer-range jets would be able to use DTL's proposed runway," Hagen adds.

Another document required to secure federal and state funding was a report detailing specific improvements that would be made. The airport's list included:

- extending Runway 13-31 to 5,200 feet;
- widening 13-31 from 75 feet to 100 feet;
- creating a full parallel taxiway for 13-31;
- building a more effective perimeter fence;
- upgrading airfield lighting and navigational aids to modern equipment with LEDs to reduce energy consumption;
- installing a new approach lighting system on the south end of Runway 12-21 to improve capabilities in all weather conditions;
- replacing Visual Approach Slope Indicators (VASIs) on 13-31 with new Precision Approach Path Indicators (PAPIs);
- relocating and upgrading the Automated Weather Observation System (AWOS);
- installing new runway and taxiway edge and threshold lighting; and
- adding a modern, energy-saving lighting control system located in a new climate-controlled electrical facility.

Planning, Funding & Phasing

The first step for Page and his team was to develop a detailed environmental assessment concerning the south end of the runway. This document involved 23 different agencies, and was coordinated by the FAA. Two wastewater treatment ponds located just beyond the airfield had to be drained and filled because the waterfowl that used them were a potential threat to planes using the runway. In addition, there was a natural wetland right where the main runway would be lengthened that had to be drained and filled.

After the environmental requirements were approved, airfield renovations were designed in winter 2016-17. "We had to use a large design team of more than 30 people for a project of this complexity," Page reports. "On any given day, there were three to six team members on-site."

Before the construction could begin, the airport had to secure funding. The budget was estimated at $25 million, and FAA agreed to cover 90% of the cost. The state of Minnesota contributed 5%; Becker County kicked in 2.5%; and the city of Detroit Lakes matched the county's 2.5%.

There were strings attached, however. Because DTL is a small airport, the FAA would not commit to the complete sum right away. After the project team completed Phase 1, the airport could then apply to receive funding for Phase 2. In total, construction was divided into four phases.

Funding for Phase 1 was granted in September 2017, and construction occurred from October 2017 to July 2018. Crews

placed 100,000 cubic yards of fill on the south end of the airport to prepare the site where Runway 13-31 and its parallel taxiway would be extended. In addition to grading the area, they also improved drainage and relocated utilities.

Work for Phase 2 started in October 2018. Approximately 56,000 cubic yards of fill were hauled in, placed and compacted within the wetland south of the runway's 31 end to create a 600-by-300-foot runway safety area. The remainder of Phase 2 was finished in May 2019. To complete the grading, drainage and taxiway extensions, contractors established a 500-foot temporary displaced threshold on Runway 31.

During Phase 3—the most significant portion of the project—contractors reconstructed, lengthened and widened Runway 13-31. That involved 230,000 cubic yards of excavation, 42,000 cubic yards of imported granular fill, 8,400 cubic yards of crushed aggregate base course and 12,400 tons of asphalt paving.

Phase 3 required full closure of the runway in June and July 2020, but DTL's shorter turf runway (18-36) remained in operation throughout the two-month closure. The new 5,200-foot-long runway—now classified by the FAA as Runway 14-32, due to magnetic declination—opened to traffic on July 31, 2020.

While crews extended the runway, they also upgraded airfield lighting and guidance signs, added new supplemental wind cones, installed PAPIs on both ends of Runway 14-32 and built a new electrical vault building.

Water Woes

A major part of the project involved draining bodies of water on and off airport property. Two wastewater treatment sedimentation ponds located just beyond airport property south of the main runway were owned by a local utility, and were considered abandoned. Since they were no longer used for treating wastewater, the city of Detroit Lakes worked closely with the Minnesota Pollution Control Agency concerning plans to drain them, and got approval to do so. As a result, the project team encountered minimal red tape to fill them.

The more complicated issue involved mitigating 27 acres of wetland impacted by the project on the far south end of the airfield—right where the new runway needed to be extended. In order to obtain the required permitting in this area, DTL had to buy wetland credits from the Minnesota Board of Water and Soil Resources. "This was an expensive option," states Hagen.

"It cost us $700,000 to just buy the credits. The initial plan was to mitigate the wetland disturbance on-site, but the decision of the stakeholder agencies was that the on-site mitigation option would require several years of monitoring the wetland. The watershed district did not have the bandwidth to provide the monitoring. Therefore, the decision was collectively made to acquire the credits of existing wetland through the local wetland bank. Considering everything that went into the project, I would estimate that 15% of the cost for the entire airfield renovation came just from doing the environmental preparations."

An important element of Phase 4 was installing a new perimeter fence around the entire airfield to keep out wildlife such as deer and coyotes. The new barrier includes more than four miles of 10-foot-tall chain link fence, topped with three-strand barbed wire. The airport also added a 2-foot-deep underground chain link fabric to deter animals from burrowing underneath the fence. Construction of the fences started in late October 2020 and was finished this spring.

Another key segment of Phase 4 involved installing the new AWOS, which was repositioned closer to Runway 32 to comply with FAA guidelines.

Finally, DTL added an automated sliding gate system at the south end of the airfield. Now, airport personnel, pilots and maintenance workers punch a security code into a keypad to enter the airfield.

New Wastewater Treatment Plant

While construction was occurring on the airfield, the city of Detroit Lakes also built a new wastewater treatment plant off airfield property. "The decision to build the new plant was made in 2015, even before any work was done on the airport," states Klemm. "We needed to build and open the new plant, and then drain and fill the abandoned wastewater treatment ponds near the airport."

The new treatment plant opened in spring 2020, a few months before the new runway reopened. "To get two major projects like this to align is very rare, but everything kind of fell into place," says Klemm.

The new plant cost $34 million, and was funded separately from the airfield projects.

Financial Dividends

With the airfield projects completed, and the airport humming along, Klemm already has noticed a boost in local economic activity. "In late spring this year, the town was very busy," he reports. "Food and tax revenues are already up. And I definitely have noticed more planes overhead."

Klemm also expects a lively summer. "We host a big country music festival every August, and I am sure that at least some of the 30,000 people expected to attend will use our airport to fly in here," he says. "We also are hoping that after the pandemic, there will be a pent-up demand for people wanting to visit our region, and perhaps using our airport as their entry point."

Ford Int'l Reconstructs & Expands Apron

BY JODI RICHARDS

Earlier this year, contractors finished the final punch list for a much needed $50 million apron reconstruction and expansion project at Gerald R. Ford International (GRR) in Grand Rapids, MI.


CASEY RIES

Casey Ries, engineering and planning director at GRR, was glad to close out the complex project the airport began planning back in 2015. Ries explains that 2018 to 2019 was the ideal time to reconstruct the terminal apron because the physical condition of the pavement was not great and the logistic conditions were favorable—funding was secured, traffic was growing and the rest of the airfield had been recently improved. In fact, in the midst of reconstruction, traffic grew so swiftly that it helped officials secure approval and funding to expand the apron as well.

Ries notes that the existing pavement had been built piece by piece over the years, and included eight sections with different specifications, thicknesses, ages and overall conditions. So the airport relished the opportunity to improve the apron around all of Concourse A and the southern half of Concourse B in a holistic manner.

With the rest of the airfield posting pavement condition index scores greater than 85 and with airfield capacity needs being met, GRR kicked off apron reconstruction in 2018. "Our runways were in great shape, taxiways had been expanded and brought to current standards," Ries recalls. "It was time to address the terminal apron."

Assembling a Team

Project designer C&S Companies was involved very early in the planning process, even before the airport had secured funding. "The team approach to the project was critical," Ries explains. After assembling the design team via a qualification-based selection in early 2015, GRR quickly engaged its airline partners, knowing that phasing would be critical to project success.

Project contractor Kamminga & Roodvoets of Grand Rapids successfully won the bid in November 2017 and rounded out the project team.

The $32 million reconstruction project covered about 167,000 square yards of apron pavement, and FAA Airport Improvement Program funds paid for 90% of the cost. Work spanned two construction seasons (April through October in West Michigan), and planners phased the project so that no more than two jet bridges or one of the three connector taxiways to the apron was closed at the same time.

Beyond the baseline phasing provisos, GRR's airline partners naturally were interested in how the project would affect their day-to-day operations. More specifically, they analyzed how aircraft, personnel and baggage tugs would navigate the construction.

Ries emphasized the importance of coordinating the apron work with airport operations, airport police and security, and the airport rescue and firefighting team. "Every time we made a change to operations, response routes and pathways would change," he notes. "It worked because the team committed to communicating and meeting so regularly."

Plans had to remain fluid and flexible, because when phasing was established, aircraft movement numbers were fully 20% less than what GRR ultimately experienced in 2019 as the project came to a close. Planning was based on GRR's primarily ADG II fleet mix of 2015 and 2016, but the type and frequency of aircraft operating there grew larger over the intervening years with significant ADG III operations in 2019.

Early and constant coordination, along with a commitment to engaging all impacted parties, contributed to the success of the project, says Ries.

The biggest challenge for project manager Robert Koller, a service group manager at C&S Companies, was developing a phasing plan that would not negatively impact airline operations. Stakeholder outreach included continual meetings with airlines, tenants and the airport, and implementing a plan that would work for all parties.

ROBERT KOLLER

Ries notes that C&S used various tech-based construction management systems to keep the construction team, designers, airport personnel and tenants fully engaged with digital documentation, daily reporting, record drawings and photo management.

GREG FEHRMAN

Greg Fehrman, principal engineer and lead onsite resident project representative with C&S, agrees that the projects benefited from a 100% electronic construction management system. "The only real paper utilized was the sign-in sheets for the meetings the first two years," he recalls. "The third year, there wasn't even a sign-in sheet because everything was done remotely [due to COVID-19]."

Digital reports were sent out weekly to detail progress, and schedule updates were issued every other day to prevent the highly fluid project from impacting operations. "The contractor really bought in and adapted to it, so it worked seamlessly the whole way," Fehrman says of the electronic management approach.

Specific cloud-based tech tools included InfoTech's Appia for project management, DocExpress for document management and SmartVid for photo management. "We were very transparent," Fehrman relates. "Anybody who wanted access could get to it—just in the project management, it was read-only access. We had nothing to hide, and we really headed off potential snags by being that transparent."

Phasing Was Critical

The apron reconstruction project was subdivided into seven phases. This limited impact to operations, but did not leave much room for contractors to work in some areas, Koller notes. Temporary provisions were created for aircraft taxiing and parking while areas were closed for construction, and some gates were consequently restricted to smaller aircraft due to limited room. "It was a lot of coordination, both in the design and construction," Koller reflects.

FACTS&FIGURES

Project: Apron Reconstruction & Expansion

Location: Gerald R. Ford Int'l Airport—Grand Rapids, MI

Total Cost: $50 million

Reconstruction Funding: 90% Airport Improvement Program, 5% Michigan DOT; 5% local

Scope of Reconstruction: 167,000 sq. yards of 16-inch pavement

Scope of Expansion: 48,000 sq. yards of 16-inch pavement

Secondary Elements: New LED lighting; roughly 16 miles of apron markings (temporary & permanent); 6.5 miles of underground storm drainage

Designer: C&S Companies

General Contractor: Kamminga & Roodvoets

Aircraft Parking Design: CAGE

Glycol Recovery System Design: Gresham Smith

Glycol Recovery System Controls: West Michigan Controls

Interlocking Safety Barricades: OTW Safety

Traffic Management Software: PathPlanner

Reconstruction Design: 2015-2017

Reconstruction Construction: 2018-2019

Expansion Design: 2018-2019

Expansion Construction: 2019-2020

Recognitions: 2020 Michigan Concrete Paving Assn. Award of Excellence (apron reconstruction); 2021 ACEC Michigan Engineering Merit Award (apron reconstruction & expansion); 2021 ASCE Michigan Outstanding Civil Engineering Achievement Merit Award (apron reconstruction & expansion)

As airlines moved gate positions, information technology systems had to be moved accordingly. Scheduling such work with airline and airport IT departments in concert with construction took careful planning to ensure that contractors were hitting schedules, while also remaining flexible. “It was a lot of temporary planning for each of those phases,” he explains. “Whether it was construction access, aircraft parking or temporary pavement ramps for aircraft between the phases, there was a lot of temporary work that had to be done just to go from phase to phase.”

Timing of the phases was primarily dictated by airline operations and construction access because thousands of trucks and personnel needed access to the most secure areas of the airport. “How they accessed and where they crossed active taxiways was a very big deal,” Ries remarks. “We didn’t want to travel over completed portions of pavement any more than we needed. So it was operations, safety and security all top of mind first.”

It was essential to clearly define contractor areas and aircraft operating areas, he adds. Contractor access points and haul routes were all specific and dedicated to those activities. When haul routes needed to cross active taxiways, the project team used dedicated flaggers outside of the taxiway object free area. To eliminate the need for engagement with air traffic control, contractor movements were kept to the non-aircraft-movement side of the airfield. Flaggers, however, monitored the ground control frequency to ensure safety. “By dedicating all those movement corridors for the contractor, they were able to isolate and control movements, and air traffic control had confidence that those potential conflicts were isolated and controlled,” Ries explains.

All contractors working on the site had to be vetted, trained and issued security badges. The project also included fulltime vacuum trucks on all haul routes to control foreign object debris. On active movement areas of the apron, low-profile barricades were used to delineate work areas.

Ries notes that it was imperative to consider all vehicle movement on the airfield during and after construction. Subconsultant CAGE used PathPlanner software to evaluate temporary and final apron markings to manage the movement of aircraft tugs, contractor equipment and other vehicles. For Ries, the interim markings were just as important as those that became permanent because the temporary markings helped keep contractors and aircraft operators safe during construction.

In all, crews applied about 16 miles of pavement markings. With six airlines operating at GRR throughout the project, the process required coordinating with each carrier for its specific gate marking standards. When the project was complete, 14 of the airport’s 15 gates were preferentially leased, with just one open for common use.

Expansion Adds Challenges

During apron reconstruction, traffic at GRR was growing quickly—so quickly that by the end of 2019, the airport was seven years ahead of FAA forecasts from only three years earlier. “Incredible things were happening in our region,” explains Ries. “Businesses were

diversifying in West Michigan, and that tremendous growth was reflected at the airport."

Fehrman notes that significant increases in operations led to "quite a bit of juggling" and a tremendous amount of temporary markings. In addition to more aircraft moving in and out of the airport, the fleet mix also changed during the project, which required even more flexibility for planning and phasing.

"It was a full team effort, and we all had to adapt, adjust on the fly and accommodate changes that were inevitable," Koller remarks.

Also during the project, Allegiant Air designated GRR as a maintenance base. This increased the number of aircraft based in West Michigan—and the associated need for overnight parking. New demand for eight remote remain overnight spaces introduced a challenge that Ries notes could not have been predicted during the project design phase. "Challenges and opportunities were stacking one on top of each other," he recalls. "But continual engagement with airlines and the design and construction team made it work, and there wasn't a single aircraft delay."

In response to the rapid traffic growth, midway through the reconstruction project, GRR officials successfully documented the need to expand the apron and secured $14 million in FAA funding

In addition to reconstructing its existing apron, the airport added 48,000 square yards of new pavement.

for an accelerated apron expansion project. While that was good news overall, the additional construction further complicated an already complex phasing process.

The expansion project required two construction seasons, beginning in 2019 and wrapping in 2020. As a result, the expansion project overlapped with the original reconstruction project in 2019, requiring even more careful coordination with stakeholders. Even though work was spread over two construction seasons, weather still posed some challenges.

Glycol Recovery

During its recent apron reconstruction, Gerald R. Ford International (GRR) took the opportunity to expand its stormwater drainage system and install an automated underground glycol collection system. In lieu of a centralized deicing pad, the western Michigan airport uses most portions of the apron for aircraft deicing to support flexible airline operations.

The airport had several goals in mind when planning the project:

- improve the efficiency of capturing stormwater that contains deicers
- reduce apron congestion from mobile collection units (its previous method of collecting deicing runoff)
- reduce the staffing burden and operational costs of managing spent deicer
- minimize environmental impact risk and,
- if possible, maximize the volume of glycol that is recycled.

Gresham Smith proposed an automated underground system that fulfilled all of GRR's objectives. In addition, it requires less than half of the equipment and human power needed for mobile collection units, notes Tim Arendt, senior vice president at Gresham Smith.


TIM ARENDT

GRR's new system for managing spent deicer includes:

- reconfigured apron drainage to minimize the collection of stormwater from non-deicing areas and minimize the area where mobile collection units are needed;
- routing drainage from the three drainage areas through individual pipes, and drawing stormwater samples from them every seven minutes;
- reducing spikes in glycol concentration flow to the airport's award-winning natural treatment system to maximize system performance; and
- routing samples to independent online monitors (one for each apron) that measure total organic carbon concentrations, which are used as a surrogate for deicer and Biochemical Oxygen Demand concentrations.

If Total Organic Carbon concentrations are high enough to allow economically efficient glycol recycling, stormwater from the drainage areas is routed to underground storage tanks. (The East Apron system has 105,000 gallons of storage; the West Apron system has 35,000 gallons of storage.)

High concentration deicer is loaded from storage onto trucks for transport to a local glycol recycling and disposal facility. If total organic carbon concentrations are not high enough for economic recycling, the stormwater-deicer mix is routed to the airport's natural biological treatment system.

"The apron expansion was necessary because of growth, but unexpected in 2019," Ries reflects. From the airport's perspective, it was fortunate that Kamminga & Roodvoets (the apron reconstruction contractor) was the successful low bidder for the expansion because that made it easier to dovetail the two projects cohesively.

Additional Improvements

In total, crews placed 215,000 square yards of new 16-inch pavement during the two projects. The project also upgraded overhead apron lighting to more energy-efficient LED fixtures and installed about 6.5 miles of underground storm drainage.

The reconstruction and expansion also allowed GRR to upgrade the apron to current National Fire Protection Association standards regarding drainage around where aircraft are fueled.

All told, about 200,000 cubic yards of soil was removed from the work area. Airport officials are especially proud that 99% of materials generated during the projects—including old concrete, piping and soil—was repurposed at GRR or elsewhere around the county.

Together, the recent apron improvements pave the way for Project Elevate, GRR's capacity expansion project for Concourse A. The three-part program will include an eight-gate expansion and widening, construction of a Federal Inspection Station and relocating the air traffic control tower. Originally slated to break ground in April 2020, the Concourse A Expansion and Widening Project has been delayed due to the coronavirus pandemic.

Fredericton Int'l Updates & Expands its Terminal

BY VICTORIA SOUKUP

Fredericton International Airport (YFC), in Canada's far northeast corner, was built more than a half century ago to accommodate 200,000 passengers annually. The original building and facilities served their purpose aptly until about 10 years ago, when the New Brunswick airport began experiencing steady growth. By 2019, YFC hit a record passenger load of 427,000 annual passengers—more than double the amount its facilities could reasonably handle.

Since March, YFC has had an essentially new terminal designed to accommodate growth for 25 years and beyond. Moreover, renovating and expanding while air traffic dramatically slowed during the COVID-19 pandemic allowed contractors to finish four months ahead of schedule and a half-million dollars under budget.


JOHANNE GALLANT

"The terminal was built in the 1960s, so you can just imagine the work that was needed to upgrade the facility," says Johanne Gallant, president and chief executive officer of Fredericton International Airport Authority. "We were over capacity for a long period of time, and with 10 years of growth at a 5% average rate of growth in each of those years, we desperately needed this expansion and renovation."

Cost of the project was nearly $32 million, with the provincial and federal governments each providing $9 million, and the airport self-funding $14 million through user fees and borrowing.

All three entities are pleased with the return on their investments. Gallant considers the airport's new food and beverage service and seating with chargers important 21st century improvements. She also notes that YFC is now roomier and more maneuverable. "Our security lines are more efficient, and the equipment is more efficient," she specifies. "The flow of passengers in the ticketing area is quite better. And we desperately needed the additional space in our secure holdroom."

Local Involvement

The Airport Authority's preference for using local firms, labor and materials proved pivotal to successfully completing the two-year project. "It was the right decision to concentrate on having local

partners," Gallant reflects. "If we had to bring individuals or materials in from other provinces or countries, it would have been a problem during the pandemic."

The project expanded the terminal structure from 38,000 square feet to 62,000, and changed the pedestrian flow to make it more efficient. Improving all critical areas, from security and baggage to concessions and gates, required contractors to strip the entire structure down to its steel columns. A multi-purpose area previously used for international arrivals and winter sun charters was repurposed to accommodate passengers during construction.

"All the walls were taken out," explains Kyle Mathers, of Mathers Project Management Consulting Inc. "You could see through the entire terminal structure to the other side. There was nothing left."


KYLE MATHERS

In the first phase of the project, the multi-purpose area was used for ticketing, departures and baggage drop while permanent areas for those functions were under construction. During the second phase of work, the area was used for arrivals.

"It certainly was a tight fit in that area," Mathers recalls. "Passengers and tenants using the space immediately recognized the need for an upgrade. [But] the temporary passenger movement flows during construction worked so well that

FACTS&FIGURES

Project: Terminal Renovation & Addition

Location: Fredericton (NB) Int'l Airport

Cost: Nearly $32 million

Funding: $9 million federal; $9 million provincial; government, $9 million (CAD); $14 million airport

Size: Terminal expanded from 38,000 sq. ft. to 62,000

Construction: June 2019–March 2021

Architecture, Interior Design, Engineering, Baggage System Design: Stantec

Project Manager: Mathers Project Management Consulting Inc.

Construction Manager: BIRD Construction

Baggage System: Alstef Group (formerly Glidepath)

Civil Work: KDB Engineers/Contractors

Electrical: Dobbelsteyn Service & Maintenance Ltd.

Paving: Hogan Paving Ltd.

Steel Work: Tek Steel Ltd.

Roofing: Atlantic Roofers Inc.

Drywall & Ceilings: Fundy Pros Specialty Construction Inc.

Plumbing: Beaulieu Plumbing & Mechanical Inc.

HVAC: Brunswick Sheet Metal Ltd.

Flooring: F.R.S. Flooring Solutions Inc.

Aluminum Windows/Aluminum Doors: Royal Door Ltd.

Seating: Arconas/Active Office

Millwork: Country Charm Woodworking Ltd.

Carpeting: Shaw

Tile: Casalgrande Padana

Sheet Vinyl: Armstrong

Flight Information Display System: Terminal Systems Int'l

Food & Beverage Service: Chess Piece Patisserie & Café

The holdroom area is larger, with higher ceilings, more natural light and new seating with power outlets.

even in the temporary quarters, everyone was walking in the right direction. In the old terminal structure, the flows were all broken up. It was apparent right away that people were going to like the new terminal with the improved passenger flow."

Light & Airy Interior

The biggest visual change is the terminal's raised ceiling, which adds an airside area with abundant natural light from large windows and skylights. The corridor that leads passengers to their aircraft has a wall of windows that provides natural light and views of the apron.

"The previous facility was very low," says Ian MacLaughlan, project manager at Stantec. "You almost felt like you were down in a tunnel."

IAN MACLAUGHLAN

To add more natural light on the landside, designers expanded the entranceway. "It helped open up that area, so there is now an entirely new feel," MacLaughlan explains. "The terminal is located in the capital of the province, and when you're walking into a transportation hub in the capital you always want that feeling of prominence."

Ticketing & Baggage Improvements

Ticket counters were consolidated from two areas into one to help maintain consistent passenger flow in one direction. The baggage drop area was also updated from two rooms to one, to eliminate confusion and additional steps needed when flights arrived or departed. The airport installed a new Glidepath baggage

handling system to improve efficiencies and accommodate flights with large amounts of baggage.

"Previously, it was always a manual decision as to which room the bags should be sent to," Mathers says. "It wasn't efficient. The new design has
a single bag room that is shared by all carriers and ground handlers. It allows for a smoother and easier flow and is more ergonomic and safety-focused for those who load the baggage onto carts."

To alleviate bottlenecks during passenger screening, the security area was expanded from one lane to two, and a Smiths CTX 5800 computed tomography system was installed. "It's such an improved area," reports Mathers. "Passengers feel so comfortable now going through security."

The CTX 5800 is designed to provide high-resolution 3-D imaging for quick, accurate threat detection in a small footprint for installation in space- or weight-restricted environments. "This new machine was installed by Canadian Air Transportation Security to update YFC's old baggage screening machine and support its new baggage operation," says Mathers.

Larger Holdroom

Post-security, YFC expanded the holdroom and installed new Arconas seating in bright colors, bringing total seating capacity to 280 passengers. "Our holdroom can now accommodate a proper number of passengers for the size of flights which are coming through," comments Mathers.

The Flyaway model seating has intermediate tables and inPower Flex 3 units, which allow passengers to charge personal devices from the comfort of their seats.


LYNN GORDON

"The blue, green and grey upholstery was inspired by the natural landscape of Fredericton, and the province of New Brunswick as a whole," explains Lynn Gordon, vice president of business development for Arconas. "In addition to enhancing the aesthetics of the terminal, it was important to provide the best passenger experience by including a power solution for passengers to charge their devices conveniently in their seat. The inPower Flex 3 power modules installed each have one AC receptacle, two USB-A ports and two USB-C ports."

The airport also added food and beverage service to the holdroom area. Previously, the only post-security options for passengers were snacks and drinks from vending machines, or beverages sold by a vendor through a small window during particularly busy travel times.

Chess Piece Patisserie & Café, a local French pastry shop, now offers airside and groundside service at the airport. Its menu includes coffees, desserts and light from-scratch meal items such as soups, sandwiches and quiches. Alcohol is also scheduled to be available landside and airside at the café, which has seating. "That is such a big improvement," says Mathers. "We are all so excited about this addition."

A local pastry shop provides new food and beverage concessions. Future plans include serving alcohol.

From an operational standpoint, the new holdroom can accommodate up to six separate boarding positions, double the airport's previous capacity. Each of the A, B and C positions has two counters for check-in. "Once you are behind that counter, you are in the airside corridor that leads passengers to their aircraft loading position," Mathers explains. Passengers then exit the corridor and walk to their aircraft for boarding via mobile stairs or ramps.

"Fredericton is unique," Mathers observes. "It's one of those places where planes come in and land and fill with passengers and head right back out again."

Heeding input from carriers, which value very quick turnarounds and indicated that bridge loading can slow them down, the Airport Authority opted to save the cost and not install boarding bridges.

Overall, 17 new flight information display screens (which can also display advertisements) were installed in the facility: two in ticketing, one in security, four in the holdroom, five in the arrivals area, two in the airside café, two in the groundside café and one in the groundside restaurant.

Full Steam Ahead

Stantec's MacLaughlan notes that the project had a tight budget. "Airport officials could see the increased flow of traffic both with arrivals and departures, and knew they had to accommodate that. But to accommodate it, they had to spend money. So budget was a huge challenge. The airport had to spend that money to get the size of structure up to accommodate the traffic."

From a construction standpoint, the COVID-19 pandemic allowed contractors to move faster than otherwise anticipated. But the airport was also constantly concerned as to whether the project would be allowed to continue.

"We never knew if they were going to shut down the construction project," Gallant recalls. "We were extremely fortunate that when our community went into lockdown, the government allowed us to continue with the project. Our team met weekly, and we were always trying to get equipment and materials in on time and make sure the employees were safe."

The project created nearly 600 jobs through on-site employment and the indirect/induced economic impact of the construction. Mathers notes that the project moved along exceptionally smoothly because nearly all the workers lived nearby. "We definitely benefited from having local people working and not having to travel through the provinces or from other countries to get to the jobsite," he remarks. "And they all certainly appreciated being able to keep working throughout the pandemic. Yes, we were affected by continuously changing safety regulations during the pandemic, but we were able to keep the jobsite going because most of the folks were from right around here."

From a supply chain perspective, time was on the airport's side because contractors had ordered materials, and in many cases already taken delivery, before COVID-19 was in full force. "We were really fortunate because we started the processes before the pandemic hit," says Mathers. "Toward the end of the project, we were beginning to see a delay in supplies."

There was also a more subtle benefit from hiring local workers, consultants and contractors. "A lot of workers felt a connection to the jobsite," Mathers explains. "The airport is an important place here in Fredericton. Workers would share recollections about experiences they had in the terminal building and enjoyed seeing the inner workings of the airport and improving the airport experience with this project."

Gallant agrees: "Everyone involved in the project had a sense of ownership. They wanted to do well. They wanted to deliver on this project because it was a key project in our community."

MacLaughlan notes that the terminal renovation and expansion poise the airport for the foreseeable future. "All the shortcomings of the previous structure have been addressed," he says. "You walk into the building now and you don't have a feeling there was an existing structure there. It is a new and very clean feeling—the colors are bright, and the natural light is bright."

Gallant considers the project a success: "We finished four months ahead of schedule and under budget. And it was complex, doing all that work during a pandemic and still keeping the facility operational. The entire community and the airlines are very pleased with the outcome. We accommodated all our airlines and other stakeholders. We are very proud and very happy with the result; and now we're ready for the recovery when people start traveling again."

New Receiving & Distribution Center Improves the Way Goods Move Through Salt Lake City Int'l

BY KIMBERLY GIBBS

FACTS&FIGURES

Project: Central Receiving & Distribution Center

Location: Salt Lake City Int'l Airport

Size: 22,000 sq. ft.

Loading Docks: 7

Cost: $5.6 million

Opened: Aug. 2020

Staffing: 15

Facility Operator: Bradford Airport Logistics

Operating Contract: $1.7 million/year for 5 years

Facility Design: GSBS Architects

General Contractor: Paulsen Construction

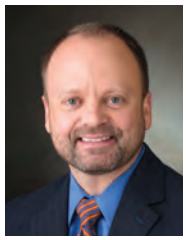
Green Features: Robust recycling program; electric (vs. gas-powered) trucks

Of Note: Airport & Bradford Logistics collect excess food from concessionaires for local food banks.

Salt Lake City International Airport (SLC) is changing the way people and goods travel through its facilities. A multiphase effort to address its changing operational needs began with an airport redevelopment program that focused on passenger flow, and a $5.6 million Central Receiving and Distribution Center (CRDC) that opened last August is enhancing the safety, security and efficiency of how goods move throughout SLC.

Management and security staff keyed into a common industry concern: airside vehicle traffic nearly 24 hours a day. With the help of Bradford Airport Logistics, SLC leaders took action to understand and address this risk in a holistic manner.

"Essentially, what we wanted to do was to get vehicle traffic off the ramp and gates," explains Shane Andreasen, director of Administration and Commercial Services for the Salt Lake City Department of Airports. "This ultimately enhances the safety and security of our airfield and surrounding assets."


SHANE ANDREASEN

After completely reconsidering how goods could move through the airport, the project team determined that a central facility was the best option to manage the inflow and outflow of essential everyday products. The 22,000-square-foot CRDC that was subsequently established allows the airport to screen, sort and deliver all products throughout its terminals and concourses,

while still meeting the time-sensitive needs of its vendors and tenants.

Limiting access to sensitive areas of the airport by vendors and non-airline operators prior to screening was a paramount priority for the project design team. All vehicles now are re-routed away from sensitive areas and to the CRDC.

Designers overhauled a former cargo building located near the terminal area to create a new facility for the trucks and processing equipment that screen and distribute thousands of products needed at SLC every day. A special CRDC team manages the complex logistics, pushing goods out through seven loading docks to trucks that deliver them throughout the airport campus. Drive time from the facility to the airport is just five minutes.

Worth the Cost?

"Fewer vehicles driving on the airfield results in a reduction in the number of delays and other issues caused by vehicle traffic on the ramp and on the roadways," says Benjamin Richter, chief executive officer and founder of Bradford Airport Logistics. "This one change can impact customers *and* airport revenue."

BENJAMIN RICHTER

The 15-member CRDC team, managed by Bradford Airport Logistics, performs regulatory inspections and screens goods with X-ray machines before consolidating them for redistribution to SLC's terminal and two concourses. The process is used for a wide variety of products, including supplies for operations staff and airline tenants, as well as food, beverage and retail items for airport concessionaires.

Richter notes that at most airports, tenants operate independently from each other and the airport, which is not efficient or secure. Redundant and frequent operations within the facilities also can put stress on the airport systems, he adds. SLC is seeing and experiencing the benefits of bringing all airport and concessionaire products together under one roof to streamline screening and handling logistics.

When SLC issued a request for proposals regarding its receiving and distribution system, Bradford Airport Logistics stood out with more than 20 years' experience in complex airport environments such as Detroit's Metropolitan Wayne County Airport. Through a competitive bid process, SLC hired the firm in April 2019 at a cost of $1.7 million per year for five years.

"One of the biggest criteria we considered in choosing Bradford Airport Logistics was the experience of the operator," says Andreasen. "We didn't want someone who was not familiar with airports." Operating costs and sustainability were other main factors, he adds.

Bradford Airport Logistics worked closely with SLC design and operations teams to develop a plan to bring a new concept for receiving and distribution to fruition. Part of the planning process included making site visits with other airports, such as San Diego International, with similar facilities.

All incoming goods are screened and sorted for distribution throughout the airport.

The concept of centralizing the receipt and distribution of goods is not new to the airport industry. About 20 years ago, CRDCs became popular in Europe, and then the model spread to the U.S. Studying existing facilities provided SLC with insight about what features to incorporate into its new facility.

Green Goals

With sustainability goals figuring prominently into the airport's multiphase improvement strategy, the project team determined that it wanted the new CRDC to use electric vehicles and include a robust recycling program. Ultimately, the airport hopes to achieve LEED Gold certification for the new facility.

Bradford Airport Logistics checked all of the boxes that SLC wanted to address. "In this industry we are often criticized about sustainability efforts," Richter reflects. "We understand the criticism and have the imagination to overcome those challenges to deliver on an airport's vision."

The Bradford team developed a sustainability program that incorporates enhanced recycling and pre-ordered electric semi-trucks from Tesla and cab-over trucks by Peterbilt. Richter notes that the team will add even more sustainability components to its plan at SLC's request.

Distributing Food to Those in Need

When personnel at Salt Lake City International Airport (SLC) expressed concern about food insecurity within their communities, management turned to the contractor that manages the airport's new Central Receiving and Distribution Center (CRDC) to help funnel unsold food from airport concessionaires to local food banks.

Bradford Airport Logistics, which prides itself in surpassing each customer's expectations, was all in.

"When we are contracted for a project, we're an integrated partner and willing to go outside the scope of our contract to meet the needs of our airport clients," explains Benjamin Richter, the company's chief executive officer and founder.

Bradford developed a plan that will encourage SLC concessionaires to bring their non-salable, but still edible, food to a secure storage cooler in the terminal. Every day, its employees will take food from the concourses to the CRDC for immediate distribution to Salt Lake City Mission, which will then distribute it to local food banks.

While "food recycling" was not part of the original work scope for Bradford, the company was happy to take on the extra task.

"We don't shy away from opportunities," says Richter. "When an airport wants to lead in the community, like SLC is, we, in turn, want to work with them to lean into new ideas and bring them to life."

In early June, the effort was on hold until pandemic-suppressed concessions traffic and associated food surpluses return to normal. A few years ago, HMSHost ran a similar program at SLC. It donated about 1,000 pounds of food such as packaged sandwiches, fruit cups and parfaits to the mission every month.

Built-in Flexibility

In order to reinvent the way goods are handled at SLC, the airport needed buy-in from tenants and other support partners to make the new processes effective.

"Our goal was to get all ancillary traffic off the airfield," Andreasen explains. "And to reach that goal, we needed the support of everyone—airlines, concessionnaires, mail services, vendors and suppliers."

As a result, the plan needed to make the switch had to be very detailed. For instance, the project team had to determine how ice should be delivered, how vending machines would be restocked and even how mail would be picked up. SLC worked closely with stakeholders to develop a process that would meet their

specific needs. For example, it added mail drop boxes around the airport, and provided tenants and employees with a detailed pick up and drop off schedule.

The project team credits strong partnerships with stakeholders as a crucial element to making the complex system work. Importantly, SLC built in the opportunity for tenants to give feedback to it and Bradford.

"We decided that if a change causes a negative impact, then it presents a problem for SLC, and we need to fix it," explains Andreasen. "This means we can't be too rigid in our processes and need adjustments over time to make this work."

He reports that airport partners continue to work closely to develop effective solutions for how goods are transported at SLC, while managing costs and keeping sustainability goals at the forefront. The result is significantly fewer vehicles in secure airside areas, and more effective and efficient management of goods flowing through the airport.

"Forward-thinking airports are doing things differently," adds Richter.

The new facility includes seven loading docks.

Raleigh-Durham Int'l Partners With Data Analytics Leader to Improve Passenger Forecasting

BY MINDY HAMLIN

When Mike Landguth, president and chief executive officer of Raleigh-Durham International (RDU), entered Kenneth Strickland's office in early March 2020, he had an important question for the airport's air service development director: How long would COVID-19 impact airline travel?

MIKE LANDGUTH

KENNETH STRICKLAND

It was the same question airport directors across the globe were asking. And when Strickland turned to trusted industry analysts for answers, he found a distinct lack of consensus.

"The potential scenarios were all over the map," recalls Strickland. "You had a lot of experts predicting wildly different things. Aviation consultants were a little more positive than other industries, yet they could not nail down a prediction for recovery."

Widespread uncertainty was understandable given the unprecedented circumstances presented by the global pandemic. But passenger forecasts impact nearly every area of operations, from parking lot closures and law enforcement schedules to concession hours and capital improvement projects. So Strickland pressed on for clearer answers.

Previously, he relied on passenger enplanement numbers, airline capacity and Gross Domestic Product statistics for near-term forecasting. "We could predict our passenger numbers with 98% accuracy based on airlines' seat capacity because seat capacity dictates demand," Strickland explains.

But COVID-19 completely changed the standard approach.

When it became clear that traditional strategies would no longer work, Strickland switched gears to a statistical analysis model he remembered from graduate school. The method, meta-analysis, combines findings and predictions from multiple studies and experts to determine an average.

"None of the studies is completely accurate individually, but collectively they will come pretty close," Strickland explains. Yet, even this broader approach only took the North Carolina airport so far.

"We kept trying to find a solution," Landguth recalls. And just as RDU executives began to consider consulting banks and other sources for insight, one of the airport's neighbors reached out to offer help.

Local Partnership

SAS, one of the largest data analytics companies in the world, also happens to be

FACTS&FIGURES

Project: Traffic Forecasting

Location: Raleigh-Durham (NC) Int'l Airport

Data Analytics: SAS

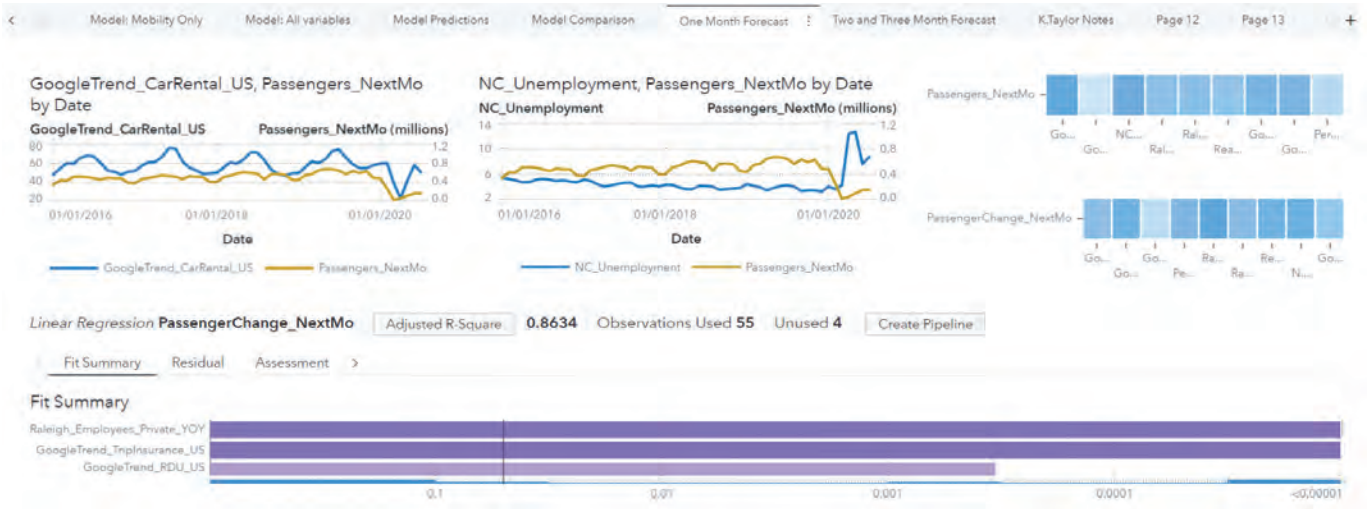
Strategy: Research alternative data, such as rental car reservations & tourist attraction hours, to help predict passenger volume

Timeline: Ongoing effort began in early May 2020

Results: Enplanement predictions are within 5% of actual traffic

Cost: $0

Of Note: SAS provided airport & other local companies pro bono counsel to help them weather business effects of COVID-19



SAS integrated non-airport data into RDU's forecasting process. While some factors correlate directly with passenger traffic, others have an inverse relationship.

located just minutes away from RDU. So is Research Triangle Park, headquarters for about 300 leading technology and life science companies.

As the impacts of COVID-19 became clearer, SAS leadership directed its specialists to reach out to customers and other local companies to see how the firm's software could help them navigate COVID-19 from a business standpoint.

"When the pandemic hit, our first thought was that this pretty much invalidates the analytics that businesses are dependent on," says Anthony Mancuso, global head of risk modeling and decisioning for SAS. "We started reaching out to customers and helping them determine how to proceed."


ANTHONY MANCUSO

David Morgan, the company's senior transportation advisor and a member of the RDU Airport Authority board, urged Mancuso to contact RDU.

"The first thing we did was meet with RDU and learn about their problem," recalls Mancuso. "Passenger traffic was completely off the charts in the negative. It was having a lot of implications for derived revenue and staffing. We looked at that and saw the exact same things in financial services." Predicting the future was difficult, because the situation has changed so much, he adds.

After identifying the parallels between RDU and other SAS clients, Mancuso and his team shared strategies that were working for other businesses.

The first step was to identify alternative data, which is commonly used in the financial services industry. Mancuso explains that if companies and organizations look beyond the values traditionally used to predict future business, their forecasts can become more accurate.

Historically, RDU had focused on variables such as airline schedules and seat capacity, which were not updated frequently. To improve the scope and timeliness of the airport's data, Mancuso and his team advised Strickland to use Google to search topics such as rental cars and Statue of Liberty hours, which could help indicate when leisure travel was picking up.

"We found that rental car reservations had a strong statistical relationship to travel two weeks into the future," says Strickland. "Using SAS' approach and software, we can also create models based on specific assumptions." These assumptions include vaccination rates and spikes in COVID cases.

By June 2020, Strickland and SAS had developed a model that predicted passenger enplanements within 5% of the actual traffic volume.

New Approach to Passenger Forecasting

Collaborating with its high-profile neighbor didn't cost RDU a dime. Mancuso explains that SAS simply wanted to help the airport and other community members through the pandemic.

"Our goal was not to sell software", he remarks. "We gave our time. The edict from my bosses and their bosses was just to help."

It's a gesture that will not be forgotten, and will continue to reap benefits for the airport.

"We appreciate SAS' partnership, which helped us through a very difficult time and a lot of unknowns," says Landguth. "We are now in a position to know when to build infrastructure for the future."

Input from SAS has also enhanced communication and interface with airlines operating at RDU.

"Credibility is key," emphasizes Strickland. "The decisions airlines make are always based on data. They have to be confident in the information you provide. Our new approach has increased RDU's reputation for providing accurate data they can rely on."

Moving forward, the airport plans to continue working with industry consultants who provide insight into airline operations and future planning. However, it also plans to continue researching alternative sources for information to supplement their efforts.

"We now strive to be more data dependent and data smart, because passenger projections have implications for every part of our business," Strickland concludes.

MaineDOT

Airports Throughout Maine Roll Out New System to Record Aircraft Data

BY KRISTIN V. SHAW

FACTS&FIGURES

Project: Recording Aircraft Radio Communications

Software Creator: Invisible Intelligence LLC

Product: G.A.R.D. (General Audio Recording Device)

Cost: $3,400/unit; $6,875 with ADS-B (no annual fees or subscription costs; airports own the systems & all associated data)

Units Sold: 150-200 throughout the U.S.

State-Sponsored Deployments: 32 FAA-funded airports in Maine; Alaska has installed systems at 2 airports, is seeking funding to add them at 20 to 30 more

Timeline: Product debuted in 2013; rollout in Maine began in 2013.

Key Benefits: Provides data about aircraft activity at airports without towers; helps operators collect revenue from after-hours customers; radio data serves as training tool for pilots & airport employees; airfield data assists statewide planning, demonstrates value of individual airports

When an aircraft is involved in a crash, finding the "black box" flight data recorder and cockpit voice recorder is imperative to subsequent investigations. If an accident takes place at a general aviation airport without a control tower, or when personnel are not on duty, it is much harder to analyze the communications and conditions that preceded the accident.

A product developed by two airport professionals in Maine is helping airports throughout the state and elsewhere bridge that critical information gap by recording radio transmissions between aircraft and airports. When equipped with Automatic Dependent Surveillance-Broadcast (ADS-B) tracking, the new technology also helps airports amass data about airfield utilization and collect landing or parking fees.

At $3,400 per unit, or $6,875 with ADS-B, Maine's Department of Transportation found the cost/benefit ratio so appealing, it paid to have the equipment installed at 32 airports throughout the state.

Tragedy Inspires Innovation

G.A.R.D.® (short for General Audio Recording Device) was developed after a fatal November 2012 accident, when a Cessna 172 carrying two passengers and its pilot crashed shortly after takeoff from Knox County Regional Airport (RKD) near Owls Head, ME.

According to a National Transportation Safety Board (NTSB) report, the Cessna collided with an airport-authorized pickup truck during takeoff and then went down into nearby woods. The driver of the truck said that he had announced his intention to cross the runway using the common traffic advisory frequency (CTAF) for aircraft, didn't receive a response and proceeded after a visual sweep didn't reveal anything on the runway.

As news of the crash reverberated throughout the area, John Guimond, manager of Augusta State Airport (AUG), just one hour away, immediately wondered how he could help. Focusing his attention on preventing similar accidents, Guimond honed in on the idea of recording CTAF and universal communications (Unicom) transmissions to provide better training for local pilots and airport workers who drive ground vehicles.


JOHN GUIMOND

All Guimond had to do was find someone to program the software he had in mind. He turned to Ron Cote, a computer programmer and electrical repair specialist for Maine airports; and the two began to collaborate. As an airport manager, Guimond knew the system had to be effective and inexpensive, or it wouldn't be adopted. After all, this was an idea to help all airports, including his own.


RON COTE

The partnership was dubbed Invisible Intelligence, and once Cote had functional software to demo, he approached Tim LeSiege, an aviation engineer at Maine's Department of Transportation. Part of LeSiege's job is to inspect all general aviation airports in the state, driving the runways end to end and parking at each threshold while he inspects the approaches. That means he often crosses runways in a truck, just like the one involved in the crash at RKD. As such, he immediately recognized the value in Cote and Guimond's idea.


TIM LESIEGE

"My gut reaction was that it was revolutionary," recalls LeSiege. "It's basically a black box for airports."

More specifically, the "black box" developed by Invisible Intelligence acts as a flight data recorder for airports, with software programmed to a laptop that can be used anywhere and moved as necessary. Files of summary data is encrypted and automatically sent via PuTTY for secure file transfer.

At the same time Cote and Guimond were developing G.A.R.D., LeSiege was considering the same issue from a different angle: using noise-attenuated counters to detect aircraft for gathering operational data. However, runways longer than 3,000 feet would require a counter at each end, and multi-runway airports would need many counters. At $4,000 each, counters would be far less cost-effective than G.A.R.D.

In addition, acoustical counters are physically unstable. Even lawnmowers can cause them to topple and relay confusing information. Game cameras intended to track wildlife could capture visual information, but they require airport employees to physically pull the equipment to retrieve information.

As Cote, Guimond and LeSiege compared various options, the audio recording concept from Invisible Intelligence continued to emerge as the preferred technology. Needing only one unit per frequency, even at airports with multiple runways, proved to be a decisive advantage.

Simplicity Wins

By design, G.A.R.D. is very basic.

Users receive four components: a laptop with battery backup, custom software, an interface box that converts input from the airport radio or scanner, and an ADS-B receiver. Using those components, the system records exactly what is being said and what occurs on the airfield, Cote explains.

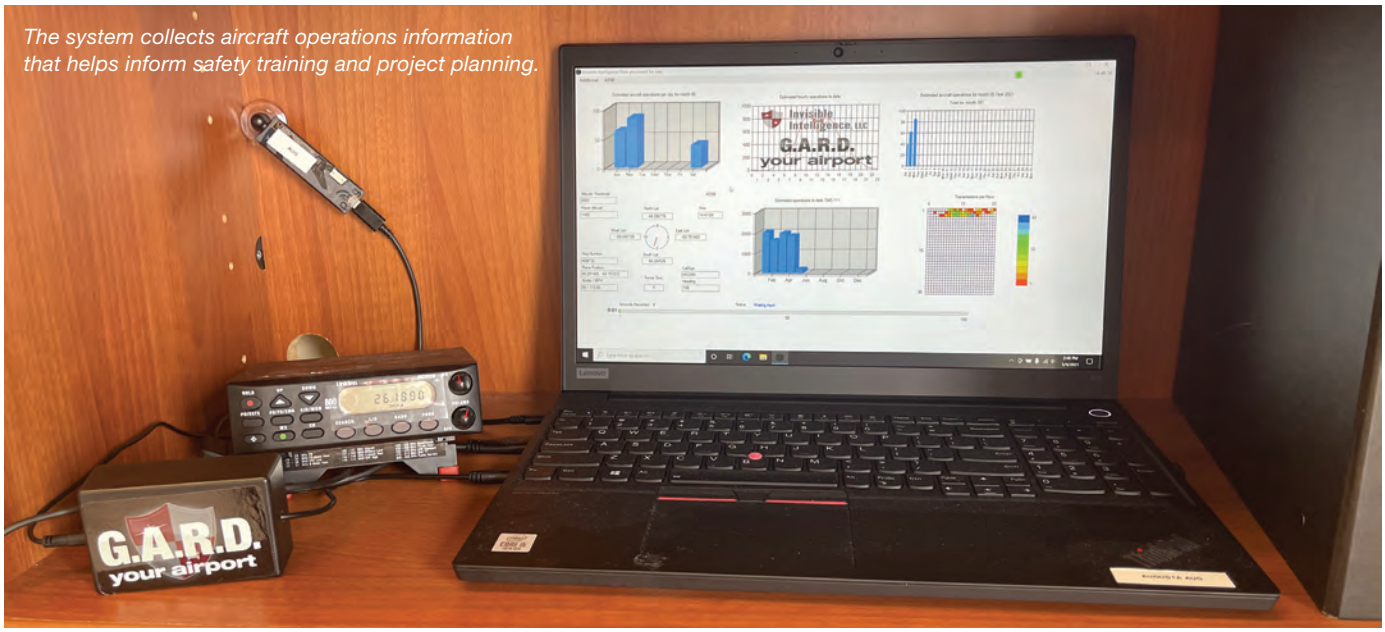
As such, the system helps airports determine if aircraft are using their runways after hours and allows them to collect associated revenue. And, true to Guimond's original vision, it's also a training tool. Airports can use collected data to correct unsafe behavior by pilots and airport employees, and to educate first responders who are unfamiliar with aircraft radio protocols.

Smaller general aviation and un-towered airports can use G.A.R.D. to calculate aircraft movements, which is information required by the FAA that is traditionally difficult to estimate accurately.

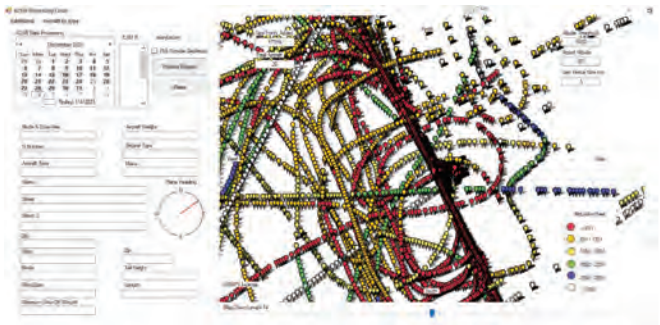
As more airports began to reach out to Invisible Intelligence about its new product, the company would invoice airport customers, and their respective Departments of Transportation would offer reimbursement. When G.A.R.D. was launched in 2013, Maine DOT paid 50%, and then 100% when ADS-B was added in 2020. Word spread quickly through the National Association of State Aviation Officials (NASAO), and soon airports in Utah, Vermont, Alaska, Arkansas and Louisiana had discovered the new solution from Maine.

One airport in Louisiana discovered that 15% or more of its operations were taking place after hours, and G.A.R.D. helped produce more accurate operations counts. Conversely, an airport in Maine that had been reporting operations in the 80,000 range discovered its traffic was closer to 30,000 after implementing the software.

LeSiege reports that 17 of Maine's 32 FAA-funded airports ordered the recording device right off the bat. He was pleased to see immediate interest in the new product, because he considers it an important safety training tool. For instance, having recorded data is key when a pilot announces an intention to use one runway



The system collects aircraft operations information that helps inform safety training and project planning.



but lands on another. The recording affords the airport a great opportunity to bring in the pilot to discuss the importance of calling the correct runway, he explains.

"I wanted my family to have peace of mind," adds LeSiege. "This gives information to them and my department to show I am doing the job I'm supposed to be doing and using the radio to let them know where I am. It offers a level of comfort that pilots should have as well, to know what's there on the runway."

Adding ADS-B to the Mix

Maine's Department of Transportation uses the ADS-B component of the system to track individual runway usage. The technology also identifies what corporations are flying into various airfields, which, in turn, helps define proper FAA design standards for planning purposes.

"What we're finding from the data is that it's not just the sheer number, but also the use of the airport: business, pleasure, medical or cargo, for instance," says LeSiege. "Each GA airport has a niche.

"We need to know which jets are showing up and for what purpose," he explains. "Having data for operations counts is important. Along with the ADS-B data, we find out not just who but what is landing at the airports."

Data collected by G.A.R.D. also helps demonstrate the value of airports across the state.

"Being able to tell folks in remote areas where aircraft are coming from, we can show how important those airports are to the local economy," says LeSiege.

Who and what are coming to Maine via aircraft was previously a story that had not been told, he adds. For instance, beyond local and itinerate corporate traffic, private aircraft dropping off and picking up kids from summer camps is big business for airports throughout the state. Guimond's airport, AUG, is so busy during "camp weekends," that it has to shut down one of its asphalt runways to have enough room to park all the extra aircraft. Prior to using G.A.R.D., the state-owned, city-managed airport could not determine where the aircraft had originated.

Nathan Moulton, director of MaineDOT's Office of Freight and Passenger Services, explains that ADS-B data improves safety, enhances planning efforts and helps prioritize various airport improvement projects.

"Some of the smaller towns worried that this system was a little Big Brotherish," Moulton notes. "But we convinced them of the importance of knowing what's happening for the sake of safety. The data is consistent, and it looks the same across the board, which creates confidence and redundancy. When managing an entire system, we like to see as much data as we can."

Not Just for East Coasters

G.A.R.D. is also proving popular in Alaska, where 82% of the communities are off the contiguous road system, and airports play a vital role in transporting people and goods.

Troy LaRue, Alaska DOT Divisions Operations manager for statewide aviation, explains that Alaska does not have an aircraft registration process, and recording accurate traffic data used to be next to impossible.

"In the past, we were calling airports and using FAA T100 data and word of mouth to measure commercial traffic," says the 25-year Alaska DOT veteran. "Even then, you're not getting GA or Part 191 guys. Now, we're getting more accurate data that we can analyze and use to make better decisions."

LaRue, who works with 239 state-operated airports in Alaska, notes that the recording technology is particularly helpful at airfields that levy landing fees. Having detailed data not only increases their revenue, but also assists in planning. As Alaska DOT prepares for its next master planning session, it is parsing data every way possible to gain the most insight.

In Alaska, day-to-day airfield maintenance is often handled by local contractors. With little to no staff at these airports, Alaska's DOT would not have a good idea of who its airport users are without the software.

"We have seen an increase in aviation in Alaska overall," says LaRue. "If our population grows, the airports grow too. We need to know if we're building the right taxiways and airport infrastructure. We would not know who most of our airport users are without the G.A.R.D. system. We have a need for about 30 to 50 more that we hope to purchase over the next two years."

Continuous Improvements

As more states and airports deploy its system, Invisible Intelligence learns a little more with each rollout and adapts its product accordingly.

"We discovered that the computer needed to be smart enough to reconnect to Wi-Fi once an hour in case someone disconnected it," Cote says.

So far, however, the system is working for the Department of Transportation in Maine and other states with minimal challenges.

"We have not had any service calls," Guimond reports.

"Well, we had one," Cote counters, with a grin. "It was due to operator error."

Lincoln Airport Reaps Long-Term Benefits From Temporary Relocation of Air Force Base Operations

BY JENNIFER DAACK WOOLSON

FACTS&FIGURES

Project: Apron & Hangar Improvements

Location: Lincoln (NE) Airport

Owner: Lincoln Airport Authority

Tenants/Operators: 55th Wing, U.S. Air Force; 595th Command & Control Group

Horizontal Projects: Apron mill/overlay (50 acres); painting; new loading dock ramp; refurbished loading dock; improvements to access roads & vehicle parking

Vertical Projects: Refurbishing 98,270-sq-ft hangar; erecting 37,120-sq-ft temporary hangar; building & other improvements over 100-acre property

Cost: $31 million

Funding: U.S. Air Force

Construction: April 2019 – Sept. 2020

Design: Jacobs Engineering

Engineer: Alfred Benesch & Co.

Contractor: Constructors Inc.

Subcontractors: Cheever; Shanahan; IESCI; Moen Steel Erection; Titanium Sprinkler

Asphalt Supplier: Constructors Inc.

Temporary Hangar: Sprung

Sliding Aircraft Gates: TYMETAL Corp.

The original runway at Offutt Air Force Base just south of Omaha, NE, was built back in 1941 and extended to its current 11,700-foot length in the mid-1950s. It received repairs in fits and starts during the intervening 80 years, and the Air Force finally decided it was time for a total overhaul four years ago. That set in motion a complex plan to temporarily relocate operations of the Air Force's 55th Wing, which includes a fleet of 29 Boeing RC-135-variants, and 595th Command & Control Group, which includes four E-4B Nightwatch aircraft (dubbed "doomsday planes" because they serve as aerial command centers for top military officials in the event of a catastrophic national emergency, such as a nuclear attack), as well as several Navy E-6B Mercury communications and reconnaissance jets. The new home Air Force leadership selected was nearby Lincoln Airport (LNK).

U.S. Air Force Lt. Col. Derrick Michaud, director of the 55th Wing Runway Program Management Office and Mission Support Group deputy commander at Offutt, is the guiding force behind the relocation. The massive effort includes the Lincoln Airport Authority, engineers, designers, contractors, fliers, maintenance and security forces; but Michaud is charged with keeping them all moving in the right direction. "My whole point in life is to just make sure the effort keeps going forward," he remarks.

DERRICK MICHAUD

Michaud says that Offutt has long had a great relationship with partners at LNK, including the Lincoln Airport Authority and the 155th Air Refueling Wing. The base has actually temporarily moved operations to LNK several times, most recently for a few months in 2006 during minor runway repair work on its own airfield. So when the base needed a place for this more extensive 18-month relocation, the choice was clear. "We already had those relationships, and we knew it was a win for us to be able to travel just an hour over there as opposed to picking up everything and going a longer distance," Michaud explains.

Although some staff members stay in Lincoln during the week, about 750 personnel commute daily in Offutt's fleet of charter buses, cars, vans and trucks. Ensuring that personnel could go home every night to spend more time with their families was a key advantage, notes Michaud.

From an operational standpoint, LNK's 13,000-foot runway also made it the logical choice.

The move began in mid-January 2021 with ground-based equipment and concluded in early February 2021 with the relocation of Offutt's aircraft and flight operations. But preparations for the project started many years ago.

Putting the Plan in Motion

Initially, Offutt was supposed to have a partial slab replacement in 2017 to repair the worst parts of the runway. But over time, it was determined that the runway was in need of a full slab replacement, which was approved in 2018. That shifted the duration of the relocation from 12 months to 18.


CHAD LAY

Originally, Offutt's aircraft were scheduled to relocate to LNK in 2018, but the move was pushed back. That's often the case with projects of this complexity, notes Chad Lay, director of planning and development for LNK. As Offutt personnel shifted gears to the expanded scope of their runway project, they also assessed the infrastructure at LNK to determine what upgrades and modifications would be required for their extended stay.

When the runway improvements at Offutt became a much larger project, that meant personnel and operations would be at LNK through the winter for the first time. "Any time you start to put snow removal operations into play with aircraft operations, that is a whole different picture," explains Lay. "And they were going to need to have more permanent facilities as a result."

Preparing for Company

The Air Force spent $31 million to remodel and lease temporary space at LNK. Construction ran from April 2019 to Sept. 2020, with improvements broken into two packages: horizontal and vertical.

Horizontal work included milling and paving 50 acres of parking apron on the west side of the airport where the former Lincoln Air Force Base was housed before it closed in the 1960s. The area remained largely unused, except for an occasional airshow and a short stint as a tractor testing center. As a result, the pavement had fallen into disrepair and was in need of fairly significant rehabilitation.

Significant renovations transformed this Cold War era hangar for modern use by the 55th Wing.

Andrew Beil, vice president and senior project manager for Alfred Benesch & Company, LNK's on-call civil engineering consultant, handled construction observation and quality acceptance material testing for the various projects—including the massive paving job.


ANDREW BEIL

Beil reports that it took about six weeks for the primary contractor, Constructors Inc., to mill all of the concrete down 3 inches and resurface it with asphalt. Before crews could begin, though, they had to remove 1,700 aircraft tie down units that were embedded in the concrete back in the 1950s. The laborious process added two to three weeks to the schedule because workers had to core out the steel pieces one by one.

Other horizontal projects included improvements to roads and vehicle parking areas.

The vertical work package involved two hangars. The first project was refurbishing a 98,270-square-foot aircraft maintenance hangar built in the 1950s as part of Lincoln Air Force Base. In 1970s and '80s, Goodyear used the facility for a distribution warehouse. Lay notes that structurally, the nearly 75-year-old hangar was in good shape, but it needed considerable interior work to bring it up to the operational status the Air Force needed.

Jacobs Engineering, designer of record for the project, modernized the space to include offices, a break area and lunchroom, computer labs and areas for maintenance, supplies and parts. Crews upgraded all of the electrical systems and installed new radiant heaters.

The other major vertical improvement is a 34,000-square-foot clamshell hangar made of extruded aluminum beams with a polymer membrane stretched over them. The temporary 160 x 210-foot structure, manufactured by Sprung, took just less than four months to erect, with a company representative on-site guiding the process. The Air Force is using the temporary building for fuel system and general maintenance.

Because of the constantly shifting schedule, one of the biggest challenges for the project team was working with the city's planning department to determine whether the Sprung hangar should be classified as a temporary or permanent structure. "The bed down for the Air Force was going to be about 18 months," Beil explains. "So even though it's a 'temporary' facility, we were walking this line between temporary and permanent, which have different code requirements."

A temporary hangar was erected in four months.

Because both hangars are located outside the airport security fence, project designers specified two rolling gates from TYMETAL Corp. to allow planes to pass through for maintenance on the landside. Workers installed the 170-foot-long "super" gates on tracks in the concrete.

In total, it took $31 million of infrastructure improvements and leased space to make LNK a suitable temporary base for the 55th Wing. With an additional $17 million in relocation costs, and $168 million for the new runway at Offutt, that brought the Air Force's total project cost to $220 million.

Collaboration & Coordination

In retrospect, Michaud feels that the temporary relocation has been successful so far. "One thing we do in the military pretty well is plan, right? We had a lot of good plans in place, and a lot of good coordination. Most things have gone pretty well."

The biggest challenge to date came early in the mission, when personnel had to grit through 13 inches of snow and frigid temperatures while relocating aircraft and other physical assets in early February. "If we ever do this again, we'll move in July," Michaud jokes.

Regarding the infrastructure changes at LNK, he is quick to credit great partnerships Offutt has with the Lincoln Airport Authority, the 155th Air Refueling Wing, the city of Lincoln and the state of Nebraska. "I cannot say enough about all the things they've done," he emphasizes. "We could probably have muscled through on our own. But it's so much better with our partners over there who have 100% taken us in and helped us out. We, as a wing, are very thankful."

Weekly progress meetings held every Friday brought together the key players. Participants checked in to ensure that everything was on track at a tactical level and to prepare for upcoming challenges. The group included representatives from Offutt, Lincoln Airport Authority, LNK air traffic control, the Air Force Civil Engineering Center, the primary contractor and its subcontractors, Benesch & Company and Jacobs, the engineer of record.

Beil says the meetings often lasted two or more hours as the group plowed through an eight- to 10-page agenda. But they were worth it. "As we got into them, we found that we needed to get more in the weeds as far as the detail goes, because the representatives from Offutt would use that

Crews milled and paved about 50 acres of parking apron pavement.

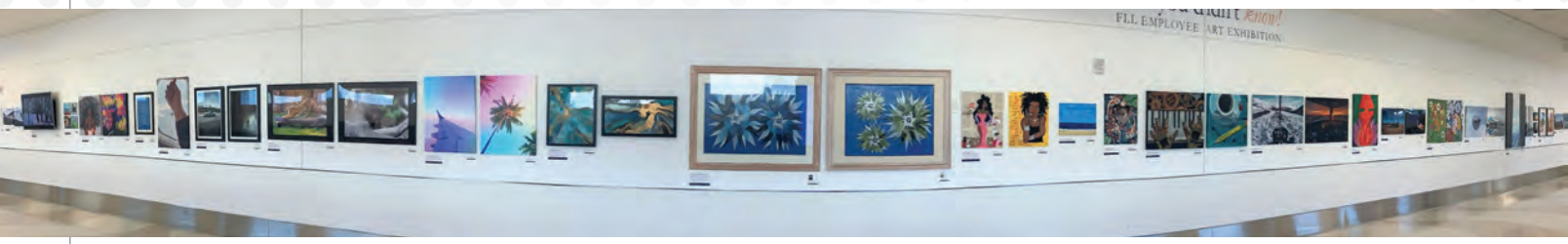
as a reporting mechanism to brief their contracting officers," he explains.

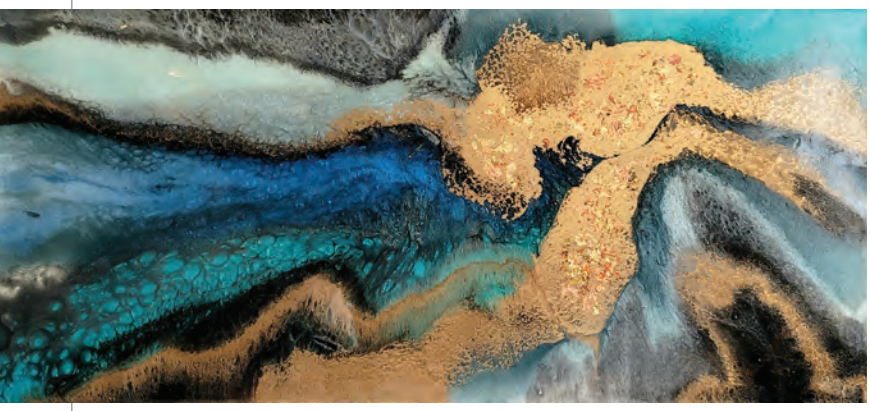
Speaking from the airport's perspective, Lay also appreciates the coordination and collaboration needed to get this kind of joint project over the finish line. "When we were going through everything from code reviews to determining the best path of fuel trucks for the aircraft, there was a lot of interaction with entities like the city," he says. "But I think they understood what it was we were trying to achieve, and that, all in all, it was a temporary operation. So everybody was willing to keep that in mind, and work in a collaborative fashion to not hold the project up."

Now that the infrastructure upgrades have been made and the relocation choreography is finished, LNK is getting used to sharing its airfield with a new large tenant that operates a lot of aircraft and follows very specific security protocols. "The operational coordination that happens day to day with them actually living here now requires a lot of back and forth between the airport and the Air Force so we can continue to carry out our airfield operational needs, but not negatively impact Offutt's operations," says Lay.

It's a challenge LNK will deal with until the 55th Wing moves its operations back to Offutt in September 2022.

When that happens, LNK will be left with many improvements. After the Air Force personnel leave, Lay and other officials plan to market the refurbished hangar to other organizations and use the 50 acres of newly resurfaced pavement to help attract tenants to grow the west side of the airport.





Horizons (resin fluid on canvas)
Myrna Gonzalez, U.S. Customs and Border Protection Officer

Dancing in My Own Parade (senior portraiture on acrylic print)
Alicia Anir, flight attendant, Spirit Airlines

Happiness Resides
(oil on canvas)
Janae Morguarge, wheelchair attendant, Direct Airline Services

Diamond on the Beach
(photograph on canvas)
Antonio Reece, customer service agent/ramp, Delta Air Lines

Flamenco (mixed media illustration)
Franklin Valdez, terminal agent/operations, Broward County Aviation Department

FORT LAUDERDALE-HOLLYWOOD INTERNATIONAL AIRPORT
BROWARD COUNTY, FLORIDA

Fort Lauderdale-Hollywood International Airport (FLL) is putting the spotlight on homegrown talent with an exhibit that features artwork by its employees and others who work at the South Florida airport.

Since its debut in August 2018, *I Bet You Didn't Know* has showcased a wide range of works, including acrylic, watercolor and oil paintings; bronze and ceramic sculptures; mixed media installations; photography; videos; poetry; and music.

The artists themselves are equally diverse, including FLL executives, operations personnel, employees from federal agency partners, airline crewmembers, concessions staff and more. To date, about 160 artists from all walks of life have had their works displayed.

Alejandro Cuevas, an expansion project administrator with the Broward County Aviation Department, contributed a sculpture called *I'll Drive the Bug* in tribute to his 1964 Volkswagen Beetle.

"The invitation to exhibit an art piece at the airport revived my enthusiasm for art," says Cuevas. "The entire process of creating my sculpture reminded me of how much I love to draw, design and create. Also, in my kids' eyes, the sculpture reassured them that daddy is still cool by building fun stuff."

The Broward County Aviation Department, which operates FLL, regularly uses public art to create a sense of place and welcome visitors from around the world. "At FLL, we are fortunate to have such talented employees who can offer visitors a warm greeting to our destination," says Mark Gale, chief executive officer/director of aviation of the Broward County Aviation Department.

The airport collaborated with the Broward Cultural Division's Public Art and Design program to present the rotating exhibition. The final installment will remain on display in the Terminal 3-4 Connector until this September.

Predicting What Projects Should Cost Requires More Clairvoyance Than Ever

There is good reason for optimism in the construction industry as the pandemic wanes in the United States. That said, restarting the economy comes with challenges, especially while significant volatility in the material supply chain is affecting all major construction, including the airport market.

Consider these dynamic factors:

- Costs have surged for select materials, most notably steel and copper. For example, the price of steel rose 25% to 50% in recent months; and lumber continues to experience month-over-month increases.
- Attention has turned away from production to supply chains and, more specifically, material delivery. Recent increases in demand have led to higher prices and longer delivery times.
- Initial studies indicate prices and delivery times are being affected by the loss of skilled workers who have chosen to retire, which has put added pressure on the remaining manufacturing workforce.
- Labor markets are still under pressure. Although the overall drop in construction activity offered a respite, it is expected to be temporary. If activity returns as expected, there could be pressure in the labor market that drives up project costs.
- There are indications that some organizations and projects are trying to get ahead of this curve, and that this trend is expected to pick up pace throughout the year. There is also the potential for difficulties in hiring across multiple disciplines, most notably within the mechanical, electrical and plumbing trades.

Despite these variables, airports expect general contractors to accurately and reliably predict what projects should cost. So we must wear many hats for our customers. We are *allies* who look out for them and serve as stewards of their budgets. We are also *detectives* who ask the right questions to uncover clues, and *scientists* who use data to drive key decisions. Acting as *maestros*, we communicate clearly and orchestrate collaboration among large project teams. Clients also rely on us to be *clairvoyants* who make reliable predictions based on historical data and current market conditions.

In turn, we encourage airports and their teams to consider a multitude of factors when forecasting cost escalation for projects:

- Materials: natural resources, energy costs, taxes/tariffs, demand, manufacturing capacity, competition, building code changes, natural disasters
- Labor: wage increases, prevailing wage/union agreements, labor availability, onsite/offsite contractors, complexity of the work, labor strikes, travel requirements, changing minimum wage laws
- Regional aspects: design criteria, weather and seasonal impacts, code changes, jurisdiction impacts, cost of living
- Dynamic market conditions: construction market saturation, subcontractor demand/availability, the impact of mega-projects to trades, industry investment, general economics/recessions, pandemics/wars/etc.
- Procurement: long-lead items/schedule requirements, special components, expediting/acceleration, market/sector trends, political environment

Despite this mixed gumbo of current challenges, there are several things airport project teams can do to get ahead. First, you should assume there will be a labor shortage, and plan upcoming work accordingly. When doing so, remember that mega-projects can suck up resources and complicate issues for a long time. It will also help to initiate programs for workforce development in your communities, support existing local apprenticeship programs and engage regional labor leaders.

We strongly encourage airports to establish a plan for material delays—potentially multi-month delays. It will be important to work with contractors and local trades to get ahead of the supply chain by pre-specifying materials as early as possible. Get creative about aligning on design parameters and be ready to pivot.

To ease stress during projects, we suggest leveraging multi-trade, multi-scope prefabrication and modular construction. This is a great option because it increases efficiency and minimizes impact on everyday airport operations while enhancing safety and improving quality. It also helps keep facilities as close to fully operable as possible and allows management to quickly address growing capacity needs.

Now more than ever, planning is key to success for any project—at airports and elsewhere. Everyone is eager to get back in motion. And as we ramp up, there is an increased need for collaboration during project planning.

Dwight H. Pullen Jr., *national core market leader for DPR Construction, is a thought leader in airport infrastructure development. Within DPR, he focuses on strategic growth in the airport sector, profitability, operational excellence, growing talent and maximizing customer engagement.*

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