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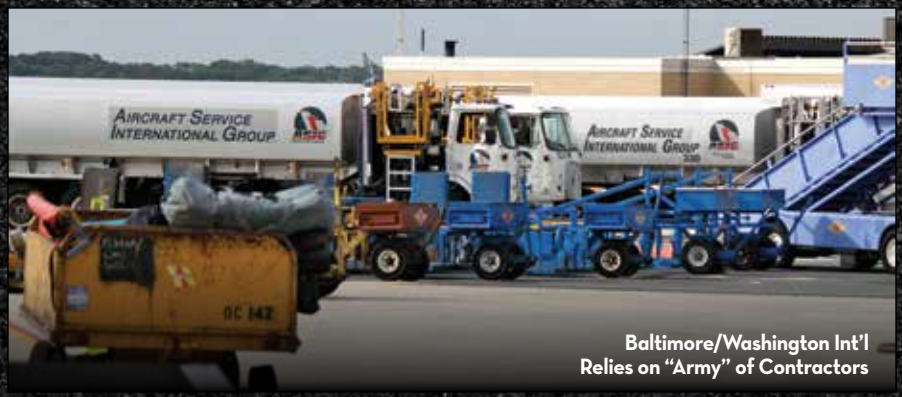
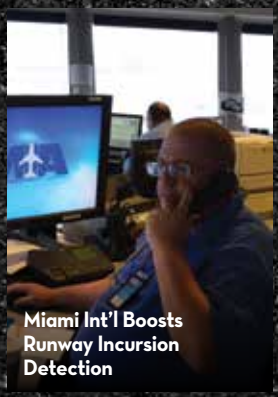


Baltimore/Washington Int'l Relies on "Army" of Contractors



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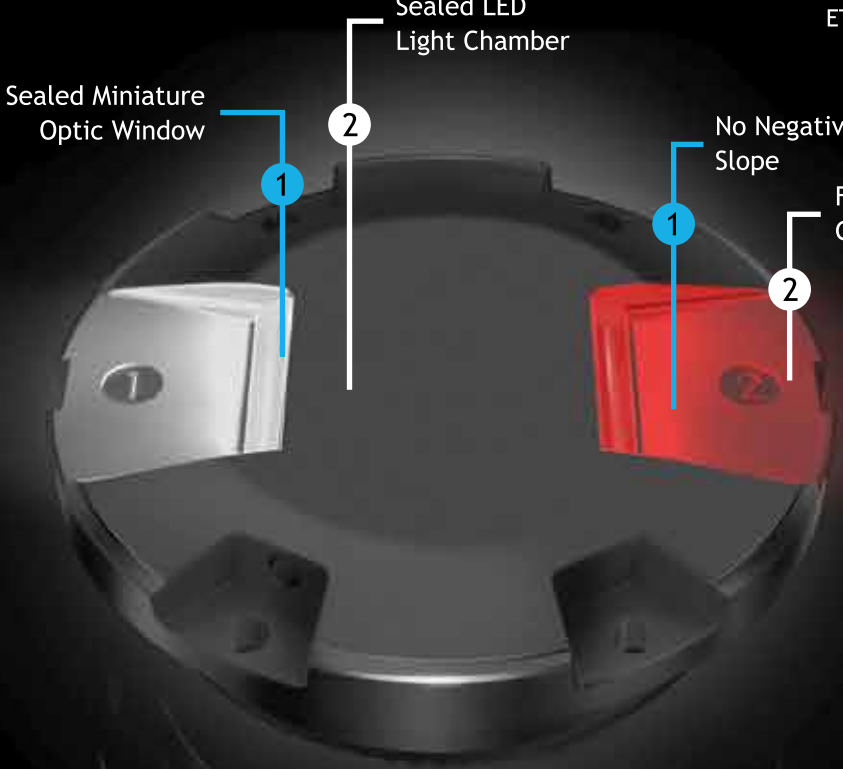

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Spot On!

There's something about face-to-face encounters for learning and networking. They invariably produce better connections and higher value than any other form of communication. Time and time again, I come away from meetings with information that wasn't even on the agenda.

This fall, the *Airport Improvement* team attended a plethora of conferences and shows. Our time in Vancouver stands out in particular. It not only included the annual SWIFT conference, but also Sightline's Airfield Marking Symposium at YVR.

Holding an airfield marking symposium at the same time, in the same city, as SWIFT is simply a good idea. Many of the attendees of one are interested in the other. It makes travel- and time-saving sense, and this was reflected in strong attendance.

The Airfield Marking Symposium on its own is an event to behold. It includes a great mixture of classroom and airfield learning; and vendors of airfield marking materials are on hand to provide real learning experiences. In my opinion, there has never been enough attention paid to airfield marking education. Donna and Mike Speidel have created a program that meets a real industry need. Thank you for inviting us to witness this wonderful event first-hand.

SWIFT was also a huge success — in part because of the volunteers who plan the agenda, and in part due to the extraordinary hospitality of YVR. (A beautiful city like Vancouver certainly doesn't hurt either!)

You'd think that after 20 years of attending conferences, there isn't a whole lot to learn. Not true! I came away with new information, story ideas and plenty of contacts.

Lastly, I'd like to thank the associate members of ACI-NA for electing me to serve on the organization's World Business Partners/Associates Board. It's an honor and a responsibility that I take seriously. Please let me know if you have any ideas or messages for our board to consider.

Cheers

Paul

Fort Lauderdale Int'l Gets Creative to Meet Growing Airfield Needs

By Jodi **Richards**

factsfigures

Project: New Runway & Airfield Reconfiguration

Location: Fort Lauderdale-Hollywood (FL) Int'l Airport

Owner/Operator: Broward County

New South Runway: 10R-28L

Est. Cost: $791 million

Funding: $250 million from AIP over 12 years; $129 million from FL Dept. of Transportation over next several years; approx. $412 million from passenger facility charges

Height of Runway's East End: 60 ft. above ground level

Program Mgmt. Prime Consultant: AECOM-DMJM Aviation

Highway/Railway Structures Prime Contractor: Tutor Perini Fort Lauderdale-Hollywood Venture (Tutor Perini Corporation & Baker Concrete Construction)

Runway Construction Mgmt. Prime Consultant: Parsons Transportation Group

Elastomeric Bearing Assemblies for Bridges: D.S. Brown Co.

Engineer of Record for Runway/Taxiway Tunnel Structures: HNTB Corp.

Associated Roadway & Life-safety Elements: HNTB Corp.

Runway Lead Designer: Atkins

Design Support, Drainage Design & Permitting: RS&H

Pavement Design, NAVAID Siting, Erosion & Sediment Control Design, AOA Fencing Design: RS&H

Dynamic Soil Compaction: Odebrecht/Central Florida Joint Venture

Runway Quality Acceptance & Materials Testing: PSI

Concrete: Archer Western

Site Civil Work & NAVAID Infrastructure Construction: Odebrecht-CFE

Airfield Lighting, Wind Cones, Constant Current Regulators, PAPIs, Halogen Signs: ADB Airfield Solutions

Engineered Material Arresting System: Zodiac Arresting Systems

Fort Lauderdale-Hollywood International Airport (FLL) celebrated the completion of a colossal, long-range airfield initiative in mid-September. The $791 million project created South Runway 10R-28L by extending, shifting and lengthening the former 9R-27L from 5,276 feet to 8,000 feet. The new runway rises from grade-level on the west end to roughly 60 feet in the air on the east end, spanning a railway line and federal highway in between.

With the complex, multi-project initiative complete, the South Florida airport now has parallel runways to serve its growing traffic demands. It also has greater airfield capacity — up from 84 flights per hour to 107.

When combined with the ongoing $450 million Terminal 4 configuration, total cost of the new runway is estimated at $1.24 billion.

Broward County Aviation Department, the entity that owns and operates FLL, funded the recently completed runway project through a Letter of Intent from the FAA to provide $250 million in Airport Improvement Program funding over 12 years; Florida Department of Transportation will contribute a total of $129 million over the next several years. Remaining costs, roughly $412 million, will be paid for by passenger facility charges.

In addition to alleviating airfield capacity constraints, the addition of a second, parallel commercial runway was engineered to reduce the potential for runway incursions and simplify ground movement of aircraft. The former airfield configuration made maintenance on the primary runway difficult and disruptive to operations, note airport officials.

Doug **Webster**

FLL previously had an imbalance between its terminal and airfield capacities, explains Doug Webster, IAP, deputy director of the Broward County Aviation Department. "The intent of the South Runway Project was really to meet the natural demand that was happening in the marketplace," says Webster. Currently, the airport services about 23.5 million passengers per year. Of those, via roughly 2.5 million are international passengers. Annual operations number 270,000.

Before the recent runway addition and airfield reconfiguration, all air carrier traffic, except for some very light commuter service, was limited to the North runway — a factor that contributed to flight delays. "Even though we had three runways, they really weren't functional to meet the demand of the airport," Webster explains.

Decades of Planning & Prep

The need to expand airfield capacity was identified in the mid '90s, when the airport

Boxed in by roads, residents and a railroad, the new runway at Fort Lauderdale Int'l includes a bridge with 12 tunnels underneath.


Steven T. **Wiesner**

was updating its Master Plan, Webster recalls. As FLL's traffic grew, delays increased as well. And the delays not only impacted the southern Florida airport, but ultimately the entire U.S. air system as well, says Steven T. Wiesner, P.E., assistant director of aviation-airport development.

Broward County Aviation Department began acquiring land for the runway expansion (about 60 acres) in the '90s. More recently, it demolished a parking garage, Hilton hotel, and building that previously housed Dania Boat Sales to create room for a runway protection zone.

Webster recalls one point during the planning phase when the Environmental Impact Study process identified nine different possible plans — including a "do nothing" option. "It was an exhaustive study," he notes.

From a geographic standpoint, the airport is essentially landlocked. With an interstate to the north and west, residents to the south, and a railroad and federal highway to the east, creative thinking and planning were key to addressing the airport's airfield needs, Webster explains.

The railroad tracks had already been moved once in the late '80s to accommodate the lengthening of Runway 9R-27L. "There wasn't going to be a whole lot more you could do from an option standpoint," he relates. "You had to find a way to get over it (the railroad track); or else this project wasn't going to happen."

Strange as it sounds, building the new runway over a federal highway and railroad tracks was determined to be the "easiest obstacle to overcome."

The associated list of project stakeholders, however, was very long: multiple airlines, FAA, Florida Department of Transportation, Florida East Coast Railroad, Broward County Board of Commissioners and more. Surrounding residents were also a crucial faction. The project's $250 million noise mitigation program includes $115 million for 1,800 homes that are candidates for sound insulation.

Preparing for Construction

Design for the runway was divided into two projects. The bridge structure was handled as a design-build contract, with HNTB serving as designer of record. Atkins was lead designer for the runway project and was responsible for the design criteria package for the bridge structures.

Prior to the project, FLL had three runways — a 9,000-foot runway on the north side, a 5,200-foot on the south side (which became the new runway) and a 6,900-foot crosswind runway that bisected both. Due to the location of the new runway's elevation point, the crosswind runway was closed permanently. That meant FLL operated with only one runway from May 2013 until recently, when the new runway opened.

"We were effectively the busiest single runway airport in the country," Webster notes. The FAA performed an "intense amount" of planning to prepare for the project, and developed a "very comprehensive game plan" to manage traffic during the construction period, he adds.

Delays were simply inevitable. While Wiesner acknowledges that some delays were "significant" — with airplanes on the ground for up to 35 minutes during the peak of winter — he also notes that on the whole, they were much shorter than originally anticipated. "We beat all expectations relative to the original forecast of what was anticipated from a delay standpoint," he reports. "FAA did an outstanding job of managing traffic."

Prior to closing the crosswind runway, the airport constructed Taxiway C, a parallel taxiway to Taxiway B on the north side of the airfield, Webster adds.

An FAA navigation aid, ASR-9, also had to be relocated prior to runway construction. In roughly two years, FLL and FAA found a new site, designed and constructed the new ASR-9 and brought it online before the old one was taken out of service, Wiesner explains.

Sorry Soil Conditions

In addition to space constraints, the runway expansion team also faced poor soil quality on the east end of the airfield. Because all of South Florida was once part of the Everglades, most of the airport's land includes fill. Project sites require significant preparation to create effective building surfaces.

The original project design, which called for removing poor soil and relocating it to a landfill, was found to be too costly, Wiesner recalls. Instead, several different soil improvement techniques were employed around the airfield. In some places, contractors brought in fill and topped it with a surcharge for about nine months to help it settle. During that time, the team performed regular surveys and readings to track the rate of settlement. Once it displayed an imperceptible amount of settlement, the surcharge was removed and the project moved forward.

On the west end of the runway site, crews encountered occasional voids in the cavity of the subsurface. Once a cavity comes to the surface, it becomes a sinkhole, explains Webster. To prevent that, crews used dynamic compaction, a process that uses heavy weights to compact the voids.

The contractor also introduced some different methods for ground improvement than were originally specified in the design — a dynamic Atkins officials attribute to close collaboration among team members. One such method was mammoth vibratory tamper, a process designed to yield the same result as deep dynamic compaction that was found

Darin **Larson**

to be more appropriate for certain areas of the project, explains Darin Larson, P.E., LEED AP, vice president with Atkins.

The different soil improvement techniques used throughout the site were carefully evaluated, says Larson: "We had to weigh the cost of doing the different techniques with the schedule impacts against the overall goal of getting the runway opened."

In total, about 6 million cubic yards of soil was needed for the runway project; and getting it to the airport in a short period of time proved to be a challenge. Because FLL is located in a congested, urban area, trucking in fill material was not an ideal option — from a cost or environmental standpoint, notes Larson. To solve this problem, the airport built a spur off of the railroad that the new runway crosses. Although some fill was trucked in, a large portion arrived by rail. For about nine months, two loads of fill material arrived on railroad cars, six days per week. At times, the contractor was applying up to 22,000 cubic yards of fill per day, reports Wiesner.

To overcome soil challenges for the bridge structure, the team used a series of stone columns around the embankment portions. Crews drilled a 2- to 3-foot diameter hole into the ground 20 to 30 feet deep, then poured in a dense gravel mixture that was vibrated into place. As the weight of the new embankment was pressed down, the load was transferred around the weaker soils and into solid ground, explains Scott Dean, P.E., associate vice president at HNTB.


Scott **Dean**

Soil conditions even affected the team's ability to maintain traffic on the federal highway, another important aspect of the project, notes Larson. As two large bridge structures were built over the top of it, workers had to "maintain a reasonable amount of traffic flow through there on a daily basis," he explains.

Working in carefully orchestrated phases, the team started by shifting the roadway itself to the east of the area where the structures were being built, Larson chronicles. At that point, the goal was to get the structures complete enough so traffic could be shifted back into one of the cells of the two bridge structures to allow for completion of the embankment on the east side, because it left a wedge-shaped area to the east of those structures that needed to be filled with roughly 40 feet of embankment material. Additionally, that material needed time to settle before it could be paved upon.

By the Numbers

The recently completed south runway project at Fort Lauderdale-Hollywood International Airport required a mammoth amount of materials:

Fill: 7 million cubic yards

Runway Concrete: 535,000 sq. yards

Concrete for Structures: 68,000 cubic yards

Asphalt: 90,000 tons

Lights: 1,200

Concrete Piles for Runway/Taxiway: 2,648

Concrete Beams for Runway/Taxiway: 855

Retaining Wall: 350,000 sq. ft. of mechanically stabilized earth wall

Cable: 90 miles

Painted Surfaces: 520,000 sq. ft.

Turf: 77 acres

Roadway Improvements: 2 miles

Drainage Pipe: 5 miles

Trees Relocated: 600+

Tunnels Under Bridge Structures: 12

Runway Structures: 6

Length of Each: 810 ft.

Taxiway Structures: 6

Length of Each: 440 ft.

Avg. Interior Height Clearance: 24 ft.

Evacuation & Ventilation Systems/Runway Structure: 4

Fluorescent Lights/Runway Structure: 134

Halide Lights/Runway Structure: 290

Fluorescent Lights/Taxiway Structure: 94

Halide Lights/Taxiway Structure: 269

The sequencing of traffic movement and settling time for embankment material became a critical element in the project, Larson recalls. Unfortunately, it was also a very open-ended issue. “You never knew how long it was going to take for that embankment to settle,” he notes.

Settlement plates were placed on the embankment to accelerate the process, and progress was measured frequently. “Knowing when we could start paving was literally a week-to-week point of evaluation,” says Larson.

Bridging the Gap

HNTB was subcontracted under Tutor Perini in a design-build agreement for the series of structures that allow the runway and parallel taxiway to cross over U.S. Highway 1, the airport entrance and service roads, and the Florida East Coast railroad tracks without interruption.

The multi-span bridge HNTB created is actually classified as a tunnel, due to the length that the traveling public must drive while underneath, Dean explains. As a result, HNTB's designs had to incorporate a full life-safety system, including lighting, fire suppression and smoke evacuation. FLL developed a unique partnership with the Florida Department of Transportation to operate the life-safety systems and maintain the roadway under the runway and taxiway, Wiesner notes.

The bridge structure used standard roadway bridge beams that were "significantly strengthened" to sustain the weight of a fully loaded 747 aircraft, Dean reports. "While we utilized a standard highway bridge beam type construction, because the loading on the bridge is more robust, the beams are thicker, heavier and denser," he explains.

In total, bridge structures accounted for $178 million of the total $791 million project cost.

Accommodating Int'l Growth

While good overall, the growth FLL has experienced in international markets over the last few years also proved to be complicating a factor during the runway project. In the first quarter of 2014 alone, FLL's international activity grew by 33%. Additionally, its ranking with

The top layer of concrete is 16 ½ inches thick.

Customs & Border Protection recently moved from the 20th to 15th busiest.

"It's made it extremely complicated and required extensive coordination and cooperation with air carriers," Webster says.

To accommodate the growing traffic, FLL often receives international flights at international gates but relocates aircraft to domestic gates as soon as passengers are unloaded.

With the runway project in full swing, Wiesner joked that there was little left at FLL that resembled an airport. "It really looks like a construction site with an airport trying to operate in the middle of it," he said, emphasizing the importance of working closely with the carriers.

"They can sometimes bring solutions to the table also," he noted. "It's really a dynamic scenario, with everyone trying to work together."

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PHOTO BY TOM SMITH

Baltimore/Washington Int'l Relies on "Army" of Contractors

By Thomas J. **Smith**

factsfigures

Project: Contracting Outside Services
Location: Baltimore/Washington Int'l Thurgood Marshall Airport
Owner/Operator: Maryland Aviation Administration
Total Operating Budget: $180 million
Contract Spending: $84 million
Total Workforce: 14,000
Airport Employees: 450
Outside Contractors
Baggage System Maintenance: Aircraft Service Int'l Group (ASIG)
Boarding Bridge Maintenance: ASIG
Fueling, Ground Handling & Ramp Services: ASIG
Gate & Ticket Counter Staffing: ASIG
Police Services: Maryland Transportation Authority Police
Annual Contract: $18 million
Unarmed Private Security: AKAL Security Services
Annual Contract: $8 million
Facility Maintenance: Chimes D.C.
Parking Operations: Maryland Parking
Shuttle Services: First Transit

Constrained by a state-mandated maximum employee headcount, Baltimore/Washington International Thurgood Marshall Airport (BWI) relies heavily on the private sector to complete many of its everyday and not-so-everyday tasks.

Of the 14,000 people working at BWI, about 450 (3%) are directly employed by the Maryland Aviation Administration, the agency that owns and operates the airport. From policing the terminal to maintaining boarding bridges, outside contractors provide a variety of key services and account for fully $84 million of the airport's $180 million operating budget.


Jim **Walsh**

"You need literally an army of contractors to operate and maintain the airport," says Chief Financial Officer Jim Walsh. "It is difficult to have all the expertise from A to Z, soup to nuts, do all the types of (specialty) services. We don't need an elevator maintenance expert on staff; we need an airfield operations person. You prioritize what you want and need."

BWI prefers to concentrate its direct hires on airfield operations, keeping airport-specific tasks such as runway/taxiway lighting, wildlife management, snow removal and vegetation control in-house. "We focus on safety and security," Walsh specifics. "We train our own people in the maintenance and operations of the airfield. They are the airport's people, and they have the most familiarity of this complex system."

Conversely, contract personnel dominate on the ramp as well as inside and around the terminal. "The private sector has the training and expertise available to us," explains Walsh. "We can take advantage of that through the competitive bidding process."

On the Ramp

BWI contracts Aircraft Service International Group (ASIG) to provide carrier services, such as maintaining the baggage handling system and loading bridges. ASIG also holds direct contracts with the airlines for ground handling and ramp services, deicing, aircraft fueling and staffing ticket counters and gates. In addition, the company fuels and maintains ground support equipment at BWI via third-party contracts.

Aircraft Services Int'l Group provides in-plane fueling for all carriers at BWI. It also fuels the ground support equipment, owns one fuel farm and operates Southwest Airlines' fuel farm.

"Baltimore is an all-inclusive operation for us," says Douglas Hofsass, vice president of operations planning for ASIG. "It is a location where we provide all lines of business."

With such a broad spectrum of services at the key Mid-Atlantic hub, ASIG stresses cross training among its crews. "We qualify our mechanics to maintain ground equipment, jetways and baggage conveyance systems," explains Hofsass. "Having cross-functional technical skill sets on the airfield allows us to provide bundled/expanded services to the airport and airlines."

ASIG handles all aircraft fueling at BWI — including the fuel farms, hydrant system and into-plane service. In addition to managing its own fuel farm, the company also operates Southwest Airlines' facilities. Together, the two farms have a capacity of 6.1 million gallons. Last year, ASIG pumped roughly 210 million gallons of aviation fuel at BWI.

ASIG is a unit of BBA Aviation and a sister company of Signature Flight Support, the fixed-base operator that services general aviation operations at BWI. According to Hofsass, the company has operations at 85 airports worldwide and employs approximately 8,000 team members; he declined to say how many work at BWI.

PHOTO BY TOM SMITH

Inside & Around the Terminal

While ASIG may have the most moving parts at BWI, it is not the airport's largest contractor. That distinction belongs to security. The airport pays $18 million a year to the Maryland Transportation Authority Police for a force of about 200 police officers, reports Walsh. "There are many airports that have their own law enforcement; we do not," he notes. "We literally rent our cops."

The airport contracts a non-profit agency that hires people with physical, intellectual and mental disabilities to clean the terminal's interior.

PHOTO BY TOM SMITH

In addition, the airport pays $8 million annually to a private security firm. AKAL Security Services provides unarmed guards at various employee-only portals.

BWI also outsources its facilities maintenance — and supports a local social initiative in the process. Since 1998, the airport has contracted its terminal cleaning services to Chimes, a non-profit agency that hires people with physical, intellectual and mental health disabilities. Three shifts of about 275 Chimes employees work around the clock maintaining hundreds of thousands of square feet in the terminal, notes Imoh Matthews, chief operating officer of Chimes D.C. Although the agency subcontracts carpet cleaning and nightly terrazzo polishing to other organizations, those agencies also hire people with disabilities.

BWI contracts with other non-profit agencies for exterior maintenance projects and landscaping services.

Throughout the property, outside contractors operate and maintain airport-owned equipment and infrastructure. Walsh points to the parking lots and associated shuttle buses as prime examples: "We own the buses (a fleet of 49 vehicles), but the maintenance and operation is contracted out."

Contactor or Consortium?

While Baltimore/Washington International Thurgood Marshall Airport and many others outsource various terminal and airfield functions, airline consortiums provide key services at others.

Two U.S. airports have consortiums operating entire terminals. At John F. Kennedy International Airport, Terminal One Group Association operates Terminal 1 and JFKIAT operates Terminal 4. The Atlanta Airlines Terminal Corp. has maintenance responsibilities for the central passenger terminal complex at Atlanta Hartsfield-Jackson International Airport.

Although the consortium model has been used in the industry since the 1960s, it has grown in use in the last 10 years. Currently, there are 38 consortiums in place at U.S. airports, reports Paul Demkovich, a consultant with AvAirPros and author of *A Guidebook for Airport-Airline Consortiums*, studies for the Airport Cooperative Research Program.

According to Demkovich's findings, nine of the 39 consortiums are equipment-focused — with most emerging since the Sept. 11, 2001, terrorist attacks to operate and maintain common-use baggage systems that are now tied to in-line explosives detection systems.

"The consortium puts the airlines in control and relieves the airport of the daily operational responsibilities and management headaches," Demkovich explains. "The airport sets the standards … but no longer has to worry about the day-to-day operation functions. Someone else gets the calls about the lost luggage."

Consortiums can also help an airport reduce its reported operations, because expenses for various services assigned to the airlines are typically not added to the airport's cost per enplanement figures, he adds.

Fully 25 of 39 consortiums currently operating at U.S. airports reflect the historic genesis for the model: providing fuel storage and distribution infrastructure.

To view or dowload *A Guidebook for Airport-Airline Consortiums*, visit http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_111.pdf.

Cincinnati-based First Transit provides 135 drivers, technicians and support staff to run BWI's 24/7 shuttle system. The firm has held the contract for more than 10 years.

"First Transit partners with BWI to customize solutions to their specific needs while delivering the highest level of safety, customer service and quality," says Brad Thomas, the firm's president.

Similarly, the airport built two parking garages and developed surface lots with total parking spots for 25,000 vehicles, but they are operated by Maryland Parking, a partnership of Parking Management and Tyroc Construction. The firm's 140 employees collect customer parking fees, provide vehicle assistance, clean the lots and conduct license plate surveys, explains Facility Manager Steven Hill.

Two Sides to Every Contract

Walsh acknowledges that relying on so many outside contractors at an airport with nearly 700 daily flights presents both advantages and disadvantages.

On the plus side is expediency. The Maryland General Assembly, which meets only 90 days a year, has to approve any new positions at the airport. As a result, BWI's core of 450 employees does not change very much, reports Walsh.

Contracting with outside companies often provides the airport with greater flexibility, pricing and control, he adds.

It's typically much easier to terminate a contractor than an employee for inadequate performance, Walsh explains. Many of BWI's contracts have "time triggers" requiring response to various issues within a specified period. Maintenance contractors, for instance, may be contractually required to fix moving walkways that have stopped working within a certain number of hours.

Contracted labor is also frequently less expensive, because public sector employees generally have more expensive benefits. "There is a cost advantage in some cases, but not all," Walsh specifies.

Outsourcing tasks such as holdroom cleaning and boarding bridge maintenance allows BWI to control services that affect its facilities — and how passengers perceive the overall airport environment. "We believe, quite frankly, that our standards are higher than the airlines," explains Walsh. "We have seen airlines skimp at some airports on the day-to-day work. We choose to handle these tasks; we have more control over our assets."

Since the airport handles traditional airline responsibilities, the cost of such services is included in the airport's standard rates and charges — part of lease agreements that were negotiated with carriers about 15 years ago, Walsh notes.

One of the drawbacks about using a vast network of outside contractors is the amount of airport resources it takes to hire and manage them. Because state procurement laws govern how BWI selects its providers, contracts go through an official competitive bidding process every three to five years. "We have very few sole-source contractors," Walsh notes. Given the size of its contracts, the airport normally has active competition for the business.

"Managing (our contractors) is a challenge, because there are so many," he adds. "We need strong management to oversee the performance. There is a management burden to it, but we believe that outweighs any drawbacks."

BWI, in fact, considers contracting various maintenance and operation functions a best practice. "It gives an airport considerable flexibility and a higher level of performance," Walsh explains. "It enables an airport operator to focus on what is most important — that is the maintenance and operation of the airfield, terminal and landside complex. That is what we do best."

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Miami Int'l Improves Runway Incursion Detection With Multi-Tech System

By Ken **Wysocky**

factsfigures

Project: Runway Incursion Detection System
Location: Miami Int'l Airport
Operator: Miami-Dade Aviation Dept.
Cost: $3.1 million
Funding: TSA
Main Components: Ground-based radar, high-resolution digital cameras, target-analytics software
Timeline: Nov. 2011 to May 2014
Project Management: Unicom Global
Subcontractors: NICE Systems; Honeywell Int'l
Radar: FLIR Systems
Cameras: Axis Communications; Moog
Benefits: Faster, more accurate detection & verification of runway/taxiway incursions
Concurrent Project: Checkpoint Infrastructure Updates
Main Components: New intranetwork; high-resolution cameras; servers; video-recording system
Cost: $6.9 million
Funding: TSA
Checkpoint Cameras: Axis Communications
Benefits: Improved image quality; increased camera coverage; better playback/recording capabilities

A new $3.1 million security system that went online at Miami International Airport (MIA) is providing one of the country's largest international hubs with new tools for detecting taxiway and runway incursions.

Funded by TSA, the airport's new system employs a variety of technologies, including ground-based radar, digital cameras and complex target-analytics software. In addition, a GPS-based remote-tracking system helps speed the dispatch of first responders.

The result is faster and more accurate identification, verification and tracking of intruders that could pose a threat. The system also reduces false alarms (triggered by wildlife, for instance) that lead to inefficient deployment of security resources, says Ray Davalos, MIA's outgoing airport building systems manager.

A key component of the incursion detection system, which went online in May, is Situator analytical software, by NICE Systems. It essentially acts as the "brain of the operation," allowing the system's various components to communicate and work together. For example, the software "talks" with ground-based radar when a target is detected on a taxiway or runway, then selects the correct camera to verify and track the target. It also automatically sends a photo of the target to tablet computers carried by first responders in security vehicles that rove the airport's 12-square-mile grounds. The link to a Google map that pinpoints the target's exact position accompanies the photo, Davalos adds.


Mark **Storek**

Prime contractor/project manager Unicom Global emphasizes the importance of a layered approach for runway/taxiway security. MIA's system uses three primary technologies: ground-based radar by FLIR Systems, fixed and pan-and-tilt digital cameras and software analytics. "Sensors are used, too," notes Mark Storek, senior client executive for physical security at Unicom. "Each target is subject to at least three verifications."

More than 70 high-resolution, low-light digital cameras cover the airfield to detect incursions. "If the target proceeds out of range of one camera, Situator allows an operator to sequence to the next available camera to start tracking the target," Storek explains. "It can even send the closest first responders an actual picture of the target in a high-resolution photo that's sharp enough to identify a threat."

Additionally, the software includes built-in standard protocols that tell operators what to do, step by step, when a target is detected. This ensures a consistent response to situations, he notes.

"It takes all this disparate data and makes it actionable — helps operators make sense of it — for an efficient response each time," Storek says.

Mapping a Response

Detected targets are tracked on a high-resolution aerial map of the airport, which MIA personnel say is a dramatic upgrade from the computer-aided design version they previously used. The ground radar is integrated with a radar video surveillance receiver, developed by Honeywell International. It captures information from an FAA-mandated automatic dependent-surveillance broadcast (ADSB), which triangulates with the ground radar to determine whether or not an incursion target is an aircraft. A radar feed from the FAA serves as a backup if MIA's ground-based radar malfunctions, Davalos notes.

"Another benefit is that even though it's primarily concerned about unknowns (targets), the system gives our folks in the tower a much better perspective on everything that's happening on the airfield at all times — a situational awareness of everything that's moving around that they didn't have before," he explains. "Part of their job is to see if there's another aircraft waiting to taxi or one coming around one of the concourses … and instead of having to call one tower and ask if it's holding an aircraft, they can see it all on a computer screen."

Before MIA's new incursion detection system was installed, it was sometimes difficult for airport personnel to distinguish exactly who or what was moving airside. "We couldn't easily tell whether a vehicle belonged where it was," Davalos says. "We also had a couple incidents in which passengers ended up on the tarmac. Now, as soon as someone gets away from the terminal and starts walking on a taxiway, they get detected."

Historically, vehicle incursions occurred more frequently than pedestrians straying onto the tarmac, he clarifies.

"For example, we're doing a major resurfacing project right now on our largest runway," Davalos explains. "At any given point in a day, there are probably more than 100 vehicles driving on the taxiways that are designated to travel on specific routes. But if someone makes, say, a right turn instead of a left, it's detected by the ground-based radar. Then Situator tracks that target and selects the nearest camera … video pops up on a computer monitor and an operator determines if the target is a 'friendly' and or an 'unfriendly.' "

New Technology

Most of the system's cameras are made by Axis Communications and work in low light or changing light conditions that would thwart conventional equipment. Each camera is essentially a lens on a computer with considerable processing firepower, explains Anthony Incorvati, head of transportation

Anthony **Incorvati**

business development in North America for Axis. When combined with a sophisticated image sensor, MIA's cameras generate image quality that didn't even exist a couple years ago, notes Incorvati.

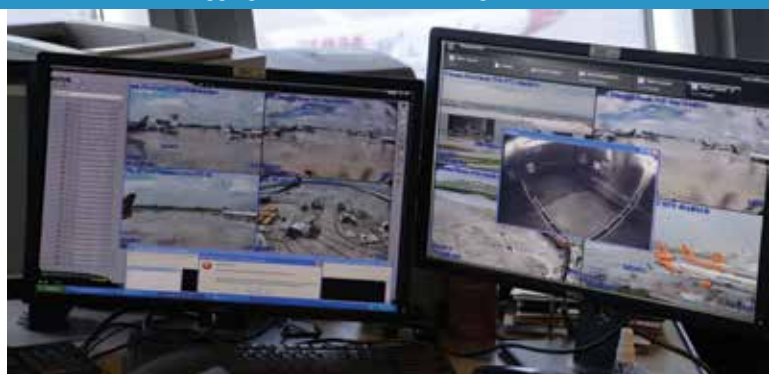
The system also includes five cameras by Moog Inc. that track targets at night. "They can see two miles when it's pitch black outside — and even identify a name tag at that distance," Storek says. "It's pretty stunning technology."

Because it wasn't feasible to run new fiber-optic lines to every outdoor camera, Unicom designed a wireless network that aggregates all camera streams and offloads them to MIA's network. "It would have cost millions of dollars to tear up the airport grounds and install fiber-optic lines, which just wasn't going to happen," Storek says. "We'd have to shut the airport down, which would be unacceptable."

In addition, the Unicom system uses solar power and battery packs to surmount another challenge: lack of electricity for cameras during daylight hours.

"The (airfield) light poles at Miami go hot only when it's dark out," Storek explains. "So we installed power processing units, or battery banks, around the runways. At night, when electricity is running, it charges the batteries. During the day, the battery packs power the cameras and the wireless gear that transmits all camera streams and images back to the NICE recorders and software."

A new wireless network aggregates streams from 70 digital airfield cameras.



Checkpoint Enhancements

In conjunction with the incursion detection project, TSA spent an additional $6.9 million inside MIA's terminal, upgrading security checkpoint infrastructure. Crews installed a new intranetwork, 219 high-resolution cameras, servers and a video-recording system.

"Before, the (checkpoint) cameras were analog," Davalos notes. "This system is more intuitive and provides better video quality, better recording and playback, and more cameras per checkpoint — 20 to 25 per area compared to 10 or 12 previously."

Axis, the company that supplied cameras for MIA's incursion detection system, also provided intelligent-surveillance cameras for the checkpoint project. "These are Internet Protocol (IP) networked video cameras, which means they're digital right at the source," notes Incorvati. "To be networked, the old analog cameras had to be encoded and then transport video over a network, and image quality suffered."

He compares the image quality of MIA's new checkpoint cameras to a high-definition television with sound color fidelity. "That's critical for better target identification, especially when you go back for forensics and zoom in for more detail, which an analog camera can't provide," he explains.

More Applications?

If it chooses, MIA can further leverage its new cameras inside the terminal and on the airfield by using a video-analytics application. According to Incorvati, more and more airports are using cameras initially deployed for security purposes for everything from queue management to monitoring third-party contractors to determining specifically where cleaning crews are needed.

"Some airports also use them for gate management," he reports. "Years ago, you never saw cameras at a boarding gate or out on a ramp. Now, we're seeing cameras at gates to help manage the boarding process."

If an aircraft doesn't leave on time, cameras can help the airport and airline understand why. They can also provide video that serves as a forensics tool to determine cause and liability in cases involving aircraft ground damage, which costs airlines millions of dollars annually, he notes.

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John Wayne Airport Completes Runway Redesignation

By Victoria **Soukup**

JOHN WAYNE AIRPORT
ORANGE COUNTY

factsfigures

Project: Runway Redesignation

Location: John Wayne Airport (SNA)

Reason: Naturally occurring shift of magnetic poles

Runways Affected: 1L-19R (commercial) 1R-19L (general aviation) became 2L-20R & 2R-20L

Cost: $885,100

Funding: FAA (81% of total cost)

Project Design & Administration: Toltz, King, Duvall, Anderson & Associates (TKDA)

Contractor: All American Asphalt

Subcontractors: PCI; Royal Electric

Airfield Paint: Ennis-Flint

Airfield Guidance Signs: ADB Airfield Solutions.

Southern California's John Wayne Airport (SNA) recently renumbered its two runways — without shutting down airfield services — thanks to coordinated efforts by airport officials, the FAA and outside contractors. Outwardly the change occurred overnight; but it had actually been in the works for years.

The project was set into motion in 2010, when a routine airfield survey found that the magnetic bearings of the Orange County airport's runways had shifted since they were constructed 45 years ago. In 1965, the runways were designated 1R-19L (general aviation) and 1L-19R (commercial) based on compass readings at the time. However, due to the gradual shift of Earth's magnetic poles throughout the years, the runways' magnetic bearing changed 1 degree. The difference was just enough for the FAA to require the airport to change its runway designations to 2R-20L and 2L-20R — a project that cost about $885,000 (81% paid for with FAA grants).

Ensuring that the redesignation project not disrupt flight operations was especially challenging, because the airport has only one commercial runway. But SNA officials were adamant about that point. As a result, crews completed much of the work months prior to the airport's critical seven-hour window of opportunity — from 11 p.m. on Sept. 17 to 6 a.m. Sept. 18. The timetable for the final changeover was unusually firm because it had to coordinate with the FAA's 56-day publication cycle of airport updates.

More Than Paint

Runway redesignations don't happen every day. SNA is among only a handful of U.S. airports that have had to make the change during the past decade. But more will inevitably join the list as our planet's magnetic poles continue to shift ever so slightly.


Ian **Gregor**

It's a complicated process that goes well beyond repainting runway numbers, notes Ian Gregor, public information manager for FAA's Pacific Division. "When the magnetic heading changes, we have to update a number of different things," Gregor explains. "This includes updating pilot

Old runway markings and airfield signs were among the last elements to be updated.

charts and airport directories, alerting pilots to the planned changes so a pilot looking to land on Runway 19 isn't surprised to see a '20' painted on the runway. It also can require changes to flight procedures if a procedure is based on an outdated magnetic heading."

Additionally, air traffic controllers often need to be trained regarding the new numberings; and airports need to review their instrument landing systems, ground lights and other navigational aids to determine if reprogramming is required.

To ensure all procedures were followed at SNA, the airport contracted Toltz, King, Duvall, Anderson & Associates (TKDA) in February 2013 to design and administer the project. The firm had previously completed a similar initiative for Minneapolis-St. Paul International Airport (MSP) and ran the SNA project from its office in Irvine, CA.

"In a case like this, it was important to hire an architect-engineer like TKDA, who's been through this before, to ensure we were doing everything we had to do," notes Jenny Wedge, SNA's public relations manager. "We wanted to make certain all our bases were covered."

Project personnel sought counsel from other airports that have completed runway redesignations, including Tampa International, Oakland International and MSP. Those airports, however, had the advantage of multiple commercial runways. "Unlike us, they could effectively just close down the runways they were changing for multiple days while using others," Wedge explains.

Setting the Strategy

The airport and TKDA spent four months developing a strategy and working closely with the FAA, recalls Leo Tang, SNA's engineering project

Leo **Tang**

Despite the tight schedule, crews took time for surface preparation.

manager: "We wanted to be sure everyone at the FAA was on board with our plan."

John W. **Ahern**

After the plan was finalized, the airport solicited bids from contractors for airfield and electrical services. Completing as much work as possible before the tightly timed nighttime changeover was crucial, recalls John W. Ahern, vice president of aviation for TKDA. That included identifying and verifying all necessary runway labeling, including labels in the electrical vaults, control room, software programs and policy manuals. The comprehensive process was necessary to ensure that when the changeover occurred, all references to the new runway numbers were correct, Ahern explains.

"We went out and verified everything that had the existing labeling on it, including the electrical cables that run out into the airfield and to each light," he notes. "We had to make sure the labeling was correct so that it aligned with what the actual signs said."

The project team also completed a review of airport software programs and control tower procedures to ensure that all references to the runways were updated.

New Numbers Require New Concrete

SNA's particular redesignations — 1-19s to 2-20s — required new, longer signage, because the numeral "2" is physically wider than "1." In total, the airport had to purchase 20 new signs, each three feet longer than their predecessors. It also had to extend the concrete pads that support the signs.

"Once the pads were finished and the new boxes installed, we put the old numbers back in so that on the changeover night, all we had to do was switch out panels," Tang says.

Rick **Cathey**

SNA Project Manager Rick Cathey stresses how important it was to complete such preliminary work before the changeover. "We would not have had enough time to change all the signs, extend the concrete pads and apply the new runway markings if we had to do it in one night," he explains.

John "JD" **Davey**

Removing 42 old runway markings and applying new ones was one of the last steps completed before the overnight switch. PCI, a parking and highway improvement contractor, scheduled its crews to begin working at night on the smaller airfield markings about a week before the changeover, explains John "JD" Davey, the company's general superintendent. "We started as soon as the blue lights went off at 11 p.m. and had to have everything painted in, complete and off the runway by 6 a.m.," he relates.

In addition to runway markings, 8 to 10 taxiway markings were water blasted off each evening and replaced with Ennis-Flint airfield paint containing reflective beads. "We painted the red boxes with the black border back in, and gradually restored the numbers to the taxiways, which was OK with the FAA and John Wayne Airport," says Davey.

The 60-foot numbers at the ends of the runways were not replaced until the overnight changeover, since they are the most important signage for pilots, he explains. "That night was the most critical night of the entire operation, and we were ready to do it regardless of rain, shine, sleet or snow. The only thing that would have stopped us was lightning within three miles of the runway. When pilots came in to land on the 18th, they needed to see the 20R. There were no ifs, ands or buts about it."

PCI did have a contingency plan for rain: large tents to cover the numbers and torches to dry the area before crews applied new paint.

According to Ahern, consulting the FAA early and coordinating the operations of all parties involved allowed the project to proceed smoothly.

"It's what we do," Ahern notes. "Anytime you're dealing with a runway, everything needs to be done quickly because service depends on it, passengers depend on it and business depends on being able to use that airport."

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Contingency Planning Saves Tucson Int'l Time & Money on New Apron Project

By Robert **Nordstrom**

TUCSON INTERNATIONAL AIRPORT
TUCSON AIRPORT AUTHORITY

factsfigures

Project: Apron Reconstruction; Hydrant Fuel & Ground Power Systems Upgrades

Location: Tucson (AZ) Int'l Airport

Cost: $42 million

Funding: FAA Airport Improvement Program (91%); AZ Dept. of Transportation (4.5%); Tucson Airport Authority (4.5%)

Apron Design, Engineering & Program Management: Stantec Consulting Services

Construction Manager at Risk: Granite Construction Co.

Hydrant Fuel & Ground Power Systems Design: Argus Consulting

Electrical: Rural Electric

Hydrant Fuel Mechanical: KEAR Civil Corp.

Hydrant Pits: Cavotec Dabico U.S.

400-Hz Ground Power System: Page Industries

Geotechnical Engineering & Quality Assurance: Western Technologies

Concrete Structures: West Point Contracting

Surveys: Dowl Hkm; Urban Engineering

Construction Cost & Scheduling: Faithful & Gould

Materials Testing: Conformatech

Of Note: Uncertain funding disbursements required detailed contingency planning

Over the past decade, the main terminal apron at Tucson International Airport (TUS) was beginning to require heavy maintenance. Cracking pavement was creating debris and the subsequent risk of foreign object damage for aircraft engines. Maintenance personnel at the Arizona airport were consequently spending a lot of time patching the approximately 50-year-old pavement.

"It had greatly exceeded its life expectancy," informs Mike Smejkal, senior director of development services for the Tucson Airport Authority. "It needed to be replaced because it was past the point of maintenance."

In addition, the airport's hydrant fuel system no longer met national fire protection standards, and the existing ground power system needed to be updated to a 90-kVA system. Together, the trio of related projects is expected to cost $42 million.

But when airport authority officials initiated studies for the improvements in 2009, federal funding for such projects was extremely tight. So tight, in fact, that the airside work at TUS was initially projected to take up to 10 years, because demolition and reconstruction were slated to occur on a piecemeal basis, due to the uncertain availability of funding.

Tucson Airport Authority officials, however, convinced the FAA to fast-track the projects by demonstrating that the airport could save about $2 million by taking a construction manager at risk approach and dividing the project into three guaranteed maximum price phases.

"When it's all said and done, the project is going to take around 22 months," says Smejkal. "We were able to show the FAA significant savings if they provided more money earlier, which allowed for construction to occur on both concourses at the same time."

Show Me the Money

The airport's ability to move the project forward without disrupting flight operations was a key cost-saving factor. Planners divided the site into 10 work zones to keep the apron open throughout demolition and reconstruction. With 17 total gates, no more than two per concourse were taken out of service at the same time.

Stantec Consulting Services handled engineering and design, construction and program management, with Granite Construction Co. serving as the construction manager at risk. Working closely with the airport and Stantec, Granite was able to offer suggestions from a contractor's perspective throughout the design process.


Mark **Koester**

Mark Koester, a principal with Stantec, details the rationale behind the approach: "Instead of putting the project out on the street, we selected Granite as construction manager based on their qualifications for doing this kind of work. This allowed us to bring (them) into the design process, and they were able to offer insights into phasing and scheduling that impacted costs."

Using the guaranteed maximum price approach, Granite was required to secure at least three quotes for subcontracted services, adds Koester.

Together, Stantec, Granite and the airport authority developed priorities and expectations in line with the project's design and funding constraints. The team planned and segmented work according to gate closures and operational requirements, developing multiple options so they could adjust depending on the funding available at any given time.


Andrew **Rogers**

Andrew Rogers, project manager for Granite, elaborates: "If the airport received $12 million, we were ready to build $12 million; if they received $14 million, we had a mechanism in place to grab another piece of work that had already been thought through."

The multitude of unknown variables made the project a complicated one to design, he recalls. The team consequently asked questions, including: What is the fleet mix and how does it affect the movement of equipment into construction areas? How quickly can we complete work? What are the fueling needs and capabilities? "All of these constraints were integrated into a plug-and-play design that could be adapted to whatever funding became available," Rogers explains.

Fortunately, the FAA was able to provide funds on a timely basis. If funding had dried up and construction halted until the next grant was secured, overhead costs would have soared. In addition, contractors would have had to construct temporary transitions between the new and old pavements, which would have added more than $600,000 to costs, Rogers estimates.


Mike **Smejkal**

"The challenge was working with the FAA to figure out how much money they could allot us each year," Smejkal recalls. "We didn't want to have to shut down and have the contractor leave. It was a balancing act working with Granite, Stantec and the FAA trying to make sure we had enough work to keep our contractors busy until we received the next grant. We were always playing out various scenarios."

With crews working since August 2013, the apron project is expected to be complete in May 2015.

Fuel, Power & Pavement

The apron work that began in August 2013 is expected to be complete in May 2015. Starting at the far ends of concourses A and B, demolition and reconstruction is moving steadily toward the center. Approximately 180,000 square yards of the old 12-inch pavement is being replaced with 16 inches of Portland cement concrete pavement (PCCP). In addition, crews are updating the hydrant fuel system and installing a new 400-Hz ground power system.

The old bottom-entry fiberglass hydrant pits are being replaced as apron work proceeds. And the existing isolation valve vaults on the hydrant loop are being moved further away from the terminal to comply with National Fire Protection Association (NFPA) requirements. Crews will also outfit them with positive shutoff double block-and-bleed valves.

Argus Consulting is the sub-consultant planning the new hydrant fuel and ground power system. "We redesigned the piping network such that we could install new points of isolation that accommodated both the current NFPA standards and the phased construction approach for the program," notes Argus Vice President Chris Straub.

To ensure fuel availability throughout the construction process, Argus designed a new truck fuel loading rack. "The old truck rack was outside the secure area of perimeter fence," Straub explains. "To address the phasing issues of the program, we constructed a new truck rack inside the fence. That way, as components of the hydrant system were shut down, the airport had the ability to quickly load fuel into trucks and drive to gates whose hydrant pits were out of service."

The airport's outdated 72-kVA 400-Hz ground power system was replaced with a new 400-Hz 90 kVA system that will support a wide range of aircraft, including Boeing-737s, -757s, and -767s, as well as Airbus-320s and regional jets.

As crews demolished concrete at various gates, subcontractor Rural Electric installed new conduit, connecting it as work proceeded through the work zones. When the apron is completed, crews will pull new cable and connect it to the 400-Hz system located in the airport's Central Room in Concourse B.

Throughout the construction process, the old ground power system must remain operational. Field investigations during the design phase, however, raised safety concerns regarding the potential for crews to hit active power lines during concrete demolition. To allay this concern, subcontractor Rural Electric decommissioned the underground power service and installed temporary conduit and cabling running along the face of the terminal to provide power to gates during construction.

As the apron project proceeds, the airport authority, Stantec Consulting, Argus Consulting and Granite Construction representatives could not be more pleased with the way work has progressed without interruptions. Funding has been timely and project contingency planning meticulous, they note.


Richard **Zych**

"The best projects are always a team effort," reflects Richard Zych, senior associate for Stantec. "The constant collaboration between our team, TAA (Tucson Airport Authority) and Granite is what kept this project moving smoothly from the beginning of the design through construction."

Smejkal agrees: "The contractor, engineer and airport authority — everyone bought into the process. As conditions changed, we found a solution, implemented it and moved on."

He also considers the project well suited for the construction manager at risk delivery method. "It allowed the contractor to perform field investigations during the design process and minimized disruptive conditions that might be encountered once work began. It also helped them understand how the airlines operate."

Next up will be interior upgrades to the terminal building, Smejkal reports, with some work beginning in early 2015 as crews complete the current apron work. "We're working through terminal design right now to optimize our space," he explains. "We expect the terminal work to be completed in 2016."

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Private Operator Looks Airside at San Juan Int'l

By Jodi **Richards**

factsfigures

Projects: Airfield Improvements & Maintenance

Location: Luis Munoz Marin Int'l Airport (San Juan, Puerto Rico)

Private Operator: Aerostar Airport Holdings

Operations Safety Aesthetics Contract: Hi-Lite Airfield Services

Pavement Management Study: AVCON

Other Airfield Project Consultants: CHM2Hill; Kimley-Horn

When Aerostar Airport Holdings took over the day-to-day operation of Luis Munoz Marin International Airport (SJU) in San Juan, Puerto Rico, it also assumed responsibility for several in-process and future projects, including airfield infrastructure upgrades. These projects, combined with other planned improvements, are expected to complement the private operator's goals for continued growth at the northeastern Caribbean airport.

Aerostar is a joint venture between Highstar Capital and Aeropuertos del Sureste that signed a 40-year lease agreement in July 2012 with the Puerto Rico Ports Authority. Aerostar received its operator certificate from the FAA in February 2013 and is part of the administration's Privatization Pilot Program.

Assuming control and payment from the Puerto Rico Ports Authority (PRPA) for airfield jobs already underway was a challenge,


Andy **Wilson**

notes Andy Wilson, Aerostar's chief development officer. "Synchronizing the accounting process between the FAA, PRPA and Aerostar had never been accomplished before, and the learning curve was steep for all parties," he says.

With the transfer of sponsorship complete, the private operator has a "fair amount of catch-up" to accomplish on the airfield, reports Wilson. While some of the work is related to the age or deterioration level of existing pavements, other stems from prior maintenance practices. "Most of the pavements on the airfield are in need of some sort of improvement," he relates.

Among the mid-stream projects Aerostar assumed is a runway safety area initiative on SJU's longest runway, 8-26. By extending the runway 400 feet to the west and relocating the east end of the runway, planners created room for a standard 1,000-foot safety area for the entire runway. Improvements were funded by a $22.6 million FAA grant and completed in mid-2013.

A taxiway repaving project also concluded after the transfer. That taxiway has since failed and is now closed, reports Ismael Bonilla, Aerostar's chief operating officer. "FAA, in conjunction with Aerostar, has hired a forensics pavement engineer to look at existing conditions of pavement on the airfield," Wilson states. AVCON contracted Robert Boyer, Ph.D., to perform the analysis; results of the studies are pending.

Other airfield improvements at SJU include navigational aid upgrades, such as the installation of FAA's Medium-Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). Another project addressing tree encroachment into the runway object-free area has been put on hold because of a disagreement regarding the removal of trees between the Army Corps of Engineers and FAA. A project to study the runway object-free area and airfield drainage, however, was recently approved for Airport Improvement Program funding.


Ismael **Bonilla**

Roughly 400 trees have already been removed near Runway 8-26 because they were impacting the instrument landing system glideslope signal. With that project complete, SJU has two fully functional instrument landing systems for the first time since the mid '90s, notes Bonilla. Prior to that, the airport experienced a lot of downgrades and restrictions because of obstructions and interferences, Wilson adds.

"We're investing heavily in this project," Bonilla says of Aerostar's commitment to airfield improvements.

Maintaining Pavements

Bonilla characterizes Aerostar's airfield maintenance program as "very aggressive." Last year, he notes, SJU spent more than $1 million repainting Runway 10-28 because of previous improper care. About $150,000 is spent monthly to maintain runways, taxiways and ramps.

"We have professional project administration capabilities that we bring to the table," he states. "And with our experience in operating airports, we'll make sure that we maintain those runways and taxiways."

Bonilla characterizes Aerostar's maintenance and repair strategy as holistic and proactive. "We try to take care of any smaller issues with the asphalt or concrete before it becomes a major issue," he explains.

Recent equipment investments at SJU include two FOD Bosses and the $50,000 restoration of a sweeper owned by the ports authority.

To supplement the airport's in-house maintenance program, Aerostar contracted Hi-Lite Airfield Services to manage the friction on SJU's runways. Per a five-year agreement, Hi-Lite performs weekly friction tests and visual inspections; rubber removal is executed as needed. Hi-Lite is also responsible for pilot visibility, including all airfield markings.


Calvin **McNeely**

"We do monthly and quarterly inspections, and we're continuously out there cleaning, painting, and whatever needs to be done to keep markings fully compliant and be prepared to pass a Part 139 inspection at any time," says Calvin McNeely, the company's executive vice president. "We're being proactive instead of reactive."

Aerostar is implementing a more proactive strategy for maintaining the airfield's asphalt and concrete. In addition to performing friction testing and rubber removal, Hi-Lite Airfield Services maintains SJU's airfield markings.

very extensive program," says Wilson. In addition, geotechnical investigations will help document pavement sections that lack record drawings.

Air cargo is a market segment Aerostar has identified as a promising revenue source. But the airport's existing facilities will need to be developed to realize that potential, Wilson notes. "Within the next 24 to 30 months, we'd like to have some significant [cargo area] improvements in place," he relates.

FedEx and UPS currently operate out of SJU, and CargoLux recently announced its return to the airport. In 2012, SJU moved about 850 million pounds of cargo, ranking 25th out of 112 U.S. cargo airports.

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Prior to signing the current contract with Hi-Lite, Aerostar hired the contractor to help prepare for the original Part 139 inspection at SJU.

Bonilla considers the contract with Hi-Lite "significant" for Aerostar. "Those guys are boots on the ground," he explains. "They have people stationed here dealing with maintaining the runways, cleaning them, cleaning taxiways, repainting everything. That way, when the inspection comes next year, we don't have to scramble at the last minute to try to make sure everything is taken care of."

The contract also saves SJU money in the long run, he adds. The cost to buy and maintain a friction analyzer alone (something required by Aerostar's contract with the Puerto Rico Ports Authority) is prohibitive, he explains.

Future Enhancements

As Aerostar continues to upgrade and maintain SJU's airfield, managing aircraft circulation around the terminal complex has emerged as most important issue, Wilson reports.

Taxiway N, the airport's main north-south connector between the runways, is programmed to receive an FAA grant for repairs in 2015. Other plans call for a $14 million full overlay and connector reconstruction of Runway 8-26 and Taxiway S in spring 2015. Runway 8-26, which hasn't been repaved for 15 to 20 years, is also due for a facelift and joint sealing repairs, Bonilla notes.

Currently, Aerostar is in the process of completing an airport pavement management study with AVCON — a process that will provide near-term, mid-term and long-term capital improvement plans (and budget figures) for pavement restoration, repair and replacement. "It's a

Orlando Int'l Slashes Power Consumption with LED Airfield Lighting

By Jennifer **Bradley**

factsfigures

Project: Runway Rehabilitation & Lighting Updates

Location: Orlando (FL) Int'l Airport

Runway: 18R-36L

Airport Owner/Operator: Greater Orlando Aviation Authority

Total Cost: $14 million

Electrical Costs: $5.2 million (37% of total)

Associated Runway Closure: Jan. 6 – June 3, 2014

Project Design: AVCON

Contractor: H.L. Pruitt Corp.

Photometric Testing: Navaid Lighting Associates

High-Intensity LED Runway Lights: ADB Airfield Solutions

Related LED Taxiway Fixtures: ADB Airfield Solutions

New LED Signs: 74

New LED Fixtures: 1,200+

5-k VAirfield Lighting Cable: 760,000 linear ft.

Junction Can Plazas: 42

Lighting Maintenance Tracking: MALMS Engineer, by Tailor Made Systems

Of Note: First airport in FL to install LED high-intensity runway edge lights; the extra $100,000 it cost to install LEDs is expected to be recovered in less than 5 yrs. via lower energy costs

Pilots flying into Orlando International Airport (MCO) are noticing brighter, crisper lighting on one of Florida's busiest arrival runways, and the airport itself is seeing dramatically lower energy bills. The changes began in June, when MCO finished a $14 million renovation of Runway 18R-36L and its associated taxiways.

The project included both surface and lighting upgrades, with electrical costs accounting for fully 37% of the total budget. (See Page 38 for details about surface improvements.)

Frank **Barczak**

The Greater Orlando Aviation Authority, MCO's owner and operator, replaced energy-hogging lights that were more than 20 years old with more modern and efficient light-emitting diodes (LEDs). "We have a large collaborative team, which embraces new technology to make the airport more efficient," notes Frank Barczak, manager of electrical systems for the authority. "This entire lighting program is a demonstration of that."

Specifically, the recently updated portion of MCO's airfield is 60% more energy-efficient than it was four years ago, reports Mark Goodacre, electrical designer with AVCON, the firm that designed the project.

The airport, however, endured five months of continual construction and electrical work (and an associated runway closure) before reaping its rewards. In addition to replacing all the lights for the 12,004-foot runway and installing more than 1,200 LED fixtures, crews also replaced 42 manholes and installed 760,000 feet of 5-kV airfield lighting cable. All the work was completed on time and within budget; there was simply a lot to be done. The runway's last major lighting renovation was in 1992.

Leading in LEDs

These days, MCO uses just 40% of the power it previously did for Runway 18R-36L, notes Goodacre. In 2007, the load for the runway's electrical vault was approximately 228 kVA. Today, after fully changing to LEDs, the load for the same vault is 89 kVA. "This is a huge savings for the airport," he emphasizes.

With its recent project complete, MCO can also boast Florida's first installation of LED high-intensity runway edge lights*. Although it cost an extra $100,000 in new fixtures to make the switch, officials did so with long-term advantages in mind. "The additional

The installation of junction can plazas will increase safety for airfield maintenance workers.

cost will be recovered in less than five years because of the energy savings and reduced maintenance," Goodacre explains.

Mark **Goodacre**

Where workers would previously repair 140 lights, they now need to repair only 20 to 25, explains Barczak. As a result, the airport is able to reshuffle its maintenance resources. "LEDs have simply allowed us to manage more with less," he comments.

Carl **Johnson**

Carl Johnson, senior aviation lighting specialist with AVCON, was pleased that the FAA permitted the use of the LED high-intensity runway light post-bid and that the aviation authority was willing to pay the incremental cost. "They are clean, clear and crisp," Johnson relates. "To have an all-LED lighted runway is pretty exciting."

LEDs, in general, are not new for MCO. The Florida facility installed the very first generation of energy-saving lights in 2002, through a manufacturer's pilot program. Barczak recalls immediately appreciating the lights' built-in surge protection. In addition, initial concerns about lightning destroying the new lights proved unfounded. LEDs are more sustainable and absorb transients regular incandescent lights won't, he reports.

Tooling & Maintenance

Crews used leveling and alignment tools when installing the new elevated runway lights at MCO this summer. David Rainey, vice president of Airfield Systems Development at Navaid Lighting Associates, urges other airports to follow suit.

** LED high-intensity runway lights are currently not eligible for FAA funding, due to questions about their compatibility with enhanced flight vision systems. Because MCO's Runway 18R-36L is not listed as a Special Authorization Runway, it is not approved for enhanced flight vision system use.*

David **Rainey**

"LEDs put out light in all directions, but the optics in the fixture are designed to create two very distinct main beams," says Rainey. The beams should point toward the centerline at 3.5 degrees and up toward the approach at 4 degrees. If a fixture is twisted or turned any way on its mounting, the beams will not point in the proper direction, he explains.

Although leveling and alignment tools are important for installing incandescents and LEDs alike, Rainey says they are more critical with the latter, because LEDs have a much sharper cut-off to the beams.

To ensure proper beam alignment, Rainey advises airports to write tool requirements into contractors' specifications.

Rainey also reminds airports switching to LEDs to follow proper maintenance routines. "(LEDs) still develop rubber buildup, contaminants on the lenses and other issues similar to traditional incandescent bulbs," he cautions, adding that bolt torque and light output on all lights should be checked regularly.

While Rainey realizes that many airfield electricians focus on circuits and power distribution, he encourages them to take a broader view: "Our real job is to make sure the lighting fixtures on that runway are providing the correct visual cues to the pilot, such as lighting patterns and distance acquisition. That's what matters."

Can Plazas vs. Mahholes

Because Runway 18R-36L was originally part of an Air Force base in the 1950s, it was built with military-style manholes. Converting them to junction can plazas was another key element of MCO's runway renovations.

Runway Rehab

Like the new LED lighting, SuperPave Asphalt, with recycled asphalt millings, is also a signature stamp of the recent runway project at Orlando International Airport (MCO).

The center segment of Runway 18R-36L is a concrete keel section, but the area outside the pavement has full-strength asphalt, explains AVCON President Sandeep Singh. By demonstrating the benefits of recycled millings and SuperPave to the FAA, and subsequently using 20% in its mix, AVCON was able to save MCO $300,000, Singh reports.

Installation crews also used some warm-mix asphalt, which is more common at northern airports than in Florida. The product was used on overrun areas and blast pads, and initial concerns about density were never realized, notes Singh. "It just went down really well, and now we'll have the ability to observe and see how it performs," he says.

In the end, Singh notes, MCO rehabilitated a World War II-era runway and addressed pavement and lighting concerns in a way that reduces maintenance and associated operational disruptions.

"We design airfield lighting systems for the safety of the traveling public (per FAA criteria) and ease of maintenance," explains Johnson. "However, each design must incorporate features that continually improve safety for airfield maintenance personnel."

Junction can plazas do just that by eliminating the need for personnel to work in confined spaces, which require permits and extra safety precautions, notes Frank Pruitt, president of installation contractor H.L. Pruitt Corp. Instead of dewatering and entering a 5-foot-by-5-foot box that reaches 10 feet below ground, MCO airfield maintenance workers can now simply reach their arms into cans, which are 2 feet in diameter and 2 feet deep. "It greatly limits the danger as well as timeframe for maintenance departments to do repairs and troubleshoot," Pruitt explains.

Climbing in manholes requires astute environmental awareness and physical protection from gases and other live electrical equipment, adds Jeff Pace, the aviation authority's airfield electrical supervisor.

Jeff **Pace**

With LEDs, the airport uses 40% of the energy it previously consumed for the runway.

Goodacre agrees and elaborates: Because each junction can contains fewer circuits, electricians can more easily identify and isolate which circuit they are working on and address additional circuits that need to be de-energized. “The electrician does not have to enter a confined space with multiple live circuits and therefore does not have the risk of being in an electrically active enclosed environment when making repairs,” he explains.

Junction can plazas also offer circuit isolation — an especially valuable advantage, given the high number of electrical wires at airports. With can plazas, maintenance teams can reduce the number of circuits in a common enclosure. If something goes wrong, only two or three circuits may be out at a time, Barczak explains. With manholes, 15 to 20 circuits are often racked together. If one circuit fails, it could conceivably damage all the other circuits in the manhole.

In total, Pruitt’s crews converted 42 military manholes into junction can plazas at MCO. Goodacre credits Pruitt for developing the idea to pre-cast the plazas — a strategy he says helped the runway project stay on schedule. “The junction can plazas were designed to reuse the existing 4-inch duct bank system while allowing for future expansion and circuit isolation,” describes Goodacre. “They pay off in less maintenance and the ability to keep electricians safe, with the lighting infrastructure working its best.”

Barczak originally learned about the benefits of can plazas at a conference presented by the Illuminating Engineers Society of North America, an association in which he believes strongly. After hearing how the model worked at Dallas-Fort Worth International Airport, he researched its applicability for MCO. The results further reinforce the value he places on industry relationships, the association's aviation lighting committee and staying current with new technologies.

An electronic wrench that automatically sets the torque for airfield electricians is expected to decrease downtime for maintenance.

Tracking & Torqueing

In addition to updating airfield lights, MCO's recent project also updated how the airport schedules and documents the maintenance and repairs personnel make to the lights.

MCO replaced its traditional, paper-based processes with a digital system from Tailor Made Systems. MALMS Engineer incorporates a scheduling tool to plan and record airfield lighting inspections and maintenance work, a PC tablet with a moving map showing operator location and assets, and GPS and radio-frequency identification (RFID) technologies to help personnel identify and navigate to individual fixtures. The system also includes a list of outstanding faults with search capabilities, and a record of all faults and maintenance actions performed, including torque checks.

Robert Shapton, chief executive officer of Tailor Made Systems, says that runways are an airport's most important asset. Effective and serviceable runway lighting is essential to maximizing runway capacity and safety — especially in low-visibility conditions, he continues.

MALMS Engineer is designed to ensure that all runway and taxiway light fixtures are inspected and maintained in compliance with FAA AC 150/5340-26C. During annual certification inspections, FAA personnel want to see a thorough audit trail of any airfield discrepancy corrections, notes Rainey.

RFID tags are key to fixture identification at MCO — and also a first at any U.S. airport, reports Shapton. The glass tags are installed in MCO's runway and taxiways next to each light fixture. Each fixture location has an electronic file that stores information such as type of fixture, supplier, color, GPS location, number of bolts and proper torque rating. It also contains a fixture-specific log of problems and repairs, including the names of workers who performed each service, and notes about further maintenance that is required.

FAA released a new CERT Alert Advisory Circular after MCO had already implemented its new system. "Incidents involving lights coming out of the runway and breaking apart are not infrequent," notes Shapton. "Most large airports will have tens of thousands of fixtures and must maintain those so they are mechanically sound."

MCO also uses M-Torque, a companion program to MALMS Engineer that prompts periodic checks of the bolts used to fasten in-pavement lights and facilitates torqueing to manufacturer's recommendations. The system uses a calibrated electronic torque wrench, which automatically sets the necessary torque level for on-site electricians. "Once the correct torque is achieved, the system alerts the operator, records that the bolt is correctly torqued, and permits the operator to torque the next bolt," Johnson explains.

MCO's new light fixtures contain six bolts, and each needs to be torqued to 185 inch pounds. "It takes a lot of time," notes Rainey. "It's hard to get the runway closed, and it is labor intensive."

The airport's new systems, however, help optimize maintenance schedules with electronic records and detailed measurements. "It allows them to determine when the lights need to be cleaned, the bolts torqued or the fixtures replaced," Rainey explains.

Johnson considers the new programs yet another measure of asset management by the Greater Orlando Aviation Authority — and part of an overall safety system that helps MCO keep its runway lights in top condition

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MALMS ENGINEER
FURTHER ENHANCES AGL MAINTENANCE

Tailor Made Systems (TMS) Limited range of infield photometric measurement systems MALMS (Mobile Airfield Light Monitoring Systems) are now in use with over 100 airports around the world including many of the leading international airports such as Orlando Airport.

Further to the range of infield photometric measurement systems, the MALMS range has now been enhanced by the development of MALMS Engineer, which allows airfield engineers to plan and record maintenance activities electronically on the airfield, replacing the need for paper based systems.

Asset details screen with attributes

MALMS Engineer utilises a touch screen Windows tablet with an airfield map showing all airfield assets that require inspection and maintenance. Each asset has its own record in the database showing its key attributes. In the case of an airfield light, this could comprise of manufacturer type, make, model, colour, number of fasteners, torque requirement, location ID, GPS location, circuit numbers, transformer type, zone number and any other description or terminology used by the airport.

The airfield engineer is therefore able to navigate utilising GPS and the airport map on their tablet to identify their position on the airfield as well as individual assets. Furthermore each asset can have a unique RFID tag installed next to it for positive identification purposes by the engineer. This is especially useful in situations where assets are in close proximity to each other.

MALMS Engineer is designed to record faults identified from visual and/or MALMS photometric inspections of the airfield ground lighting. Any faults found during such an inspection will be recorded on the database as and shown on the airfield map as a red dot for use by the airfield engineer for maintenance purposes.

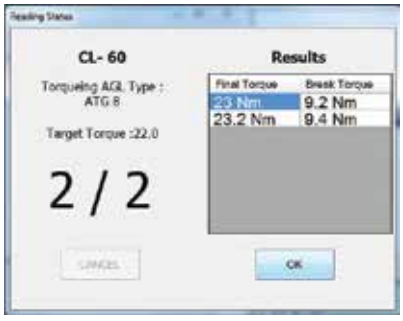
Airfield map with assets shown

A work scheduling tool that may be used on its own or integrated with an airports asset management system to create an electronic work order. The engineer then uses the tablet to locate the asset that requires attention and record results of the wok performed.

MALMS Engineer also offers an integrated torque management option (M-Torque). This has been developed following a number of incidents where airfield lights have become dislodged through loosening of the retaining bolts or studs as the result of vibration and negative air pressure from passing aircraft. The use of M-Torque can be integrated as an option that allows the adjustment and measurement of the AGL fasteners thus confirming that such assets are secure on the airfield. [Photo 4-torque.jpg] Any further faults such as damaged fasteners or studs can be recorded electronically for further maintenance.

M-Torque in use

All data from such inspections or maintenance activities are recorded electronically and the data transferred either by LAN or WIFI to an office based or CLOUD based server. This will allow the Airfield Maintenance Manager to look at maintenance activities by date, asset type, location and engineer, as well as identify assets that keep being 'red flagged' as having a persistent problem. Specific asset trend analysis can be undertaken by the Manager to proactively enhance the maintenance of the airports airfield assets. The system also provides a database to evidence that the airport is operating safely to both management and regulators.



Torque value before and after torque check

Evansville Regional Moves Roads & Railways to Reconstruct Runway

factsfigures

Project: Runway Reconstruction & Relocation

Location: Evansville (IN) Regional Airport

Cost: $67 million

Funding: FAA Airport Improvement Funds (90%); state & local funds (10%)

Design & Engineering: CHA Consulting

General Contractors: Blankenberger Bros.; W.B. Koester Construction

Of Note: Multiple enabling projects included land acquisition & relocating a state highway and railway

Subcontractors

Airfield Electrical: Alva Electric

Pavement Sawing & Coring: Capital Drilling & Sawing of Kentucky; Diamond Coring

Traffic Signals: Hummel Electric

Navigational Aids: HMI, Midwestern Electrical Group

Runway Paving: JH Rudolph

Pavement Joint Sealing: Huff Sealing Corp.

Runway Grooving: Cardinal Int'l Grooving & Grinding

Soil Stabilization: Mt. Carmel Stabilization

Roundabout Concrete Construction: JBI Construction

Taxiway Paving: E&B Paving; JH Rudolph

Road Paving: E&B Paving

Road Guardrail: C-Tech Corporation

Pavement Milling: Mid-American Milling Co.

Airport Security Fencing: Tri-State Fence Co.; James H. Drew Corp.

Traffic Control Signage & Barricades: Indiana Sign & Barricade; Road Safe Traffic Systems

Pavement Marking: Road Safe Traffic Systems

Perimeter Road Pavement Marking: Indiana Sign & Barricade

Tree Clearing: Kramers Land Clearing

Material Transport: Liggon Trucking; Starnes Trucking; Naas Brothers; Denny Excavation; Paul D. Cooper; WBE Trucking; Ohio Valley Trucking; Materials Transport; AN Transport

Bridge Steel Construction: Harmon Steel

Erosion & Sediment Control: Earth Images; CA Fulkerson

With the clock ticking and a dauntingly long list of complex enabling projects to complete, Evansville Regional Airport (EVV) recently beat the Dec. 31, 2015, FAA deadline for runway safety area improvements by over one year.

To do so, however, the airport had to:

- acquire and demolish homes on 70+ acres of land
- relocate utilities, roads and more than one mile of railroad
- improve the approach to its secondary runway (so it could be used while the primary runway was closed)
- decommission, relocate and install airfield navigational aids
- relocate its primary runway and taxiway approximately 2,400 feet to the northeast

In total, the project cost $67 million and was financed largely with FAA Airport Improvement Program funds.

"The main purpose of this project was to comply with the runway safety standards passed by Congress approximately a decade ago," explains EVV Executive Director Doug Joest. "We didn't have a large enough safety area on the southwest end of our main runway. It was too close to roads, highways and railroad tracks and lacked the 1,000-foot safety area beyond the end of the runway that we needed."

Doug **Joest**

When updating the airport's master plan in 2004, airport officials quickly realized that given the existing location of its primary runway, they lacked the space to make the requisite safety area adjustments.

Puzzle-like Project

Although EVV's primary airstrip, Runway 4-22, was closed from March to August 2014, preparatory work for the multi-phase project began back in 2008.

By Robert **Nordstrom**

"We had to make improvements to crosswind Runway 18-36 to allow for commercial traffic once 4-22 was shut down," informs Todd Schultheis, vice president of aviation technical services, CHA Consulting (EVV's design and engineering firm for the project). "We had to clear trees on the approaches and put down precision markings. Runway markings were improved. Because it was a visual runway, GPS instrument approaches had to be added."

An environmental assessment performed after the master plan was updated determined that Runway 4-22 would have to be shifted approximately 2,400 feet to the northeast to make necessary improvements to the runway safety area. To clear that zone, however, a jigsaw-like series of enabling projects had to be coordinated and completed.

First on the agenda was relocating approximately 2,600 feet of an Indiana state highway and 9,400 feet of a county road — feats that included building two roundabouts and a major bridge structure. Another county road and a major bridge structure were also widened in the process.

In addition, approximately 6,650 feet of Indiana Southern Railroad tracks were relocated. The already formidable challenge of relocating the tracks was further complicated when the original railroad company was purchased by another railroad.

"Here we were on a fast-track project, and we had to restart negotiations with a brand new owner," relates Schultheis.

Todd **Schultheis**

Other major enabling projects included floodway improvements and mitigation of a local creek. Overhead electric power lines were removed and buried underground to improve the new runway's approach and provide LPV (localizer performance with visual guidance) landing minimums for Runway 18-36. Taxiway A was realigned and extended; homes on 14 parcels of property totaling more than 70 acres were acquired and demolished; and the airport's North Perimeter Road was extended. The perimeter fence around the new end of the runway was extended and upgraded with a higher, less penetrable model designed to prevent animals from sneaking through or digging underneath it.

Unplanned Hiatus

Given all the preparatory work that had to be accomplished before crews could begin reconstructing the primary runway, project timing and coordination were critical concerns. Then, just as the first phase of the project was designed and bid, the FAA pulled the brake lever.


Scott **Crimmins**

"They halted the project for about six months in order to re-evaluate program costs," informs Scott Crimmins, CHA's consulting section manager of aviation technical services. "We quit working on design and preliminary engineering for the entire project. Then, when the FAA came back and told us we could start back up, they requested we shave a year off the program schedule.

"As the FAA Airports District Office became more comfortable with the accuracy of the cost estimates, they lobbied the regional office to accelerate the funding stream. Because of the way we had planned the project, we were able to take advantage of the accelerated funding by being ready to quickly advertise construction packages that fit the available funding."

Finally, with enabling projects nearing completion, contractors were ready to begin relocating and reconstructing Runway 4-22. Given last winter's extreme weather, however, airport officials were nervous about breaking ground for the new runway in early March.

To address their concerns, CHA specified the use of large quantities of chemical modifier. "This helped dry the soil and allowed contractors to start earthwork early in the year, when soils would not dry using conventional measures," Schultheis explains.

Construction crews demolished approximately 2,400 feet of pavement from the southwest end of Runway 4-22 and constructed an equal length on the northeast end. The old concrete was crushed onsite and used as base material for the new section of runway. Contractors milled off the top layer of asphalt and incorporated it into the new asphalt mix.

Before reconstruction began, crews relocated approximately 1 million cubic yards of dirt from various sites elsewhere on airport property to use as fill for the new runway

extension. An additional half-million cubic yards, drawn from 9 feet of soil graded off the northeast end of the old runway in order to meet FAA design standards, were moved during construction.

At the peak of construction, more than 100 workers were onsite, reports Dianna Page, EVV's director of marketing and air service development. At one point, the project required so many dump trucks, contractors ran out of local options and had to import more from surrounding counties. "The project had a significant and positive economic impact on the community," Page relates.

Meeting the Challenge

Before closing Runway 4-22, EVV met regularly with airline tenants to update them on the project and facilitate smooth operations.

Because the various enabling projects were so intertwined, it was important to identify lynchpin items early, reflects Nate Hahn, the airport's director of operations and maintenance. "The entire project can be held up if you don't stay a step ahead. In fact, if you're not three steps ahead, you're probably a step behind," he muses.

Airport officials also held several public hearings to keep the local community informed. Residents' suggestions were studied as part of the environmental assessment.

By moving the runway away from U.S. Highway 41, aircraft now have a longer stretch of usable pavement. Under the old configuration, pilots approaching from the southwest could not use the runway's full length because of obstructions on the approach. The move also eliminates the intersection between the primary and secondary runways.

FAA Public Affairs Officer Tony Molinaro categorizes the EVV project as very important. "The project was done on time. And from a safety standpoint, it's important we got this completed," comments Molinaro. "It was a tough challenge for the airport. They had to move a railroad and a state highway. But they jumped right in and figured out how to meet these very challenging tasks. Now they have a safe runway … and hopefully an even more efficient airport."

In retrospect, Joest is surprised that the airport didn't encounter a "big, show-stopping event" while improving the airfield. "When you enter into a project like this, you're always concerned about how wrong things could go," he relates. "We had challenges, but we worked through them. Like any project of this magnitude, you have a few surprises. But when those surprises came up, everybody worked together to find solutions."

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PHOTO BY MCFARLAND JOHNSON

Student Project Leads to Prototype Snowmelt System at Greater Binghamton

By Kristin Vanderhey **Shaw**

Greater Binghamton Airport
FlyBGM.com

factsfigures

Project: Geothermal System

Location: Greater Binghamton (NY) Airport

Delivers Power To: Prototype snowmelt system for apron; air conditioning system for terminal

Total Cost: $1.25 million

Funding: $900,000 from FAA for snow melting system; $350,000 from NY State Energy Research & Development Authority for terminal cooling system

Installation: May 2012 – Oct. 2014

Project Manager: McFarland Johnson

General Contractor: FE Jones Construction

Plumbing: Petcosky & Sons Plumbing & Heating

Electrical: Nelcorp Electrical Contracting

Key Benefits: 50% greater efficiency in air conditioning system, which prevents the annual emission of 93 metric tons of carbon dioxide; powering snowmelt system with geothermal vs. existing oil-fired boilers is estimated to save 10 metric tons of carbon dioxide emissions/year

Officials at Greater Binghamton Airport (BGM) are enjoying the "green glow" of a $1.25 million geothermal system recently installed at the New York facility. In addition to powering a prototype snow melting system that reduces airfield maintenance costs and improves ground boarding operations, the geothermal system also increases the efficiency of the terminal's air conditioning system by 50% and prevents the emission of 93 metric tons of carbon dioxide per year.

And it all started with a group of college kids from the State University of New York at Binghamton.

William **Ziegler**

A team of students, led by Professor William Ziegler, hatched the idea for BGM's geothermal system when competing in the FAA Design Competition. The annual program challenges undergraduate and graduate students to develop innovative approaches to aircraft technology and airport design.

When Ziegler approached BGM about the project, Airport Commissioner Carl Beardsley fostered the idea and connected the student team with McFarland Johnson, the planning and construction company BGM has worked with since the 1980s. The firm is not only well versed in airport operations, but also in geothermal technology from previous projects, explains Beardsley.

As the team brainstormed, the students honed in on BGM's persistent snow management challenges (it receives more than 84 inches per year) and developed an idea to use geothermal technology to power a radiant heating system for melting snow on the airfield. Although the students knew little about the specifics of geothermal energy and radiant heat, they were optimistic about their base idea.

"At one time, I owned a car wash that used a radiant system to heat the floors; so I knew a little bit about it," says Professor Ziegler. "But as far as we knew, there were no airports using it. We started digging in and getting on the Internet and talking to people … and the airport was an excellent resource as our research facility."

Serving as the team's advisor, McFarland Johnson Senior Vice President Chad Nixon encouraged the students to scale back their

initial intention of heating all of BGM's pavement. "I told them that might be a little ambitious, and that led to the idea for the terminal area apron prototype," explains Nixon.

Like many cold-climate airports, BGM spends a significant amount of overall operating expenses on airfield snow removal and deicing. Current industry processes are time-consuming and accrue labor, equipment and material costs. The use of sand can cause damage to aircraft engines, and many deicing chemicals are considered environmentally unfriendly. In addition, the Transportation Research Board has been investigating a potential link between potassium acetate and premature wear on concrete runways for years.

According to Beardsley, BGM budgets approximately $200,000 per year for snow removal. This figure includes the cost of sand, sodium acetate, labor and other related expenses. The airport spends another $200,000 per year for electricity in the passenger terminal building and to light its main apron. Another $150,000 is spent annually heating the passenger terminal building. The students' project took direct aim at all these expenses.

"Radiant heating using geothermal technology is a low-maintenance and environmentally friendly solution for ice and snow prevention on airport surfaces," explains Ziegler.

Geothermal 101

The basic premise of radiant heating systems is to circulate heated fluid through tubing under a surface and radiate its energy evenly to heat a room, surface or building. Geothermal heat pumps do not generate energy; they instead provide a means of harnessing stored thermal energy underground.

Interestingly, geothermal systems can support both heating and cooling requirements.

During winter, geothermal heat pumps collect thermal energy from beneath Earth's surface through a series of pipes, called a loop, installed below the surface of the ground or submersed in a body of water. A secondary pump circulates fluid, typically refrigerant or a glycol/water mixture, through the loop and carries the heat back to the main pump installation. An electrically driven compressor and a heat exchanger then concentrate the energy, making it available for use at a higher temperature.

In summer, a geothermal system acts in a reverse cycle, similar to a refrigerator. Pumps move excess heat from a target location underground into a relatively cool area beneath Earth's surface. By utilizing the ground as a heat sink in the summer, the system offsets the change to soil temperature sustained during winter months around the installation area.

A drainage system is also important, notes Ziegler, because water is inefficient at conducting heat. With a good drainage system, the water is displaced and the geothermal heat pumps can work properly, he explains.

According the students' proposal, geothermal heat pumps are 300% to 400% more efficient than standard power sources and are "topographically suited" for installation at many airports. The collegiate team analyzed successful commercial radiant system installations, expanded previous installations to a scale suitable for airports, and concluded that a radiant system installed during a routine pavement tear-up is a viable alternative to current deicing methods.

The proposal nabbed 1st place in the 2009 FAA Design Competition, Airport Operations and Maintenance category. And in 2012, the FAA awarded BGM $900,000 to design and build a prototype of the students' prize-winning system for melting apron snow.

PHOTO BY MCFARLAND JOHNSON

Under-pavement heaters powered by BGM's new geothermal system help keep snow and ice off the apron.

"I wasn't surprised that the students won; it's a great idea," says Nixon. "The idea of using geothermal and radiant heating at airports has been batted around, but no one had brought it to an airport in this manner."

After receiving FAA funding, BGM successfully applied to New York State Energy Research and Development Authority for an additional $350,000 to help expand the geothermal project for summer cooling. Although the state authority has funded several geothermal system installations in the past, this was the first time it funded an airport project.

Once the grant money was awarded, the airport folded the plan into a large, existing construction project to maximize efficiency. "I would recommend considering a project like this when you have a major rehabilitation project on your apron," notes Nixon. "You wouldn't want to rip out your apron to put this in; it wouldn't be cost effective."

Working For an "A"

As a prototype, BGM's system includes a series of sensors and monitors to gather data about its performance. "We have been engaged in numerous sustainability projects," says Nixon. "These projects can sometimes be difficult to quantify directly, however this project has immediate benefits."

Ongoing testing will help quantify the all-important cost/benefit ratio of BGM's new systems. "We believe in projects that are Earth-friendly, but the project should also consider a monetary payback to the airport. It's being green in more than one way, and we believe that's important for airports," Nixon notes. "Airports are businesses, and they want to be environmentally friendly, but also effective and efficient."

Officials at the New York State Energy Research and Development Authority hope BGM's geothermal system will serve as a model for other airports that want to cut costs, reduce fossil fuel dependence and reduce greenhouse gas emissions. "This project underscores Greater Binghamton Airport's commitment to sustainability," says Todd Baldyga, the authority's director of energy efficiency services. "Projects that incorporate renewable energy and energy-efficient technologies are critical to the state's efforts to scale up the clean energy economy and help to support Governor Cuomo's agenda of a cleaner environment for all New Yorkers."

BGM's initiative also helps create a positive first impression about the community, adds Baldyga. Educational kiosks within the terminal give visitors a glimpse into the geothermal technology being used to power airport systems. The presentations help show the benefits that a renewable energy source such as geothermal can have on the environment, he explains.

"In the winter, our passengers will be safer," says Beardsley. "They can walk to the terminal without worrying about slipping on the snow and ice. And in the summer, we'll be able to reduce our energy costs while still providing a cool, comfortable environment for our passengers. Ultimately, the reduction of energy costs will make us more attractive to airlines, because we'll be able to reduce our overall costs."

Overall, airport officials are very positive about the changes the geothermal system will bring, and McFarland Johnson is working to quantify the changes in objective terms. "We'll document the project and measure it," says Nixon. "And if the system is as successful as we think it will be, we'll keep it in mind for the next opportunity to expand it."

The airport's next step is a full-scale sustainability study, and the geothermal project provided a natural springboard to it.

"This project gives other airports a very good understanding about how a strong, community-oriented collaboration can work," summarizes Beardsley. "In this instance, each group worked together to reach one common goal, and I'm very proud of the results. It ended up being the perfect storm of individuals from education, the private sector and public service."

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Ottawa Int'l Sets Precedent With Grooved Runway

By Mike **Schwanz**

International Airport Authority
Administration de l'aéroport international
Ottawa

factsfigures

Project: Runway Grooving

Location: Ottawa (Ontario) Int'l Airport

Annual Operations: 168,000

Runway Grooved: 7-25

Length: 8,000 ft.

Width: 200 ft.

Approx. Cost: $360,000

Project Duration: 10 days

Contractor: Cardinal Int'l Grooving & Grinding

Post-Project Performance Study: LPS AVIA Consulting

Key Benefits: Increasing safety for aircraft landing on the often-wet runway

For More Information: Consult FAA Advisory Circular 150/5320-12C

When Ottawa International Airport (YOW) added grooves to one of its main runways last summer, it became the first major Canadian airport to do so.

The $360,000 project was undertaken to improve aircraft braking and handling in wet conditions. After operating on the grooved runway for more than a year, airlines are apparently pleased with the change. Response has been so positive, in fact, that the Ontario airport plans to groove its longest runway next summer.

Marc **Gervais**

Marc Gervais, YOW's director of airside operations, explains the research and consideration that preceded the $360,000 project: "We were in the planning process for the rehabilitation of our major runways, and we wanted to ensure that we would reconstruct them to the highest safety standard. Adding grooves, which had already been done by many of our U.S. counterparts, was one option we thought would be beneficial, even though runway grooving is not required by regulation in Canada."

YOW personnel consequently contacted peers at airports in Boston, New York, Minneapolis, Chicago and other U.S. cities with climates similar to Ottawa's. In addition to seeking general feedback about the durability and overall characteristics of grooved runways, they were especially curious about how grooves perform during winter — an initial concern raised by management.

In addition to plenty of rain, YOW typically receives about 92 inches of snow and five or six ice storms per year, Gervais reports.

"Fortunately, we had input from a much smaller airport in Canada (Norman Wells

Airport, in the Northwest Territories) that showed no adverse winter effects," he notes. "That facility regularly experiences bad weather, and added grooves a few years ago."

With support from senior management, the board of directors and the airport's major carriers, YOW added grooving to its existing runway rehabilitation plans.

Crews installed grooves the entire length of Runway 7-25 during summer 2013 — a full year after the 8,000-foot runway had been reconstructed. The lapse between the projects allowed time for the asphalt to fully cure. Contractors followed the standard FAA configuration of ¼-inch wide, ¼-inch deep grooves, spaced 1½ inches apart, center to center. The project took 10 days and cost approximately $360,000.

"Costs for grooving depend on the hardness of the surface being grooved," explains Gervais, noting that concrete runways are the most expensive to groove. "With other factors, the price can range from $1.15 per square meter to $4 per square meter."

Post-project research conducted last winter by LPS AVIA Consulting validated YOW's decision to groove Runway 7-25. "The report concluded that the grooved runway has had a beneficial effect on aircraft braking performance without negatively impacting runway friction in winter," Gervais summarizes.

Why it Works

John Roberts, executive director of the International Grooving and Grinding Association, emphasizes the safety advantages of runway grooving projects. "When a pilot is landing on a wet runway and steps on the brakes, there is much more even braking with a grooved runway," Roberts explains. "Grooving minimizes the potential for hydroplaning, and delivers the best possible overall ground handling and stopping characteristics that today's state-of-the-art technology can provide."

The nature of the work required to add grooves allows airports to keep runways open intermittently throughout construction. "If you have an 8,000-foot runway, you can do the grooving in sections each night for a few nights, until completion. The runway can be used that morning, without missing a beat," he adds.

Some airports, however, prefer to close a runway to allow crews longer work periods. "If you are able to completely shut down a runway for a few days, that obviously lessens project completion time," Roberts says.

Grooving operations can occur in most weather conditions, including driving rainstorms, he adds. The exception is temperatures at or below freezing, due to the use of water to cool the cutting blades.

Several factors affect project cost, Roberts notes:

- Available work periods. Allowing a contractor to work 24 hours a day instead of only eight allows for better equipment utilization and speeds project completion.
- Type of surface. Concrete runways require more time and higher-quality diamond blades because they contain harder aggregate than asphalt surfaces.

The airport allowed the asphalt on Runway 7-25 to cure for a full year after its last renovation before adding grooves.

- Runway length. Some airports reduce costs by adding grooves only to the ends of a runway. Projects funded by the FAA, however, must groove the entire length.

Roberts encourages airport managers to consider the safety enhancements as well as the costs of runway grooving. This is especially important for managers at airports in Canada and Europe, where grooved runways are less common, and misperceptions still prevail about grooves complicating winter operations and maintenance, he notes.

"Hopefully, the success shown at the Ottawa airport and other hubs located in the northern United States will help other airport executives convince their boards that grooving is an economical and time-tested investment in safety," Roberts comments.

Based on the way Runway 7-25 performed during the particularly harsh winter of 2013-2014, YOW plans to repeat the grooving process next summer on its recently reconstructed Runway 14-32, which is 10,000 feet long.

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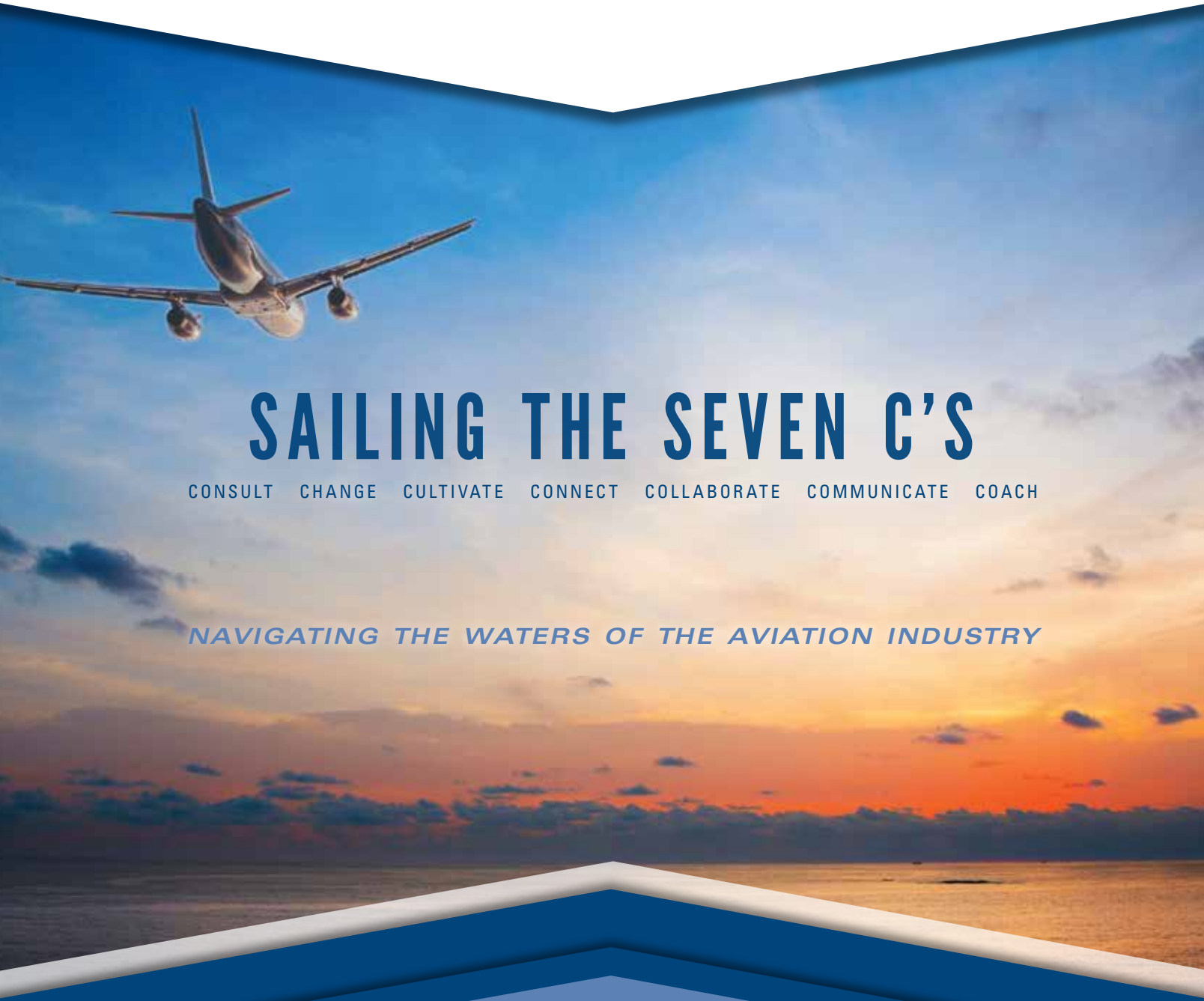

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Orlando Sanford Int'l & FAA Test Artificial Turf As Tortoise Barrier

By Nicole **Nelson**

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Project: Artificial Turf Test Plot

Location: Orlando Sanford (FL) Int'l Airport

Objective: Determine whether artificial turf prevents gopher tortoises from digging burrows

Method: 1-year study of 2 different turfs, installed with & without vegetative growth inhibitor

Turf Installation: Feb. 2014

Stakeholders: Sanford Airport Authority, FAA Airport Technology Research & Development

Turf Suppliers & Installers: AvTurf; ProGrass

Test Area: 153,000 sq. ft. subdivided into 4 different sections

Approx. Cost: $580,000

Funding: FAA

Other Wildlife Mitigation Methods Used: Cannons, pyrotechnics, lights, sirens, traps, etc.

Vendors: Reed-Joseph, Margo Supplies, Atlas Ammo, etc.

George Speake lightheartedly refers to Orlando Sanford International Airport (SFB) as the "home of gopher tortoise condos." But the long, deep burrows he jokes about are located within the Florida airport's runway safety area; so they actually present a glaring safety problem for SFB's good-natured vice president of operations and maintenance.

George **Speake**

Because gopher tortoises are a threatened species, the reptiles *and* their burrows are protected under Florida law. What started as a state issue morphed into a federal matter. The broader regulatory attention, however, elicited resources and grant money for research. In spring, a one-year study began at SFB to determine whether artificial turf can keep gopher tortoises out.

So far, the results look promising.

How Bad Is It?

"Go on Google Earth right now and pull up the airport," Speake urges. "If you zoom in on the northwest corner of the airport and around the Runway 18 approach, you can see little white dots all over the place. The white dots are gopher tortoise burrows — lots, and lots, and lots of them."

Realizing the serious safety problems lurking in all those little white dots, Speake turned to the local FAA Airports District Office for help excavating, capturing and relocating the herbivore scavengers that were digging up crucial sections of his airfield. A survey conducted last June by FAA Wildlife Biologist

John Weller documented nearly 1,200 burrows within the airport's perimeter fence — some stretching 48 feet long; others reaching nearly 10 feet deep.

"You cannot just dig a hole and put the equipment out there every time you see a burrow and not impact (aircraft) traffic," Speake laments. "On top of that, the tortoises are just going to come back. We excavated over 800 burrows from our safety areas; and by the time we were done, we had 12 back in the areas that we had just cleaned out!"

Ryan King, program manager for FAA Wildlife Hazards Research and Development, explains that the burrows, whether occupied by tortoises or not, are important to the local ecosystem because other species such as snakes and rodents also take refuge within them.

"It makes mitigating a difficult issue, because you have to have multiple permits on various levels just to move and handle gopher tortoises," says King. "You can't just pick them up, take them out, bulldoze the burrows and call it done."

The Tortoise & the Dare

In addition to consulting FAA's Airport Division and Airport District Offices, SFB officials organized a conference with biologists from the U.S. Department of Agriculture and the state and U.S. Fish and Wildlife Services. Consensus among the wildlife specialists was to have the airport serve as a test site for an artificial turf wildlife deterrent. FAA's Airport Technology Research and Development branch was pulled into the mix, and a 3.5-acre area around the approach to SFB's test runway was selected as the test site.

After receiving the general requirements, specifications and construction standards for the project, the airport issued a request for proposals and received three responses. ProGrass and AvTurf earned the contract with a winning bid of approximately $580,000 to provide and install two different weights of turf on a test plot around the perimeter of the runway's blast pad.

AvTurf President Daniel McSwain explains that the test plot includes 22-ounce and 38-ounce turf products that have been subdivided to contrast the low and high densities of the plastic grass blades.

"We are continually trying to find more cost-effective ways for airports to be able to enhance airport safety with the use of artificial turf," McSwain explains. Testing the 22-ounce product next to the 38-ounce product will show that we can reduce costs while still maintaining maximum safety."

In addition, the turfs' sand infill ballast is being tested both with and without a specially formulated vegetative growth inhibitor.

Before the turf was installed, a biologist that specializes in turtles marked existing burrows with flags, and then lowered a camera on a scope into every burrow to see if it was occupied. If a gopher tortoise was found, it was removed and relocated.

"I believe we mapped 120 burrows under the (test site); and of those, nearly 100

The airport uses canons and several other devices to help disperse birds and other animals.

were occupied," King reports. "Those tortoises were removed, and then the area was excavated and leveled and prepared for the artificial turf."

The FAA's yearlong process of monitoring the area began in May. Motion-activated cameras that operate day and night take snapshots of wildlife around the artificial turf to help document its performance. Since the artificial turf was installed last February, the FAA has not seen any burrowing activity in the test area, King reports.

"The gopher tortoises will walk on the artificial turf occasionally … but there is no evidence of any burrowing or attempts to burrow through the artificial turf," he details. "The jury is out, because it is a one-year study; but so far, there have been no indications or evidence of burrowing. So as a barrier to burrowing for gopher tortoises, artificial turf looks promising."

FAA is also studying how vehicles — operations trucks, aircraft rescue and firefighting equipment and even aircraft — perform on the material.

Other Tools in the Arsenal

In addition to testing the artificial turf, personnel from FAA Wildlife Hazards Research and Development also suggested that SFB install an "exclusion barrier" to stop the tortoises from digging onto airport property in the first place. The barrier would essentially be a fence that runs along the perimeter fence of the airport, either above or below ground.

Aircraft rescue and firefighting vehicles test the turf for support.

Airport vehicles perform preliminary braking action tests on the artificial turf.

SFB has identified the north end of the airport, where gopher tortoise activity is known to be a higher volume, as the most likely site for the barrier. Although the fencing has yet to be selected and installed, King says it will likely be chain-link or high-tensile plastic.

"The important thing is to make sure that the runway safety area is free of any condition that would make it unsafe for an aircraft," says King. "For that reason, we are attempting to keep gopher tortoises out of the airport entirely. Right now, they are still burrowing on areas of the airport, but their burrowing has been mitigated exactly where the artificial turf is."

But gopher tortoises aren't the only wildlife challenge at SFB. The airport also deals with foxes, coyotes, eagles and other birds. "We have implemented every single device that we have been able to find that we felt was not a waste of money or a further potential hazard," Speake reflects.

As a result, the airport's arsenal includes cannons, pyrotechnics, lights, sirens and traps. "Animals will habituate to anything," he reflects. "So it takes all of that, along with taking animals, in order to have an effective wildlife program."

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Kerrville Municipal Builds Hangars with Support From City & County

factsfigures

Project: New Hangars
Location: Kerrville (TX) Municipal Airport/Louis Schreiner Field
Scope of Development: 12 T-Hangars
Cost: $801,000
Funding: TxDOT; FAA; city; county
Primary Contractor: Lansford Co.
Hangar Lease Rate: $325/month
Key Benefit: New $46,800/year revenue stream for airport

Located in "Hill Country" just 65 miles northwest of San Antonio, the city of Kerrville, TX, (population 22,344) has been home to the Mooney Aviation Company for more than 60 years. According to local lore, the Mooney brothers moved their single-engine aircraft company there from Wichita to be closer to the family farm.

Today, Kerrville Municipal Airport/Louis Schreiner Field (ERV) plays an important role serving the high-tech corridor that has developed in the area — and is still international headquarters for Mooney, which resumed manufacturing operations earlier this year. Throughout the years, ERV has grown steadily to accommodate business travelers and now averages about 60,000 operations per year. Recent airfield improvements include runway and taxiway upgrades, the addition of an instrument landing system, and updated security. A new terminal was added in 2007.


Bruce **McKenzie**

The airport's latest infrastructure enhancement is the addition of 12 new hangars, an $801,000 project funded by the Texas Department of Transportation (TxDOT) and FAA. Typically, governmental agencies manage TxDOT aviation projects, but ERV's recently completed project was managed by the local airport board to coordinate participation with the city and county. The development dramatically increased the airport's aircraft storage capacity, and will provide an additional income stream for the city/county-owned facility, explains Airport Manager Bruce McKenzie. Currently, ERV has 182 based aircraft that operate from two runways (3,600 feet and 6,000 feet).

By Dan **Vnuk**

"Hangars normally are a great revenue-generator for small general aviation airports," says McKenzie. "(Previously), the airport had 16 T-hangars, all of which were leased, and there was a waiting list of people saying they would rent one if one was available."

The airport plans to lease the new hangars for $325 per month, generating about $46,800 of new revenue each year for the airport. "We began diligently working on the proposal once the go-ahead was given," McKenzie says. "It was also at this time we were notified that the Texas Department of Transportation Aviation division approved a grant request to fund 90 percent of the new T-hangar project."

FAA funds for the project were allocated to ERV under a trial program that allowed the local airport board to coordinate participation

The airport's additional hangars are expected to generate about $46,800 of new revenue per year.

with the city and county. "Specifically, the city pledged to pave part of the project and the county to complete the site work," explains McKenzie. "Both contributions reduced the overall cost of building the hangars."

History of Support

Kerr County has had a long history of matching funds for airport improvements ever since the city of Kerrville deeded it one-half interest in the facility in 1952. In 1978, the city annexed 64 acres along the state highway that borders the airport and 459 acres of airport property into the city limits; and extensive development occurred on the east side of the airport during the following 10 years. A fixed-base operator and other tenant activities (three aircraft service operations and an air EMS unit) developed around the ramp area as it exists today. Mooney partially occupies an area west of the secondary runway.

In 2008, a joint city/county board with five members was established to manage the airport. "(The board's) only agenda is to make this airport the best that it can be for the community," notes McKenzie.

In 2011, TxDOT recognized ERV as the state's General Aviation Airport of the Year. "This airport is the gateway to our community," says McKenzie. "We have tourists, hunters, a 737 that flies in for a huge summer camp, as well as other industries that fly in and use our facility. Our recent improvements give Kerrville the opportunity to flourish."

McKenzie is also quick to acknowledge the TxDOT Aviation Division for its guidance before and during the airport's hangar project.

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Monroe County Airport Repairs Airfield Sinkholes

By Kathy **Scott**

factsfigures

Project: Sinkhole Repair

Location: Monroe County (IN) Airport

Cost: $11 million

Funding: $9.8 million from FAA; $1.2 million from Monroe County & IN Dept. of Transportation

Scope: 3 Sinkholes Along Main Runway

Project Engineer: Hanson Professional Services

Contractors: Crider & Crider; Dave O'Mara Contractor

Key Benefit: Increased airfield safety

Catastrophic sinkhole incidents are horrific events that take victims by surprise and leave onlookers shaking their heads in disbelief. From the Florida man who was killed when his bedroom floor collapsed beneath him last year to eight cars being swallowed from the National Corvette Museum earlier this year, they're all hard to fathom.

Last fall, Monroe County Airport (BMG) in Bloomington, IN, completed an $11 million project to increase runway safety and ensure that the Indiana airfield would not become the subject of the next sinkhole disaster. Armed with carefully engineered plans, crews literally worked around the clock to repair an area near BMG's main runway that was 260 feet wide and up to 30 feet deep. After mending the damaged areas using a geogrid material, workers filled the holes with rock, geotechnical fabric and soil.

When they were finished, you could practically hear Airport Director Bruce Payton's blood pressure drop.

Photo by Deborah Stroud-Hubbard/ *Hoosier Times*

Bruce **Payton**

Statistically speaking, sinkholes are more common than many people assume. According to geologists, Florida alone has more than 19,000. Any area characterized by karst topography — land formed from water-soluble rock such as limestone and carbonate rock — is at risk for sinkholes. While most don't prove tragic, they are unpredictable and contain the potential for dire consequences if not found and addressed.

There's a *What* Near Your Runway?

As shocking as the term "airfield sinkhole" sounds, Payton wasn't completely surprised when one was detected near BMG's main

runway in the early 1990s. The general landscape around Bloomington, IN, is dominated by karst topography; and he knew that crews had cut into a "cave" when building the runway back in 1966.

Initial tests showed no imminent signs that the sinkhole would grow; and the airport stabilized the site with cement fill. Payton and other officials, however, knew that the fill was not a permanent fix.

Mother Nature reminded them of the ongoing issue throughout the following years. Between 1996 and 2013, Monroe County experienced 73 hailstorms and six floods, putting more stress on the airport's already unstable sinkhole area. By May 2011, after storms dropped more than 11 inches of rain in the area, three sinkholes were identified in the runway safety area and along the pavement of the airport's main 6,500-foot runway.

"One was encroaching on the asphalt edge," recalls Payton. Based on years of rainwater erosion, it was critical to determine the stability of the pavement.

Payton requested and obtained $50,000 in emergency funds from the construction account of the county-owned airport and hired Hanson Professional Services to manage the preliminary investigation. In addition to having knowledge about the airport's karst terrain from previous projects, Hanson engineers had access to specialized equipment to assess site conditions, notes Payton.

The engineering and planning firm's immediate objective was to begin assessing whether the runway was viable for continued use. Later, team members performed an environmental assessment to help guide the project's strategy.

Throughout the process, Hanson leveraged several different testing technologies and cross-referenced their results. Initially, the Indiana Department of Transportation used a falling-weight deflectometer and ground-penetrating radar to gauge the size of the sinkholes. In addition, Payton invited geology experts from Indiana University to assess the stone and other airfield conditions.

"Electrical resistivity testing provided the best approximation of the subsurface voids," notes Hanson Project Manager Joe Worley. "Ground penetrating radar is inconclusive in clay soils."

Joe **Worley**

Hanson's team analyzed the data and developed seven different scenarios based on a menu of risk assessments and potential responses. Worley describes the option that was selected as "environmentally friendly mitigation that would bridge over the karst area, yet continue to allow ground water to maintain its natural flow."

With the project strategy selected, Hanson applied for FAA funding on the airport's behalf. In the meantime, the runway was deemed usable if the surface holes were temporarily secured with coarse aggregate and covered with load-bearing steel plates. Not all charter services felt comfortable with the temporary fix, though; and BMG lost revenue while waiting for funding.

Ultimately, FAA contributed $9.8 million to the project, and the county and Indiana Department of Transportation funded the remaining $1.2 million.

The Big Fix

Bloomington contractor Crider & Crider and Dave O'Mara Contractor, which has an office in Bloomington, were awarded the contract for airfield repairs. While the companies were chosen based on their bids, Payton stresses how crucial it was having local businesses work

Because karst topography is common in the Bloomington, IN, area, BMG was a likely site for sinkholes.

on the project. In addition to their familiarity with karst topography, the contractors were available to begin immediately — a substantial advantage, given the project's 68-day project window.

"We required all involved to meet the deadline," Payton relates. The contractors, testing services and Hanson consequently had to work 24 hours a day, seven days a week.

Excavation began on Sept. 16, 2013 — the very day that the Monroe County Board of Aviation Commissioners gave notice to proceed, notes Payton. With the runway closed, workers began by removing nearly 300,000 cubic yards of earth from the suspect area. Next, crews repaired the hole using a geogrid material topped with layers of various gradations of large and small stones, a geotechnical fabric and soil.

The project lost two days to rain, and the main runway reopened Nov. 19, 2013 (precisely two days behind schedule.)

The airport and Hanson both consider the project a big environmental success. The repair strategies used maintain the natural flow of ground water through bedrock cracks as much as possible, explains Payton. Additionally, asphalt from the excavated material was milled and earmarked for recycling into future pavements; and all new stone used on the project was provided by a quarry less than a mile away.

On the negative side, airport tenants felt an economic squeeze during the construction phase of the project. With the airport's main runway closed, Cook Aviation had to temporarily move its larger aircraft to Indianapolis International Airport. BMG Aviation, the privately owned fixed-base operator that provides fuel and maintenance for the field, also took a hit. The airport's bottom line also suffered from decreased flowage fees.

Given the revenue losses, Payton was especially glad that area contractors won many of the contracts for the project. Hiring local companies helped mitigate the net effect on Bloomington's overall economy.

Payton was also pleased that the repairs were made before any more moisture soaked into the airfield. Just two weeks after the runway re-opened, the area received its first snowfall. "That snow stayed on the ground," he recalls, "and winter continued with record snowfall for this portion of Indiana."

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Why Peer Reviews Are More Important Than Ever

When it comes to aviation peer reviews, the more things change the more they stay the same. Content changes relentlessly, but form does not — at least it should not, and for very good reason. The need for aviation professionals to convene and exchange information through a structured process is a constant.

Actually, there might be one change: With the current lightning-speed advances in technology and processes, peer reviews are more important now than they ever were.

This is not the aviation industry I joined 47 years ago. Yes, we're still flying planes and we still have pilots and airports. But the context of virtually everything else has changed, particularly when you take into account events like Sept. 11. In fact, security serves as a perfect example. Previously, airport security was largely about figuring out where to put metal detectors and aircraft operating area fencing. Today, security is an integral part of airport design — from conception through construction and operation. That's *not* a small change.

Still not convinced?

When I started the first aviation peer review group 25 years ago, I never would have believed that "clouds" would eventually refer to data storage and transfer as well as airfield weather conditions. Because information systems are changing so rapidly and becoming more complex, and because they are affecting more areas of our industry, the importance of meaningful exchanges about new technology and processes could not be greater. As the margin of error slims with each technological advance, aviation professionals can easily go off the rails if they don't gain from the experience and lessons learned by others.

If you're still not convinced, let me illustrate it this way: Each year, I present a guest lecture titled *Airport of the Future* for an Airport Systems Planning and Design course at the University of California, Berkeley. This year, my presentation contained some of the following issues, which I gleaned from recent peer reviews and various LinkedIn groups:

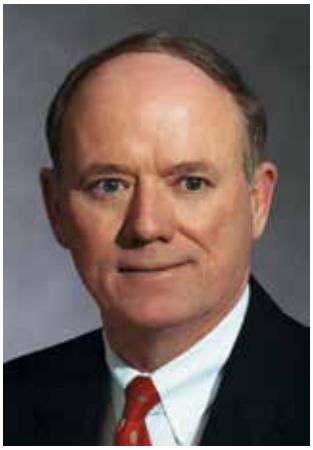
- HPD (Health Product Declaration) and EPD (Environmental Product Declaration) for material selection
- LCA (Life-Cycle Assessment)
- Air-rail links
- Centralized utility plants
- Project validation, costs and risk identification
- Procurement and alternative project delivery methods
- Multiple agency coordination
- Public-private partnerships
- Technology and security
- Runway improvements to help with climate change
- Cybersecurity and the role of airports in resiliency planning

How many of these topics would have been important 10 years ago? Five years ago? How many of these topics could be eclipsed by something else tomorrow?

In truth, none of us knows what tomorrow will bring. But the peer review process gives us a mechanism to handle the future, no matter what it holds.

Now let me give you a recent, industry-specific example of the value of peer reviews: International traffic is one of the few bright lights for airlines at present. But increased traffic creates greater challenges for Customs officials. Recently, some airports installed passport readers and kiosks that markedly improve flow rates. Not only does this speed the Customs process, it also provides an added measure of security, as Customs officials are freed up to better observe passengers. Implemented initially in Canada (because staffing cutbacks there preceded reductions here), the smooth U.S. implementation of Customs kiosks came as a direct result of a peer review! Canadian officials explained how they rolled the kiosks out and the issues they encountered — the type of knowledge that can only be derived from informed, experienced users.

So you see: The more things change, the more they really do stay the same. Though the content of aviation peer reviews will change, the form does not. And neither does the need for peer reviews. With funding more scarce than ever before and technology changing so rapidly, peer reviews are actually *more* important now than they ever were.



William A. Fife

William A. Fife, P.E., founded the aviation peer review process, a method that has benefited more than 150 airports throughout the world, including almost all of the top 25 U.S. airports. Formerly, Fife served as general manager of Aviation Planning and Technical Services for the Port Authority of New York and New Jersey. As principal of The Fife Group, he is a senior advisor to Weidlinger Associates and other firms.

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