

Airport Improvement



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Bismarck Airport Maintains Operations While Replacing Runway

RUNWAY & RAMP

SPECIAL EDITION



Paoli Municipal Makes Significant Improvements to Its Sole Runway

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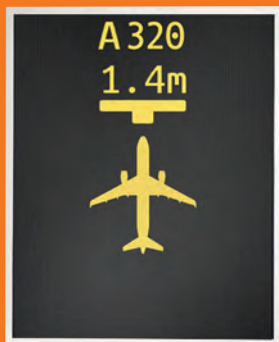
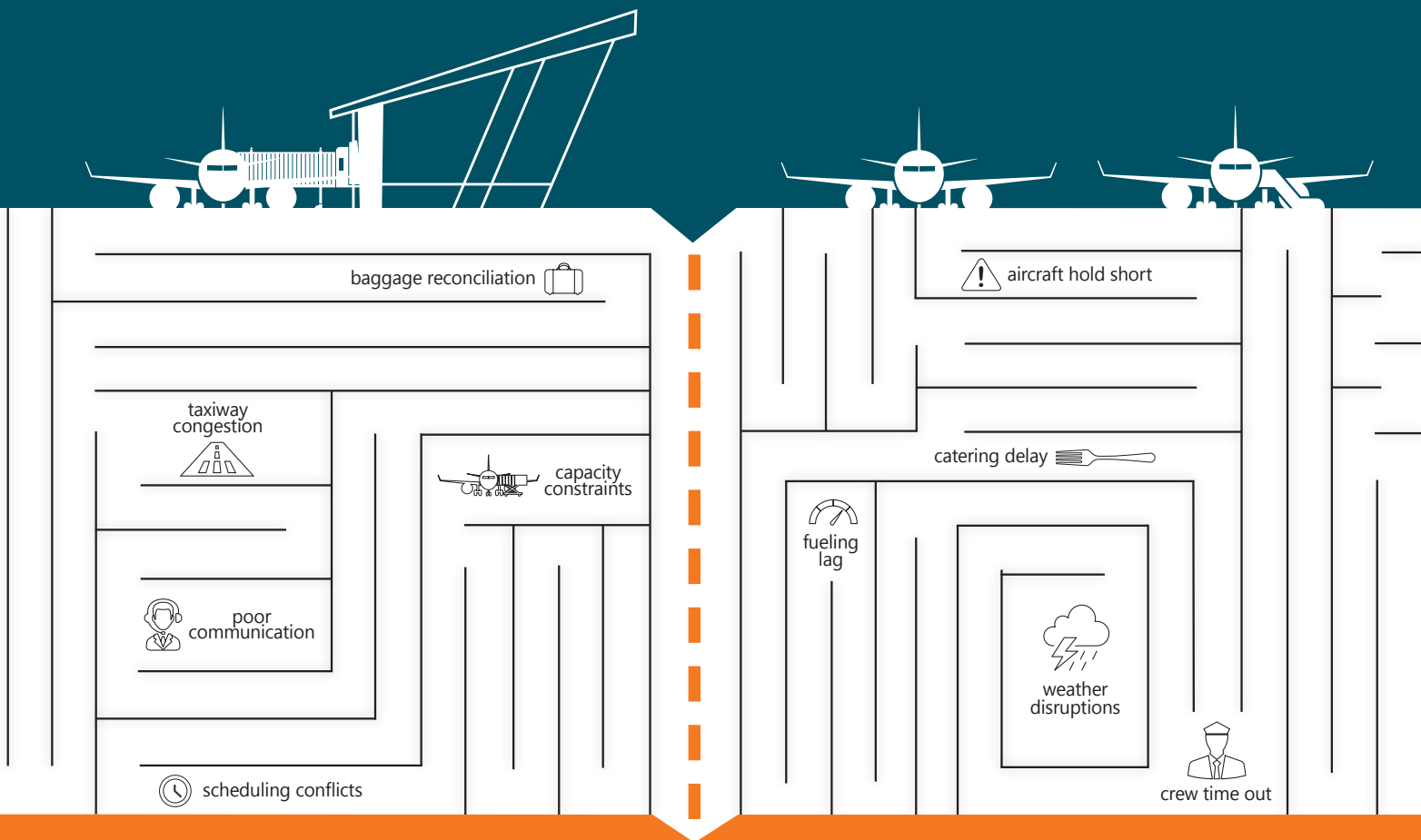


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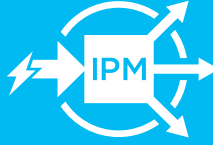
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Time to Vote

Welcome to October's issue. It's our annual Runway & Ramp Special Edition.

Rather than provide a preview of what's inside, there's another important topic I'd like to call to your attention. We all need to vote!

With the general election coming November 3, now is the time to plan. I'm not suggesting that we become one-issue voters, but it *is* important to know how candidates at the local, state and federal levels feel about our industry. We need to consider how candidates stack up on a host of issues, including aviation. This takes a little homework, and now is the time to do it. Given the way our industry is financed, there are jobs at stake here. We need to elect candidates who don't just

pay lip service to airports, but those who will vote for money to be spent on them.

And here's an appeal to all of the airports, consulting firms and industry suppliers out there. Help your employees help themselves, and our industry, by making it as easy as possible for them to vote. The U.S. typically has an embarrassingly low voter turnout compared to other developed countries. When you factor in the COVID-19 pandemic, the standard situation becomes even more problematic. With fewer polling places, longer lines and questions about our postal service being able to deliver absentee ballots in time, there are new obstacles voters need to overcome this year.

Proactively encouraging employees to vote isn't just the right thing to do,

it could also help facilitate the election of candidates who support our industry. Your part can be as simple as allowing employees to vote during the workday, hosting a voting drive or providing "how to vote" materials. For more ideas, visit maketimetovote.org. It's a completely nonpartisan movement that more than 700 companies had already joined by late August, when I wrote this.

Be a leader. Help get out the vote.

Cheers,

Paul



PAUL BOWERS, PUBLISHER

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Bismarck Airport Maintains Operations During Runway Replacement Project

BY BRIAN SALGADO





There were plenty of factors that could have forced Bismarck Airport (BIS) to shut down while crews replaced its 8,794-foot main runway: an unusually high water table, the diverse needs of five different air carriers and a construction schedule heavily influenced by funding. Despite these challenges *and* an early winter snowstorm, the North Dakota airport managed to remain open for traffic throughout the \$64 million project.

“We did not want to see our community lose access to the national airspace system while the runway was being reconstructed,” says Airport Director Greg Haug.

Runway 13-31, originally built in the 1950s, had been maintained as well as possible but was far beyond its useful life, he explains. During the course of the full-length, full-width replacement that concluded in October 2019, BIS also made the change from asphalt to concrete pavement for greater longevity and decreased maintenance costs.

When airport officials started planning the project with engineering consultant KLJ, the FAA indicated it would need to deliver funding over three years.

“We had to break out the phasing based on what we knew about funding,” says KLJ Project Manager Tom Neigum.



GREG HAUG



TOM NEIGUM



FACTS & FIGURES

Project: Runway Reconstruction

Location: Bismarck (ND) Airport

Owner: City of Bismarck

Cost: \$64 million

Funding: 70% FAA; 25% city of Bismarck; 5% North Dakota Aeronautics Commission

Construction: June 2017 to October 2019

Carriers Affected: Allegiant; American Airlines; Delta Air Lines; Frontier Airlines; United Airlines

Engineering Consultant: KLJ Engineering LLC

Construction Contractors: Strata Corp. (Phases 1 & 2); Northern Improvement Co. (Phase 3)

Electrical Contractors: Edling Electric (Phase 1); Strata Corp. (Phases 2 & 3)

Geogrid Systems: Tensar BX1200 (Phase 1); Thrace Linq TLG-12 (Phase 2); Tensar BX Type 2F (Phase 3)

LED High-Intensity Runway Lighting: ADB SAFEGATE

Airfield Signage: ADB SAFEGATE

Pavement Sensors: Vaisala

Awards: Construction contractor Strata Corp earned back-to-back Gold awards for concrete work from the North Dakota Ready Mix & Concrete Products Assoc.

The first phase of the project started in summer 2017 and focused on the first 2,200 feet of the runway's south end, with work extending through the intersection of the crosswind runway. This required BIS to temporarily shorten the main runway to three different lengths, ranging from 5,450 feet to 7,050 feet. Most aircraft operations were able to continue as usual. Phase 1 cost approximately \$25 million to complete.

The second phase, which also cost about \$25 million, reconstructed the next 5,500 feet from just north of the crosswind runway toward the north end of the main runway. Work ran from spring to fall in 2018 and required the airport users to operate on the 6,600-foot crosswind Runway 03-21.

During Phase 3, crews replaced 1,100 feet on the north segment for \$14 million. An unseasonably early snowstorm in October 2019 dumped 16 inches of snow on Bismarck and caused the final phase to extend past the deadline about one week.

Funding for the \$64 million project came from three sources: the FAA, the North Dakota Aeronautics Commission and the airport itself, which is run by the city of Bismarck. (For more details about the funding process, see sidebar on Page 14.)

Years in the Making

The origins of the project date back to 2011, when BIS had KLJ conduct a geotechnical evaluation of the pavement. The report

revealed that the transverse cracks were so bad that pavement on either side of the main crack was also cracking and hinging, with pavement on both sides dropping lower and lower. Core samples of the runway confirmed the composition of the many different pavement sections from one end to the other, varying from 9 inches with a gravel base to 22 inches on top of dirt with no gravel base. The consulting engineer's report also revealed that groundwater was causing problems underneath the pavement and heaving during freeze/thaw cycles.

Haug and his team knew the runway would soon need substantial upgrades due to its declining condition and advanced age. Initially, they thought a 4- to 6-inch mill and overlay would be needed. However, as planning for a mill-and-overlay fix progressed, it became apparent that the problem was worse. The longitudinal and transverse cracking and differential movement of the pavement was progressing at a much faster pace than expected, explains Haug.

In 2014, a significant amount of foreign object debris on the pavement made it imperative for BIS to do something to keep the runway safe and operational. As airport leaders worked with FAA to justify a complete reconstruction of the runway, they settled on a "keel project" that proceeded with a 4-inch mill and overlay of the center 60 to 75 feet—the section in the worst condition. This allowed the airport to improve safety until funds became available for a complete runway reconstruction.

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Water Table Issues

The pavement section was a major challenge for the design team. Knowing that the airfield's groundwater was only a few feet under the surface, the big question was: What would hold up to North Dakota's grueling temperature extremes, which can range from -40 to 110 degrees Fahrenheit?

Ultimately, KLJ settled on a 59-inch section that provided partial frost protection. Full frost protection would have required a more costly 72-inch pavement section. In addition, the design added a drain tile system to remove groundwater from underneath the new pavement.

The airport and KLJ also secured approval from the FAA to utilize 12 inches of recycled asphalt millings at the bottom of the pavement section and on top of a geogrid material instead of following the standard practice of scarifying and recompacting the bottom 12 inches of soil. This created a very stable construction platform to build upon, explains Neigum.

On top of that, crews installed a geotextile fabric, 17 inches of subbase, 8 inches of imported crushed aggregate base course, 6 inches of cement-treated base course and 16 inches of concrete pavement to top it off.

"Having the geogrid and the 12 inches of recycled asphalt millings was the saving grace for us," Neigum reflects. "If the

FAA had told us we had to construct it the traditional way [recompacting], I'm not sure we would have been able to meet compaction requirements and construct the pavement section with our limited construction season."


In order to meet FAA standards for the crushed aggregate, the contractor imported aggregate from Minnesota and Montana. Haug notes that the airport tried to source material from local vendors to keep costs down, but the quality of aggregate in the Bismarck region does not meet stringent FAA requirements.

New Practices

Switching from asphalt to concrete runway pavement is requiring the airport to change some of its snow and ice control practices.

One issue is that concrete reacts to winter weather differently than asphalt. In particular, asphalt absorbs heat better, and consequently burns off more snow and ice as it heats up. Since concrete does not share this characteristic, BIS will need more deicer to maintain the runway during winters. The airport has prepared for the upcoming winter season by stocking an additional 10,000 to 15,000 gallons of pavement deicing chemicals to keep planes flying on schedule.

Haug considers the additional cost for deicer miniscule compared to the ongoing repairs and maintenance that asphalt requires.



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He and other airport leaders know that winters will be forever different for BIS snow removal crews, but they are confident that the advantages of concrete will outweigh the advantages of asphalt.

Coordination Was Key

Haug notes it was fairly complicated to work with air carriers throughout the project, because it included numerous changes to the usable lengths of both the main and crosswind runways, especially during the first phase. But maintaining adequate runway length for airline operations was crucial.

During Phase 1, the useable runway and length changed three times. For six weeks, the main runway was 5,450 feet and accommodated general aviation aircraft, while the airlines used the 6,600-foot crosswind runway. For the next 10 weeks, the main runway had 6,300 feet of usable length and accommodated all traffic while the crosswind runway was closed for intersection work. The last four weeks of the first phase had all traffic on 7,050 feet of the main runway.

“The airlines were really good to us during all phases of the construction,” Haug reports. “They changed equipment as much as they could and/or needed to in order to keep our service alive.”

Haug credits Assistant Airport Director Tim Thorsen for managing coordination between the project team and the five different airlines that serve BIS. Informing all stakeholders about the construction schedule long before shovels hit dirt was especially important, he emphasizes.



TIM THORSEN

“We started talking with the airlines about a year ahead of groundbreaking,” Thorsen recalls. “As we got closer to construction, we started sending diagrams and emails every month with updates. So they ended up using airplane types that would be compatible with the runways we had available.”

Project Within a Project

Working through the details of airfield work that would affect FAA services and equipment was another complicating factor.

“It was like a project within a project,” Thorsen relates. “The FAA is fastidious with its requirements, so we worked with them back and forth to get what was needed. We wanted to figure out what would work for us *and* meet the FAA requirements.”

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The FAA and airport entered into four reimbursable agreements: two for flight checks of the new runway, one for the repair, replacement or relocation of FAA equipment, and another for planning.

“Obviously they were involved in the project all along,” Haug says. “We had meetings with them monthly as it was progressing over the course of three years, and they noted that there was going to be impact.”

For example, crews had to lower the main cable running underneath the runway from the air traffic control tower to the airport surveillance radar because the horizontal profile of the new runway changed according to current FAA design standards—as much as 5 feet in some areas. New cables were bored in and pulled through the conduit underneath the runway at a deeper depth, and new splice boxes were installed on both sides of the runway.

The project also required modifications to the safety areas of the instrument landing systems on both ends of the runway.



The airport switched from asphalt to concrete during the full-length, full-width replacement project.



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Riding the Federal Funding Rollercoaster

The original cost estimate for a complete reconstruction of the 8,794-foot main runway at Bismarck Airport (BIS) was \$70 million. That left Airport Director Greg Haug in a lurch because at the time, FAA could only commit to paying for 53% of the cost even though the project qualified for 90% funding.

That inspired the project team to embark on a series of design changes that brought the cost down to \$67 million before finally going out for bids—still a lofty sum for BIS to cover the balance of, notes Haug.

However, through a series of fortunate events and fortuitous timing, FAA wound up covering about 70% of the costs.

Since BIS bid the project in three phases, work for the final phase of construction was being bid just as Congress passed a \$1 billion supplemental funding program for airport infrastructure projects, which was distributed as Airport Improvement Program discretionary grants.

Among other things, projects had to be “shovel-ready” (bids in hand, ready to begin) and highly visible to qualify. The full-length reconstruction of Runway 13-31, already through its first two

phases, met all the requirements, and BIS was one of 37 U.S. airports to receive money from the first wave of supplementary funding. In fact, the \$9.7 million grant BIS received was the sixth-largest that was awarded in the first round.

“It was a funding kicker for us, and it helped us with the overall cost of our project,” Haug remarks. “When we looked at the requirements and the type of timeframe for this program, we realized we met every single requirement with our runway project. It couldn’t have been better for us.”

In the end, FAA covered 70% of runway project, the city of Bismarck paid 25%, and the state of North Dakota covered 5%—*much* better than the 53/47 split the airport originally faced.

“Reaching that 70% mark was a godsend,” Haug recalls.

After all the ups and downs of the funding process, BIS leaders had everything they wanted for the new runway...except upgraded lighting. The one aspect of the project not approved by the FAA was LED high-intensity runway lights.

But that, too, worked out. And excellent timing again played a major role.



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While working on the original design for the overall project, Haug and Assistant Airport Director Tim Thorsen caught wind that LED lighting might be approved down the road. So they saved that portion of the work for the third phase of construction, and had crews reinstall the existing incandescent runway lighting in the meantime.

As luck would have it, the FAA approved LED high-intensity runway lights for funding just *after* the airport bid out its third phase. At that point, FAA allowed BIS to change order the LED lights into the project. However, the new LED lighting material wasn't scheduled to arrive until mid-winter. Because North Dakota's winters have been known to start as early as October, the airport opted to reinstall its incandescent lights and replace them with LEDs in spring 2020.

Haug reports that the new airfield lights were worth the wait. Despite costing more than incandescent lights, LED equivalents reduce the daily electric use for the runway lighting systems and also require far less maintenance.

Given the massive snowfalls the area can receive, BIS opted to use 30-inch light stems, the tallest allowed by FAA.

Other FAA-related work included the installation of new foundations for the medium-intensity approach light system with runway alignment indicator lights (MALS-R).

Haug explains that the FAA wanted the safety areas around the new runway to be "as smooth as slate on a pool table." This required a great deal of dirt work on both ends of the runway.

FAA inspectors were onsite throughout construction. FAA charged its fees against a reimbursable account for all costs for work involving the agency's assets. At the end of each phase, FAA personnel inspected the job, and BIS turned ownership of the equipment back to the agency.

"This runway has been in place a long time, and it was designed under an old criterion," Thorsen says. "We rebuilt it to bring it up to today's standards."

"We're glad to have this project behind us," Haug reflects. "It was a challenge to design, construct and finance. We're thankful for all the men and women who played a part in it". ✈️

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San Francisco Int'l Installs New Perimeter Security System

BY JODI RICHARDS

 The location of San Francisco International Airport (SFO) is both a blessing and a curse. While the nearby San Francisco Bay provides stunning views for passengers, roughly 10 miles of waterfront perimeter are challenging to monitor and secure. The crucial job is further complicated by notoriously foggy weather that hampers visibility.

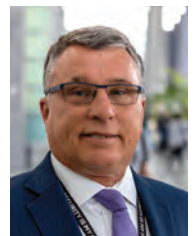
A new \$2 million perimeter intrusion detection system that combines radar and video cameras is helping SFO meet its geography-inspired challenges. High-definition radar allows the system to differentiate between legitimate threats and innocuous kayaks, birds, sea lions, etc. High-definition cameras provide surveillance images that allow operators to better distinguish important details for further assessment.

According to the system vendor, the combination of technologies produces almost no nuisance alarms. And SFO leaders are pleased with its performance.

Strategic discussions about perimeter security, especially along the waterfront portion, heated up about five years ago. Knowing that the future of security was more about technology than physical barriers, airport leaders included infrastructure improvements to support more advanced technologies in their dialog.

At the time, SFO was using basic cameras that provided views of the perimeter, but it largely relied on physical patrols by security personnel. But low visibility conditions caused by the Bay Area's foggy and rapidly changing weather regularly created challenges for equipment and humans alike, notes Ralf Ruckelshausen, director of Safety and Security Services at SFO.

Those challenges, and the high-level discussions they inspired, led the airport to engage with security consultant Ross & Baruzzini and the National Safe Skies Alliance, which has conducted waterfront perimeter security research. Ruckelshausen and his team also reached out to airports with similar water-based challenges, such as Amsterdam Schiphol Airport and John F. Kennedy International. Extensive research early on helped develop the scope for the perimeter security project, explains Ruckelshausen.



RALF RUCKELSHAUSEN

Defining the Requirements

The airport tasked Ross & Baruzzini with conducting a comprehensive security needs assessment. When the outside consultant reviewed SFO's environment and conditions, perimeter security indeed



FACTS&FIGURES

Project: Perimeter Intrusion Detection System

Location: San Francisco Int'l Airport

Cost: \$2 million

Installation: Jan. 2018 – Jan. 2019

Security Consultant: Ross & Baruzzini

System Mfr: Security Radar Integrators Inc.

High-Definition Cameras: FLIR

Radar: Navtech

Key Benefits: Boosts security for 10 miles of waterfront perimeter that can't be fenced; technology decreases need for human patrols; radar & thermal cameras can detect threats in low-visibility weather

stood out as a priority. The firm then worked with various airport stakeholders to determine how perimeter security needs affect practical operational matters.

On a specific level, the airport was looking for a solution that would provide accurate, early detection beyond SFO's buoy line and track potential threats as they approach the shore and move toward the airfield. Moreover, the system needed to work in low visibility conditions and include the ability for airport personnel to "set the dial" to reduce false alarms, explains Ruckelshausen.

"There's a lot of activity out on the waterway," he says. "We learned from other airports that they had a lot of false alarms, so we wanted to have the ability to adjust for that."

The solution had to be able to detect, assess and, if necessary, track any object that crosses the perimeter 24/7, in all weather conditions, adds Ann Barry, director of aviation security consulting at Ross & Baruzzini. SFO also wanted a system that could capture all that information in reports.



ANN BARRY

"In general, when designing a perimeter intrusion detection system, you want to use multiple technologies that complement each other," says Barry. "Every technology has strengths and weaknesses. If you're smart about aligning them, the strength of one technology compensates for the weakness of another, and they are very strong working together."

Layering radar and thermal cameras provides SFO the benefit of early detection as well as the ability and time to resolve possible threats without impacting operations, Ruckelshausen adds.

In addition to performing a needs assessment and developing the resultant perimeter intrusion detection request for proposals and requirements, Barry assisted SFO in establishing objective evaluation criteria for system vendor proposals. Two of the three firms that responded to the airport's request for



The new system uses radar and video to track potential threats from the San Francisco Bay and elsewhere.

proposals were invited to participate in a two-part evaluation.

First, Ross & Baruzzini and airport personnel developed test scripts that allowed each prospective vendor to demonstrate how its technology would perform at SFO. "We staged different scenarios to mimic some of the potential threats we wanted the system to be able to detect and report on," Barry explains.

Next, candidates ran their systems onsite for a 24-hour period, while the airport recorded the number of alarms that were activated and other key performance data. "What we were trying to do is let the candidate systems run in the regular environment," Barry says. "We were not running any scenarios then, but rather looking for system performance and the number of nuisance alarms produced when operating passively as would be typical of day-to-day use."

The onsite exercises allowed airport personnel to see how the systems responded to specific staged events and how many times each system would trigger an alarm for something that was not actually a threat. "If the system alarms every 15 seconds, a security operator is going to stop paying attention after a while," Barry explains. The challenge is to set the detection threshold at the appropriate level—sensitive enough to detect only legitimate breaches, she adds.

Based on the preliminary research, functional requirements and understanding of best practices, the project team determined that radar coupled with cameras would be the

best technology for SFO's waterfront perimeter. Barry explains that radar is great for monitoring wide, flat areas in a quick, volumetric search; and cameras are ideal for putting eyes on an object or subject. "So radar and cameras are really complementary and a good combination," she says.

Barry credits SFO for the way it approached and executed the project: carefully considering its needs, clearly defining its technical and operational requirements and developing a concept of operations, which helped define what the security operator needs to effectively perform the job. The choice of technology to meet all requirements was the last, not the first, step in the process, she notes. In fact, Barry encourages other airports to emulate SFO's methodology as it reduced project risk by ensuring that the needed system—as defined in the requirements—was the system that was implemented.

Selection & Deployment

Ultimately, the airport selected a turnkey system from Security Radar Integrators that includes Navtech radar, color/thermal cameras from FLIR, and Navtech's AdvanceGuard security platform. The contract was approved in December 2017, and the roughly 12-month installation began in January 2018.

To automate surveillance, the system uses multiple overlapping radar units near the water perimeter that have line-of-sight views of the secure area, shoreline and airfield. Although security buoys are posted around the airport's perimeter, boats and windsurfers still occasionally



Installing infrastructure for new radar system was an important preliminary step.

pass into the secure area. And physical markers naturally mean nothing to wildlife.

“Monitoring the secure area with patrols or closed-circuit TV was not practical,” relates Dan Flynn, president of Security Radar Integrators. “The airport needed to automate surveillance.”

The \$2 million SFO invested in its new system included installation of radar, thermal cameras and a high-powered desktop computer in the security operations



DAN FLYNN

center. SFO uses its own workstations to run the cloud-based security platform for situational awareness and alarm processing.

Installation and deployment took roughly 12 months and was performed in phases, starting with the installation of fiber and power to support the new technology. The first airfield radar system units were operational in 2018, and the last units came online in 2019. “This strategy provided increasing protection of large sections of perimeter as the infrastructure progressed,” Flynn explains.

Key Components

When the radar detects an object, AdvanceGuard classifies it as a person, vehicle or boat, etc. and applies pre-set guidelines to determine whether it is a threat. According to Flynn, the resolution of the Navtech radar units in SFO’s system is 17 times better than the next-best alternative.

If a detected object is deemed irregular, an alarm is triggered in the security operations center and the operator assigned to the water perimeter begins the resolution process.

Flynn explains that normal activity, such as an airport operations vehicle on the service road, triggers a camera to follow the object, but not an alarm. A boat or jet ski crossing the buoy line into the secure area, however, initiates the camera follow function and triggers an alarm that must be addressed by security personnel.

The system uses adaptation and machine learning to reduce false alarms, adds Flynn. Adaptation constantly evaluates and adapts to changes in the environment so that variations in the tide, wind, rain or other factors do not impact system performance. Machine learning is used to classify detected objects by assessing their attributes and behaviors—an especially valuable feature in a complex environment like SFO, notes Flynn.

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Proprietary software from Security Radar Integrators allows the airport to adjust for size, direction and other object attributes. As the system becomes familiar with the objects and patterns at SFO, it has the capability to reduce false alarms, Flynn explains.

Each airfield radar system stand is 13 to 15 feet tall and includes a Navtech radar unit, a FLIR color/thermal camera and an enclosure to support the electronic equipment. The enclosure is sealed and cooled to protect the equipment from water and the salt air environment. The stand and enclosures are manufactured by Security Radar Integrators and mounted with frangible couplings to the concrete slab.

Patience Pays Dividends

Installing the system amid SFO's busy air traffic required a carefully phased approach to avoid impacting operations. It was also a challenge to extend power and fiber to remote areas of the airfield. "I would tell somebody that's putting in a system like this to be patient," comments Ruckelshausen. "I didn't think it was going to take an entire year, but it was worth the wait."

Moving forward, SFO plans to integrate the new perimeter intrusion detection system into its existing video management system. "It does have playback capabilities, but it's a stand-alone

system that we would like to integrate into our security operations center overall," Ruckelshausen explains.

Security and operations personnel especially appreciate the system's masking feature, which allows operators to shut down radar coverage in a given area while the rest of the system continues operating. "If we have any type of maintenance, the system will allow us to use the masking feature versus taking a large portion of the system down," says Ruckelshausen.

The system even helps detect windsurfers and people in small boats who are experiencing trouble in the bay. That's a benefit SFO leaders didn't anticipate but certainly appreciate. "Because the radar fans out so far, situations that need to be resolved get brought to the attention of our security operations center," Ruckelshausen explains. "We see that they are not threats, but can help folks that have gotten stranded on the waterways. We've had a few of those incidents, and it feels good to be able to help."

Overall, SFO's Safety and Security director reports that he is very pleased with the system. "One of the challenges this airport has is the waterfront—we can't build any type of fencing or walls out there," he relates. "This system really mitigates that risk." ✈️

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Nashville Int'l Cuts Costs for Airfield Markings With New Inspection & Maintenance Strategy

BY MIKE SCHWANZ



FACTS&FIGURES

Project: Airfield Markings Assessment

Location: Nashville Int'l Airport

Consultant: Sightline

Markings Assessment: \$30,000

Airport Staff Training: \$15,000

Mapping System Implemented: Jan. 2018

Markings Assessments: Daily by airport staff; annually by Sightline

Last Staff Training: July 2019

Airport Maintenance Employees: 75

Contractors: Markings Impressions Corp. dba Pope Striping; Pavement Restorations Inc.

Key Benefits: Targeted assessment of markings is reducing maintenance costs & increasing quality



People use the phrase “Don’t paint yourself into a corner” to offer advice about everything from business strategies to personal relationships. It also can apply, somewhat literally, to airports that establish years of fixed budgets for airfield marking projects. Sadly, many end up overspending.

Nashville International Airport (BNA) has taken a different approach to the ongoing task to avoid painting itself into a proverbial corner, and to avoid paying too much in the process. In early 2018, it started using a high-tech mapping system that helps the airport pinpoint specific spots and areas of markings that require maintenance as identified by BNA’s Operations Team during daily and monthly inspections. As a result, it is able to reduce the scope for many paint projects, which saves time and money.

“Before 2015, our markings program was somewhat fragmented,” explains Floyd Crook, BNA’s director of

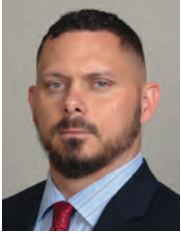
maintenance. “We decided we needed a complete assessment of our markings plan, so we hired a consultant, Sightline, to do a complete assessment of our airfield during the winter of 2014-2015.”



FLOYD CROOK

Sightline recommended that instead of setting a fixed budget and replacing markings on a calendar basis, BNA should address markings gradually, as they begin to show the need. The outside contractor also counseled the airport to enroll some of its experienced maintenance workers and contractors in the company’s training program so they could perform regular inspections to help identify when markings needed cleaning or repainting.

Daniel B. Brown, the airport’s manager of safety and quality assurance, oversees



DANIEL B. BROWN

the program. One of the first things he did was increase the oversight of outside contractors. “In the past, a company would apply markings, and there would be little to no oversight,” he explains. “We trained our inspectors as to what had to be done.”

The airport also began requiring contractors to provide their own quality control. “Before contractors leave for the day, we have to make sure they did what was required,” Brown says. “We want to see each contractor catch their own nonconforming items 90% of the time.”

In addition, Brown’s Inspection personnel check daily that the materials being applied are exactly what the specifications require and to which the contractor agreed. Brown insists on using high-quality materials that conform to or exceed FAA requirements. As such, crews primarily use Type III paints and beads as they seem to work best for the airport’s needs. “We want to make sure that the materials follow FAA guidelines and the manufacturer’s recommendations for application,” he relates.

As part of the process, Brown’s inspectors carefully monitor weather forecasts because high humidity, rainfall and extreme temperatures can all adversely affect paint’s quality. If conditions are not right for application, they will delay the work until the weather improves. “We are all flexible, including the contractors,” Brown adds. “We make sure our contractors are flexible and are on-call for the next morning or next night for emergency work.”

Every day, Brown’s inspectors assess the runways and taxiways, aided by a geographic information system (GIS) on their laptops and cellphones. When they find an area that needs maintenance, they take photos so crews can repair the pavement at exactly the right location. The mapping system can identify small spots that need treatment, as opposed to an entire runway.

So far, FAA inspectors have commented favorably on the improvement in the airport’s markings.

In-House & Outsourced Elements

Getting key maintenance staff trained to inspect runways and taxiways was an important precursor for BNA’s new approach. Mike Speidel, vice president with Sightline, emphasizes that it’s also vital to long-term quality.

“Our Airfield Marking Professional (AMP) certificate training is considered among the best in the industry,” says Speidel. “We think the cost [\$15,000] will help all participants to go back to their airports and save a lot of money when it comes to maintaining markings.”

Speidel suggested the following three-step approach to BNA for maintaining its airfield markings. However, other airport operators can follow the same strategy:

- 1) Understand FAA requirements
- 2) Conduct objective assessment
- 3) Clean more and paint less



MIKE SPEIDEL

Visual inspections performed daily by airport operations personnel work in concert with annual analysis by Sightline in spring. In fact, BNA recently issued the company a new four-year contract to provide continuous assessments of its airfield markings. The last assessment, completed earlier this year for \$30,000, was performed with Sightline’s Mobile Retro-reflectometer (Mobi) scanning unit. “This device took hundreds of thousands of scans of the pavement markings,” Speidel explains. “We then transposed color-coded data on a good aerial shot of all the runways, and showed which sections needed repair and which were OK.”

The data provides airport management with a comprehensive blueprint to follow for future work, and maintenance employees trained and certified by Sightline perform daily assessments. Any problems on the main runways, especially in the landing and takeoff areas, receive top priority.

Sightline’s recent assessment included a recommendation to remove painted markings that had built up over the years. “The runways were the biggest issue,” Speidel says. “The paint markings were very thick. When planes landed, tire contact would accelerate chipping.”

In 2015, Sightline’s recommendations included significant quantities of marking removal. As a result, an outside contractor removed the buildup on Runway 2 Right, on the east side of

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the airfield. “This work is expensive, but necessary,” Speidel comments. “We suggested up front that the airport add this to their budget.”

The majority of the new markings, applied by Markings Impressions Corp., are expected to last at least five years. “Nashville now has one of the highest quality markings systems I have seen,” Speidel reports. “They paid attention to details.”

To achieve the best results, he advises airports and contractors to focus on:

- Project Design
- Materials Selection
- Surface Preparation
- Application
- Inspection

Financial Implications

Since adopting the new inspection and maintenance strategy, management at BNA is pleased with the quality and bottom-line



The airport has increased oversight of outside contractors and boosted inspection skills of internal employees.

costs of recent markings projects. “In the past, we budgeted to paint the surfaces on a four-year basis,” says Crook. “We would do one-quarter of the surfaces every year, so that after four years, all the surfaces would have been painted, whether they needed the work or not.”

The savings to the airport were significant. Caitlin Dillon, design project manager with Metropolitan Nashville Airport Authority, estimates that BNA saved about \$350,000 from its markings budget this year alone.

Crook expects the savings to continue for several years. “Our intent is to get yearly assessments that will show us immediately what sections of the markings need the most work,” he explains. “This will help airport officials prioritize their projects.”

In short, BNA prefers its new full-spectrum approach because of the results it produces from targeted expenditures made only as needed. ✈️



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“BNA saved about \$350,000 from its markings budget this year alone.”



Congratulations, BNA. Nashville International Airport set the new industry-best rating for performance during their annual Airfield Marking Assessment in the spring. The fast, affordable, data-driven strategy to maintain the airfield markings saved them \$350,000 in 2020 and that’s just the beginning.



Blizzard of Off-Season Work Keeps Maintenance Crews at Minneapolis-St. Paul Int'l Plowing Ahead

BY KEN WYSOCKY

FACTS&FIGURES

Project: Landscape Management

Location: Minneapolis-St. Paul Int'l Airport

Consultant: Nutrien Solutions

Funding: Airport revenue

Mowing Equipment: Deere & Co., Exmark Manufacturing; Hagie Manufacturing Co.; Schulte Industries Ltd., The Toro Co.

Herbicide Application Equipment: Kawasaki Motors Corp.; Polaris Inc.; Shindaiwa USA

Pavement Cleaning Equipment: Bobcat; Tennant Co.; Triverus Cleaning & Environmental Solutions; TYMCO Inc.

Other Equipment: Stihl backpack blowers

Program Benefits: Less time spent mowing & applying herbicides; less herbicides used & handled by employees; better wildlife deterrence; increased employee productivity; enhanced vegetation control; decreased fuel costs; less engine emissions



The maintenance team at Minneapolis-St. Paul International Airport (MSP) is well-known for its expertise in snow removal. But after the snow stops flying, crews quickly turn their attention to a myriad of other duties.

Much of the off-season work centers on landscape management to help deter wildlife on the airport's 2,930-acre campus. However, the roughly 90-person department also scours parking ramps, mends fences, maintains signage and repairs runways, roads, taxiways and aprons.

Those assigned to the fleet maintenance team keep everything from weed whackers and backpack blowers to service vehicles and fire trucks running in tip-top shape. The 30-person group includes welders, mechanics, equipment-service workers, parts personnel and the like.

In short, maintenance employees aren't sitting around waiting for the next snowstorm to blow in. "I'm amazed at all the work our employees do every day," says Charlie Beuning, MSP's field maintenance operations manager.



CHARLIE BEUNING

The parking facilities alone are a handful to maintain. Currently, the airport has nine garages with 75 levels and close to 29,000 individual parking spaces. To enhance the longevity of the parking structures, crews power-wash every level of all ramps to remove oil, grease, salt and other harmful materials. It takes crews using specialized utility equipment six months to complete the job.

“It’s a very long process,” Beuning remarks.

Machines from Triverus Cleaning & Environmental Solutions capture spent water and cleaning chemicals so they don’t drain into stormwater sewers. Crews empty the collected waste mixture into sanitary sewers for treatment to make the process more eco-friendly.

The Beat Goes on

The airport also has a construction team that performs concrete and asphalt surface repairs on runways and roadways—a never-ending job thanks to Minnesota’s harsh weather. When such repairs are needed during winter, employees sometimes deploy powerful space heaters inside ice fishing tents to make pavement warm enough for patching.

Maintenance employees also periodically repaint 750,000 square feet of runway markings and 900,000 square feet of taxiway markings each year. They apply about 14,850 gallons of paint and 47 tons of reflective glass beads to keep airfield markings clear and visible for pilots.

“All that snow removal—plowing and brooming—wears away the lines and markings,” Beuning explains.

Then there are 20 miles of perimeter security fences to maintain and repair. Maintenance employees also empty more than 200 trash receptacles and blow clean six miles of sidewalks every day using Stihl backpack blowers. Street cleaning machines are regularly used on airport roadways, and smaller pavement cleaning machines help tidy other areas.

“We also have a team dedicated to taking care of all airfield and roadway signage,” adds Beuning. “You wouldn’t believe what happens to signs, with large semi-trucks and construction vehicles driving through here. We always have signs going down.”

Controlling Vegetation

Four years ago, MSP adopted a landscape management program developed by Nutrien Ag Solutions, a consulting division of global giant Nutrien Ltd. After using the program for several growing seasons, Beuning reports that the efficiency/productivity of ground crews is up and MSP’s use of herbicides is down.



Crews repair pavement and apply new markings during warmer months.

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By removing food sources of birds and other animals, the program also helps minimize the chances of wildlife strikes and enhances the airport's compliance with FAA requirements for weed control. From a health and safety standpoint, employees are handling fewer chemicals and reducing engine emissions and fuel consumption, thanks to less frequent mowings and herbicide applications.

While it's simple to compare the amount of gas burned or landscaping chemicals applied, the financial savings associated with the program are more difficult to quantify. However Beuning notes that grounds crews now have more time for other tasks because

they are spending less time applying herbicides and mowing the airport's 1,000 acres of airfield turf. Bottom line: MSP is able to get more done with the same number of employees.

"Landscape management absolutely tends to fly under the radar because it's not as glamorous as, say, a new terminal or people mover," says Mike Maine, project manager of vegetation management at Nutrien Solutions. "The importance of it often is overlooked.



MIKE MAINE

"Nonetheless, vegetation control is an FAA requirement," adds Maine, who has an urban forestry degree and a master's in ecological restoration. "Every airport has to do it...and sometimes they need a partner that knows how to manage landscapes effectively and efficiently."

Rethinking Herbicides

One of the biggest changes to MSP's landscape management strategy is a significant reduction in the herbicide use. Previously, crews applied two different herbicides: one for killing weeds in turf areas and another for killing weeds in pavement cracks and crevasses, landscape beds, along fence lines and so forth.

Because the weeds invariably grew back, crews had to apply herbicides three to four times a year. Moreover, mixing and applying them are labor-intensive and time-consuming. In addition to 1,000 feet of airfield turf, the airport has 320 more acres of grass outside the airfield and 50 acres of landscaped beds, filled with shrubs, trees and flowers.

"Spraying herbicides could take weeks," Beuning says, noting that crews use a combination of propelled spraying equipment and smaller backpack units. "Getting access to the airfield is difficult and requires a lot of coordination with airside operations."

The solution? A herbicide created specifically for MSP that requires only one application per year. The custom blend is more expensive, but Beuning reports that the added cost is more than offset by less wear and tear on equipment, decreased fuel consumption and emissions, and increased productivity from ground crews.

"Labor costs are much higher than the cost of the herbicide," Maine points out.

Increased Efficiency

Since the airport switched to a custom-blended herbicide, employees no longer need to mix multiple chemicals. Now, they add a



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half-gallon of the herbicide to a 50-gallon tank of water on a spraying machine. It is much more efficient than the old method, Maine stresses.

“Putting together the herbicide is a very simple process,” Beuning concurs. “And we only apply a half-gallon of herbicide mixture per acre, once a year, which reduces the amount of active herbicide ingredients in the environment.”

The custom-blended mix, which includes four to five different herbicides, targets unwelcome vegetation such as rogue grasses, broadleaf weeds and woody vines. It also contains a pre-emergent herbicide that prevents weeds from germinating, Maine explains.

Beuning has noticed that the benefits are cyclical: Grass grows better without weeds, and more vigorous, healthier grass can naturally deter weed growth.


“Nutrien also provided hands-on training that taught our crews to properly apply herbicides and to know what they were applying and why,” he adds. “That was great because we are leanly staffed, so it’s important for us to work smarter, not harder.”



Controlling excess vegetation supports wildlife management efforts.

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Crews apply a custom-blended herbicide just once a year.



Maine also showed employees how to calibrate equipment for optimal herbicide application and stressed the importance of wearing personal protective gear. “He coached them just like they were a sports team,” Beuning remarks.

Slowing Growth

Another key aspect of the program is every homeowner’s dream: applying a growth-retardant to turf areas so grass doesn’t grow as quickly. This is particularly useful in the airfield, where there’s never a good time to mow the grass, Beuning observes.

Maine explains that the treatment, known in the industry as plant growth regulation, stops grass from growing for four to six weeks, depending on rainfall.

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In addition, the airport is starting to use a high-endophyte seed to grow a special variety of tall fescue that is both drought- and salt-tolerant. Better yet, the seed's endophytes (symbiotic fungus that live inside plants) make the grass extremely distasteful to birds and other wildlife.

"Plant growth regulation and the custom-blended herbicides are the two main cornerstones of the program," Maine states. "They're the biggest timesavers and provide airports with the most bang for their buck."

"Think about how much turf there is at an airport," he continues. "It creates a huge safety issue because wildlife is attracted to weeds and flowers and plants on the airfield. So if you eliminate those food sources, the birds and other wildlife are less likely to show up."

"In my industry, we jokingly refer to it as removing the fridge from the airfield."

Easier-Going Mowing


Anyone who has pushed a manual lawnmower knows that grass with a lot of weeds is tougher to mow. The same is true for the airport's riding equipment.

"You're almost weed-whacking with the mower; so you have to go a lot slower," Maine explains. "We can reduce the time it takes to mow turf by 50% just by reducing weeds, which become more fibrous after they get cut down and regrow."

Ultimately, he boils it all down to maximizing airport employees' time.

Crews at MSP use tractors towing "brush hogs" (mowing machines) to cut the large expanses of turf. Smaller zero-turn riding mowers are used in areas that require more maneuverability.

Overall, Beuning says it's difficult to quantify exactly how much time and money Nutrien's landscape management program is saving the airport. But he says there's no doubt that it has reduced weed growth and the time required to mow and apply herbicides.

"This program has radically changed how we handle vegetation management," Beuning reflects. "By increasing the efficiency of our grounds employees and including an employee education component, it has taken us to a whole new level." 



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FACTS&FIGURES

Project: Direct Feed Fuel System

Location: Milwaukee General Mitchell Int'l Airport

Configuration: Off-airport bulk storage & pumping that feeds 3-terminal hydrant system with on-airport truck rack & hydrant cart test stand

Approx. Cost: \$25 million (including purchase of storage facility)

Total System Capacity: 7.9 million gallons

Working Capacity: 6.85 million gallons

Airport Owner: Milwaukee County

System Owner: MKE Fuel Company LLC (airline fueling consortium)

Fuel Farm Manager/Operator: Menzies Aviation

Construction: April 2019–June 2020

Design & Construction: Burns & McDonnell

General Contractor: Burns & McDonnell

Sub-contractors: Lunda; AZCO; Pieper Power

Hydrant Pump Manufacturer: Goulds Pumps

Tank Gauging System: Honeywell Servo; Temp Probe

Electrical Contractor: Eaton VFDs

Generator: Caterpillar 1000KW

Of Note: Decommissioning of Shell pipeline & nearby storage facility prompted fuel consortium to re-engineer MKE's fuel system; new system supplies MKE & other regional airports

Fuel System Upgrades at Mitchell Int'l Benefit Tenant Airlines and Nearby Airports

BY JENNIFER DAACK WOOLSON



For decades, Milwaukee General Mitchell International Airport (MKE) received its jet fuel from an off-airport Shell storage facility supplied by a pipeline running from Chicago-area refineries up the western shore of Lake Michigan through Milwaukee to Green Bay, WI. But in 2016, the pipeline operator decided to decommission the segment of pipeline north of Milwaukee, and Shell consequently announced plans to sell the facility that supplied all of MKE's jet fuel.

Suddenly, it became essential to rethink fueling operations for the county-owned airport. The solution, dubbed the Direct Feed Project, included a modernized fuel hydrant system for the airlines, removing the underground storage tanks at the on-airport facility, installing a new pumping facility and a new two-position island for

over-the-road transport trucks loading and unloading jet fuel at the off-airport bulk storage facility.

After a \$25 million investment by the airport's fueling consortium, MKE now has a more modern and efficient fuel supply system—and the consortium can supply jet fuel to other regional airports to offset its costs.

"This upgraded fuel facility supports the safe and efficient flow of fuel to airports across the region," says MKE Airport Director Brian Dranzik. "I'm pleased our airline partners at MKE are making this investment to support future growth."



BRIAN DRANZIK



First Things First

Even though the fuel consortium had been using the off-airport facility for years, a few surprises emerged once it took ownership. And they weren't pleasant surprises.

Based on the results of a site inspection/evaluation, the project team's highest priority was replacing the bottom of one of the aboveground storage tanks. An overall assessment prompted the consortium to work with Burns & McDonnell on a plan for reconfiguring both the on- and off-airport fuel facilities.

But the first order of business was putting a new bottom on the tank, which took about 10 months. Grant Smith, director of Aviation Services at Burns & McDonnell, emphasizes that it was key to address the tank bottom and permitting issues quickly to ensure the long-term use of the facility.



GRANT SMITH

"The airport was obviously very much involved," Smith says. "The overall coordination and communication on this project was excellent." Burns & McDonnell primarily worked with MKE Environmental Manager Greg Failey and Menzies Aviation, which manages and operates the fuel farm.

After engineers further evaluated and assessed the facility, they developed a plan called the Direct Feed Project, so named because the end result was moving pumping capacity to the off-airport facility and converting the on-airport facility into just a hydrant cart test stand and load rack for refueler tanker trucks.

Real Estate Purchase

When Shell decided to sell its storage facility near MKE, that prompted the airport's fuel consortium to purchase the facility because on-site storage capacity at MKE was small—just two 40,000-gallon underground tanks for an airport that served seven major airlines and 7 million passengers last year.

Southwest Airlines is one of the airport's key carriers and fuel consortium members. Tom Kelly, associate fuel category manager for Southwest and MKE fuel consortium chairman, explains that MKE got by with its previous fuel system by replenishing the on-airport tanks with Jet-A from Shell's nearby storage facility several times a day. It was a workable solution, but not a sustainable one.



TOM KELLY

"When we heard Shell was going to sell the facility, we didn't know who was going to own it or what was going to happen to it," Kelly recalls. "But we did know that if someone else decided to turn it into a diesel facility, Milwaukee [International] would really be in a bad way."

In early 2017, when it became apparent that MKE's fuel supply was at risk, the fuel consortium committee formed a limited liability corporation, secured financing and entered negotiations with Shell to buy its bulk storage facility. The consortium also promptly contracted Burns & McDonnell to lead design, construction and construction management for the project, which was executed in two phases.

End-to-End Enhancements

Once the tank bottom was secure, it was time to get to the meat of the larger plan Burns & McDonnell had devised.

Phase II focused on installing a new truck loading island at the off-airport facility. To improve vehicle flow, project designers relocated a section of perimeter security fence and access gate, and also moved an emergency generator. The site's water well was protected with a cover that trucks can drive over.

Modifications to the direct feed bulk facility also led to the installation of a new into-hydrant pumping system. The new system includes three centrifugal pumps with variable frequency drives, filter separators, a backpressure control and recirculation loop, provisions for future leak detection testing, and a new electrical service entrance, emergency generator, programmable logic controls and electrical enclosure.

One of its many high-tech bells and whistles is an automated system that can be operated, maintained and viewed from three different computer screens: one in Menzies' office, one at the on-airport facility, and another at the off-airport facility. Operators can control and monitor the whole system, perform maintenance and troubleshooting, and remotely address problems.

Smith explains that the new variable frequency drives make the system safer, more efficient and more environmentally sound because they help the pumps run more smoothly. He equates it to using the gas pedal when driving a car. "With the old system, the pumps would just come on full throttle," he says. "But with

a variable frequency drive system, it doesn't hammer or force on the piping in the system. It makes it much safer and more efficient. We have already seen a 30% to 40% reduction in electric usage."

When modifying the direct feed airside facility, crews removed existing filter separators, piping, valves, pumps and a 500-gallon waste tank, and closed the two 40,000-gallon underground storage tanks.

A new automatic tank gauging system for all three storage tanks at the bulk storage facility was constructed, along with new remote surveillance at the bulk storage facility that includes display units and a digital video recorder. Crews also replaced the perimeter lighting and added more poles to better illuminate the facility exterior.

Phase II also involved working with the Department of Transportation to designate the existing transfer line from the off-airport facility to the hydrant system from an interstate pipeline to a facility transfer line regulated by the U.S. Environmental Protection Agency and Wisconsin Department of Natural Resources.

In the meantime, airlines at MKE still needed fuel. "Obviously there were still aircraft flying and fuel that needed to be used," says Smith. "So there was a lot of coordination with Menzies Aviation to make sure they could take the jet fuel in from the West Shore pipeline, handle it properly, and get it to the aircraft in a

safe, efficient manner while we were building new facilities right next to the operating facilities."

Switching to the new pumping system without disrupting service required several overnight sessions. "You go in at night when there is low or no activity and do the transfer over to the new system," Smith explains. "We had to pressurize it and make sure it all worked and was ready for the 5 a.m. fueling. Sometimes you only have a few hours to be able to do that, so it's definitely a challenge in planning and coordination."

Kelly notes that working with MKE staff made that task easier. "In my position, I see and hear a lot of stories about how difficult airports can be to work with," he remarks. "That was not the case here in Milwaukee. It is a great relationship with the airport staff, who are very accommodating."

Meeting Regional Demand

One of the factors that prompted Shell to sell its storage facility was that the facility had too much capacity to serve only MKE. The fueling consortium turned that "problem" into an opportunity by installing a two-spot truck rack so it could make fuel from the facility available to other airports.

When the local segment of pipeline was taken out of commission, small airports all over the region lost access to Jet-A. Some were driving south to Des Plaines, IL, or as far north as Minneapolis to pick up fuel. Now, the revamped facility near MKE serves their needs—and the fuel consortium charges a user's fee to offset the cost of the loading facility infrastructure.

Kelly notes that the MKE's airlines are also pleased with the new arrangement. "It's off-airport and completely owned by the consortium. So we have tremendous freedom to do whatever we need to do at that facility as long as we are still servicing the airport," he explains. "We are looking forward to being able to provide for the region's Jet-A needs, and are in negotiations with potential users looking forward to that long-term asset at the facility."

To accommodate the fuel facility's new customers, project engineers added new ingress and egress, with paved lanes for transport trucks from the entrance to the exit and automated gates for ease of use.

Not surprisingly, the consortium is excited about the prospects that the facility enhancements provide. "We are left with a great facility here in Milwaukee," says Kelly. "It's going to be able to service the airport for a long time, and the truck rack is going to be able to service the overall regional Jet-A market for a long time. We are very pleased with the end result."

Getting Up to Speed

Smith and Kelly shared a similar takeaway after the recent project: Although new features are generally better, they can also be confusing.

"We realized that with the computer controls and heavy modernization that come with a project like this, a lot of times the way the facility operates is really a question mark to the



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operators—even though they might be very familiar with the facility and working there for a long time,” Kelly explains.

Typically, a comprehensive operations and maintenance manual solves such issues. But when it came time to assemble one at the end of the project, no one was absolutely clear on how it was going to be written, what it should cover, and what the deliverable really was.

Smith likens turning the new facility over to Menzies with asking an accomplished 737 pilot to fly a new A380. “They’re experienced and familiar with the process, but a brand-new facility can be shocking, especially when it has a tremendous leap in modernization,” he explains. “We need to help them adapt to that...train them on the new systems and get them up to speed.” ✈️

One of the top priorities was replacing the bottom of an aboveground storage tank.

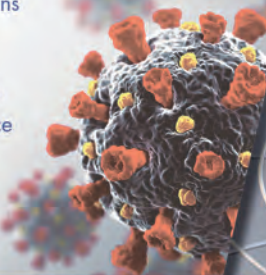


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Noise Study at San Diego Int'l Reveals Surprising Results

BY PAUL NOLAN



Plenty of unknown challenges emerged when COVID-19 turned the industry upside down in a matter of weeks. San Diego International Airport (SAN) also found an opportunity.

While air traffic is at record lows due to the global pandemic, the metropolitan airport is analyzing how the noise data it routinely collects correlates with the number of noise complaints from the community. Spoiler alert: The relationship is not what you might expect.

An uptick in complaints while flight operations are down dramatically has airport officials somewhat perplexed. What the research will ultimately lead to is not yet clear, but Sjohnna Knack, SAN's program manager for Airport Planning and Environmental Affairs, says that it is important to assemble the data now and determine how to use it later.



SJOHNNA KNACK

"The study is really just to capture this moment and what this [operating level] actually sounds like," she explains. "It's a way to let people know where we're at."

Knack also sees a silver lining in the coronavirus fallout: "We have this unique opportunity to re-engage with our communities."

Unexpected Response

Like many airports, SAN continually monitors audio levels in the communities around its facility to help evaluate its noise abatement strategies and programs. Collected data also helps

guide the development of aircraft departure/arrival procedures that minimize the impact of aircraft noise based on altitude, flight path and time of day. SAN's Airport Noise and Operations Monitoring System by Envirosuite uses 23 strategically placed microphones on steel poles to collect information about airport and other ambient noise from nearby communities. Data is collected and sent via wireless connection for continuous analysis.

For years, SAN has contracted Envirosuite, a global company that specializes in environmental intelligence technology, to help collect and decipher the data. For its special COVID-19 analysis, the airport connected Envirosuite with the aviation division of HMMH, a noise consultant based in nearby Anaheim, CA. The firm has also studied noise issues at a general aviation airport near SAN, and multiple national and international airports have expressed interest in providing their data for analysis.

When a community member files a noise complaint with SAN, Knack's team uses Envirosuite's tools to match it up with the corresponding noise and aircraft information. "We're looking at the flight tracks—where our aircraft are going in relation to the ground, how high they're flying and other factors," Knack explains. "We do this to see if we can make adjustments and to help educate the community."

Less Noise, but More Complaints?

Oddly, as landings and departures began to decrease in mid-March (when health officials encouraged travelers to stay at home), SAN experienced a notable uptick in community noise complaints.



FACTS&FIGURES

Project: Study of Noise Complaints

Location: San Diego Int'l Airport

Impetus: Dramatically reduced air traffic during COVID-19 pandemic

Cost: No additional expenses were incurred because airport routinely collects & analyzes noise data; new noise consultant worked gratis

Airport Noise & Operations Monitoring System; Noise Data Analysis: Envirosuite

Noise Consultant: HMMH

Key Finding: Although airport-generated noise dropped as operations dramatically decreased, noise complaints from the community spiked before settling back to pre-COVID levels.

Follow-up Action: Airport Noise Advisory Committee will use COVID-related data to analyze whether additional noise abatement steps are needed

Pre-pandemic, the single-runway airport averaged nearly 600 daily operations; by late April, daily operations had dwindled to 134. During roughly the same period, the airport's community noise equivalent level (CNEL), a 24-hour noise measurement metric, dropped from around 66 decibels in January to a low of about 54 decibels in June—a decline that would have been perceived as at least 50% less noise. In fact, beginning in April and running through June, the airport's noise level was lower than the noise level of the rest of the community—something that rarely occurs, notes Justin Cook, a principal consultant with HMMH.



JUSTIN COOK

In spite of this, noise complaints from the community jumped in late March, hitting a single-day high of 778, after hovering between 300 and 500 daily complaints in January and February. Complaints dropped to around 200 per day in April and stayed there through June.

Knack and others note that the March spike in noise complaints could be attributed to more residents being home all day due to the pandemic—residents who were unaccustomed to, and more sensitive to, aircraft noise.

Matt Mills-Brookes, a senior aviation specialist for Envirosuite, reports that data captured by his company indicates that airport noise dropped throughout the world by 50% or more after the

pandemic hit. Community noise dropped as well, as there were far fewer commuters and business vehicles on the roads.

“For noise, halving is a massive change,” Mills-Brookes emphasizes. “We would have thought that as communities got quieter and there were less aircraft, the complaints would almost drop to zero; but they didn’t. They remained quite high. The ratio of complaints to the number of flights actually went up [after the emergence of] COVID.”



MATT MILLS-BROOKES

The Psychology of Noise Complaints

The seeming mismatch of measured noise levels and associated complaints naturally led to a discussion about what actually drives noise complaints from the community. Airport managers understand that beyond the noise of aircraft operations, non-acoustic factors play a key role in how neighbors perceive airport noise. Such factors include the community's level of trust in airport authorities to control noise levels and individuals' attitudes regarding aircraft noise and whether it is going to get better or worse next year.

Mills-Brookes adds that the pandemic may have broadened non-acoustic factors—for instance, residents may now be concerned about the potential increase in virus transmission from inbound passengers. And such attitudes, whether conscious

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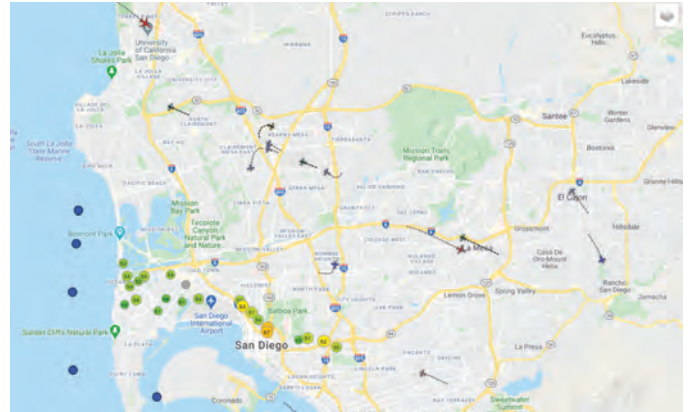
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or subconscious, could lead to increased noise complaints. Conversely, as traffic at SAN increases, some community members may interpret more flight activity as a positive sign of economic recovery.

Interestingly, Mills-Brookes says that non-acoustic factors have a significantly greater influence on a community's annoyance than the actual aircraft noise. That, he reasons, is why the community's feelings about air travel in and out of San Diego during the current pandemic are so important and impactful. This heightens the need for SAN officials to focus on community outreach programs that reinforce the airport's efforts to be a conscientious member of the community during and after the pandemic.


Mills-Brookes emphasizes that this is an important time for all airport executives to be positive industry ambassadors in their individual communities. "We need to be the face of the industry—to be proactive and tell the community, 'It's a safe operation. The airlines are using COVID safety procedures and bringing jobs back.' It's important to let people know that you're working with the airlines to keep noise levels as low as possible."

Knack reports that the team at SAN is up for the task, and is leveraging its long-standing Airport Noise Advisory Committee, which includes community members as well as aviation



The airport routinely matches complaints with corresponding flight data and information from its noise monitoring system.

stakeholders such as airlines and local elected officials. The committee is overseeing a noise compatibility study to help generate recommendations for viable noise abatement measures.

"Hopefully, before we get ramped up to our historic passenger levels—whether that is three or more years from now—we can re-engage with the community in a positive and productive manner to work cooperatively," she says. "It's all part of working together to see if anything can be done better." 

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Facing a Tight Deadline, Lakeland Linder Achieves What Some Thought Impossible

BY KRISTIN V. SHAW



FACTS&FIGURES

Project: Runway Rehabilitation

Location: Lakeland (FL) Linder Int'l Airport

Cost: \$26.9 million (plus \$2.9 million for ILS upgrade)

Funding: \$10.3 million FAA Airport Improvement Program grant; \$8.5 million in FAA supplemental funds; \$5.8 million from FDOT; \$2.3 million airport contribution

Notice to Proceed: December 2, 2019

Paving: Jan. 3- March 12, 2020

Runway Re-Opening: March 16, 2020

Construction: 162 days

Grooving, Markings & Punch List Items: 54 days

Lead Designer: Atkins North America Inc.

General Contractor: Hubbard

Asphalt Installed: 94,500 tons (4,725 truckloads)

Lime Rock Placed: 53,850 tons (3,000 truckloads)

Pre-Design Geotechnical Investigation: Imperial Testing & Engineering Inc.

Construction Quality Assurance Testing: Terra Inc.

Topographic Survey: Chastain Skillman

Construction Phasing & Specifications: AmHerst Consulting



The Sun 'n Fun Aerospace Expo, held at Florida's Lakeland Linder International Airport (LAL), is one of the world's largest aviation events. The popular fly-in and airshow are such a big to-do that the FAA dispatches its most experienced air traffic controllers to manage the 1,200+ daily operations it draws.

This would have been the 46th Sun 'n Fun, but like most large events in 2020, it was cancelled due to the COVID-19 pandemic. If

only LAL Director Gene Conrad had known that in 2019 when planning began for major airfield improvements, he could have relaxed the timeline. But lacking a crystal ball, the project team completed a complete rehabilitation of its 8,500-foot main runway within a tight 108-day window to prepare for the spring fly-in and airshow that were ultimately cancelled.



GENE CONRAD



While some contractors were up to the challenge of rehabbing and strengthening Runway 9-27 in time for Sun 'n Fun this April, others told LAL that its 108-day timeline was irrational. One even walked out of a pre-bid meeting. But LAL executives didn't veer from their aggressive plan. They knew the project would be a long sprint, but also firmly believed it was possible. Ultimately, they were correct.

Diverse Tenant Base

In addition to being a reliever facility for Tampa International Airport, LAL is home to the Central Florida Aerospace Academy, Polk State College Aerospace programs and the National Oceanic and Atmospheric Administration (NOAA) Hurricane Hunters. That last one may sound like a college team, but it's an important hurricane forecasting group, particularly for storms in the nearby Atlantic Ocean and Gulf of Mexico. Specially equipped NOAA aircraft play an integral role in keeping the nation's residents safe by improving the accuracy of tropical cyclone forecasts, and the Hurricane Hunters' base at LAL offers central access to the Atlantic Ocean and Gulf of Mexico.

"What's special about our facility is the uniqueness about what happens here: NOAA's Aircraft Operations Center, Amazon operations, our fly-in event, an aviation-focused high school, the college aerospace program," says Conrad. "A high school flying club takes off on a grass strip...two of the largest RC modeling events are here...and five flight schools, two hotels, avionics shops and three solar farms that generate revenue. We're business oriented!"

So perhaps it's no surprise that LAL attracted the attention of Amazon. In fact, the bustling airport's recent runway project was already part of its FAA capital investment plan in December 2017, when Amazon began to vet the airport for a facility to accommodate its private fleet of cargo aircraft.

"We shared with Amazon our capital plan, and the runway project was in the five-year window they were considering to start operations," Conrad explains. "Essentially, we had to figure out how to get the rehab and strengthening project done before they started operating in 2020."

Amazon Air had actually considered LAL back in 2015, but those routes ended up going to Tampa International. After that loss, Conrad called the program manager for the Florida Department of

During the \$25.9 million project, contractors also upgraded the airfield's instrument landing system from a CAT I to a Special Authorization CAT II and performed preliminary work for a CAT III system that will begin construction in April 2021. To prepare for the CAT III system, crews installed a rollout runway visual range system, elevated runway guard light cans, and conduit and light cans for centerline and touchdown zone lighting.

All of the airfield enhancements are tied to a new gateway facility for Amazon Air that began operating in July 2019.

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Transportation (FDOT) about initiating an intermodal feasibility study to make LAL a more attractive location for future opportunities. When the report was complete, the airport team lined up the grant funding, completed the environmental assessment and design, and started construction on a 50-acre intermodal site in November 2018. Although the airport was completely full, Conrad thought it was important to invest in the \$17.8 million project because even if LAL didn't land Amazon Air as a tenant then, another opportunity might present itself. He was also betting on the strategic value of the airport's central location between Orlando and Tampa.

"It was a calculated risk, but I have a great team and tremendous city support," Conrad remarks. "When I first got here in 2010, the airport had already been working toward a master plan, and we jumped head first into it. We identified this area as a potential air cargo site, and it made sense for us to start planning to make investments. Completing the intermodal feasibility study put us into warp drive. We opened up our own opportunities."

In rapid succession, lease negotiations with Amazon Air started in February 2019, the ground lease was executed in May 2019, and the shipping giant started building at the airport in July 2019.

"We were very fortunate to get the big fish," Conrad reflects.

Crazy or Confident?

Through the industry grapevine, personnel knew that San Diego International Airport had completed a big runway project by laying 300 feet of pavement per night. That boosted confidence that LAL's own tight timeline was achievable, and having a second runway relieved even more pressure.

Pursuing an aggressive schedule with FAA and FDOT to put plans in motion quickly, LAL received a \$10.3 million FAA Airport Improvement Program grant in 2019, \$8.5 million more from the FAA in the form of a supplemental grant and \$5.8 million from FDOT. The airport paid about \$2.3 million of the \$26.9 million total cost.

Hiring Atkins North America Inc. as lead designer for the project further boosted management's confidence because the firm had completed a number of other infrastructure improvements at LAL over the last 10 years. After receiving the notice to proceed in June 2019, Atkins calculated backward from the goal date and figured the team had just 11 weeks to complete the design. Typically, the firm would have several months to complete the design, but the schedule did not allow for that.

Instead, the team approached the design process more like a construction schedule, printing out a roll plot of the runway every week and unfurling it on the conference table for project meetings.

"Fortunately, one of the benefits of having been their general consultant is that we had a lot of the data we needed to gather, like the topographical survey, already in-house," says Tom Roda, Atkins' Southeast Aviation



TOM RODA

What you need to know about Runway Braking, Friction & Safety

An informational series by *Tim Neubert, Tim Neubert, MBA, A.A.E.*



When I started my career in aviation forty years ago, I never expected to witness so much aviation history in my lifetime--from the following the 1986 Voyager's

first nonstop flight around the world without refueling (Jeana Yeager and Dick Rutan) to seeing a fully electric-powered commercial airplane land last year. Airport operations have also changed. Huge numbers of commercial airplanes land on runways every day. Large numbers of private pilots now vie for runways space on airports often originally conceived and constructed a century or more ago. Imagine how amazed early aviators would be at the number of private pilots who can land their own planes!

Despite rapidly changing aircraft and monumentally increased traffic on today's runway, some airport operation fundamentals remain the same. Yet with all of the change in running airports, we all know, safe takeoff and landing is ultimately the only thing that matters to passengers in the end.

Fundamentally, jet aircraft braking principles have not changed. The degree of surface friction for a specific aircraft at

a given moment is directly proportional to the braking action, subject only to the activation of wheel lock-up and anti-skid protection systems.

Aircraft braking coefficient is dependent upon the surface friction between the tires on the aircraft wheels and the pavement surface. Less friction means less aircraft braking coefficient and less aircraft braking response. Many aircraft runoffs actually occur during an afternoon rain shower and not during a winter event as many people may think. Did you know that when a runway has heavy rubber deposits greater than 1mm and is wet, jet plane braking is comparable to an icy runway? Not knowing this can be the difference between a safe landing and an aircraft runoff.

One critical bit of aircraft friction science everyone in airports needs to know is the difference between decelerometers and continuous friction measurement equipment (CFME). Another is the difference between winter and summer airport runway needs.

My hope is to provide to readers a short (but interesting) primer on runway fundamentals. Topics to include winter operations and runway rejuvenation. Until next month, Cheers!



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Division manager. "Having that preliminary data in advance was critical."

Despite the inherent advantages of working with a design team that essentially had a head start, some potential construction contractors were scared away by the project's short timeline. Assistant Airport Director Chris Hallstrand recalls one incumbent vendor walking out of a pre-bid meeting saying, "You guys are crazy. This can't be done, and we won't be bidding on this."



CHRIS HALLSTRAND

Ultimately, four firms bid on the project, and it was awarded to Hubbard Construction Company in November 2019. The pertinent questions Hubbard personnel asked during the pre-bid phase made Roda and other Atkins' managers confident that the firm was taking the project seriously. That helped the entire team get a running start, says Roda.

Work kicked off promptly on Dec. 2, 2019, with March 17, 2020, as the target date to reopen the runway (not including grooving and final striping).

"In this industry, we can do anything as long as the means are there," says Matthew Griffin, Hubbard's construction manager for the project. "Anything and everything is possible as long as it falls in the right pattern. Right out of the gate, once I received the handoff documents, it was clear that the job could not only be done, based on our internal schedule, we could complete it a day or two early."



MATTHEW GRIFFIN

Weekly meetings and active, ongoing communication between team members proved to be particularly important. "There wasn't enough time for people to get into their own silos," explains Roda. "By working together, we could meet the schedule."

"Obviously, there were a lot of points where we could have gotten overwhelmed by what we were asked to do," he reflects. "But sticking with it and creating a plan worked out in the end."



The airport expedited everything from funding requests and design to construction and paving.

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The team used Atkins' roll plot to plan each week's work and check in detail how each phase would affect the taxiways and other operational activity. Roda and representatives from Hubbard and key subcontractors met with airport leadership regularly.

Speaking from the building contractor's perspective, Griffin notes that the accessibility of airport management helped construction stay on track. "They were engaged more so than any other owner I've worked with," he reports. "They knew the goal was to have a successful project, and that requires direct dialogue."

In the end, the team pulled it all off. "Were we nervous?" asks Hallstrand. "Absolutely! But this airport is very good at orchestrating what some perceive to be the impossible. We have more will than anyone else. We're passionate about what we do, and we're conscious of our tenants and users. We felt confident and knew we could will it into fruition."

Extra Challenges

Between the runway rehab, installation of new in-pavement lighting and ILS upgrades, the airport had a lot to complete in a short time.

Hubbard hauled 3,000 truckloads of lime rock to the airfield from a quarry 25 miles away for the runway's base layer. In some areas, rock needed to be added; in others, the existing surface was scarified (broken into pieces with heavy machinery) then rolled and regraded.

Per FAA design standards to accommodate 767-300s, Runway 9-27 required 9 inches of asphalt. Project engineers achieved that in three individually rolled layers, with a bituminous liquid called

tack in between—much like a multi-tier cake with buttercream frosting between its layers.

Due to Florida's fickle weather, Hubbard had to remain flexible because the pavement materials have specific tolerances for temperature and moisture per FAA regulations.

Typically, crews started at 6:00 or 6:30 in the morning. On colder days, however, they had to wait until 8 a.m. "The contract didn't allow for weather allowances," notes Griffin. "We had to work around it, but we were allowed to work 24/7 if we needed to."

Rain, which has its own capricious cadence, required crews to protect the exposed lime rock and ensure that water could drain off it. Keeping the runoff clean was a challenge, but needed to be a priority, notes Hallstrand. Sometimes, workers applied a thin layer of tar to seal the lime rock and prevent moisture from penetrating it. Crews also used vacuum trucks to remove water and debris from trenches in the runway.

"We had to make some important decisions in a quick timeframe because the runway grades had ripple effects we didn't anticipate," says Roda. "As soon as we got the survey back, we realized the (original) profile didn't meet the FAA requirements. They had increased the category of the airport because of the Amazon planes coming in."

As a result, Atkins had to re-analyze the connector taxiways. Two were removed and relocated; five others were adjusted to accommodate grades and geometry.

Hallstrand notes that the team had to solve multiple challenges like that in the field, and everyone needed to be present to make that happen. "Nobody could sit back and say, 'I don't want to deal with this today.' A lot of times we'd have to put our heads together and shoot it through our engineering team," he recalls. "There was no time to take a couple of days to think about it. We had to be fluid to find the most efficient way to cure the problem."

Griffin credits LAL's operations personnel for the role they played. "They were one 100% prepared for this project," he emphasizes. "They knew the plans, and they knew every little nook and cranny of the airport property. They were engaged to make sure the project was successful."

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Despite the project's intense pace, the team managed to run the gauntlets and finish everything as planned. The 108 days came and went quickly, with 30 additional days after the originally scheduled Sun 'n Fun event for grooving, final painting and installation of risers on the in-pavement lights. Although the annual fly-in didn't happen this year, LAL is more than ready for 2021.

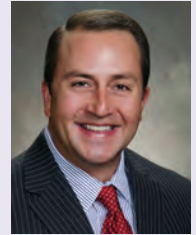
"Gene Conrad deserves a lot of credit," Roda enthuses. "He does a great job getting everyone energized and is a great leader. He'd say, 'You can do this. We can do this together.'"

Hallstrand agrees. "This has been one of the best projects in my career because the whole team performed at a high level," he explains. "This one had its difficulties, but we overcame them quickly. We met the timelines and worked as a team. And the end product was high quality.

"It was demanding, it was stressful, and we didn't always like each other," he says, smiling. "But we did it." 

Hiring for Passion

Gene Conrad has served as airport director at Lakeland Linder International (LAL) for the last decade. Before that, he spent nine years working his way up at three other airports, feeding his enthusiasm and passion for aviation.



GENE CONRAD

Conrad wants the same kind of passion from his employees, and for years he wanted Chris Hallstrand on his team. In 2016, Conrad finally recruited Hallstrand away from Wittman Regional Airport (OSH) in Oshkosh, WI, where he was living out his aviation dreams working as a C-130 crew chief and serving as the superintendent of maintenance and operations. Flying into OSH is a coveted logbook entry for many pilots, because the airport hosts EAA AirVenture, the country's largest fly-in airshow. Before joining the ranks at OSH, Hallstrand worked at a corrugated cardboard company near Price County Airport (PBH). And he often looked across the street wishing he could work at the airport instead.

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"I had two small kids at the time and didn't have a lot of money, but I took a part-time job at the Price County for less money than I was making (at the cardboard company) just to work there," Hallstrand explains.

After nearly a decade at PBH, a connection in the aviation industry tipped off Hallstrand about an opening at OSH. He relocated to Oshkosh after accepting the job, and that's where he met Conrad.

In his gut, Conrad knew that Hallstrand would be a good fit for LAL. "My team is what makes it work," he says. "You can train skills, but you can't teach passion. That's why we hire for passion. Chris (Hallstrand) gets it. What we do here is super unique, and it scares some people."

Conrad points to LAL Operations Manager Adam Lunn as another example. Born in Lakeland and raised in nearby Bartow, Lunn started volunteering for the local Sun 'n Fun fly-in as a teenager. He also called regularly asking for an internship.



ADAM LUNN

"He called so many times, we finally gave it to him," Conrad laughs. "From there, he worked his way up by showing he had the abilities to get the job done."

Case in point: During Lunn's internship, the airport had to vet its security cardholders against TSA's no-fly lists every day because it still had commercial service at the time. With thousands of names to review, the process would have been extremely time-consuming to perform manually. Conrad told Lunn if he could figure out an answer to the problem, he would hire him. Working overnight, Lunn used the Microsoft Access database management system to merge the TSA no-fly list with the file of people with security cards for LAL and identify anyone who appeared on both lists. His method allowed the airport to satisfy the TSA requirement in a matter of seconds. And the rest, so they say, is history.

"Our staff is so passionate to go and get it done," says Hallstrand. "We have decades of experience between us, and we're responsive on figuring out the way to move forward. Pooling all of our strengths and weaknesses makes us better. It's our job to manage our strengths and minimize their weaknesses."

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FACTS&FIGURES

Project: Study of Heated Airside Pavement

Location: Des Moines Int'l Airport

Technology: Electrically Conductive Concrete

Principal Investigator: Halil Ceylan, Professor, Iowa State University

Funding: FAA (50%); Iowa State University (50%)

Associated Airport Costs: \$10,000-\$15,000

Project Partners: American Concrete Pavement Assoc.; Asbury Carbons; Central Iowa Ready Mix; Foth Infrastructure & Environmental LLC; GCP Applied Technologies; Iowa Concrete Paving Assoc.; Kingston Services LLC; Zoltek Companies Inc.


Of Note: 1st use of this technology at U.S. airport; airport combined installation of test slabs with other planned airfield improvements

Preliminary Results: Trial indicates that electrically conductive concrete is technically & economically viable for heating airside pavements

Key Benefits: Less need to deploy personnel for snow removal; reduced use of chemical deicing agents

Test Slabs at Des Moines Int'l Bode Well for Electrically Heated Airside Pavement

BY ROBERT NORDSTROM

 Central Iowa may not be the first location that springs to mind for cutting-edge technology breakthroughs, but Des Moines International Airport (DSM) is defying that stereotype.

The small hub facility is the first U.S. airport using electrically conductive concrete with embedded electrodes to heat airside pavement. Two test slabs installed on DSM's general aviation apron in 2016 are producing promising results. Specifically, they are eliminating the need for the airport to dispatch personnel or use chemical agents to remove snow and ice.

The project is a cooperative research initiative being performed by Iowa State

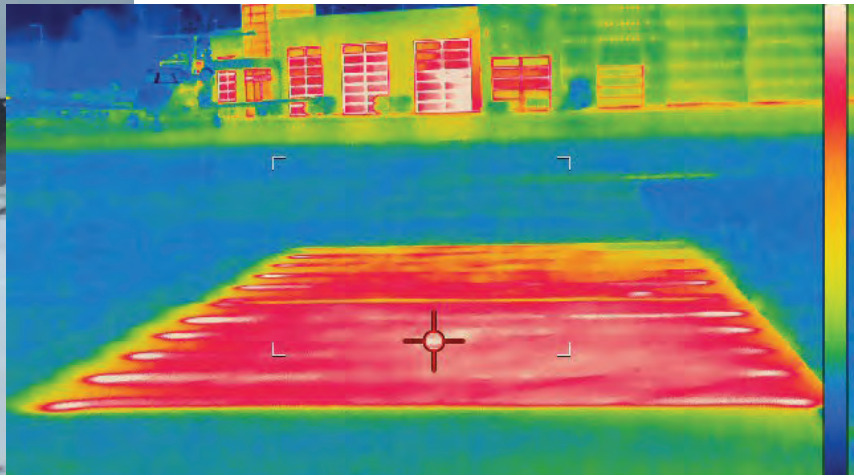
University and the FAA as part of the federal agency's Partnership to Enhance General Aviation Safety, Accessibility and Sustainability (PEGASAS).

Bryan Belt, director of Engineering and Planning at DSM, was intrigued when the research team approached airport officials in 2013 about participating in a study to determine the economic viability of the new pavement technology.



BRYAN BELT

"They (university researchers) were looking at ways to heat airside pavements in order to



Researchers use thermal imaging to measure heat levels of the test slabs.

participate in the FAA-subsidized study. So they simply coordinated some of that work with the timeline for the research project. In 2016, crews installed an electrically conductive concrete heated pavement system in two full-size 15-by-13-foot concrete slabs on DSM's general aviation apron. The airport provided materials and labor, electric power and Wi-Fi service to help researchers visually monitor the surfaces and track data from various sensors.

"We were going to replace those panels of concrete anyway," notes Belt. "We incurred maybe an additional \$10,000 to \$15,000 in costs. Of course, this project was being done on a small scale; if done on a larger scale, comparative [per slab] costs would decrease significantly."

reduce the need for maintenance crews, snow and ice removal equipment and chemicals on pavement surfaces during inclement weather," recalls Belt. "Initially, they were looking at a geothermal system with piping and pumps cycling heated water or glycol beneath the runway pavements. However, that was determined not feasible economically, and they proposed the installation of an electrically conductive concrete heated pavement system instead."

The ongoing project at DSM is being led by Halil Ceylan, a professor at Iowa State, founding director of the university's Program for Sustainable Pavement Engineering and Research, and the school's site director for PEGASAS. "You can use state-of-the-art snowplows to clear runway surfaces fairly quickly. However, you cannot do that in congested areas such as gates, ramps and high-speed taxiways," explains Ceylan. "That's where airport managers and operators are going to get the maximum benefit from this technology. With luggage trolleys, fuel trucks and food trucks operating in the area, you can't send in large snowplows during winter weather events. Your only option is to use a large number of small vehicles and equipment to try to keep up with snow and ice removal. A lot of accidents happen in those areas. As a result, they became the No. 1 target areas for us."



HALIL CEYLAN

By coincidence, DSM was already planning to make apron and taxiway pavement improvements when airport officials agreed to

Industry First

The DSM project is the first full-scale electrically conductive concrete heating system installation at a U.S. airport, Ceylan informs. Project engineers eliminated the need to heat the entire 7.5-inch thickness of the concrete slabs by pouring them in two separate layers and adding electrodes and conductive material to the top layer.

Crews began by installing a 4.5-inch bottom layer of P-501 Portland Cement Concrete. When they poured another 3 inches of the same mix (with conductive agents added) on top, the research team guided installation of six electrodes per slab, with fiberglass rebar for protection. Electrical energy running through the embedded electrodes allows the pavement itself to serve as the heat source, explains Ceylan. Carbon fibers added to the concrete mix assist with electrical conductivity.

"Our technology is unique in that we are using small amounts of conductive agents and are still able to make the system work," he notes. The concrete mix used at DSM only contains about 1% carbon material per cubic yard of concrete. By comparison, mix designs that use steel shavings or carbon powder to aid electrical conductivity require much more material—25% to 30%. Ceylan notes that higher dosages of conductive material reduce the concrete's strength and workability, and add to the overall cost of the mix. Steel fibers and shavings are also susceptible to corrosion.

"By adding carbon fiber, we are improving the mechanical properties of the concrete mix *and* making the concrete stronger,"

he explains. "While our goal is to improve conductivity, we also achieve the additional benefits of strength and durability. The fibers help prevent micro cracks from opening up, and thus improve the long-term performance of the pavements under mechanical and environmental loadings."

Because the slabs at DSM were designed primarily for research/demonstration purposes, project engineers included numerous probes and gauges to monitor moisture, humidity, temperature, current/voltage and system strain. Crews installed the various measurement devices and equipment when pouring the concrete. In a real-world application of the technology, the system would only require a few temperature probes (with associated conduits) and electrical wires for the electrodes.

Environmental Benefits

Ceylan points out that heated pavement can eliminate the need for deicing and anti-icing chemicals that damage concrete surfaces and contaminate water runoff. This important and substantial sustainability benefit is particularly salient for airports near national parks and other environmentally sensitive areas. Winter maintenance can be very expensive for airports that have to collect and truck away contaminated slush, he explains.

The system can be tailored to various locations and climates by adjusting the electrode size, spacing and voltage used. For example, in Iowa the system requires about 415 watts per square yard to melt ice and snow; in North Dakota, Ceylan estimates that it would need approximately 765 watts per square yard.

While the overarching goal of the research is to help keep airports open, safe and accessible during winter weather events, Ceylan emphasizes that the technology's sustainability benefits should not be underestimated. Deicing chemicals are harmful to the environment when they migrate into nearby waterways and streams after mixing with slush and runoff water, he explains. The chemicals also reduce pavement life and corrode aircraft parts and airfield lighting fixtures. Heated pavements can eliminate these problems and costs, notes Ceylan.

Dollars & Sense

Results regarding return on investment also seem promising. Ceylan reports that the system's benefits outweigh its costs with more than 70% reliability, and the benefit-cost ratio increases with airport size. He considers it significant that electrically conductive concrete makes financial sense at a relatively small airport like DSM, which handles 2.9 million annual passengers and 74.9 million pounds of cargo per year.

"Obviously, there are added costs initially," he elaborates. "However, long-term cost-benefit analyses and lifecycle cost analyses show that the system is a smart choice for dealing with winter maintenance issues."

After observing the two test slabs, Belt says that electrically conductive concrete would be best applied at DSM near the gates and terminal, where ground handling staff and equipment have to get in and out of tight areas. "During winter months we spend a lot of time pulling snow away from gates and aircraft.

That's where we believe we could see a significant dollar savings," he shares.

In general, airport officials are impressed by how the pavement system has performed. "Bottom line," Belt stresses, "right now we can go out there in any inclement weather we have here at the airport, and those two panels are free of snow, ice and are usually dry."

Bright Future

Given the performance of the test slabs at DSM, Ceylan and his co-researchers have filed for two patents associated with the technology. They are also fielding plenty of inquiries from within the industry.

"Our work has been attracting a lot of attention," Ceylan reports. "For example, Swedavia Airports contacted us. They have hydronic heating systems with vented tubes placed in concrete and asphalt in which liquids such as glycol are circulated. They indicate that they are experiencing a huge headache because over time the tubes break, crack and leak. Glycol is very corrosive and a huge concern for their airports. They were very excited about this new technology."



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The American Concrete Paving Association is also taking note. “They, too, see the benefits of eliminating the need for deicing chemicals by incorporating carbon fibers into concrete mix,” says Ceylan.

Mainstream interest in the topic is more surprising. In 2018, the technology at DSM was featured on NBC’s *Today Show* and *Nightly News With Lester Holt*.

Getting specifications for heated airside pavements added to FAA Advisory Circulars will be a crucial stop in bridging the gap between promising research results and wider deployment of the technology. “Once we get that done, airports will have the mechanisms in place to apply for Airport Improvement Program funding,” explains Ceylan. “That’s an important part of our research project that is currently under review by the FAA.”

In the meantime, officials at DSM are evaluating how the technology could be implemented more broadly at their airport—in particular, how it could fit into plans for the new terminal that is scheduled for construction in 2026. “The system works,” Belt remarks. “We will look at implementing this technology near gates and exposed ramps, and possibly on landside sidewalks in front of the terminal and parking garage. Not spending money on salt,

Electrically conductive concrete for heating airside pavement is showing promising results.



chemicals and staff to keep sidewalks clear is an obvious benefit. Plus, it creates a safer environment for travelers.”

Ultimately, both researchers and DSM officials agree that the future looks bright for electrically conductive concrete at airports. ✈️

For more information about the research project at Des Moines International Airport, consult “Sustainable Cities and Society,” Volume 41 (2018), pages 195 to 204.

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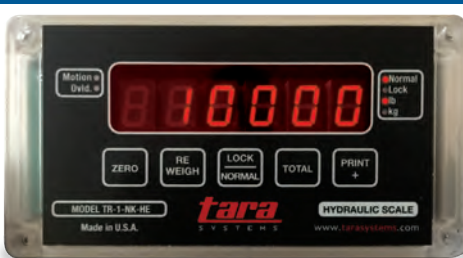
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Spirit of St. Louis Shines Brightly With New Lighting System

BY JENNIFER BRADLEY



FACTS&FIGURES

Projects: New Runway Pavement & Lighting

Location: Spirit of Saint Louis Airport

Total Cost: \$1.34 million

Funding: 90% FAA grant administered by Missouri DOT-Aviation Section; 10% local match

Runway Length: 7,500 ft.

Project Timeline: Planning & design 2018; construction March–June 2019

Design Engineer & Construction Manager: WSP-USA

Main Contractor: Millstone Weber

Concrete Joint Repair: 20,000 linear ft.

Concrete Spall Repairs: 2,000 sq. ft.

Airfield Lighting Manufacturer: ADB SAFEGATE

High-Intensity Runway Lights: 98

Lighting Subcontractor: Reinhold Electric

Lightning Protection: Bare Copper Counterpoise

Lighting Cable in Conduit: 20,000 linear ft.

The airfield at Spirit of St. Louis (SUS) Airport is safer and brighter following a \$1.34 million project that overhauled its main runway with freshly renovated concrete and upgraded lighting.



DAVID SCHUBERT

“Both systems were in need of some attention, and this runway is our bread and butter,” says Deputy Director of Aviation Dave Schubert.

Since Runway 8R-26L was already scheduled for pavement rehabilitation, SUS management figured it was an opportune time to upgrade the runway’s lighting, too. The south runway is considered the airport’s main runway for landings and departures, because its shorter north runway, 8L-26R, has operational restrictions in bad weather for corporate traffic.

Initially, SUS expected the lighting project to entail removing and replacing the existing

light fixtures, which were a combination of stake-mounted units and base cans. But when the design process began, project engineers found that the fixture spacing was non-compliant and concerns also emerged about the age-related condition of existing in-ground circuits. Airport leaders consequently decided it was time for an entirely new system. In the end, contractors installed all-new lighting in concrete-encased bases with new cable and conduit, including new homeruns (the lighting circuit loop that runs from the runway back to the power supply in the electrical vault).

An FAA grant administered by the Aviation Section of the Missouri Department of Transportation covered 90% of costs for the lighting and pavement upgrades. The federal grant was much needed (and appreciated) by the county-owned airport because it is completely self-funded with traditional revenue sources such as fuel sales, hangar rentals and land leases.

Rob Heine, an airport engineer at SUS, explains that the FAA had strongly encouraged the airport to install new

lighting on Runway 8R-26L due to its length. Throughout the years, the south runway has undergone a series of extensions and is now 7,500 feet. The previous direct-buried circuits and stake-mounted light fixtures required high levels of maintenance, where storms or electrical disruptions within the system would bring down 10 lights at a time, requiring emergency repairs.

In retrospect, Schubert and other airport personnel are glad they pressed on and completed both projects. The pavement work is designed to keep the runway performing safely until a full replacement can be performed sometime around 2029; and the new lighting system is also expected to last 20 years.

While making improvements on Runway 8R-26L, SUS took the opportunity to have the project team evaluate the rest of the airfield pavement, too. "This gave us a roadmap on what we need to do to the south runway over the next decade to keep it viable and prolong that full-depth reconstruction," Schubert explains. Information gathered recently will also help support future grant requests.

New Incandescents

The decision to stick with quartz lighting entailed a lot of thought and debate. While cost-savings associated with LEDs were tempting, the project team felt that traditional incandescent lights are better suited to the airport's temperate, but varied, climate.

"We're right on that geographical line where the lights need heaters to handle the snow and ice load we get in winter," Schubert explains.

In addition to tapping the project engineers and contractors for input, Schubert solicited opinions from other directors at predominantly corporate airports, and they were split right down the middle.

Although the team ultimately opted for quartz runway lights, the airport has LEDs on its taxiways. Because 8R-26L is a precision-approach runway, it has a five-step approach for lighting intensity.

Safety and reliability were major considerations as well. Jennifer Kuchinski, senior project manager at WSP, explains that lightning strikes and high water tables are prevalent at SUS, and the old lighting system regularly suffered shorts and outages. "Maintenance knew to be leery of working on the line due to shocks," she comments. "With this new lighting system, they will not need to worry about the circuit's integrity and reliability."

In addition to providing better visibility for pilots, the upgraded runway lights will streamline maintenance for the airport. "While the maintenance staff kept the [previous] system working with impressive regularity, maintaining the circuit became an increasingly laborious task over time," notes Kuchinski. "The new system will allow the maintenance staff to balance their efforts toward other airfield facilities and maintaining a world-class business/reliever airport for the community."

Ben Sanchez, project manager with primary contractor Millstone Weber, reports that the project was fairly simple to execute. "Once the ball got rolling it was just keeping it going day after day until the scope was complete," he says.



Concrete-encased base cans were prepared in a staging area prior to installation.

Reinhold Electric executed the lighting system upgrades, working as a subcontractor to Millstone Weber.

Innovation on the Fly

Keeping the runway open while contractors installed the new lighting system was a high priority, but as-built drawings revealed that the existing circuit was positioned right in line with the new light fixtures. This would present the safety risk of workers cutting into the existing circuit and would have caused delays, increased costs, as well as

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extended circuit outages. During design there was no opportunity to trace out the entire circuit, so the design team played it safe.

“We designed a complete temporary circuitry system on-grade to keep all the lighting energized while the new system was installed almost right on top of the old cable,” explains Robert Roseman, the electrical engineer of record from WSP. “This proved to be a challenge to detail the temporary cable connections to existing lights, some of which were in-pavement at taxiway connectors. In addition, we designed in savings by incorporating re-use of 24 existing displaced threshold and end light base cans, which were in the proper locations and in good condition.”



ROBERT ROSEMAN

However, once in construction, as the contractor performed the required cable locating and marking, the existing cable was found to be routed just outside of the proposed new light locations. Consequently, the project team huddled to devise another way, and the contractor proposed a temporary jumper concept. Roseman notes that these issues affected the team’s decision not to install a full temporary circuitry system. “Until then, we kicked back and forth ideas of how much time the airport wanted to have the runway out of commission, just due to lighting versus the installation cost of the temporary system,” he relates. Ultimately, the team decided to execute the contractor’s proposal.

Each day after work was complete, crews used a series of jumper cables to tie the old lights into the new circuit so all runway lighting was operational. “The biggest risk to that, is that when you tie in new and old lights you can encounter high impedance, shorting out the ground,” Heine explains.

Fortunately, the jumper cable plan worked without a hitch.

Kuchinski also highlights the way contractors and WSP’s field team worked with the airport maintenance manager to map out the existing circuitry and utility locations as accurately as possible. This largely helped crews avoid inadvertently cutting into active lines. Kuchinski notes that the few times that did happen, the team worked together to identify the exact location of the cut so workers could perform a permanent repair to restore service quickly.

The team’s combination of preventive and on-the-spot fixes saved time and money. “That was the goal,” says Roseman. “The savings from not using the full temporary circuit allowed additional pavement repairs to be made.”

Heine notes that it was a “big moment” when the team realized it didn’t need to install an entire temporary lighting system.

Learning Along the Way

Ultimately, construction began in March 2019, the runway closed for two weeks in May, and the project was finished by late June. “The schedule gave the contractor time to get their feet wet, get

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used to the phasing,” Roseman recalls. “[It also] gave the airport time to become familiar with the scope of the project and perform cable locates and make the decision to go with jumper cables.”

The airport was able to use its existing lighting controls, but needed to install a new constant current regulator and 3,000 feet of home run to the electrical vault. “Think of it as Christmas tree lighting,” Heine explains.

Team members highlight phasing and communication as crucial to the project’s smooth success. Many specifically emphasize the value of explaining the construction process to airport tenants, soliciting their input, working collaboratively with contractors and designers and regular progress meetings.

“Schedule constraints were the biggest challenges,” Sanchez reflects. “Having to open the runway daily to operational criteria had to be accounted for in production projections.”

Roseman reminds other airports considering similar projects to loop in their maintenance staff. “It’s important to talk with the people who actually maintain the lighting and electrical systems,” he explains. “As-builts can only show you so much, but if you walk the site, they can point out locations of underground infrastructures, etc.”

In retrospect, Heine says that it was important to upgrade the runway’s lighting system, given the spacing issues, maintenance



Workers trenching in new high-intensity edge lights for the main runway.

challenges and other ongoing concerns. “We accomplished it, and it proved worthwhile to add in the extra cost,” he says.

Schubert agrees. Most years, 200 to 250 aircraft fly in and out of SUS on a busy day; but flight operations have slowed 30% to 50% during the coronavirus pandemic. Even with traffic down, he reports that everyone is appreciating the newly lit, freshly paved runway. ✈️

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Buffalo Niagara Int'l Knows Snow

BY JODI RICHARDS

FACTS & FIGURES

Project: Winter Airfield Maintenance

Location: Buffalo (NY) Niagara Int'l Airport

Airfield Maintenance Staff: 25

Runways: 8,829 & 7,161 ft. long; both 150 ft. wide

Multi-Task Equipment: M-B Companies

Plows: Oshkosh

Brooms: Sweepster

Snowmelter: Trecon

Of Note: Airport receives unpredictable weather due to its location in western NY, on Lake Erie & close to Lake Ontario



With winter weather that is beyond unpredictable, Buffalo Niagara International Airport (BUF) needs top-notch expertise and equipment to keep its airfield clear for aircraft operations. “There’s no typical winter here in Buffalo,” says Airfield Superintendent Joe Guarino. “There’s always something different that happens during a snow event.”



JOE GUARINO

The airport’s location in western New York greatly complicates matters for crews battling the snow and ice. In addition to being in the path of winter storm fronts making their way across the country, BUF

often receives lake effect snow—a common occurrence in the Great Lakes area caused by cold wind moving over a warm body of water. Because BUF is located on the shores of Lake Erie and across a thin strip of land from Lake Ontario, it is vulnerable from multiple directions.

Guarino explains that lake effect snow can be alternately predictable and unpredictable. “I’ve been told a number of times it should have been over two hours ago, but it’s still hanging over us,” he relates.

Nevertheless, he and his crews closely monitor weather forecasts and work to prepare the right staff and equipment for managing winter conditions. BUF works directly with the National Weather Service,



PHOTO: ©WWW.TOMWOLFIMAGING.COM

interacting almost hourly during snow events, to aid its decision-making process.

And then there are Buffalo's temperature fluctuations, Guarino adds. A snow event can start out with 20-degree air temperatures and dry, blowing snow that is easy to clear off the airfield, but quickly transition to a completely different beast if the temperature rises near 31 degrees and moisture begins to freeze on the pavement.

By necessity, BUF's winter operations strategy is very fluid. "We have a basic snow plan that we brief our stakeholders and staff on regularly, but things change depending upon the conditions," says Guarino.

For example, if a storm brings heavy snow accumulation, the maintenance department will most likely dispatch its large vehicles that are equipped with both plows and brooms. But if freezing rain begins to fall, it will likely switch to equipment that apply chemical treatments.

According to Guarino, blizzards that cause reduced visibility are the most challenging conditions for BUF's airfield crews. "I've been here where the sun is shining and the wind is blowing so strongly out of the southwest that we couldn't see our hands right in front

of our faces—zero visibility," Guarino stresses. "There have been a number of times where we had to escort aircraft to the departure ends of the runway so they could get out."

But airfield improvements are in the works to take some of the sting out of BUF's challenging winter weather. A complete rehabilitation of Runway 5-23, scheduled for 2022, will include the installation of a surface movement guidance system (SMGS) and a parallel alpha taxiway equipped with full centerline lighting and an SMGS route to increase airfield safety in reduced visibility conditions.

Last year, the airport logged more than 80,000 annual operations on its two runways. Runway 5-23 is 8,829 feet long, and Runway 14-32 is 7,161 feet long; both are 150 ft. wide. Given BUF's challenging and capricious weather, it takes a lot of work to keep each and every foot of the airfield safe for pilots and their passengers.

Equipment

One of the ways Guarino has improved the efficiency of snow removal throughout the years is acquiring and leveraging equipment that can perform multiple functions such as plowing and brooming. In fact, his department just received approval to purchase two more MB5 MTE (multi-task equipment) vehicles,



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bringing the airport's total to five when the new units are delivered next winter.

Guarino notes that the additional equipment will allow crews to clear the full 150-foot width of BUF's runways more quickly and efficiently than in the past. "It will be a great addition to our fleet," he remarks. "They are durable and very maneuverable."

In addition to its three giant multi-function vehicles from M-B Companies, BUF also uses Sweepster runway brooms, Oshkosh P-series plows, two 4,000-gallon deicing boom trucks and a variety of blowers and rotary plows. "There are times where some of them sit for a whole snow event," says Guarino. "And other times, we're using every piece of equipment."

Such is the norm for an airport nestled in between two Great Lakes.

Each of the new MB5 MTE vehicles that BUF is eagerly awaiting will have a 24-foot plow on the front, a 22-foot broom in the center and a 1,300-gallon deicing system in the back. "Not only can they plow and broom at the same time, they can also deice the runway with just one operator," says Alan Luke, a regional sales manager for M-B Companies.



ALAN LUKE

Having multiple functions in one vehicle resonates with Guarino. "We need to be efficient to get on and off the runway surface as quickly and safely as we can," he explains.

The airport is prone to lake effect snow from nearby Lake Erie.



PHOTO: ©WWW.TOMWOLFIMAGING.COM

With the airport's large multi-task equipment focusing on runways, other single-use equipment is available for use on taxiways, intersections, aprons and other areas that require more time to clear.

Luke notes that operating a uniform fleet—that is, multiple pieces of the same brand—can save an airport time and money for operator training, maintenance and spare parts.

Because of the impact the coronavirus pandemic has had on airports, FAA waived its local match requirement for Airport Improvement Program funds, and the MTEs and two front end loaders were funded at 100%. Additionally, BUF received \$21 million under the Coronavirus Aid, Relief and Economic Security (CARES) Act, which the airport put toward its debt service.

"Like a lot of airports, we lost a lot of traffic; so revenue is not coming in like it used to," explains Guarino. "It was huge for that equipment to be 100% funded."

Training

Guarino considers thorough training a critical part of safe and efficient winter operations. He consequently takes advantage of mild winters and warmer months to make sure that all 25 members of his department are familiar with the airport's equipment and standard practices. Particular attention is paid to FAA Part 139 requirements and reviewing the previous year's performance. In addition, recurrent training covers situational awareness, fatigue and other common challenges for equipment operators.

Guarino also requires all staff to attend the basic and advanced Snow Academies at the annual NEC/AAAE International Aviation Snow Symposium held in Buffalo. "It makes us sharper and more focused," he says of the hometown event that draws attendees from across the country and abroad.

The Snow Symposium is also a great venue for sharing best practices with other airports, he adds. "We learn from each other." ✈️

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Paoli Municipal Makes Significant Improvements to Its Sole Runway

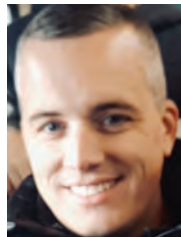
BY VICTORIA SOUKUP





Robbie Lambert recalls his flight instructor repeatedly telling him, “If you can land at Paoli, you can land anywhere.” It was a profound statement coming from an experienced veteran who once worked as a bush pilot in Alaska.

With practice, Lambert learned to navigate the challenges of Runway 2-20 at Paoli Municipal Airport (I42) in southern Indiana...and now serves as president of the Paoli Board of Aviation Commissioners, which governs the small city-owned airfield.



ROBBIE LAMBERT

“Paoli Airport had the shortest runway in our airspace in Indiana,” Lambert recalls. “It was like landing on a matchstick. We were on a hill, we had a line-of-sight issue with a bump on one end, and we often had very windy conditions. There were a lot of variables that made our runway really difficult to land on for even fairly experienced pilots.”

But things have improved dramatically. These days, the airport’s sole runway is 508 feet longer and 10 feet wider, measuring 3,301 by 60 feet. The extra length and width make operations much safer, says Lambert. “Due to the shape of the wall, now it’s like landing on an aircraft carrier. We jokingly call it the USS Paoli.”

Adding 10 feet of width was more significant than it may sound. “One side of the runway had a huge drop-off right into the trees,” he explains. “We’ve actually had people run off the runway and go down into the trees. Giving an extra 5 feet on each side of the centerline is helpful, especially when we have a strong crosswind.”

The \$9.61 million improvement project, which was set for completion in September, presented significant engineering challenges. Since the runway is on a hill, the airport had to add fill to create a level surface for the extension. Engineers made up the 100 feet of grade difference with a vegetative, mechanically stabilized earth wall. Filled with dirt and surrounded by carefully placed stone, the wall is held together with geotextile fabric and gabion baskets.

FACTS&FIGURES

Project: Runway Extension/Widening

Location: Paoli (IN) Municipal Airport

Cost: \$9.61 million

Funding: 90% FAA; 5% state; 5% local (from airport budget)

Timeline: 10 years from concept to completion (end of 2020)

Consulting Engineers: Woolpert Inc.

Engineering Strategy: Create a vegetative mechanically stabilized earth wall to accommodate extension

Wall Construction: 4 years (completed in July 2020)

Construction Contractors: Ragle Inc.; E&B Paving

Geotextile Fabric: Tensar

Rock Suppliers: Cave Quarries; Calcar Quarry

Specialized Grass Seed: Varied by phase, most produced by Caudill Seed Co.

Electromagnetic Conductivity Mapping & Electrical Resistivity Imaging: Mundell Consulting Professionals

Paving Contractors: Ragle Inc.; Calcar Paving

Runway Markings: Elite Line Striping

Associated Projects: New LED lighting & precision path indicator system

Lighting & PAPI Manufacturer: ADB SAFEGATE

Lighting Contractor: Appalachian Foothills Contracting

An extra 508 feet of length and 10 feet of width have made the runway much more forgiving for pilots.



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The complex process began 10 years ago when the airport first explored extending Runway 2-20. “The reasoning was two-fold,” Lambert explains. “We needed to move forward for safety reasons, and also because nearby French Lick is a tourist area and we wanted to service potential overflow from there.”

Lambert notes that Paoli Municipal keeps fuel prices low to encourage pilots to stop there. But before the recent airfield improvements, some would routinely divert to other airports because they were not comfortable landing on Runway 2-20.

Thinking Outside the Box

Woolpert, the consultant leading design and engineering for the challenging project, began by analyzing the airfield and surrounding property to determine the best way to lengthen the runway. “We knew the extension was needed; we just didn’t know how it was going to happen,” recalls John Baer, associate project



JOHN BAER

manager at Woolpert. “We actually looked at extending one end or another, or even a combination thereof. We opted to build up the whole end of Runway 2 to support the extension. We had to get creative to save money and provide a safe area for aircraft operators to land on.”

Baer estimates that constructing the wall, as opposed to building farther out to match the grade, saved the airport \$2 million to \$3 million in dirt and clearing costs. It also proved to be more environmentally friendly because the airfield is surrounded by trees. “To bring in all that dirt to meet the grade, we would have had to clear trees in a massive area,” says Ryan Robinson, project manager at Woolpert.



RYAN ROBINSON

Baer adds, “The further we would have had to go with the grading, the more trees would have had to come down. This option saved a pretty significant number of trees.” Creating the wall also protected nearby wetlands. “We cleaned up the wetlands but didn’t build or put fill on top of them, which we would have done if we did not construct the wall,” he remarks.

The wall extends 20 feet underground and rises 80 feet above the surrounding ground level. It was constructed in 18-inch segments—with larger rocks carefully positioned at the base to stabilize the structure’s exterior, and smaller rocks used toward the top.

The wall’s dirt interior is bound to the exterior rocks by two layers of geotextile fabric, which is surrounded by gabion baskets. “The primary layer goes in between the layers of aggregate every 18 inches,” Robinson explains. “A second layer goes up and around the exterior next to the baskets and interlocks everything in place. When these baskets eventually decompose, the wall will go into tension with the fabric.”

Tensar, the company that supplied the geotextile fabric, emphasizes that its product is guaranteed against decay and damage from the sun’s ultraviolet rays for 75 years. “We had to make sure that the material we selected met that specific criteria, because if we saw deterioration of that fabric over the years, the wall could collapse,” Robinson notes.

Contractors referenced a conformance checklist throughout construction to ensure that the wall remained within strict structural tolerances. “As you come up, each basket is 6 inches in from the one below it,” says Robinson. “And at the top of the wall, you have to meet that width for the runway safety area. So we had to perform a checklist with 10 different criteria for each point surveyed on every constructed segment, as well as the previously constructed segments to ensure no impact was caused by construction.”

Crews used more than 72,000 cubic yards of rock and 88,000 cubic yards of dirt to create the wall. So much rock was needed that contractors had to construct a road on airport property to transport the heavy material to the runway. “It would have destroyed the ramp and taxiway if the trucks used that pavement to deposit the rock,” Lambert says.

Four Years, Two Contractors

Due to bidding and funding timelines, two separate construction contractors were the low bidder and awarded the work for the project. Although this was not the project team’s preference, Robinson notes that the associated four-year construction timeline allowed ongoing inspection of previously laid layers of the wall. The team also used high-resolution drone imaging by Woolpert’s UAS Group to verify the wall’s structural integrity.

“There was a little bit of risk and liability with multiple contractors performing the work,” Baer comments. “But on the positive side, the wall was constructed over multiple years, which meant that we would have seen any differential settlement if it would have occurred.”

Engineers had the contractors add grass seed to the dirt fill to improve visual acuity for pilots and to help protect the geotextile fabric from sunlight. A special seed mix was used to ensure that the grass will grow to a length that does not require maintenance. The grass is engineered to grow out in spring and early summer, and then die off in the hotter months and during winter. The mixture is comprised of thermally refined wood fiber, crimped interlocking man-made biodegradable fibers, mineral activators

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and water absorbents. The product is designed to produce rapid germination and dormant seeding, and therefore provide long-term protection for the wall, Robinson explains.

Baer notes that the outer portion of the wall also serves as a “French drain” by facilitating water flow and adding a natural pollution-prevention element that filters sediment out of the runoff.

Construction of the wall began four years ago. In mid-August, contractors were on pace to complete the project by the end of September. Crews are scheduled to finish paving and markings before winter arrives.

Removing This, Improving That

Aside from extending and widening the runway, the airport also removed a troublesome hump in the center of 2-20 caused by a limestone bedrock just below the surface. “It was a visual line-of-sight issue where you couldn’t see the taxiway from the end of the runway,” Baer says.

Crews flattened the 3-foot hump and reconstructed that portion of part of the runway—about 1,110 feet of pavement 50 feet wide. “It is still difficult to see from one end to the other because the elevation still changes 13 feet, but now the runway slopes from south to north without getting higher in the middle,” Robinson explains.

New LED lighting and a four-box precision approach pathway indicator (PAPI) system were other related improvements.

“Most airports have two landing PAPI lights, but we actually got approved by the FAA for Runway 2 to have four lights to help give pilots a safer and more accurate glideslope reference,” Lambert says. “With a two-light system, if you have two reds, that means you are low; but it doesn’t tell you how low. With four lights, if you have a white and three reds, you know you are *really* starting to get low. It is going to give pilots more time to realize they are getting lower than they should be.”

Runway 20 has a traditional two-box PAPI system.

The new runway safety area meets FAA requirements for a 60-foot width of unobstructed surface area on each side and 250 feet long at the departure end of the runway. Millings connected with a cabling barrier system are being installed along the edge of the vegetative mechanically stabilized earth wall to protect personnel mowing grass and performing maintenance.

Surprise!

When workers began preparing the site for construction, they made an unexpected discovery. “We were doing tree clearing and by dumb luck, the team stumbled upon a karst system,” Baer explains.



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Naturally, the open underground fissure prompted the team to pause site prep. Given that the airport is located in an area known for limestone deposits, further investigation was required.

“The karst system was in the steepest corner of the wall, and we had big concerns about the potential of caves being under the area where the wall was to be constructed,” Baer explains.

As a result, a specialist performed electromagnetic conductivity mapping and electrical resistivity imaging to assess the condition of the area. Crews drilled 50 feet into the ground in four areas and dropped a video camera down into the holes to survey subsurface conditions.


Additional borings were performed during a geotechnical investigation and fortunately, no other voids were found, prompting the team to conclude that the karst discovered earlier was an isolated anomaly.

Return on Investment

Thanks to federal and state funding, the city's share for the \$9.61 million airfield project was \$494,000. That portion was paid out of the airport budget.

Lambert credits its engineering and design consultant for making the complicated project a reality, from start to finish. “The Woolpert team has been fantastic to work with,” he says. “They really seemed to have our best interests at heart.”

In addition to improving runway safety, the recent runway improvements are expected to make Paoli Municipal a more attractive stop for pilots. Specifically, the aviation board hopes to win the business of pilots who need fuel when traveling south for the winter, overflow traffic from the French Lick tourist area or even planes headed to and from the annual EAA fly-in at Oshkosh, WI. The airport's fixed base operator is ready to accommodate the additional traffic with showers, kitchen facilities and multiple courtesy vehicles for pilots and passengers.

“The airport is also going to help facilitate new pilots by promoting flying,” Lambert adds. “And for even the more experienced pilots, they will now experience the pleasure of flying into Paoli. The economic benefits are strong for pilots and for our community. It's win-win.” 

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Winnipeg Int'l Adds Multiuse Facility to Enhance Cargo Operations

BY PAUL NOLAN

FACTS&FIGURES

Project: Ground Service Equipment Multiuse Building

Location: Winnipeg James Armstrong Richardson Int'l Airport

Size: 96,175 sq. ft.

Cost: \$27 million

Funding: Winnipeg Airport Authority capital budget

Construction: Sept. 2018-March 2020

Architect: LM Architecture

Contractor: Con-Pro Industries Canada Ltd.

Strategy: New facility will house 7 tenants; most are moving from east campus, which will be redeveloped to increase cargo capacity



A Chinese proverb encourages us to, “Be not afraid of growing slowly, be afraid only of standing still.” Tyler MacAfee, vice president of communications and government affairs for the Winnipeg Airport Authority, can relate.

MacAfee is excited about the recent completion of a \$27 million multiuse building on the east side of Winnipeg James Armstrong Richardson International Airport (YWG)—not only for the accomplishment itself, but also for the facility’s role in a larger plan to redevelop the airport’s east campus cargo facilities.



TYLER MACAFEE

Most of the seven tenants that will be moving into the new 96,000-square-foot facility are moving out of buildings on YWG’s east campus. At least two of the older buildings will be demolished to make room for new cargo facilities.

“The multiuse facility is the first domino of a much bigger redevelopment of the airport campus,” MacAfee explains. “It all drives off our desire to build the airport out as an asset for the community. We’ve been looking at what we should be investing in that is a need for this community, and cargo is a big part of that.”

Last fall, the Airport Authority received a \$30 million grant from the National Trade Corridors Fund, a Canadian transportation infrastructure investment program. That money will be put toward a \$62 million project to increase cargo capacity at YWG. The airport is a key transportation hub for central Canada, the Canadian North and for Canada’s international trade. The new multiuse facility was funded completely by the Airport Authority’s capital budget and is not part of the \$62 million cargo project.

Much-Needed Space

Crews broke ground in September 2018, but eventually encountered delays due to steel shortages, subcontractor staffing



issues and inclement weather. Construction was nevertheless completed in March, and 60% of the building's tenants were slated to move in by end of summer. The remaining businesses will stagger their move-in dates over the following months.

The building is 750 feet long—the size of two football fields—with individual tenant footprints ranging from 4,000 to 30,000 square feet. Tenants will include Air Canada, Airport Terminal Services and Gate Gourmet Canada.

The new building will also house Inland Technologies, which provides YWG's deicing services. After handling the reclamation and recycling of deicing fluid at the airport since 2002, the company began providing deicing services this past winter after purchasing the parent company of U.S.-based Integrated Deicing Services in 2015.

Blair MacAulay, northwest regional operations manager at Inland Technologies, says the new multiuse facility will hold the company's seven deicing vehicles and three deicing support vehicles. Inland will have four bays for vehicle storage and maintenance, a welcome expansion after spending last winter juggling 14 vehicles in and out of the facility used by its deicing reclamation operations.

"It was a really challenging year to conduct major maintenance from this single-bay shop and still be able to run our operations," he reflects. The company will continue operating its fluid reclamation services out of the original space.

Location, Location, Location

All of the tenants in YWG's new multiuse facility will be more conveniently located to the airfield compared to their previous east campus location. Workers also will now be inside the designated security area once they start their day, and will no longer have to pass through security checkpoints when shuttling back and forth between the facility and airfield apron.

"It's a state-of-the-art facility because it has a groundside that interfaces with the airside component," says Robert Bachart, director of real estate and development for the Winnipeg Airports Authority.

Apparently, tenants are impressed by the new building, too. "They're telling other airports they want a cut-and-paste of what we've done in Winnipeg because they believe it's going to be the next generation of footprints," says Bachart.



BLAIR MACAULAY

Current Realities

Naturally, fallout in the travel industry from the COVID-19 pandemic could impact the companies that have agreed to lease space. Consolidation or smaller staffs could change the amount of space they need.

The airport's focus on enhancing its east campus cargo facilities comes at a time when passenger carriers are relying on increased cargo loads to cushion the loss of passenger revenue



Individual tenant spaces range in size from 4,000 to 30,000 square feet.

due to the COVID-19 pandemic. A *New York Times* article from late May reports that the three largest U.S. airlines—American, Delta and United—began running cargo-only flights in March. American Airlines had not flown an all-cargo trip in more than three decades. In May, it was flying 140 a week.

Pre-pandemic, about half of all airfreight was transported in cargo planes operated by companies such as UPS, FedEx and DHL. The other half was carried in the bellies of passenger airplanes. The grounding of most flights worldwide in March contributed to a nearly 23% decline in air cargo storage, according to the International Air Transport Association. But demand fell a more modest 15%. Passenger carriers saw the need and filled the void, in part by retrofitting airplane cabins to accommodate cargo.

“We don’t know what the other side of this coin is going to look like from an airport perspective when we come out of the pandemic,” MacAfee comments. “Traffic could be half of what it was pre-COVID and not return until four or five years from now.”

Plans for the cargo project on the east campus are being reviewed, he adds.

The Canadian government addressed the importance of YWG’s cargo expansion project when announcing the award of a \$30 million grant from the National Trade Corridors Fund for the initiative in September. The project “provides wide-ranging economic and trade benefits for Canadian producers in the region by offering additional export capacity for commodities that would otherwise be exported via U.S. transportation hubs,” it said via a prepared statement. “The project will also improve accessibility and affordability of goods in Canadian remote and Northern communities.”

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The statement specifically cited benefits for producers in e-commerce, agricultural livestock, pharmaceutical, nutraceutical and aerospace, which require the type of specialized storage space YWG is including in its expansion project.

“One of the things we really focus on as an airport authority is how we innovate,” MacAfee says. “We’re looking at the space to see what we can do from an innovation standpoint: What are the opportunities?” 

Canada’s Push for Increased Cargo Business

According to a statement from the Canadian Minister of Transport, an efficient and reliable transportation network is key to Canada’s economic growth. That is why the government invested \$30.4 million to increase air cargo capacity at Winnipeg James Armstrong Richardson International Airport (YWG).

Here is Transport Canada’s take on the project:

- While the U.S. continues to be Canada’s top trade partner with \$741.4 billion in 2018 (\$437.6 billion exported, \$303.8 billion imported), trade is growing with international markets. From 2015 to 2018, trade with Asia (excluding the Middle East) grew by 18.9% to \$199.2 billion; and trade with the European Union grew by 19% since 2015 to \$118.1 billion in 2018.
- This project will strengthen the safety and sustainability of YWG, which is part of the National Airports System. The 26 airports in the National Airports System serve about 95% of all scheduled passenger and cargo traffic in Canada, and handle almost all of Canada’s international trade flows by air.
- By Investing in Canada Plan, the Canadian government is investing more than \$180 billion over 12 years in public transit projects, green infrastructure, social infrastructure, trade and transportation routes, and Canada’s rural and northern communities. The aim is to help Canadian exporters accelerate their presence in new markets and take advantage of the new opportunities that exist because of the trade agreements the government has secured in the past three years.

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The Clean Transit Initiative

Not since 9/11 have I seen an entire industry re-invent itself. The COVID-19 pandemic has surely changed life as we know it: travel suspended, businesses halted, gatherings cancelled, economy jolted, and our daily social lives disrupted. As a member of the architecture, engineering, and construction community that serves clients in some of the most heavily affected industries (aviation, cruise lines, healthcare and government), Faith Group understands more than ever what is at stake as we help our clients navigate this unprecedented current climate.

Like many firms, our offices closed on March 17, 2020, and on March 18th we began to think about how COVID-19 will change the transportation industry forever. With little direction and clarity from the CDC, and each airport being impacted by regional and local health authority mandates, we focused on developing a baseline of policies, procedures, and technologies to guide our clients toward

a balanced solution. Our Clean Transit Initiative, launched with support from Atkins, Carlyle Group, and Schneider Electric, focuses on providing clients with an end-to-end solution combining technology, policy, procedure, and process to reduce overall risk and restore confidence back into the travel experience.

The overall approach is based on turning CDC recommendations into actionable initiatives. Let's face it, in times of crisis, "silver bullets" don't exist. Technology innovations are flooding the market with claims that they mitigate the pandemic risks. The reality is that it takes a combination of technology and policy changes, at all levels of an organization, to be effective and make a real difference.

With that in mind, our team began developing multiple solutions, in a layered approach, to address the pressing need to reduce the risk that infectious diseases pose to public wellness. A few core areas include:

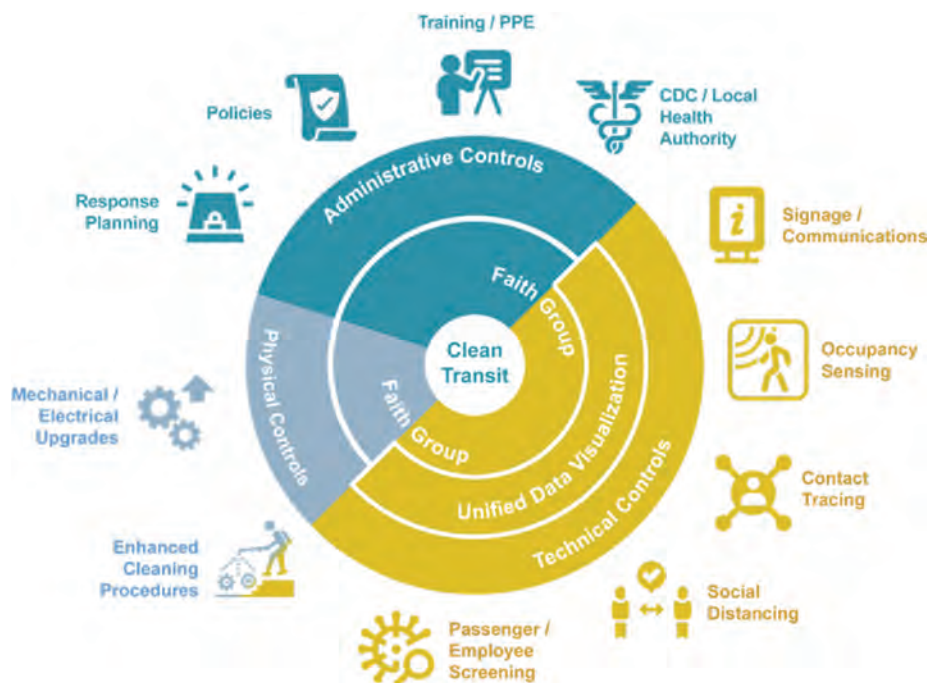


Faith Varwig

As the founding principal for Faith Group, Faith Varwig has more than 30 years of experience as a leader in airport

security and technology planning/design, including policy and procedure development to support complex business processes. Her work for airports and airlines includes virtually every type of facility in the aerodrome environment. She is a past board member of the Airport Consultants Council and a past steering group member of the Information Technology and Public Safety and Security committees for Airports Council International.

- Gap Analysis** – Understanding where internal risks exist is the first step to developing a comprehensive solution. Our automated survey and risk-based assessment tool allows mitigation efforts to be "valued" to determine the most effective areas to spend precious financial resources.
- Thermal Screening** – While asymptomatic carriers can still spread COVID-19, many people do develop a fever. Studies show that an estimated 46% of cases would not be detected by thermal screening—meaning more than half *would* be detected, which is still a substantial number. In a recent intercept survey of Delta passengers at Los Angeles International Airport, 87% said that thermal screening made them feel safer flying, and 77% indicated it would make them more likely to travel again. A word of caution, though: Not all thermal screening technology is created equal, and there are a lot of unreliable products entering the market.



- **Touchless Travel** – This initiative has been on the roadmap for several years but has not been a high priority for most airports and airlines. COVID-19 has certainly changed that and has brought to light the need to look for technical solutions that can work in harmony to enable end-to-end solutions. This approach includes virtual queuing, facial recognition at key locations, additional self-service baggage drop systems in departures lobbies, and the development of remote baggage drop and screening.
- **Contact Tracing** – While the CDC and many local and state health officials require some form of contact tracing to re-open, deploying an effective,

automated solution becomes difficult. Video analytics may be the obvious choice since most airports already have robust video systems, but it is not effective without identity information to match with guest pictures. Privacy concerns would also need to be vetted with the airport/airline legal teams.

- **Air Filtration** – If there has been one area that has risen to the top of the list as being important in mitigating risk, it is having the appropriate filtration and airflow in indoor spaces. Recent studies have confirmed that coronavirus particles can hang in the air for up to three hours. Faith Group recently completed an assessment of Customs

and Border Protection, baggage claim and retail spaces at a large international airport utilizing the facility's existing system design to effectively model viral propagation, resulting in the calculation of system Contamination Containment Efficiency (CCE).

For decades, flying has been the safest form of travel. COVID-19 IS A SAFETY ISSUE! Healthcare institutions and airports around the world have already approved and implemented screening in a *layered approach*. U.S. airports should do the same. As we move forward through the second half of 2020, the aviation industry must push for a uniform approach to address the pandemic and restore the public's confidence in travel once again. ✈️

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Airfield Art



The newest painting at Centennial Airport (APA) in Englewood, CO, is far too large for a frame. The compass rose, painted by The Ninety-Nines Organization of Women Pilots, adds a crisp, colorful graphic to the ramp outside the Wings Over the Rockies Air and Space Museum.

At 40 feet from tip to tip, the new compass rose (completed in July) is actually a half-size decorative version of what the group usually creates. Airport Director Robert Olislagers notes that APA has a full-size piece of The Ninety-Nines' signature artwork that is certified, so pilots can use it to check the calibration of magnetic aircraft compasses.

That painting, located near Taxiway A, began with a county surveyor marking magnetic headings on the pavement. Then, a cadre of volunteers from the Colorado chapter of The Ninety-Nines chalked in the 12-point compass design, taped off individual sections and rolled on blue and white paint. "Lots of people show up to help, and it's always a fun day," notes

Airmarking Chair Stephanie Wells, who organizes one or two compass rose projects every summer.

The tradition dates back to the early 1930s, not long after 99 female pilots originally formed the organization. In those days, members painted town names on the roofs of prominent buildings to help guide pilots who were navigating visually, and typically without radios. They also painted airport names on runways to prevent aircraft from landing at the wrong airfield.

During World War II, members blacked out about 13,000 relatively new markings to prevent enemy forces from using them to identify bombing targets—and then dutifully repainted the same names and directional cues after the war ended. Later, chapters began painting compass roses with the organization's logo of interlocking nines in the center.

In total, APA has three compass roses. Another full-size version, not painted by The Ninety-Nines, is located in an area used for engine run-ups. 



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