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# Welcome to our annual Runway & Ramp Special Issue

We expect a lot from our airfield pavement — despite the continual abuse it takes from environmental factors including repeated freeze/thaw cycles and harsh chemicals such as jet fuel and deicing fluid. Factor in the incredible loads it withstands from fully packed aircraft perched on relatively tiny wheels, and it's no wonder that finding the right design, installation and maintenance strategies can prove so challenging.

Fortunately, plenty of airports are finding effective new solutions. That's what this special issue is all about. Take Garfield County Regional Airport in Rifle, CO, on page 28. Its coordinated efforts with the FAA, state of Colorado, a consultant and an innovative product supplier pulled together the knowledge, budget, idea and, most importantly, the willingness to develop a different formula for the preventive maintenance of a nearly new runway.

I hope this is a practice that others can/will employ. All too often, the bare minimum is spent on runway maintenance. After years of this practice, runways can no longer take it and require full reconstruction. Money is too often available for reconstruction but not for maintenance.

Remember that airport control tower fiasco brought about by sequestration earlier this year? Hard not to, right? Perhaps there are solutions that can deliver some of the safety and information provided by control towers without the brick and mortar. This summer, Raleigh County Memorial Airport in West Virginia held a demonstration of an unmanned traffic advisory system. The premise is sound, and the results are promising. If the concept continues to prove itself, we could have real solutions to ATC funding shortfalls. Take a read on page 48.

As always, please let us know what you like, don't like or would like to see in AIRPORT IMPROVEMENT. Enjoy the issue.

Cheers,

Paul


# Detroit Metro Splits Runway Reconstruction & Fast-Tracks Construction to Maintain Asian Service for Delta

By Robert **Nordstrom**

## **facts**figures

**Project:** Runway Reconstruction

**Location:** Detroit Metropolitan Wayne County Airport

**Cost:** $150 million

**Design Team:**

Michigan Aviation Partners (joint venture of Kimley-Horn & Assoc. and Tucker, Young, Jackson, Tull)

Aviation Alliance; Barnard Dunkelberg & Co, a Mead & Hunt Company; CDM Smith Michigan; Connico; Jacobsen/Daniels Assoc.; Orchard, Hiltz & McCliment; Roy D. McQueen & Assoc.; Somat Engineering

**Construction Team:**

South End General Contractor: Ajax Paving Industries

North End General Contractor: Angelo Iafrate Construction Co.

Dan's Excavating; Rauhorn Electric; Walter Toebe Construction Co.

**Preformed Pavement Seals:** D.S. Brown

**Runway Lighting & Signage:** ADB Airfield Solutions

**Preformed Thermoplastic Markings:** Ennis-Flint

**Markings Installation:** P.K. Contracting

**Runway Weather Information System:** Vaisala

**Of Note:** Fast-track reconstruction, performed by 2 separate general contractors working in slightly overlapping phases, allowed for continued operations during peak summer months; new runway can serve Group VI aircraft

Runway 4R-22L serves a special role at Detroit Metropolitan Wayne County Airport (DTW). At 12,000 feet long, it's the only runway that allows a fully loaded 747 or 777 to depart and fly nonstop to Asian destinations during the warm summer months. As such, 4R-22L is a key element in the airport's role as Delta Air Lines' Asian hub.

So when it came time to reconstruct the deteriorating runway, airport officials' primary concern was maintaining operations during the massive project.


Tom **McCarthy**

"We had to have the runway open for Delta's overseas flights in the summer, so they wouldn't be faced with weight restrictions during their peak season when temperatures and humidity are at the highest and headwinds over the Pacific are greater," explains Director of Airfield Capital Projects Tom McCarthy.

To alleviate the potential conflict, DTW split the $150 million project between two general contractors and two main phases. Angelo Iafrate Construction Co. completed the north end last year, and Ajax Paving completed the south end this year. "The runway was out of operation from April through July each year, reopening for Delta's peak season in August," notes McCarthy.

Using fast-track construction methods and working in overlapping four-month construction seasons, the two general contractors and more than 30 subcontractors completed full reconstruction of the 12,003-foot runway and Parallel Taxiway Z 12 days ahead of schedule.

"With this type of project, the normal timeframe for completion would be probably twice as long," notes Pete Mann, project manager for Ajax. "But we were working 16- to18- hour days, seven days a week."

"Despite the weather and magnitude of the work, we were able to finish both phases of the project in a safe and timely manner due to the strong performance and efforts of a great construction team," adds Bruce Young, project manager of Angelo Iafrate.


## Divide & Reward

Angelo Iafrate broke ground in April 2012, completing approximately 4,000 feet of runway on the north end as well as adjacent taxiway work before the runway reopened in August. Ajax Paving, general contractor on the south end, began work in April 2013 while Angelo Iafrate finished up the north end and crosswind runway work.

To encourage on-time completion, DTW incentivized the contractors with bonuses of $20,000 per day for early completion. On the flip side, liquidated damages in the amount of $200,000 per day and $500 per minute would have been assessed if they had not met the Aug. 1 deadline.


J.J. **Morton**

"The fact that both contractors, who normally would be competitors, were able to work closely together to complete this project 12 days ahead of schedule was a tremendous feat," notes J.J. Morton, of the design team.

Ajax's Mann, in turn, credits Michigan Aviation Partners for keeping everyone on track: "We had a lot of meetings. We had to coordinate with the other contractor, with electricians, the owner. We were able to eliminate potential problems by discussing them up front."

Michigan Aviation Partners, a joint venture of Kimley-Horn and Associates and the local minority-owned environmental and civil engineering firm of Tucker, Young, Jackson, Tull, provided engineering, design, project management and construction phase services for the runway reconstruction.


George **Karmo**

George Karmo, president of Tucker, Young, Jackson, Tull, describes the project as a win-win for his company and the Wayne County Airport Authority. "We've done a lot of utilities work at the airport, but we didn't have experience in runway construction," relates Karmo. "For us, it was an opportunity to be mentored and trained by Kimley-Horn to perform design work and get experience in runway construction. In the process, the airport authority kept monies in the local community."

## Big By Any Measure

The massive project was split into six bid packages:

- Relocation and reconstruction of Parallel Taxiway Z to meet Aircraft Design VI separation standards and demolition of a 30,000-square-foot hangar to create a staging area
- Construction of Taxiway M service road for airport rescue and firefighting vehicles
- Installation of a new airfield lighting vault
- Reconstruction of the northern portion of Runway 4R-22L and associated taxiways, including a portion of Crosswind Runway 9L-27R and Taxiway V
- Reconstruction of the southern portion of Runway 4R-22L and associated taxiways
- Installation of Runway 4R-22L NAVAIDS and visual screen (to be completed next year)

Quantifications of individual phases convey the immense scale of the overall project. For instance, the amount of concrete poured — 614,000 square yards of 17-inch thick pavement — is equivalent to nearly 87 lane miles of highway. The new runway also includes more than 7,800 tons of reinforced concrete pipe, which is 500 more tons than the steel structure of the Eiffel Tower.

In addition, crews installed more than 44,000 linear feet (approximately nine miles) of taxiway and runway shoulder pavement, 700,000 square feet of taxiway and runway pavement markings, more than 1,700 individual runway and taxiway centerline and edge light fixtures, more than 100 new LED runway and taxiway guidance signs and 110 miles of electrical cable. LED lighting was used for all fixtures, except for the high-intensity runway edge lights.

Airfield safety upgrades include the installation of in-pavement runway guard lights as well as elevated runway guard lights at all runway-taxiway intersections to minimize the potential for runway incursions. A runway status light system was installed along the length of the runway to mitigate runway incursions of departing aircraft. A new pavement surface sensor system was added to monitor the runway for icing conditions.

DTW also upgraded and expanded its Vaisala Runway Weather Information System during the project. In addition to updating existing electronics and adding new sensors to collect airfield condition data, the airport is moving to a hosted system.

"This means that Vaisala will poll the sensors and collect the data at our data center in Colorado," explains Stephanie Haynes, the company's sales manager. "Airport users will be able to access the data from any computer via a Web-based display called Navigator II. This is a departure from the traditional system, where airports were required to have a server onsite collecting observations and generating the display. The hosted system is more robust, easier for the airport to manage and gives them the latest and greatest in display software."

Instead of paint, Kimley-Horn and Associates specified preformed thermoplastic runway and taxiway markings. "These markings enhance and retain visibility over time and limit the need to close runways for periodic repainting," explains J.J. Morton, the company's vice president and project manager.

DTW's constrained construction season combined with its need to have a fully functional runway for a portion of the summer presented significant challenges, notes Morton.


"Batch plants were located on each end of the runway to expedite the project as well as to save fuel consumption and decrease emissions," he explains. "A key element in the project was the use of stringless pavement technology for all of the subgrade preparation and paving operations. They were able to keep the grades within 2/100 of a foot at all times."

Surveyors used lidar scanning, a remote sensing technology that measures distance by illuminating a target with a laser and

*Separate crews poured 614,000 square yards of concrete (left) and installed preformed pavement seals (right).*

analyzing the reflected light, to facilitate work at night without hindering runway operations.

## Two Down, One to Go

The newly reconstructed Runway 4R-22L replaces a predecessor that was built in the 1950s to accommodate Boeing-707s.

"We had to work closely with the FAA to bring the runway up to standards," McCarthy explains. "Obviously, we're working with much larger aircraft today. Our reconstructed runway is designed to accommodate Group VI aircraft. It can handle B-747-8s, and if someone wants to bring in an A-380 in the future, we'll be able to handle that."

During the third phase of the project, which will begin next year, DTW will displace the threshold at the 4R end of the runway and construct an end-around taxiway screen — the second at any U.S. airport, notes McCarthy.

The screen will block the view of aircraft on a parallel runway's taxiway at the far south end of 4R-22L. Because the runway is so long, pilots preparing for departure on the north end could mistakenly think an aircraft is crossing the runway and abort their takeoffs, he explains. The FAA-required screen will hide aircraft on the taxiway to avoid such cases. Because pilots will only be able to see an aircraft's tail, they will know that the aircraft is on a taxiway beyond the end of the 4R-22L and it is safe to takeoff, McCarthy continues.

Once the threshold is displaced, the runway will be 509 feet shorter for flights arriving from the south to meet FAA standards, he adds.

*Two general contractors worked on opposite ends of the runway during slightly overlapping phases to expedite the project.*

## Unfortunate Timing

All told, DTW's $150 million runway reconstruction created more than 1,000 jobs during its two-year duration — a significant bonus to an area with a particularly distressed economy.

That said, funding for the project continues to be a challenge. Overall, the airport was expecting approximately 30% FAA grant funding for the runway reconstruction, but current circumstances call that amount into question, McCarthy explains. Last year, DTW received $20 million for the project. This year, it applied for $24 million, but has yet to receive a penny. Wayne County Airport Authority officials attribute the funding delays in large part to gridlock in Congress and the subsequent sequestration.

"It has really hurt the FAA's AIP grant program and has presented a serious problem for us," McCarthy laments. "Whereas grants were generally executed in April or May, this year we're looking at an August to September timeframe."

Because FAA grant funds cannot be applied to projects already in process, DTW's situation is even more dire. "Obviously, we couldn't wait," explains McCarthy.

The airport did, however, receive an allowance to reimburse itself for work completed *if* grant money becomes available before the end of September, when the FAA's fiscal year ends. If funds do *not* become available by then, the opportunity for federal contribution this fiscal year will be lost. The airport will be forced to use airport revenue bonds, on which the airlines pay debt service, explains McCarthy.

"With the FAA funding tower operations through AIP funds, less money for construction projects is available," he adds. "It's a big problem."

On a more positive note, McCarthy and other airport officials are pleased with the results of the project. "We had a great team that performed very well to mitigate the negative impacts we knew this project was going to have on airport operations," he relates. "I was very impressed with all of our partners."

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# Detroit Metro Quells Noise Complaints With Unique Ground Run-up Enclosure

By Robert **Nordstrom**

## factsfigures

**Project:** Ground Run-up Enclosure

**Location:** Detroit Metropolitan Wayne Co. Airport

**Size:** Nearly 90,000 sq. ft.

**Dimensions:** 310 ft. long, 290 ft. wide, 42 ft. tall

**Prime Consultant:** C&S Companies

**Prime Contractor:** Dan's Excavating

**GRE Design & Construction:** Blast Deflectors, Inc.

**Engineering & Construction Admin. Support:** Kimley-Horn of MI

**Aerodynamic & Acoustical Design:** BridgeNet Int'l

**Noise & Land Use Compatibility Study:** Barnard Dunkelberg & Co, a Mead & Hunt Company

**Environmental Planning:** Barnard Dunkelberg & Co, a Mead & Hunt Company

**Pavement Engineering:** Roy D. McQueen & Assoc.

**Geotechnical Engineering:** Somat Engineering

**Civil Engineering:** Northwest Consultants

**Avionics Consultant:** David Quintet

**Key Benefits:** Facility absorbs noise produced when crews run aircraft engines at full power while on the tarmac to test post-maintenance performance levels

**Of Note:** Structure is one of the largest GREs in the world; sub-grade design helps preserve sight lines for air traffic controllers despite the facility's midfield location; precisely angled exterior steel panels reflect aircraft radar signals

Ever since Detroit Metropolitan Wayne County Airport (DTW) opened a new midfield ground run-up enclosure (GRE) last November, its neighbors are snoozing soundly through the night — and noise complaints have dramatically decreased.


Kelly **Ferencz**

"The calls have pretty much disappeared since we built the GRE," reports DTW Project Manager Kelly Ferencz. "Most of the heavy maintenance on aircraft takes place in the evening hours. This meant that engine run-ups were done when neighboring residents were trying to sleep."

Efforts to build DTW's one-of-a-kind $11 million structure began back in 2009. That's when a noise study conducted by Barnard Dunkelberg & Company (now part of Mead & Hunt) confirmed what airport officials already suspected from spikes in noise complaints when crews ran engines at full power of aircraft on the tarmac to confirm maintenance work.

"The study showed excessive noise intrusion that was not day-night sound level based, but rather maximum noise level based as a result of aircraft maintenance run-ups," reports company president, Ryk Dunkelberg. "Study results recommended that the airport construct an enclosure to minimize the impact of noise on residents in neighboring communities."

The 90,000-square-foot structure the airport built is not only one of the newest GREs in the United States, it's also one of the largest in the world. In addition, it features custom design elements such as a below-grade profile and precisely angled steel-clad panels.

Before the unique facility was built, noise from engine run-ups affected approximately 1,800 residences over 20 square miles surrounding the airport. Now, only those within 2.2 square miles are affected.

## Design Twists

At 310 feet long and 290 feet wide, the airport's new three-sided GRE is large enough to accommodate a Boeing 747-8 (the largest aircraft

*Building the 42-foot-tall structure on an excavated site preserved controllers' line of sight to the airfield.*

that flies into DTW). It also provides enough room for a Boeing 757 to turn around inside, under its own power. During construction, contractors placed approximately 25,000 square yards of Portland cement concrete pavement.

More than 2,000 acoustical panels line the structure's interior to absorb engine noise. Maintenance crews using the GRE at night can activate the facility's lights remotely with a passcode before they arrive, and a timer shuts them off after a pre-set amount of time.

Wayne County Airport Authority, DTW's owner, hired C&S Companies to provide planning and engineering services for the project. Blast Deflectors, Inc. designed and constructed the GRE as a subcontractor to prime contractor Dan's Excavating.

Bob **Koller**

C&S Project Manager Bob Koller recalls that the project required extensive coordination with the FAA and various stakeholders. "The facility is located in the middle of the airfield between two parallel runways, which significantly increased the complexity of the design compared with a location on the perimeter of the airfield," explains Koller. "When we submitted the initial design, the FAA (via its Safety Risk Management Panel) analyzed the facility's impact on airport safety and identified several concerns."

The first significant design challenge was maintaining a line of sight to all runways and taxiways for FAA air traffic controllers. To do so, designers essentially placed the 42-foot tall structure in a large hole — almost 15 feet below grade at its deepest point.

The widescale excavation meant that the foundation of the GRE and apron pavement would be built on previously undisturbed clay soil. To allay concerns about site drainage during and after construction, crews placed a layer of crushed open-graded aggregate below frost depth and installed a drain system to disperse water beneath the foundations and in the pavement section.

Rick Kincaid, project manager for Dan's Excavating, notes that he has never heard of another below-grade GRE. "It required a lot of earthwork," he recalls. "Opening up a hole this big meant that much of the surrounding acreage would be draining into it. So the first thing we had to do was establish drainage by tapping into a 70-inch sewer drain that was about 27 feet deep."

Crews used approximately 160,000 cubic yards of excavated material to build engineered sloping berms around the enclosure. This not only reduced the airport's material expenses, but also minimized vehicle emissions and costs associated with hauling away the excavated matter.

Because the GRE is located close to the airport's very high frequency omnidirectional range (VOR), which radiates VHF radio signals as azimuth information to pilots, maintaining a clear line of sight around the VOR was crucial. A computer-modeled avionics study confirmed that the new structure would not degrade the VOR signal.

The GRE's location relative to the airport radar systems presented another challenge. One radar antenna is located on the roof of the air traffic control tower and the other systems are located due west of the GRE.


Don **Bergin**

"In designing a GRE, many site-specific factors must be carefully analyzed, including aerodynamics, acoustic objectives, prevailing winds, position on the airfield, aircraft mix and user requirements," explains Don Bergin, director of technical sales for Blast Deflectors, Inc. "During the design stage, concerns were raised that the proposed facility location could interfere with the airport's ground radar system. Radar signals potentially could reflect off of the facility and create false signals."

Coordinating with C&S and the FAA, the company went back to the drawing board and returned with a unique design to mitigate this problem. "The geometrically precise steel-clad panels of the facility were set at a 14-degree angle in order to reflect radar downward, where it could be dispersed into the ground," Bergin explains. "In effect, Detroit's facility is our first 'stealth' GRE."

The team also worked closely with FAA engineers to determine the proper site grading characteristics to eliminate potential interference with the radar systems. Final site grading included specific embankment elevations and slope irregularities to minimize the presence of large, smooth surfaces that might reflect radar.

## Silence Is Golden

Director of Airfield Capital Projects Tom McCarthy considers DTW's new noise-absorbing GRE a success. With more than 90% of all ground run-ups occurring in the new facility, associated noise complaints have been eliminated, he reports.

Ferencz acknowledges that the airport initially experienced pushback from the airlines regarding the distances aircraft have to taxi to access the enclosure. But those complaints diminished once the facility was in full use. "It's a bit more effort for them, but they seem to have embraced it," she relates. "And the community is enjoying the results of this project, with the reduced noise in the area. For me, no comment is a good comment."

Many of the comments, however, are overwhelmingly positive. To date, DTW's new facility has garnered three awards: the FAA Great Lakes Region 2012 Safety Award; the Michigan Concrete Association 2013 Award of Excellence; and the Michigan Engineering Merit Award from the American Council of Engineering Companies.

"We were very fortunate to have a great team, in terms of airport authority stakeholders, the designers and the contractors," Ferencz summarizes. "We had to overcome a lot of obstacles along the way, but we worked through them together and now the community is enjoying the results."

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# Palm Springs Int'l Boosts Perimeter Security With Radar-Based System

By Ken **Wysocky**

Palm Springs International Airport

## factsfigures

**Project:** Perimeter Security Upgrades

**Location:** Palm Springs (CA) Int'l Airport

**Cost:** $2.9 million

**Components:** Perimeter Intrusion Detection System (PIDS); new fenceline; additional closed-circuit television cameras

**Funding:** 90% FAA, 10% airport

**PIDS Manufacturer:** FLIR Systems

**System Design:** Reynolds, Smith & Hills

**Size of Airport:** 940 acres

**Benefits:** Faster, more accurate intruder detection & tracking; fewer false alarms

Palm Springs International (PSP) recently joined a small vanguard of U.S. airports using perimeter security systems that employ ground-surveillance radar and infrared cameras to detect intrusions.

Thomas **Holan**

Contractors completed the installation of the Perimeter Intrusion Detection System (PIDS) at the California airport in July. The new radar system, coupled with enhancements to existing measures, improved PSP's security from "solid to supreme," says Thomas Nolan, executive director of the airport. "I'd compare it to going from a college football team to joining the National Football League."

In addition to installing the new radar system, crews also replaced about 12,000 feet of old fenceline to meet stricter TSA requirements and added six wireless closed-circuit television (CCTV) security cameras in restricted-access areas. All told, the upgrades cost $2.9 million, with the new PIDS accounting for just less than one-third of the budget. FAA Airport Improvement Fund (AIP) money paid for 90% of the projects, and PSP picked up the rest of the tab.

Reynolds, Smith & Hills managed the design, integration and installation of the fenceline and PIDS units at the 940-acre airport.

"We integrated the PIDS technology into the fenceline-replacement project, which already was part of an airport capital improvement program," Nolan explains. "With support from

*PSP recently added a perimeter intrusion detection system, similar to the one shown here.*

the TSA, we inserted it into the existing fenceline program to make it eligible for FAA (AIP) funding."

Nolan can't specify the number of PIDS units installed, because TSA requires such information to be kept secret for security purposes. But he notes that PSP required fewer units than other similar-size facilities because of its geographic layout.

"Radar systems work on line of sight … the radar waves have to travel in straight lines," he explains. "Because of that, the size and cost of a (PIDS) system is a product of how an airport is laid out. Our airport is basically a rectangle, and because it's more symmetrical in shape, it required fewer radar units."

## Early Adopters

Nolan became interested in PIDS technology at an American Association of Airport Executives conference, where he saw a unit displayed by FLIR Systems, the company that designs, develops and manufactures the radars, cameras and software used by the detection units.

After months of discussion, airport officials concluded that PIDS units could "elevate an already solid perimeter security system up a notch," recalls Nolan.


Andrew **Saxton**

PSP, which expects to handle a record 1.9 million passengers this year, is the ninth commercial U.S. airport to adopt PIDS technology, reports Andrew Saxton, director of airport security for FLIR. While the technology is relatively new to the airport industry, military bases and government installations have used it for years. "There are thousands of units installed around the world in other applications," Saxton notes.

"The ability to see more than you could see yesterday, see further than you used to and react to threats earlier and smarter than you could before is driving the industry to consider technologies like these," he explains. "The market looks favorably on the fact that we've developed these technologies for military bases around the world, and they've withstood extremely harsh environments. The technology is already validated."

Visually, the PIDS units resemble R2-D2, of *Star Wars* fame. Inside each, however, is a CommandSpace ARGUS surveillance system, which includes a radar unit and two cameras that can "see" in total darkness and almost any weather, including rain and fog. When the radar detects a perimeter breach, the cameras hone in on the intruder and transmit an image to a monitor in a security command center.

"The operator immediately has eyes on the object of interest," Saxton explains, noting that a single Argus unit surveys 2.4 square miles of area.

At the same time, global positioning satellite technology provides the exact location and displays it on another monitor via an aerial photo of the airport, overlaid with its security perimeter boundaries. The system also tells the operator how fast the detected object is moving and where it's going. "It's no longer enough to know only where a target is," says Saxton.

The system's ability to prevent security personnel from reacting to false alarms is one of its hallmarks, he adds. "Our system uses sensors that provide more information, so operators only have to deal with real threats," explains Saxton. "At a distance of one kilometer, we can tell the position of a target within one meter. Older systems would tell you within six meters."

## Better Detection, 24/7

The radars use frequency-modulated, continuous-wave technology, a radar method pioneered by FLIR that provides more precise target information than Doppler radar, notes Saxton. By enclosing the detection equipment in a single 3-foot-tall structure with minimal infrastructure requirements, the company can offer a simple, clean setup that doesn't intrude on airport operations, he adds.

The cameras in each PIDS unit – one thermal-imaging camera and a daylight camera – provide sharp, high-resolution images via a FLIR algorithm that automatically blends the thermal and daylight images, says Saxton. The system also takes into account more standard factors such as light and weather conditions to improve image quality.

"Instead of operators manipulating the cameras and choosing how to blend their images, the system automatically does those calculations and presents the best picture possible," Saxton says. "As a result, operators can pay attention to a target, not operating the cameras."

*A system that combines radar and infrared cameras helps personnel surveil the airport's 940 acres.*

The heart of PSP's new perimeter-detection system is a command-and-control center with a scalable platform that includes video management and storage capabilities. FLIR's software can integrate multiple third-party legacy systems into a single, cohesive operating platform, notes Saxton.

The company put a lot of thought and effort into making the system user-friendly and intuitive to minimize operator frustration, he adds.

"You can set your own detection criteria, and if an event occurs, the system can automatically notify people around the facility … even send them a priority e-mail with a picture and the location of the threat," he describes. "This allows airports to focus on interdiction and resolution of events, instead of picking up radios, taking photos and so forth."

Nolan highlights the system's ability to distinguish authorized and unauthorized entries. "This really enhances our ability to immediately identify and track intrusions," he explains. "Every airport has a fixed number of security assets, so it's always better if you can minimize distractions that aren't true security threats and focus on those that are. The PIDS system enhances our ability to identify and address threats, while enabling us to maximize deployment of resources."

The new PIDS units also enhance the airport's wildlife management program, he adds. "This system is so accurate it can track a rabbit," Nolan raves. "Or, if a coyote penetrates our system – and they can do that – we can actually track it and alert the tower that we have a coyote approaching the runway…and notify pilots. We can even pick up flocks of birds – right down to a group of about three dozen sparrows – then send someone out to scare them away to avoid engine-ingestion problems.

"We're still discovering other possibilities," Nolan adds. "With each month, you can bet we'll discover more capabilities and contour them to our specific needs."

## Integration Challenges


James H. **Duke III**

The system's installation went smoothly, reports James H. Duke III, regional airfield service group leader for Reynolds, Smith & Hills. Integrating the old and new systems, however, proved challenging. "We had to coordinate closely with equipment manufacturers to ensure all parts and pieces could talk to each other," explains Duke, noting that integration is a common obstacle in such projects, because rapid advances in technology often render older systems nearly obsolete.

Palm Spring's extreme summer weather, with temperatures of 110° F to 115° F, also threw the team a curve by overheating radios inside the PIDS units and causing them to drop wireless signals. Switching to "more robust" radios solved the problem, Duke reports.

The installation at PSP drove home the importance of considering airport topography when determining where to locate PIDS units. "We tend to think of airports as large, flat expanses," relates Duke, noting that FLIR ruled out one of its initial placements due to potential line-of-sight issues.

Looking forward, Duke predicts that radar-detection technology will become more commonplace at commercial airports – providing yet another layer of security above and beyond existing fences, CCTV cameras and controlled checkpoints.

After integrating the new PIDS system at PSP, Nolan encourages other airports to embrace, rather than fear, the technology. "It's not as complicated as you'd expect," he assures. "We sleep a lot better at night knowing we have this additional cloak of security technology."

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Photo: Laurie Zaleski, Art-Z Graphics

# Airports Battle Algae, Rust & Fading to Maintain Effective Airfield Markings

By Victoria Soukup **Jensen**

Operations Supervisor Glen Barentine was thrilled when crews painted 14 new surface hold position markings on the taxiways at Hot Springs Memorial Field Airport (HOT) back in January 2012. But his happy demeanor didn't last.

Glen **Barentine**

"Six months later, the red had turned to pink because of the sun," recalls Barentine. "Even when you looked at them in the daytime, the markings had a faded color to them."

Because the Arkansas airport wanted to solve the problem instead of simply repainting, officials opted to install preformed thermoplastic markings just 11 months later. "We're very impressed with the thermoplastic," Barentine reports. "It looks great and the color, thus far, has held up amazingly."

The disappointing experience at HOT is not as unusual as most airport operators would hope. Unusual soil or pavement conditions — and even weather — can quickly turn pavement markings that look good into a "do-over."

HOT had to dig deep into its pockets for a fix. The eight thermoplastic markings crews have already installed cost $7,000 each; and the airport is planning on installing another six, for a complete replacement of all 14 painted markings.

Personnel from Ennis-Flint, the company that provided HOT's new markings, note that although preformed thermoplastic markings cost four to five times more than painted markings, they are designed and engineered to last eight to 12 times longer. "The cost is minimal when looking at the longevity of the product," says Chris Brooks, sales director of specialized markets for Ennis-Flint.

Chris **Brooks**

Airports that should repaint every six months often stretch their interval to a year because of budget constraints, Brooks relates. If such airports applied preformed thermoplastic markings, they wouldn't have to go back and repaint every year, he adds.

## **facts**figures

**Project:** Applying & Maintaining Airfield Markings

**Airports:** Brooksville-Tampa Bay Regional Airport & Technology Center; Hot Springs Memorial Field; Naval Air Station Patuxent River

**Respective Markings Issues:** Algae; fading; rust discoloration

**Airfield Markings Consultant:** Sightline

**Markings Contractor:** Hi-Lite Markings

**Preformed Thermoplastic Markings:** Ennis-Flint

**Rust-Resistant Paint:** Safety Coatings

*After its painted markings faded in a matter of months, HOT switched to preformed thermoplastic markings.*

Brooks cites the Ennis-Flint markings applied at Newark Liberty International Airport (EWR) in 2006, which are still functioning seven years later, as an example of the product's longevity. "Those markings now lasted 14 times the life of paint, because they paint twice a year," he reasons.

The performance at EWR makes Barentine optimistic about HOT's anticipated replacement interval. He figures that if EWR gets seven years' of life out of its markings, HOT's markings should last 10 years, due to milder winters and lighter traffic.

Before preformed thermoplastic markings are installed, crews first apply a sealer to the substrate surface to function as a bonding agent for the markings, explains Brooks. They then roll out a preformed marking (which includes a red background, white inscription and black trim) and apply it to the sealed pavement by heating it for 60 to 90 minutes with infrared equipment in 16-foot-wide sections.

Total closure time is from two to four hours, and traffic can resume in the area 15 minutes after application, Brooks notes.

Reflective glass beads are incorporated into the preformed thermoplastic markings, adds Barentine. "The beads are embedded throughout the material," he explains. "So as it wears away, and aircraft go across it and snow plows go across it, a new layer of beads will come up."

## Fungus Among Us

Severe blue-green algae have long plagued Brooksville-Tampa Bay Regional Airport & Technology Center (BKV) in Florida. Fueled by the hot, humid Gulf Coast weather, the growth became so severe that BKV's concrete runways looked like asphalt, recalls Airport Supervisor Rob Mills.

The accumulated dirt and dark algae eventually made it tough for pilots to distinguish the airfield markings. And about three years ago, the airport decided to clean its airfield and remark the runways and taxiways, which average 5,500 takeoffs and landings each month.

"Our runways had never been cleaned in literally 70 years," notes Mills.

BKV contracted Hi-Lite Markings for the job. "We went in with 20,000-psi water pressure machines and cleaned nearly 3 million square feet of surface," reports Brad Dunn, the company's Southeast Division manager. "We got rid of all the built-up algae that made the markings very difficult to see."

Brad **Dunn**

After cleaning the concrete, Hi-Lite repainted all the markings using standard waterborne paint. By closing only portions of the pavement at a time, Hi-Lite allowed BKV's airfield to remain active throughout the entire six-day cleaning and remarking process. "We were very careful to be as quick as possible in the areas and have constant contact regarding live aircraft," Dunn explains. "The airport never had to disrupt their operations. And it looks like they got a brand new airfield."

According to Dunn, algae growth is a common problem at airports in the southeast, because many are former military bases with porous concrete airfields. BKV, for instance, was built in 1942 by the U.S. Army Corps of Engineers for training B-17 Flying Fortress heavy bombers.

Algae growth does not always require costly remarking, clarifies Dunn. “A lot of times, we can just come in and do the pressure washing and it restores the reflectivity, the brightness of the

markings and you don’t even have to paint,” he explains. “And why paint when you can just clean? We can save airports a good bit of money and down time.”

When remarking is necessary, cleaning the surface first is still vital, Dunn cautions. “You have to have a good bond between the paint and the surface,” he explains. “If you have algae, mold or mildew, those will act as a contaminant on the surface. And your paint job is only as good as the bond between your paint and the concrete. We always say that the three most important things in painting an airfield are surface prep, surface prep and surface prep.”

It’s been several years since BKV’s cleaning and painting, and Mills is still pleased with the results. “The paint is still holding up well,” he reports. “No algae are creeping through. It took 70 years for this stuff to accumulate, and it may be another seven to 10 years before we have to have them cleaned again. We’re very happy.”

## Bleeding Rust

Rust was the culprit on runways at Naval Air Station Patuxent River (NHK), in St. Mary’s County, MD. “It was really bad,” recalls Airfield Manager Jim Fletcher. “It was almost like somebody came out and sprayed tar over the top of the paint – it was that dark. You would never guess that the paint was white.”

NHK’s problem began after a routine painting in 2002, when crews used a product with different specifications because of new environmental and performance standards. “After that, we started to see the discoloration in the white pigment,” says Ken Barbour, AICUZ/RAICUZ Program Manager for the Naval

*Pressure washing helps brighten markings darkened by mold at BKV.*

District Washington. "The rust color eventually overtook the light pigment. It was more of a brown stripe than a white stripe."

Donna J. **Speidel**

Marking consultant Donna J. Speidel, president of Sightline, attributes the discoloration to an iron derivative in either the aggregate used in the asphalt or the airfield's groundwater. Speidel recommended that the markings be cleaned with water blasting and then repainted with a modified formulation of TT-P-1952E waterborne paint that resists iron and rust staining.

Fletcher reports that although some rust discoloration has returned since the project was completed in 2006, "it's not nearly as bad as we had it originally."

New discoloration is isolated to cracks in the pavement that allow the iron to seep up to the surface and stain only around the cracks, notes Speidel. She consequently counsels NHK to continue using the special waterborne paint for future marking projects. "The fact that the majority of those markings are still white is a testimony to the formula modification," Speidel explains.

Keeping airfield markings clean and free from contaminants is vital to airport safety, she emphasizes. "Airport operators become accustomed to seeing stained or contaminated markings on their airfield, and they think it has to be that way; but it doesn't," says Speidel. "We're trying to provide a short-term solution to these problems so the markings last longer than they are accustomed to."

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Photo Credit: Korom Photography

By Nicole **Nelson**

# Green Bay's Airport Rescue & Firefighting Facility Mirrors City Hue

## **facts**figures

**Project:** Aircraft Rescue & Firefighting Facility

**Location:** Austin Straubel Int'l Airport in Green Bay, WI

**Airport Owner:** Brown County, WI

**Cost:** $9.4 million

**Funding:** $7.9 million in FAA entitlements & discretionary funds

**Construction:** Oct. 2011 – Dec. 2012

**Design & Engineering:** Mead & Hunt

**Construction Contractor:** C.D. Smith Construction

**Project Delivery Method:** Design-Bid-Build

**ARFF Services Contractor:** Pro-Tec Fire Services

**Emergency Phone System:** VoiceInterop

Green Bay, WI, is known to "bleed green and gold" for its beloved National Football League team, the Packers. But the local airport adds a little silver to the city's color palette as well.

The new aircraft rescue and firefighting (ARFF) facility at Austin Straubel International (GRB) recently earned silver certification in Leadership in Energy and Environmental Design (LEED) from the U.S. Green Building Council. The designation places the county-owned airport in an elite group of facilities with cutting-edge ARFF stations, as it is among the first to achieve silver-level certification.

Thomas W. **Miller**

Airport Director Thomas W. Miller explains that new $9.4 million, 20,000-square-foot facility will not only improve ARFF functions at GRB, relocating the station was a "jumping off point" for more mindful and efficient operations overall.

Although the airport's previous facility met FAA mandates requiring a three-minute initial response time for aircraft emergencies, it was located on the air carrier ramp side of the airport, east of the main passenger terminal. Rescue vehicles had to cross a ramp south of the terminal to access accident and incident sites, often causing conflicts with and sometimes delaying air carrier traffic.

In addition to being old (circa 1976) and in poor condition, the 6,800-square-foot facility was also simply too small, he notes. A space needs analysis deemed that the facility was insufficient and did not meet the revised FAA Part 139 ARFF standards.

"We were trying to get 10 pounds into the proverbial 5-pound bag in the old facility," Miller recalls, noting that expansion was not an option

*GRB's new ARFF station is nearly three times bigger than its previous facility.*


Photo Credit: Korom Photography

because the facility was boxed in by buildings and other construction projects.

In 2009, the airport determined that the firehouse needed to be relocated to another site and expanded to accommodate the airport's larger ARFF equipment.

A study included in GRB's 1999 master plan indicated that a centrally located ARFF facility would improve the response time and allow for future expansion of the terminal. And in 2008, architectural/engineering firm Mead & Hunt conducted a concept budget study for a new ARFF facility. Within that study, planners researched specific space needs and completed a more detailed assessment of two potential sites – one in the northwest quadrant of the airfield and another in the southwest quadrant. Both sites underwent environmental reviews in accordance with FAA project guidelines, and the midfield location northwest of the intersection between Runway 6-24 and Runway18-36 emerged as the best location for the new facility.

After Mead & Hunt finished the final design of the facility in July 2011, C.D. Smith Construction began construction of the design-bid-build initiative in October 2011 and completed the project in December 2012.


Basement


Gear Wash Room


Kitchen

Mead & Hunt Project Manager Tim Close explains that 2,200 square feet of the new station is a below-grade area that houses mechanical and electrical equipment, while a single-story high-bay vehicle storage area contains 6,000 square feet for hose drying, aqueous film forming foam storage, a pump and generator room and four apparatus bays.

A 10,000-square-foot single-story area adjacent to the high bay contains a watch room and offices for the fire chief and captain. It also includes dorms, kitchen and dining areas, showers, a gear washing area, and communications and training rooms.

Together, the three areas provide nearly triple the space available in the previous facility.

## Green Elements

Mead & Hunt included several environmental energy conservation measures, including the structure's deliberate solar orientation and a building envelope designed for low maintenance, durability, insulation value, noise attenuation and cost control, notes Close.

Other energy conservation measures include solar light tubes, high-efficiency gas boilers, an in-floor radiant heating system, and automated controls for lights and heating, ventilation and air conditioning.

"Heat and air conditioning are being provided by geothermal wells, which were drilled into the ground 300 feet," adds Miller, noting that 24 units supply the ARFF facility.

Many of the building materials were extracted and/or manufactured locally, while others were made from recycled content. The facility's edifice is made of concrete from within 500 miles of the airport, and its steel roof contains recycled materials. Finishes with low or no volatile organic compounds were specified as well as water-saving plumbing fixtures such as dual-flush toilets and low-flow urinals, lavatories and showers.

## Gold-Level Amenities

In addition to being environmentally conscious and LEED-certified, the airport's new ARFF facility is also cutting-edge in many other regards, says Close.


John C. **Reed**

The airport consulted ARFF personnel to find the right products and features to meet their needs, explains Assistant Airport Director John C. Reed. "We knew we wouldn't be building another fire station for another 30 years, so our fire chief, Trace Paulson, as well as our employees, did a lot of research looking for the newest and best available while being as cost-conscious as possible," he recalls.

Paulson and the airport's ARFF crews are employed by Pro-Tec Fire Services, a Green Bay firm that was the first company to offer privatized ARFF services to airports back in 1974. Its first client was none other than GRB.

Paulson credits the airport for relying on the expertise of its contractors and letting end users have a lot of input into the facility's design.

Reed highlights the facility's crash phone system, by VoiceInterop, as a key improvement.

Photos: Korom Photography


Turn Out Room


Watch Room


Entryway

The system provides immediate contact between the airport's air traffic control tower and the watch room inside the new ARFF facility.

"When the folks in the tower pick up the phone to announce an emergency, it automatically opens all of the apparatus bay doors," Reed notes. In addition, the system concurrently notifies key airport administration personnel via cell phone, and allows them to monitor communications between the tower and ARFF personnel.

All utilities in the kitchen of the new firehouse are automatically turned off when the crash phone is activated — a backup provision added during the project's design phase that could save ARFF personnel the ultimate embarrassment.

"If someone is cooking food when the alarm is activated, they don't have to worry about shutting off (the oven) or making sure they don't set the firehouse on fire, because it automatically shuts off in order to prevent any potential fire from developing in the building while they are gone," Reed explains.

Bucking the tradition of firefighters crawling on top of fire trucks to use gravity when filling the equipment with water, GRB opted for a system that refills trucks from ground level. An in-floor fire hose box with a fiberglass grate cover was installed to contain water and chemical supply piping joined to a quick-connect fire hose. As a fire truck pulls in, a hook removes the grate cover and the hose is drawn from the hose box and coupled to a ground-level fill port on the truck.

GRB also opted to start buying its aqueous film-forming foam in bulk containers and pressure feeding it into trucks in a similar fashion to the water. The change prevents firefighters from climbing on top of trucks to manually dump 5-gallon pails of chemicals into trucks, thereby greatly reducing the chance of fall-related injuries.

A public safety officer is stationed 24/7 in the new facility's communications center to monitor GRB's access control and closed-circuit television systems to detect potential issues throughout the airport. A "smart wall" of monitors allows personnel to see a multitude of views, says Close, highlighting the center's added capabilities.

Fire Chief Paulson notes that the new station's training room and individual dorm rooms (vs. group bunkhouse accommodations) provide marked improvements in personnel comfort.

"Workout rooms are not unusual for a fire department, as firefighters have to work out to stay in shape; so we built a very small one," Reed relates. "But we, as an airport, could not afford the equipment to go into that room. The money just wasn't there."

That's where the hometown football heroes came through again. "The Green Bay Packers actually donated workout equipment to our guys," he explains. "Not every fire department can say they have used NFL equipment in their station."

Another popular, albeit less glamorous, improvement is the station's full-size kitchen with standard appliances. Previously, crews used a "dining nook" with a small refrigerator and microwave.

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# Garfield Regional Accelerates Maintenance to Preserve

## factsfigures

**Project:** Resealing Seamless Asphalt Runway

**Location:** Garfield County (CO) Regional Airport

**Total Project Cost:** $360,000

**Sealant Cost:** $250,000

**Funding:** 90% from Colorado DOT; 10% from Garfield County

**Project Duration:** 4 days

**Project Engineer:** CH2M HILL

**Project Contractor:** United Paving

**Paving Contractor:** Maxwell Asphalt

**Paving Supplier:** Asphalt Systems

**Product Used:** GSB-88

**Unique Approach:** Pavement joints were pretreated before sealcoat was applied

**Primary Benefit:** By performing prompt preventative maintenance every few years, the airport expects to spend $1.5 million over 25 years vs. an estimated $6 million to resurface the runway twice

**For Product Case Study:** Visit http://asphaltsystemsinc.com/images/documents/GSB_88_Department_of_defense_evaluation

Nothing looks better from the ground or the air than a freshly surfaced runway, apron or taxiway. It's new, it's fresh and it looks professional.

Then Mother Nature goes to work — with pounding rain, scorching sun, freezing temperatures and howling winds. As weather batters it daily, the pavement groans under the weight of heavy equipment and aircraft rolling over its surface. Soon, it begins to crack, moisture seeps in and the nice, beautiful runway looks like someone took a pickax to the surface.

That's a scenario Garfield County Regional Airport (RIL) in Rifle, CO, was determined to prevent after crews laid fresh, new pavement there three years ago. Instead of waiting five years before resurfacing the new runway as most airports do, RIL devised a preventive maintenance program to postpone a full resurfacing. Data from consultants and vendors indicate that promptly spending a few hundred thousand dollars every few years could save the airport millions of dollars over the runway's total lifespan.


Brian **Condie**

"We (had) an absolutely perfect runway," explains Airport Director Brian Condie. "So, one month after it was finished, we completed a 20-year maintenance plan to make sure it stayed in that same condition."

Minimizing inconvenience to airport users was also a primary consideration. Before its previous runway was torn up and replaced, RIL shut down for several days every year while maintenance workers sealed every surface crack they could find.

Not so with the current runway. "Every year, we still go out and do maintenance checks, but we don't have to do any crack sealing. Even the longitudinal joints were still tight three years after it was poured," reports Condie.

# New Runway

By Greg **Gerber**

On a similar vein, RIL's preventive maintenance project took four days to complete, while its last complete runway rehab lasted months.

When crews replaced RIL's pavement back in 2010, equipment ran nonstop for three days to create a single, uninterrupted section of asphalt for the runway's surface layer. "The pavers started at zero and didn't stop until they were at 7,000 feet," recalls Condie. "There are no transverse joints and no cold-cut seams on the runway. It is the first seamless runway in Colorado."

Not surprisingly, pilots love gliding to a stop on the pavement. James Edwards, chief test pilot from the avionics center at Ohio University, told Condie it is the smoothest runway on which he has ever landed. Intent on keeping it that way, Condie sought the advice of the airport's engineering team at CH2M HILL. The engineers, in turn, sought the advice of Asphalt Systems, a liquid asphalt products supplier out of Salt Lake City, to help determine the best long-term maintenance to keep the runway looking and performing like brand new.

Together, they decided to apply GSB-88, a relatively new type of sealant that Asphalt Systems describes as "well-documented" and "expanding tremendously" nationwide. When Condie and his team presented the idea to FAA officials, they immediately saw the benefit and encouraged the airport to use its annual $150,000 entitlement for the project.

"The FAA has always been pro-maintenance on runways," relates Condie.

Because the project came in around $300,000 (vs. the originally anticipated $470,000), RIL officials opted to carry over the airport's entitlement funds for a bigger project next year instead. Potential angst about not using the federal funds for runway maintenance was eliminated when state officials offered to fund 90% of the sealing project. (Garfield County picked up the remaining 10%.)

"I talked to the state aeronautical division and explained that if there was ever a way to find out if airports can save money on maintaining runways, there is no better way to test those theories than by trying it out on a brand new runway," explains Condie.

## Spend Sooner, Save Later

William VanHercke, manager of aviation services for CH2M HILL's Northwest Mountain Region, is well acquainted with the challenges RIL faces as a Colorado airport. He blames ice formation during freeze/thaw cycles as the primary culprit for most early pavement failures.

William **VanHercke**

"In mountainous areas subject to extreme weather conditions, asphalt will fail after only 12 years, even if a runway was initially designed to structurally hold for 20 years," notes VanHercke.

The cost of early and regular preventative maintenance saves considerable money over the long term, he stresses.

RIL, for instance, recently spent about $300,000 to apply sealant to its pavement. If it spends $300,000 every five years, it will spend $1.5 million over the runway's anticipated 25-year lifespan. If the airport does *not* apply sealant, VanHercke says it would likely require a full-depth resurfacing project when the runway is about 12 years old — at an estimated cost of $3 million.

"So rather than spending $1.5 million to maintain the runway over a 25-year period, the airport winds up spending $6 million on two resurfacing projects over the same timeframe," he chronicles.

A full resurfacing is also more disruptive to operations, he adds. During a major rehab, crews grind out 2 inches of material and replace it with 2 inches material, then pour a new overlay — a process that requires the runway to be out of use for one to two months. Closing two days to reseal every five years is much preferred to closing for one to two months to resurface every 12 or so years, contrasts VanHercke.

"For regional airports in communities the size of Rifle, closing its only runway is a major loss to the entire community," he notes.

Cost comparisons and closure estimates were instrumental in convincing the Colorado Department of Transportation and the FAA to fund RIL's "early" maintenance project, says VanHercke. That said, he notes that Colorado officials tend to place a greater emphasis on maintenance than those in other parts of the country.

*By performing preventive maintenance early and regularly, RIL hopes to postpone the need for a full runway resurfacing.*

"In an area where governments face an intense number of competing projects with limited money, officials often push maintenance out and wind up exacerbating their problem a few years down the road," he laments.

## Getting it Done

Condie scheduled the maintenance for mid-July, when temperatures are ideal for sealcoating, and the likelihood for rain is low. Because the sealcoat requires heat and ultraviolet light to help it soak into and harden the asphalt, crews applied the product during the day. To confirm that the sealant was applied properly, Condie and his staff personally followed the truck down the runway as it sprayed the material.

"I didn't want any bare spots," he explains. "So when one of the sprayers clogged up, we flagged down the guys on the sprayer, and they took care of it right away."

Original estimates indicated it would take crews five days to sealcoat the runway, taxiways, ramp and apron, and then apply new markings; so the airport scheduled a five-day closure. "The local tenants didn't really appreciate it, but they understood why we were doing it when I explained the benefits of maintaining the runway now," recalls Condie.

Running sealing and marking crews at the same time, however, allowed crews to beat the schedule by a full day. It took workers 2½ days to apply the material and another 1½ days to restripe the pavement.

Shutting down RIL for airfield maintenance reminded Condie of how crucial the airfield is. "It's not something you really notice until the airport is shut down," he reflects. "But once the runway is down, and the phone calls start, you come to appreciate how many people rely upon us."

Although the closure was communicated in advance, a few local pilots apparently failed to read their Notice to Airmen and attempted to land at RIL. "We don't have an air traffic control tower, so we had to station staff members by the airfield to get the attention of the pilots trying to make an approach," Condie relates.

*RIL's runway was resurfaced in 2010, and Airport Director Brian Condie is intent on preserving its new look and performance for as long as possible.*

## Why So Soon?


Brad **Grose**

RIL's advisory team considers the four-day closure for prompt sealcoating a strategic move. Brad Grose, sales and marketing manager for Asphalt Systems, explains that when pavements are laid, the binder and glue immediately begin to age — even before installation is complete. Once the installation is complete, he continues, raveling is often close behind.

Raveling — when aggregate in asphalt comes loose and starts rolling around on the pavement — is extraordinarily dangerous at airports, because jet engines can suck up the small pieces of asphalt, and cause major damage. That's why it's so important to ensure that the surface binder remains effective, stresses Joel Harry, airfield civil engineer and CH2M HILL project manager.


Joel **Harry**

GSB-88 contains a rejuvenating agent that penetrates into the pavement, and Gilsonite (the "G" in GSB), a natural black bitumen that provides long-term protection to treat the pavement, he notes.

"A topical agent won't penetrate on its own," Harry explains. "In fact, when asphalt is subject to really high or fluctuating temperatures, a topical agent can become brittle, which leads to further cracking."

In contrast, GSB-88 helps keep the material pliable and flexible, he adds, noting that in addition to Gilsonite and asphalt, the product also contains light oil and plasticizers.

"It's a pure hydrocarbon that blends into the asphalt to make it extremely resistant to ultraviolet rays and water," Grose explains. "It fends off Mother Nature very well by preventing UV rays from breaking down the oil in the asphalt. Without it, the pavement is subject to accelerated cracking and raveling."

Grose cites a Navy airfield that experienced a 400% rate of return on its GSB-88 treatment to punctuate his point. (See the Facts & Figures box on Page 28 for a website link to the case study.)

At RIL, workers applied a double dose of GSB-88 to construction joints, where a portion of the new asphalt adjoins the previous material. These areas, known as "cold joint," are less firm than the rest of freshly laid pavement, due to the density of asphalt and compaction.

Three years after the runway was refurbished, some of RIL's joints were showing signs of premature raveling.

"We decided to pre-treat all the construction joints prior to the overall application of the GSB-88," says Grose. "That step does a fantastic job retarding Mother Nature by reinforcing the pavement joints."

Asphalt Systems also recommended that crews dilute the GSB-88 with two parts water, rather than the typical 1:1 ratio. This required less material to be trucked to the site, less propane to heat the mixture and less labor to apply it.

"That decision provided a pretty significant cost savings on time, fuel, energy and transportation," Grose explains. "The 2:1 dilution also works better on grooved runways, because the viscosity is higher and there is less migration of material out of the grooves and onto the shoulder."

Because crews used sprayers that applied the pretreatment to an 18-inch area along the entire distance of the joints, an extra 6 to 8 inches of material was applied to each joint. According to Grose, this is an inexpensive way to prolong the integrity of joints.

"It's so simple and it makes so much sense to apply extra sealant to the joints first, that I don't know why it isn't employed in every sealing or preservation project," he explains. "It really is surprising. Most engineers adopt canned specifications without seeking insights from the experts as to how the project could be improved. But doing so goes a long way toward improving the overall quality of a project when the engineers take the time to seek advice from a supplier."

Had the airport not applied the extra material to the joints, raveling would have likely begun there within a few years and quickly spread to the rest of the asphalt, he adds.

Grose credits CH2M HILL for asking the material supplier about ways to prolong the life of the pavement.

"Not a lot of engineers will do that on a project," he relates. "Thankfully, we knew the engineering group well enough to help them design proper treatment for the pavement."

## Making Maintenance a Priority

RIL's accelerated approach sets its pavement project apart from others CH2M Hill has performed.

"It's not a typical maintenance schedule," notes Harry. "Runway pavement starts to deteriorate and crack much sooner than most people wish to admit. The sun, temperature changes, expansion and contraction of the

*Colorado's multiple freeze/thaw cycles present extra moisture challenges for airfield pavement.*

pavement itself, combined with the normal loads carried on the runway, make it easy for chips and cracks to appear in the asphalt."

Even a slight opening in the pavement allows moisture to work its way through the material. With the freezing and thawing of winter, the asphalt quickly gives way and a crack or crevice appears. Airports that neglect regular maintenance must resort to reactive measures to correct such problems. Often, however, it's too late, he explains.

"A lot of people will lay down pavement and just leave it, assuming it will be good for years," Harry relates. "If they would just apply some preventative maintenance on a regular basis, most airports could extend the life of their runways by many years."

Research shows that *if* airports maintain asphalt pavement every three to five years, they can get more than 20 years out of a runway — if not 30, he notes.

Conversely, runways that don't receive maintenance go from excellent to fair condition in just 10 years, and from fair to failure in another three, he emphasizes. Even when a runway is in fair condition, reactive maintenance will only stretch the life another three to five years, adds Harry.

## Long-term Planning

Despite the brutal mountain weather that constantly pounds RIL's airfield, Condie doesn't expect to need a comprehensive runway rehab until 2031, thanks to minimal maintenance tentatively scheduled for 2018, 2023 and 2027. By continuing to apply a seal coat every five years, VanHercke says the airport should be able to preserve its runway for at least 20 years, if not longer.

Condie attributes the attractive lifespan to an "innovative asphalt project" and "forward thinking" within Colorado's aviation community. He also extends kudos to the engineering team for designing the "perfect runway," the original pavement contractor, United Paving, for constructing a picture-perfect runway, and Maxwell Asphalt for keeping it that way.

"The team from Maxwell Asphalt … bent over backward to make sure we were happy, and the crew never complained when we flagged them down to fix a clogged sprayer," he recalls. "Like us, the Maxwell team was proud of the appearance of our runway."

Steve Maxwell, president of Maxwell Asphalt, agrees: "The aesthetics make the runway look brand new again — even from the air."

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# Fast-Track Fuel Farm Expansion is Team Effort at Atlanta Int'l

By Jennifer **Bradley**

Hartsfield-Jackson Atlanta International Airport

## factsfigures

**Project:** Fuel Farm Expansion

**Location:** Hartsfield Jackson Atlanta Int'l Airport

**Farm Owner:** Airport

**Leased & Operated By:** ATLECON Fuel Consortium

**Expansion Cost:** $8 million

**Project Duration:** 11 months

**Timeline:** Feb. 1 – Dec. 31, 2011

**New Equipment:** 2 fuel tanks, 50,000 barrels each; a pair of 1,000 gal/min hydrant pumps; 800-gal/min inbound filtration bank

**Total Capacity:** 8.19 million gal.

**Engineer/Consultant:** Pond & Co.

**Primary Contractor:** Pond Constructors

**Tanks:** Fisher Tank Co.

**Subcontractor:** Player and Co.

One of the hallmarks of any good team is players who give due credit to their teammates. And airport project teams are no exception, as demonstrated by the crew that pulled off an $8 million expansion of the fuel farm at Hartsfield Jackson Atlanta International Airport (ATL) two weeks early and under budget.

The team added a pair of new 50,000-barrel tanks, more than doubling the capacity of the facility leased and operated by ATLECON Fuel Consortium. Most notably, the players did it all — design to construction — in less than a year, finishing months before fuel needed to flow from the expanded facility to the Maynard H. Jackson Jr. International Terminal F that opened last May.

Olen **Bennett**

Olen Bennett, a strategic sourcing manager for Delta Air Lines and ATLECON chairman, describes the project as a "well-planned symphony." Of the many projects he's been involved in throughout his career, Bennett expects ATL's to distinguish itself for a long time to come.

"Based on my experience with other consortiums, this was probably the most aggressive schedule I've seen," he reflects. "The fact that this entire project, from initial blueprint to finish, was 11 months was exceptional."

Dean **Flessas**

Dean Flessas, vice president of Pond & Company, recalls the team's marching orders as: "We need this done, and we need it done tomorrow." Bennett considers the facility's performance — tanks performing "flawlessly" and a complete lack of operational issues since the December 2011 completion — as a testament to the team's work.

*With a pair of new tanks, ATL's fuel farm can now hold more than 8 million gallons of fuel.*

## On Task

Once the team was given the go-ahead, ATLECON and ATL reviewed several options for increasing the fuel capacity to service the airport's new 16-gate international terminal. It was an unusual predicament, Bennett recalls, as the task was to be completed within less than a year.

With Pond & Company in place as lead engineer, all project leads began the permitting process. Keeping the deadline-driven project on task required strong program managers, and Bennett says Pond & Company did just that.

Team leaders also chose the right subcontractors, he adds, mentioning Player and Company in particular. "The success story here is the relationship between the engineering firm and their subcontractors, ensuring none of them missed the deadlines set for them," Bennett reflects.

Ken **Bilson**

Ken Bilson, senior project manager and associate at Pond & Company, agrees that it was important to get the right team in place, but also to include them in decision-making from the beginning. This was especially true for Pond Constructors, the lead contractor that finished two weeks ahead of schedule. Bilson characterizes the company as a "valuable sounding board" for reviewing concepts and discussing constructability. "With this rigorous time schedule, it made sense to do it turnkey, and all the right players made it successful," he explains.

ATL's role was ensuring that the team had what it needed to meet its tight schedule, notes Bennett. In retrospect, he notes that this type of fast-track project would not work for fuel consortiums that lack open and honest communication with their airport authorities. "Nobody wins; that doesn't work," he says plainly.

Local and state fire marshals, municipal water authorities and FAA officials also played a primary role in the design process, and were included from the very beginning. When fire officials required an access drive around the facility, engineers had to determine how to fit it into ATL's tight space, recalls Bilson. Involving such key personnel and implementing their design requirements at the beginning eliminated redesigns later, he notes.

"We couldn't afford to start the design and then find out we had some big bust in the concept," explains Bilson.

ATL's established relationships with the various permitting agencies proved invaluable throughout the planning stages, adds

*Boxed in on all four sides, designers and work crews were constrained while expanding ATL's fuel farm.*

Bennett. A large part of staying on task was working through the red tape, and an early start and good working histories with the agencies helped facilitate the process, he notes.

Another important part of the strategy was "making it worth the extra effort." According to Bennett, using financial incentives to encourage the team to meet tight deadlines worked for ATLECON, and he encourages airport executives with similar project schedules to consider using them, too. Contracts at ATL were written to allow incentive bonuses to flow down to subcontractors employed by Pond Constructors, a subsidiary and group closely connected to Pond & Company.

Dennis **Dunham**

Dennis Dunham, on-site project manager for Pond Constructors, made sure materials were in place and minor glitches addressed. "When I first took the job, I worried about the worst; and it was nothing like that," he reflects. "It couldn't have been better."

Dunham agrees with Bennett about the value of incentives. Simple acknowledgements such as providing pizza for the construction crews were a big hit, he notes.

While Bilson cites Buck Buchanan, ATL's Planning and Development facility manager, as an integral part of the mission, Buchanan shrugs off the compliment and directs the praise back to the team, noting that good contractors and communication make "a tremendous difference."

Bill **Carpenter**

Bill Carpenter, a senior electrical engineer at Pond & Company, joins in on the verbal high fives: "Early on, all the people involved recognized the importance of planning, so when we did implement the construction, we had a definite course to take."

## Built to Fit

The fuel farm at ATL is locked in by taxiways on two sides, and a ground run-up facility and jet fuel pipeline easement on the other two sides. It was up to Pond & Company to maximize the limited space, explains Flessas. Despite the physical constraints, ATL's airlines want the capacity to bring in extra fuel when market prices are favorable, plus the ability to keep flying if a mishap strikes the farm.

Engineers more than doubled the farm's previous capacity by adding two 50,000-barrel fuel tanks to the existing footprint. The new design also left operators confident that they have room to contain a potential spill should one occur, notes Bilson.

The tank building itself is "impressive," says Dunham. He marvels at the efficiency of crews from Fisher Tank, who welded seven steel rings on each tank with custom equipment that completed 250 feet of circumferential weld in less than one day. A welder was positioned in a suspended basket, with equipment inside and outside the tank. "It was absolutely amazing," he remarks.

With the project scheduled to end during winter, coating the extremely large tanks was initially a concern, because necessary layers can't be applied in cold temperatures. Fisher Tank addressed the concerns by priming the tanks in its shops. The strategy not only eliminated the risk of weather-related delays to that portion of the project, it also saved time on-site, explains Flessas. Good weather prevailed, however, throughout the entire construction period, notes Dunham.

Working at a fully functional airport was a challenge, recalls Buchanan. Even though the welding could only occur in daylight, the fuel farm never shut down during the project, he adds: "We were literally working within the flight-restricted area the entire time."

Another significant challenge was ensuring that the new control systems were compatible with existing units that were built in the 1990s. From an operator's standpoint, this was essential, stresses Buchanan. Carpenter agrees, but notes that such issues are common. "It's rare that we have a greenfield," he explains. "The challenge is to go in and identify the existing infrastructure and how it works."

In addition to the two new tanks increasing the facility's storage capacity, a new 800 gallon-per-minute inbound filtration system increased its flow rate from the Colonial and Kinder Morgan Pipelines. More importantly, the new features provide redundancy, ensuring that product can be moved, emphasizes Flessas. Crews also added a pair of new hydrant pumps and filter separator sets, each pumping 1,000 gallons per minute out of the fuel farm.

"Lots of particulars go into such a design," Bilson concludes.

With such a large volume of details during the $8 million project, it's easy to understand why so many key participants stress the importance and value of good teamwork.

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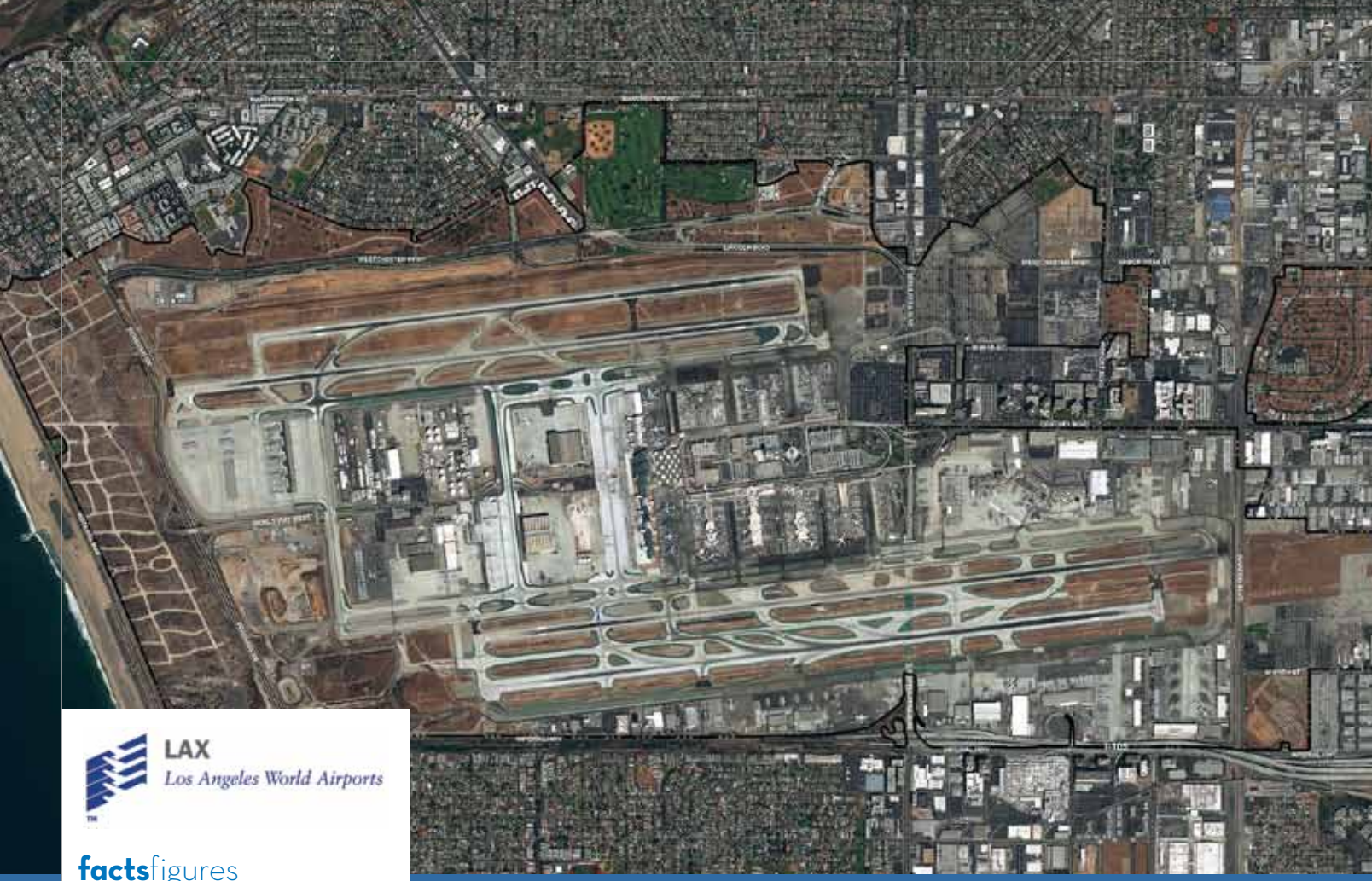

# Los Angeles Int'l Overhauls Airfield

LAX
Los Angeles World Airports

## factsfigures

**Project:** Airfield Pavement Maintenance & Management

**Location:** Los Angeles Int'l Airport

**Primary Elements:** Markings; Rubber Removal; Foreign Object Damage Prevention

**Airfield Pavement Maintenance/Mgmt. Engineer:** HNTB

**Airfield Pavement Markings Consultant:** Sightline

**Airfield Pavement Markings Contractor:** Sterndahl Enterprises

**Airfield Pavement Markings Maintenance Budget:** $2 million

**Striping Equipment:** M-B Companies

**Striper Cost:** $380,000

**Power Washing & Rubber Removal:** Extreme Pressure

**Power Washing Budget:** $500,000/yr

**Rubber Removal Costs:** $340,000/yr

**Friction Testing Equipment:** Dynatest 6875

**Truck Cost:** $200,000

**Rubber Removal Equipment:** NLB Corp.

**Rubber Removal Consultant:** Dynatest Consulting

**Pavement Management Software:** MicroPaver

**Geotechnical Testing:** Diaz-Yourman & Assoc.

**Non-Destructive Deflection Testing:** Dynatest Consulting

A quiet, yet sweeping, transformation has occurred in the way Los Angeles International Airport (LAX) manages and maintains its airfield pavement. Efforts have spanned multiple years, cost millions of dollars and required commitment across many departments. All the work, however, is paying off — in lower maintenance costs, longer lifecycles and safer runways, taxiways and ramp areas.

The primary catalyst for organization-wide change was an airfield pavement discrepancy report flagged during the airport's Part 139 compliance inspection in December 2011. The FAA considered the issue serious enough that it required a written plan for improvement, which the airport promptly provided in February 2012.

One of the first things LAX did was hire a consultant, Sightline, to perform a markings audit, explains David Shuter, deputy executive director of Facilities Engineering & Maintenance.

David **Shuter**

Issues identified ran the gamut from peeling paint to markings with improper dimensions and non-current layouts. Reflectivity, which affects pilots' ability to see markings at night, was a particular problem.

"We found out what needed to be done, split up the work between in-house crews and contractor, crafted a detailed plan and did it," recalls Shuter. "At our next Part 139 inspection, in January 2013, the FAA inspector found that we had zero discrepancies."

Donna Speidel, president of Sightline, lauds LAX for its quick corrective action. Crews from Sterndahl Enterprises removed most of the airport's existing markings and replaced them with new, updated versions in about six months. "They (Los Angeles World Airports) had a daunting amount of work to do, and they made a fast turnaround," she recalls.

Donna J. **Speidel**

Director of Operations Barry Rondinella considers hiring an outside expert with fresh eyes an important part of the airport's dramatic change. "The first step to recovery is acknowledging you have a problem," Rondinella quips, only half-jokingly. "We needed to understand the totality of our issues before we could turn the tide. Paint and pavement maintenance had not been stressed for years; and in the meantime, the ACs (FAA advisory circulars) had changed, and our machinery and training became outdated."


Barry **Rondinella**

## Organizational Revolution

Shuter identifies the airport's new Airfield Markings Regulations and Compliance Unit as a key component in the fix. "Before, we didn't have an organization that was dedicated to airfield paint," he recalls. "That's no longer a missing piece."

Airports Maintenance Supervisor Conor Roche, who directly oversees the unit, is enthusiastic the airport's new six-gun striping unit from M-B Companies. "It works from one end of the runway to the other, laying down precise, sharp lines," Roche reports. "And it can paint two different colors at once." Crews have been so pleased with the equipment's accurate millage, even bead disbursement and other performance factors; the department has budgeted for another unit to use on taxiways.


Conor **Roche**

Ralph Morones, director of the Maintenance Services Division, knows firsthand how many the markings and other airfield maintenance crews contribute to the overall airport, but he also credits Rondinella and Shuter. "Management really stepped up for us and gave us the equipment and support we didn't have in the past," he explains.


Ralph **Morones**

With the needed marking adjustments complete, LAX is now in maintenance mode. Cleaning — rather than painting or repainting at regular intervals — is now emphasized.

"By washing markings when they need it, we don't have to repaint as often," explains Operations Chief Jeff Mort. "If you continue to add layers of paint to markings, the buildup can eventually break away and cause FOD (foreign object debris) that could be ingested by aircraft engines."


Jeff **Mort**

The savings associated with cleaning vs. automatically repainting could potentially be considerable. Speidel estimates that it costs about 50 cents per foot to clean markings and

# Pavement Maintenance Strategy

By Rebecca **Douglas**

*Some of LAX' markings are preformed thermoplastics instead of paint.*


*Regular friction testing has become an important part of LAX' airfield pavement maintenance strategy.*

about $5 per foot to remove and repaint them. The difference isn't fully tenfold if markings are still thin enough to be just repainted instead of removed, but it's still about $2 vs. 50 cents per foot.

Even though power washing costs more in California than in other markets, investing in the preventive measure will allow LAX to prolong the life of its markings and postpone replacement, notes Speidel.

Since the change in strategy, markings are repainted or replaced only as needed, rather than on a prescribed calendar schedule. Markings in high traffic areas are repainted as often as once monthly, while others can last for years with regular cleanings, estimates Speidel. Last year, Roche's painting staff (two crews, each with six people) covered 2.8 million square feet.

Speidel prescribes water blasting at a relatively low pressure (about 20,000 psi) to clean the dirt and stains off markings without disturbing their reflective glass beads. "If markings weren't applied well originally, they can come up during cleanings," she cautions.

LAX rents power washers for its crews to use rather than contracting out the work. Speidel considers this a sound approach, and reports that the airport's personnel are becoming skilled power washers. "I prefer to see an airport empowering its own crews with equipment, knowledge and resources," she explains. "They have a vested interested in maintaining the airfield properly."

Now that markings are no longer repainted at preset intervals, checking their condition regularly has become more crucial. LAX seems to have taken Speidel's mantra — "monitor for maintenance" — to heart. Airport Operations personnel evaluate airfield pavement condition three times per day rather than the once daily schedule required by the FAA. "Inspectors document discrepancies and changes in condition, and put in work orders for maintenance," explains Mort.

"A lot of what we attack day to day comes from what the inspectors find," adds Roche. "And it's not just centerlines that need attention; it's also hold bars, signs, etc."

Stretching the span between marking replacements is especially important at an airport as busy as LAX. Last year, it moved nearly 63.7 million passengers and more than 1.9 million tons of air cargo via 605,000+ operations on four runways.

"When we close a runway for maintenance, it disproportionally affects the others. So we accomplish as much as we can at once," explains Rondinella.

While one crew repairs concrete, another will remove and repaint markings. At the same time, electricians may change bulbs as other workers mow the grass that's too close to cut when the runway is active. "We also coordinate with the FAA technical operations crews, so they can get in and check or repair their equipment," notes Mort.

## Cultural Evolution

In addition to updating equipment, forming specialized crews and modifying maintenance strategies, LAX also initiated cultural changes. One is a renewed emphasis on training and understanding exactly what the FAA expects regarding airfield markings. "We really dug into the ACs and became subject matter experts," says Mort. "It became a focus, and we're in a much better position now."

Frontline inspectors and maintenance personnel are systematically sent to Sightline symposiums to eliminate knowledge gaps among crews. "(Those) who have attended really rose to the challenge, soaked up the training like a sponge and now apply it in the field," reports Roche. Inspectors are also armed with kits including tape measures, current ACs and other tools needed to check marking.

The department is also working to build a cadre of employees who want to build a career at LAX. “All of our positions are city personnel classifications. Traditionally, the way to get promoted was to move from location to location, like from city hall to the library system,” explains Rondinella. “We’re trying to change that. We want airport specialists who understand the safety implications of everything that goes on here.”

Roche already sees the culture evolving, and links changes to the new emphasis on training. “They take pride in doing their jobs well,” he explains. “They’re enthused to be at the airport and want to stay here.”

Shuter stresses the importance of cooperation between LAX’s Facilities Maintenance and Operations divisions. “One can’t do it without the other,” he notes.

Looking in from the outside, Speidel notes a new sense of cooperation and mutual respect between individuals and their sections. “Everyone is working together toward the same goal,” she relates.


Joe **Sawmiller**

Joe Sawmiller saw a related metamorphosis at LAX when he served as program manager during HNTB’s four-part, largely airfield pavement management and engineering contract with the airport. Now with Hatch Mott MacDonald, Sawmiller still keeps a watchful eye on the progress of pavement management and other pavement-related projects at LAX.

“I’ll always have a special place in my heart for LAX,” he reflects. “They’ve accomplished so much and really embraced some pretty big changes.”

Sawmiller says LAX was excellent about including all the stakeholders needed to keep projects moving: “In addition to the obvious participation by Operations and Maintenance, they included Facilities/ Engineering, Planning, Properties and Grant Administration/ Finance. And senior management paid a lot of attention to the process. Everyone from the top down made airfield maintenance a high priority.”

*Regular power washing stretches the interval between repainting and reduces the associated risk for "homegrown FOD" from excessive paint buildup.*

## Long-Term Efforts

Two major areas of change were friction testing/rubber removal and pavement cataloging/assessment. Sawmiller commends LAX officials for committing to a 100% visual survey of all x square feet of pavement at the airport rather than settling for a compliant, yet less effective, network level pavement review.

"They really saw the light, and wanted to do it right," he recalls. "Now, they have a comprehensive database of the entire airfield's condition. With this baseline, they can optimize the maintenance and management of their largest asset."

Collecting the data was a laborious process, recalls Shuter: "They inspected everything slab by slab, each 400 square-foot panel at a time."

Visual inspections, combined with "core and bore" data from geotechnical crews, deflection data from non-destructive testing and friction testing results, provided invaluable information for planners — some Sawmiller describes as "eye-opening."

The discovery of reduced Mu values (the numeric expression of runway friction that predicts aircraft braking efficiency) and other runway anomalies led to a new friction testing program.

*New markings provide increased uniformity and reflectivity for better pilot visibility.*

After initially renting the necessary equipment, LAWA purchased its own in 2011. These days, runways are tested once per week; and rubber is removed (as needed) every three weeks on the north runways and every two weeks on the older south runways.

"It's a more sophisticated and reliable approach," says Sawmiller.

In addition to inspiring new maintenance practices, LAX's pavement survey may also eventually influence the terms of lease agreements. Separating data about tenant-managed pavements from LAWA-managed pavements illuminates unrecovered maintenance costs, Sawmiller explains. By including specific pavement maintenance standards in future contracts, some costs could be shifted to tenants in the future.

Dynatest, the company that manufactured the airport's Runway Friction Tester, also provided consulting services and collaborated with HNTB on studies that analyzed LAX' previous removal methods and presented suggestions for improvements. "By slowing the hydro blasting machine down a hair — just one or two miles per hour — we helped them remove more rubber, increase their friction numbers and stretch the time between cleanings," explains Frank Holt, senior vice president of Dynatest Consulting.


Frank **Holt**

Changing the way LAX evaluates and compensates its power washing contractor also helped. "With a small window to clean pavement and a contract based purely on production, it's no surprise the contractor was rushing," says Holt. "By adding performance and quality control measures, they've gotten much better results."

Shuter understands that rubber removal is a tricky task: "There are so many factors: pressure and volume of water, angle and height of nozzles, truck speed, etc."

Holt, whose professional career has focused on pavement friction since 1972, agrees: "Too fast, and the machine doesn't clean enough; too slow, and it damages the pavement. Now, they clean only where and when they need to, based on mu values. This has a positive effect on capital expenditures and the longevity of their concrete."

While LAX considers improved marking maintenance an important FOD reduction measure, it's by no means the only one. "We come at it from a lot of different angles: sweepers that run all three shifts, magnets for metal and three airfield operations superintendents who monitor traffic and constantly pick up materials," describes Morones. Extra vigilance is used where service roads cross taxiways, and crews know to watch for damage to the edges of pavement whenever an ultra-heavy, extra wide A-380 rolls through -- operations that are increasing, notes Roche.

The combination of efforts seems to be working. "Given our volume, we have very few FOD calls from pilots," reports Shuter.

## Next Phase

Sawmiller expects LAX to continue refining its approach to airfield management and maintenance. By continually updating the database from its pavement survey, it could develop a powerful tool, he explains: "Eventually, when maintenance workers go out to fill a crack or pick up a piece of FOD, they will know the entire history of that particular piece of pavement. That will allow the airport to be proactive and forensic-minded about maintenance. They'll be able to address root causes and efficiently schedule the most important work in the highest priority places. Eventually, with enough data, precise predictive modeling could put them ahead of needs."

Speidel hopes the vigilance about markings continues, too. “Improving markings is a process, not an event,” she advises, noting that most airports need improvements. “Just because an airport hasn’t been cited, doesn’t mean its markings are good, or even OK. Airfield markings are poor worldwide, and are something that’s off the radar for most airports. Pilots become accustomed to operating without good markings, and airports don’t often stop to evaluate their effectiveness until they have a problem or audit.”

Both Speidel and Sawmiller stress the benefits of taking proactive rather than reactive measures. “Airfield pavement is most airports’ largest asset to maintain,” Sawmiller explains. “And there are genuine opportunities to save significant money over the long run. One dollar spent now can easily save $5 to $10 down the road when a pavement reaches its critical threshold.”

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*Slowing down rubber removal crews helped increase their efficiency.*


# Raleigh Memorial Funds Initial Research of Unmanned Air Traffic Advisory System

By Robert **Nordstrom**

## *"Success!" "Beyond our expectations!"*

That was the enthusiastic reaction as stakeholders and other curious observers watched the initial demonstration of an unmanned air traffic advisory system at Raleigh County Memorial Airport (BKW) in mid-July. While many are quick to dub the system a "virtual tower," its developer is quick to point out an important distinction: The Synthetic Air Traffic Advisory System (SATAS) advises pilots of potential conflicts in the airspace and on the airfield so they can act accordingly; it does *not* direct pilots the way actual air traffic controllers do.

Comprised of readily available technologies, the unmanned system is squarely aimed at enhancing safety at airports without control towers. While more research and work needs to be done before the system can be rolled out, the initial success of SATAS is testimony to the creative vision of Dr. David Byers, president of Quadrex Aviation, and the persistence of the Raleigh County Airport Authority and BKW Airport Manager Tom Cochran.


David **Byers**


Tom **Cochran**

## Don't Take *No* for an Answer

It all started several years ago, in Beckley, WV.

With 58 based aircraft and two industrial parks flanking the airport on opposite sides, BKW is one of West Virginia's largest airports for corporate traffic. The facility also offers commercial service to Washington, D.C., via

### factsfigures

**Project:** Synthetic Air Traffic Advisory System

**Location:** Raleigh Co. (WV) Memorial Airport

**Consultant/System Developer:** Quadrex Aviation

**Surveillance Radar:** DeTect

**Multisource Surveillance Receivers:** PASSUR Aerospace

**High-Definition Thermal Airfield Surveillance Cameras:** American MicroTech

**Airport Funding:** $75,000

**Estimated Future Research & Installation Costs:** $3 million

**Key Benefits:** Unmanned air traffic advisory system could enhance safety at airports without air traffic control towers

United Express, but its general aviation traffic has increased significantly over the years.

"Our primary focus and paramount thought here is safety," Cochran notes. "However, we are the only commercial service airport in the state without a control tower."

Yeager Airport, about 60 miles north in Charleston, WV, provides a measure of air traffic control to BKW, but the mountainous terrain surrounding the airport limits coverage to above 5,000 feet.

"Charleston can give flight clearance to aircraft flying into our airport based on what they see above 5,000 feet, but from 5,000 feet on down, pilots are on their own," says Cochran. "There could be wildlife or another aircraft on the runway creating an unsafe condition."

Further complicating matters is BKW's "one-in/one-out" format. "When a flight comes in, the airfield is closed until that aircraft's flight plan is closed out," Cochran explains. "We've had situations where the pilot who lands forgets to close out his flight plan, and a flight behind him is low on fuel or perhaps experiencing icing conditions and needs to land immediately. There's no one to direct him. We can't do it — we don't have the equipment, and we're not air traffic controllers. This puts limitations on the airport and creates unsafe conditions."

With such safety concerns in mind, Raleigh County Airport Authority added a control tower to its 2009 master plan and hired Quadrex Aviation to perform a cost-benefit analysis.

At a cost of approximately $2.5 million to construct the tower and $500,000 annually to staff it, BKW did not qualify for the FAA Contract Tower Program.

Not one to turn back when he runs into a brick wall, Cochran decided to walk around the obstacle instead. When a tower didn't seem possible, he asked Byers for ways to improve safety at the airport.

As it happened, Byers had long been kicking around an idea for a virtual unmanned advisory system — the configuration subsequently named SATAS.

"I had this idea noodling around in my head. It's not a unique idea by any stretch," he modestly reflects. "But over the years, I became intrigued with the idea of taking off-the-shelf systems and assembling them to do pretty much what a control tower would do. Not everything, but a lot of things a control tower would do. Essentially, the system would provide traffic advisories to aircraft arriving or departing an airport."

While Byers emphasized that there were no guarantees the system would work, Raleigh County Airport Authority was intrigued enough to stake Quadrex Aviation with $75,000 to study the concept's feasibility and bring a prototype to the airport for testing.

## New Applications for Existing Technologies

The goal of the research was to investigate the applicability of available technologies to enhance operational safety at airports that do not have or cannot afford traditional air traffic control services, yet have substantial air traffic. Byers, who also teaches airport management and development at the University of Nebraska's Aviation Institute, emphasizes that the system is not air traffic control, in that it is not designed to direct pilot activities. Instead, SATAS advises pilots of potential conflicts in the airspace and on the airfield so they can determine the appropriate action to take.

Byers used data from existing radar to map flight paths, essentially by connecting the dots. Because radar visualizes activity in a particular airspace with "blips" that are translated into time-stamped x and y coordinates, the blips can be connected to create a flight track.

"I can do the math to project where an aircraft is going to be in, say, five minutes," he explains. "Then I can do that with another aircraft and determine whether their paths may cross within a specific time frame. If the system could recognize that this target and that target are in potential conflict, then trigger an advisory to alert the pilots of the situation so they can take appropriate actions, safety is enhanced."

Pilots, he stresses, are still responsible for their own separation. "All I'm doing is letting the computer do the math, by writing the algorithms that define airspace rules such as 'I don't want anybody within two miles of anyone else without one or both aircraft knowing about the presence of the other.' We're not inventing anything new, hardware-wise," he notes. "Similar technology is being used today to track ultralights crossing the border illegally."

The system consists of several off-the-shelf components: X-S band surveillance radar by DeTect, multisource surveillance receivers by PASSUR Aerospace, and high-definition thermal airfield surveillance cameras by American MicroTech.

DeTect's HARRIER ASR is an active air surveillance Doppler radar system designed to detect cooperative and non-cooperative targets. The product was designed primarily for small third-world airports without air traffic control that need situational awareness of airspace, and for industrial and border security applications.

The company developed a custom display that was ported out through a Web interface so users could view the data at the July demonstration. Chief Executive Officer Gary Andrews was pleased with how the radar performed: "We were getting very good performance … at a 12-nautical mile range. The whole project went off very well and we were getting extremely good detection, particularly in light of the terrain around the airport. All the data integrated well, and it was an unqualified success. It demonstrated the possibility of using this type of technology to provide situational awareness for a small airport."

Gary **Andrews**

PASSUR Aerospace's Web Tracker™ is a visual flight tracking technology that integrates both airborne and surface tracking into a single application, allowing users to move among surface, terminal airspace and en route flight tracking on a single screen without having to adjust for data sources. This is accomplished through the integration of multiple datasets, including the PASSUR radar surveillance network, ASDE-X and ADS-B.

"This project is not about active air traffic control," emphasizes William Leber, vice president of PASSUR's Air Traffic Innovations. "Our role is to provide secondary surveillance, mostly through transponder interrogations, while DeTect provides primary surveillance."

William **Leber**

Although PASSUR did not install sensors at BKW for the July demo, a company representative showed attendees how the system works in other areas of the country. PASSUR's privately owned network of sensors at more than 150 U.S. locations pinpoints where aircraft are, with data updated every 4.6 seconds, reports Leber.

"This application would be a new capability in our existing network of secondary surveillance," he notes. "We do not currently provide air traffic advisories, but it is very doable — a new application of existing technology. It's a matter of writing algorithms for creating advisories and creating sophisticated filters to show what pilots need in their particular airspace. It's 2013 and time for a more sophisticated approach to air traffic situational awareness for pilots."

The final element for the demonstration was the installation of high-definition surveillance cameras to visually sweep the airfield.

"That was the missing component," says Byers. "These cameras use Doppler radar to sense activity on the airfield." Such coverage, he notes, could be especially helpful at night, to identify wildlife or other obstacles, such as recreational all-terrain vehicles intruding on the airfield. "We can then alert a pilot who is

*A "one in/one out" policy and lack of control tower sometimes complicates flight operations at BKW.*

on a short final approach that there's an object on the runway, which gives him the information he needs to make important decisions," he continues.

## What's Next

While the July event succeeded in demonstrating the benefits of the various technologies, the next challenge is getting them to communicate with one another.

"It all needs to get fed into a common database with a common platform and a common language," Byers explains. "We have the visual aspects of the system and the database. (At the demonstration) we captured the data and showed observers what it looked like in real time."

Tabatha Cox, a former military air traffic controller who now works part time at BKW, was stationed to observe the airfield from above throughout the demonstration. And to everyone's delight, Cox confirmed that what she saw out the window " absolutely" matched the data portrayed on screen.

According to Byers, another crucial step is developing the advisory process, so the system can provide simple radio transmissions to pilots. "This is what we don't have yet," he relates.

Byers estimates that additional research to work out such bugs, plus installation of a prototype SATAS, will cost about $3 million. Given the amount, he's at a frustrating juncture. As it stands, the system is a promising alternative for small airports that need air traffic control but cannot afford it; but current sequestration makes government funding to bring the concept to fruition especially hard to secure.

"I've been working with three other airports over the past three years that have the numbers to qualify them for a tower, but the FAA … has apparently taken the position that they don't want new towers coming into the program," reports Byers. "That does not make the problem of managing congested airspace go away. At the same time, they (FAA officials) may be looking at culling out towers at some of the low-activity airports."

Once fully developed, SATAS could potentially help budget-constrained airports with 24/7 tower operations reduce personnel costs by cutting shifts during low-traffic periods. "If they had a system like this in place, the controller could flip the system on and let it run until a controller shows up in the morning," explains Byers.

Currently, SATAS stakeholders are waiting for a report from an FAA representative who attended the demonstration in July. West Virginia Senator Jay Rockefeller and Congressman Nick Rahall have pledged their support in securing federal grants to fund more research for the project. In addition, they are also pursuing the private sector for financial support, which they believe would allow Byers to move forward more quickly, with fewer bureaucratic entanglements.

"It's all about safety," Cochran summarizes. "We want that and certainly pilots want that. They aren't looking for more regulations, but they do want to be safe. And we want to provide them with the tools that will keep them safe."

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# Manchester-Boston Regional Leverages Technology &

Manchester-Boston REGIONAL AIRPORT

## factsfigures

**Project:** Ongoing Airfield Maintenance

**Location:** Manchester-Boston Regional Airport

**Average Snowfall:** 66 inches/year

**Airfield Maintenance Fleet:** 70 vehicles

**Airfield Maintenance Staff:** 25 full-time employees, plus seasonal supplements as needed

**Multitask Vehicle:** Customized Beam VX800 (earlier version of A8000)

**Distributor:** Fortbrand

**Runway Friction Tester:** Dynatest

**Snow-Melting Pits:** Trecan

**Wildlife Control System:** Ultima Scarecrow, by Sherwin Industries

**Of Note:** Airport convinced equipment distributor to modify a glycol recovery truck so it can also be used for rubber removal, pressure washing & transporting sand/deicing fluid

With more than 2.45 million passengers and 176 million pounds of cargo to move last year, Manchester-Boston Regional Airport (MHT) couldn't afford to let weather or wildlife disrupt operations. Fortunately, its Airfield Maintenance Department has developed a variety of measures throughout the years to keep the airport's runways open and safe.

Carlton **Braley**

As one might expect, weather is no small factor for the New Hampshire facility, located 50 miles north of Boston. "We average 66 inches a winter, but it seems as if we either get 100 inches or 30," says MHT Maintenance Superintendent Carlton Braley. "Last winter (2012-2013), we got 20 inches of snow in one storm alone."

Although MHT has used snow-melting pits for about 20 years, it turned up the technology on its strategy two years ago with two new pits from Trecan, each about 40 feet wide and 12 feet deep. Five natural gas heaters maintain a temperature of about 60° F inside the pits, allowing the system to melt up to 300 tons of snow and ice per hour.

The high-tech aspect of MHT's newer pits is the computer tablets that snow plow operators use to monitor and operate them. After maintenance personnel turn on the equipment manually and inspect the system on foot to confirm everything is working properly, they can operate the pits from inside their vehicles — protected from the harsh weather that necessitates their very use. With tablets in hand, operators can remotely increase or decrease the system's melting capacity, depending on the amount of snow being pushed into the pits.

In addition to increasing operator safety and comfort, the tablets also allow the airport to run the burners only when necessary. "Once we started using this system, we noticed an immediate reduction in our fuel costs the following winter," Braley reports.


# Customized Equipment for Airfield Maintenance

By Mike **Schwanz**

Handheld tablets also figure prominently into MHT's wildlife management strategy. Braley considers the Ultima Scarecrow system from Sherwin Industries an important part of daily efforts to control the airport's bird population. "The onboard tablet computer allows us to select the species we are looking to disperse, and the computer produces an audible distress call of that species that will scare away the intended bird(s)," he explains.

Other species must be lured away from the field, so crews set up off the airport and select an attracting call to entice the birds elsewhere. "(It) works both ways," Braley notes.

The tablet also collects a wealth of data, adds Braley. The system records activities from specific shifts and allows personnel to print time-stamped reports with information about specific bird/animal species, total count of dispersals, observations of flyovers, carcass recoveries and various dispersal methods used. In addition, the system maps the locations of all reported activities.

"We use it in conjunction with habitat management methods and scare-shot techniques to help reduce the number of birds around the airfield," he notes.

## Self-Spec'd Equipment

In some cases, MHT has taken the reigns and devised new systems to improve maintenance procedures. Frustrated with the cost of acquiring and operating separate vehicles for rubber removal, glycol recovery, cleaning markings and collecting sand, airport personnel worked with an equipment manufacturer to develop a customized vehicle that could perform all of these jobs — and more.

Although Braley is thrilled with the result, he acknowledges that getting the machine produced took a lot of trial-and-error. The first manufacturer that airport personnel approached about renovating a street sweeper to also perform rubber removal turned them down flatly. "They said it was too far of a stretch," Braley recalls. "Then we went to Fortbrand, (an equipment distributor) with whom we have had a terrific working relationship over the years."

Fortbrand customized a Beam truck MHT was primarily using for glycol recovery to also remove rubber from runways and taxiways. "They added a third broom and a large liquid tank to hold the cleaning solution," explains Braley.

After testing the modified truck for a few months, MHT maintenance personnel suggested a few additions, such as a hot-water tank, a burner to heat the water and high-pressure nozzles. In spring 2008, the modified VX800 truck was delivered. (The upgraded model sold today is the A8000.)

MHT crews are enthusiastic about the performance of the multipurpose vehicle. "With a 55-gallon tank, we can do three to four hours of rubber removal an evening, with no overtime," Braley reports. "It takes us less than 30 minutes to clear a runway. We accomplish about 20,000 square feet of rubber removal each evening. Depending on the severity, we choose to clean a wider path or a longer path. The square footage remains the same. We could double the production, but it would put undo stress on the morning schedule; and with our current rubber removal procedure, we never reach a critical buildup of rubber."

Although MHT is open 24 hours a day, the last flight usually arrives by 1 a.m. This allows crews to remove rubber from the runway without disrupting traffic. The overnight/early morning schedule also helps minimize the evaporation of chemicals.

By reducing overtime and burning less fuel, the airport's multipurpose vehicle helps reduce maintenance costs, notes Braley. "For rubber removal, it is less expensive per square foot. Our only expense now is the cost of the chemicals."

Besides removing rubber, the truck also moves about 1,000 tons of sand each winter and collects fluid from the airport's secondary aircraft deicing locations. Crews use the ve-


*Airport personnel use computer tablets to operate snow-melting pits and a wildlife dispersal system.*

hicle's high-pressure wand to clean snow melters, catch basins, manholes, trenches and sidewalks. It has also proved helpful in prepping airfield markings for maintenance.

## Human Help

MHT employs 25 full-time airport operations and maintenance specialists, plus 12 more on the "street side" for terminal maintenance. In addition, it hires temporary and seasonal employees for winter operations.

Interestingly, the local union seems to accept, even embrace, this arrangement. "We have a good working relationship with the union here," Braley explains. "They don't want to work 24 hours straight in a storm, and they know keeping the airport open is a priority, and that safety is extremely important."

Helping the dynamic, MHT often fills permanent positions from the temporary and seasonal worker pool when more permanent employees are needed. "They are already familiar with our operation, and we have first-hand knowledge of their work ethic," Braley notes.

During winter, temporary workers may log 32 to 40 hours per week. Some come from nearby Daniel Webster College, which offers aviation-related degrees. Students gain "real-world" airfield experience while plowing snow, clearing brushes or performing other assistance functions. They don't, however, drive the airport's large multifunction truck until they have at least a few years of experience.

"It takes a while for our seasonal workers just to learn the airfield," Braley explains. "We put them in the cradle, and start them with light equipment. If we are using three snowplows to clear a runway, they might be in the middle plow, and ride along with another experienced driver. They won't drive a plow until we are sure they are ready."

Braley also stresses training for permanent Maintenance Department personnel. Ideally, he wants every member of the crew to be able to operate all 70 of the airport's maintenance vehicles, including the VX800. When the airport first purchased the multipurpose Beam truck, Fortbrand provided training for both operators and mechanics. "Each person on our staff got at least eight hours of training, and many received a lot more," Braley recalls. These days, he relies on senior operators to train new employees. "For rubber maintenance jobs, we might train someone for three nights to make sure they get the hang of it," he explains.

## Industry Forecast

Braley, a member of the International Aviation Snow Symposium Committee, anticipates technology to play an important role in increasing airfield safety. "I expect more tablets and even smartphones to be used in the future," he says. "My only reservation is that plow operators may become distracted by them, and not pay attention to what is going on around them."

He also predicts that more organized training, including a certificate program, will become a reality for airfield workers.

On the equipment front, he foresees better tools for removing snow around airport lights. “The new LED lights being installed in many airports are more expensive to replace, but will last 50,000 hours compared to 12,000 hours with standard incandescent lights,” he explains. “They will eventually save airports quite a bit of money.”

He also expects more sophisticated and accurate weather forecasting to help airport maintenance staffs stay on top of challenging conditions: “We should have a better idea of when storms will hit, and how long they will last.”

Above all, he predicts that multipurpose equipment such as MHT’s Beam truck will become more popular at other airports, although he acknowledges that their price remains a challenge.

“Receiving AIP funding from the FAA for certain specialized equipment can be challenging,” Braley says. “Currently, the FAA may provide grant money for snow-removal equipment, but not for MTEs (multiple task equipment). Hopefully, that will start to change.”

With or without federal funds, Fortbrand Executive Vice President Alan J. Stearn encourages airport directors to consider total cost when evaluating equipment prices: “Airports need to think about long-term savings in labor and the costs of maintaining many vehicles, since this machine (the A8000) can do the functions of several machines with one operator.”

While some operators still prefer the base unit, which is designed for glycol recovery, more and more want the multifunction configuration, notes Stearn. Over the past year, the company has delivered six A8000s to a firm that services several Canadian airports.

Andrew Perrone, director of airfield equipment sales for Fortbrand, is similarly enthusiastic about the A8000 and its larger cousins, the A9000 and A12000: “In the past, one vehicle dedicated just for glycol recovery would sit in a garage most of the year. With the Beam, every function is within the vehicle; there are no attachments. It is ready to go.”

Perrone also encourages airports to analyze the equipment’s long-term benefits, as MHT did: “It will eventually pay for itself and save money in the long run, but the initial outlay must be overcome.”

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# Washington State Airport Harnesses the Sun

By Kathy **Scott**

PORT OF PORT TOWNSEND

## factsfigures

**Project:** Solar Energy Array

**Location:** Jefferson County (WA) Int'l Airport

**Cost:** $135,000

**Solar Installation:** Power Trip Energy Corp.

**Solar Panels:** Silicon-Energy

**Size:** 88 x 190 watt pv modules totaling 16.7 kw

As an airport manager, you've likely been approached about building a solar array on airport property. You're not alone. Since 2007, federal and state tax credits designed to encourage green energy production have prompted private companies to seek out public entities with large undeveloped property, like airfields.

Small and large airports alike are jumping into solar projects to varying degrees. Jefferson County International Airport (TWD) in Port Townsend, WA, demonstrates that airport solar farms don't have to break the million-dollar mark to be successful. In 2010, Power Trip Energy Corp. approached the entity that manages TWD (the Port of Port Townsend) about using a consortium to fund a solar panel array at the airport.

"Public entities can't take advantage of the 30% federal tax credit, so private investors that could use those tax credits can be good partners," explains Andy Cochrane, president of Power Trip Energy. "Airports typically have large unshaded and unused areas of ground and rooftops available for solar arrays."

Jefferson Solar Group was consequently established, and it financed the purchase and installation of solar panels at TWD, says Jim Pivarnik, Port deputy director. The group will lease the airport property for 10 years and earn the associated tax incentives during that time. The airport, in turn, uses energy collected by the array to power runway lights, the airfield beacon and an airport building. After 10 years, the Port has the option of purchasing the solar array at an amortized rate or continuing to allow the Solar Group to own/maintain the array and earn the associated tax benefits.

Power Trip Energy provided a turnkey installation and maintenance, which totaled $135,000, again, paid for by the Jefferson Solar Group. Cochrane notes that the photovoltaic components used in the TWD array are more costly than other options, because they were made in Washington and yield a higher incentive rate. Manu-

*Andy Cochrane, president of Power Trip Energy (right) Washington State Rep. Steve Tharinger (left)*

factured by Silicon Energy of Marysville, WA, the panels are a double-glass photovoltaic module with a 125 psf wind and snow loading on both the front and back, says Susan Mattison, the company's national sales and marketing director.

Washington is not unique in using legislation to foster and incentivize green energy initiatives. Mattison encourages airport executives to review the Department of Energy's database of state incentives for renewables and efficiencies at www.DSIREUSA.org. It provides all federal, state, local and utility incentives, she notes.

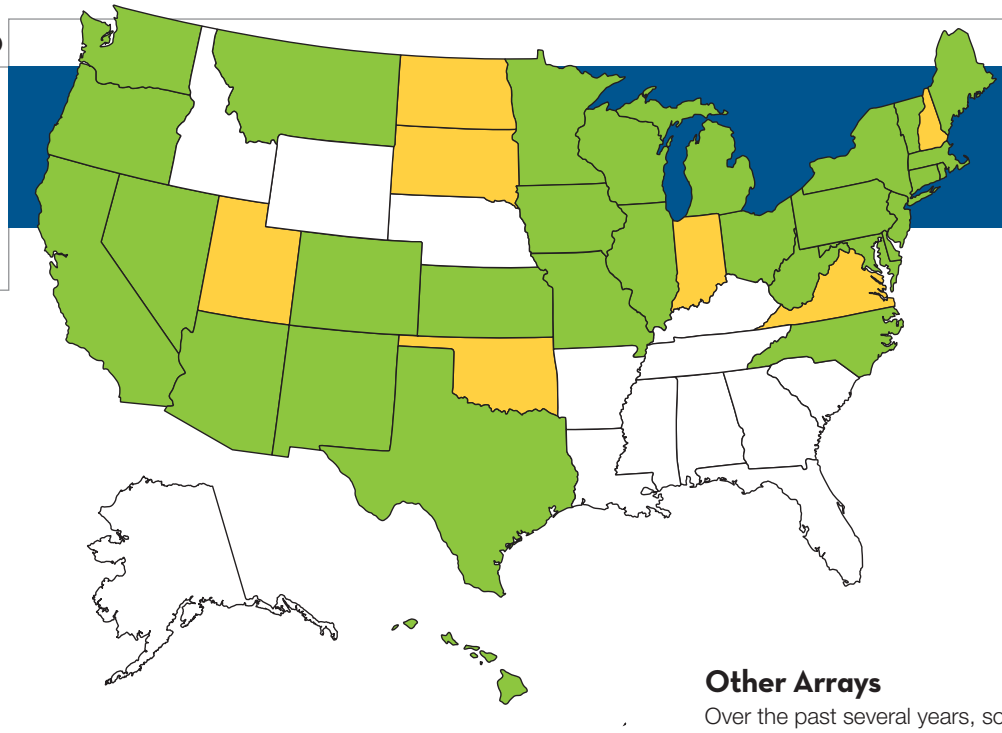
"Most states offer net metering, which means the utility will credit your bill for the electricity you sell back to the grid," explains Mattison. "There are often low-interest loans and other local financing programs available."

According to the U.S. Energy Information Administration, 30 states and the District of Columbia have enforceable renewable portfolio standards or other mandated renewable capacity policies as of January 2012. (See map on page 60.)

Cochrane urges airports considering solar projects to contact their state chapter of the American Solar Energy Society. In addition to providing helpful background information, they can provide recommendations for solar developers/contractors.

TWD's array, located on the west side of the airport, includes 88 x 190 watt photovoltaic modules, totaling 16.7 kilowatts. The panels are covered by a 30-year warranty, but tests performed by the National Renewable Energy Laboratory predict a much longer expected life, notes Cochrane.

"In this case, the Port saves about 10% on (the airport's) electric bill and derives some minimal income from leasing the land for the array," he says. "The Jefferson Solar Group sells the electricity generated at a reduced rate to the Port, and the investors pocket the tax credit and the state's annual production incentive, which should provide sufficient income to pay for the system by 2020."



**States with Renewable Portfolio Standards (mandatory) or Goals (voluntary).** January 2012

Standards

Goals

*Source: N.C. Solar Center at N.C. State University, Database of State Incentives for Renewables and Efficiency (accessed July 2012).*

*Note: The map includes West Virginia as a state with a renewable portfolio standard. The Interstate Renewable Energy Council, however, categorizes it as a goal state.*

At that time, if the investors and the Port agree on a purchase price for the array, ownership will transfer to the Port, and it can use the array to generate all of its own electricity, Cochrane explains.

Currently, the Port is sending back more power than it is using, and electricity costs are down, reports Pivarnik.



## Other Arrays

Over the past several years, solar energy businesses have helped cultivate partnerships between private and public entities. In 2010, the FAA released *Technical Guidance for Evaluating Selected Solar Technologies on Airports* to meet the associated information demands.

"Airport interest in solar energy is growing rapidly as a way to reduce airport operating costs and to demonstrate a commitment to sustainable development," notes the guide. "Most existing airport solar projects involve an airport partnership with private investors. These arrangements take advantage of federal and state tax credits and state-mandated electric utility purchases of renewable energy. Sponsors benefit from these arrangements through lower airport electric utility bills, lease revenues and the delegation of maintenance costs."

In 2011, Denver International Airport (DIA) completed a 4.4-megawatt ground-mounted solar power system on 45 acres of its land. Constellation Energy built and maintains the system, and DIA buys electricity produced by the solar panels.

Indianapolis International Airport (IND) has had a solar project in the works for more than two years. It expects to complete the Indiana Solar Farm this fall. The 44,000-panel array on 75 acres is designed to produce 25 megawatts of energy. Indianapolis Power & Light Co. will purchase the energy produced and feed it directly into its grid.

IND's project is the result of a partnership between Telamon Corp. and Johnson Melloh Solutions, which partnered with the Indianapolis Airport Authority, the city of Indianapolis, Indianapolis Power & Light Co. and General Energy Solutions.

## Renewable or Responsible?

Some people struggle with the very definition of "renewable energy" and consider it a bit of an oxymoron. Energy is not renewable. Once it's used, it's gone. This isn't, however, an argument against harnessing solar, wind or water power to produce energy.

Using such resources doesn't pollute the air or deplete natural reserves, but the products and equipment needed to generate electricity from them and deliver it to users does require traditional materials with finite lifespans.

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# Orlando-Sanford Int'l Completes Award-Winning Runway Extension

By Dan **Vnuk**

Located midway between Walt Disney World and Daytona Beach, Florida's Orlando-Sanford International Airport (SFB) has carved a niche for itself as the popular tourist area's secondary commercial airport. Although tourism-driven passenger traffic accounts for much of its volume, additional traffic from local flight academies, plus significant domestic, international, charter and freight operations, helped SFB rank as the third busiest airport in Florida and the 25th busiest in the country in 2012, as measured by flight operations.

The airport also serves as the focus city for Las Vegas-based Allegiant Air. In August, Allegiant and SFB announced nine new non-stop locations — the largest service expansion in the airport's history. Since adding the new routes, Allegiant now serves more non-stop destinations than any airline in Central Florida.

With Orlando and Daytona Beach both less than an hour's drive from SFB, all of airport's service segments are important to the local economy, which is heavily oriented around tourism and convention business. Disruptions to SFB's considerable traffic flow are simply not an option — even when the airport needed to extend its primary air carrier runway, 9L-27R.

The need for a longer primary runway was driven by the airport's increasing amount of wide-body international traffic, especially during summer months, when the planes have full loads of passengers and are heavy with cargo.

Larry **Dale**

"In Florida, we get a lot of hot, humid days during our busy season," explains Airport President/Chief Executive Officer Larry Dale. "On high density altitude days, the aircraft couldn't carry cargo full loads, or had to re-arrange the loads because we were short on takeoff runway length."

Total cost of the project topped $40 million, and was funded by the FAA and the Florida Department of Transportation Aviation Trust Fund. The multi-phase project included the purchase of $22 million of nearby property and a 1,400-foot runway and taxiway extension. SFB also increased the runway's accelerated stopping distance, so there was a safety benefit to the expansion as well, adds Dale.

To minimize passenger inconvenience, SFB officials scheduled the runway work in an eight-month construction period that began during the area's rainy season and was sandwiched between peak European flight periods.

The $14 million paving portion of the project included relocation, replacement or modification to the runway; glideslopes for 9L and 27R; localizers for 9L and 27R; and a medium-intensity approach lighting system for 27R.

Although the runway extension involved removing both of the airport's instrument landing systems, only three diversions occurred during the entire eight-month construction period, reports

## factsfigures

**Project:** Runway Extension

**Location:** Orlando-Sanford (FL) Int'l Airport

**Cost:** More than $40 million

**Funding:** FAA; Florida Dept. of Transportation Aviation Trust Fund

**Electrical Engineer:** AVCON

**Electrical Contractor:** H.L. Pruitt Corp.

**Airfield Lighting & Signs:** ADB Airfield Solutions

**Of Note:** One of the first projects to include systems installed to new FAA EB-79 standards

**Previous Duties:** Until 1968, the airport served as a naval training facility for carrier-based aircraft. Later, it was designated as an emergency backup landing field for the Space Shuttle, but was never needed for such services.

Dale. "It was important that we kept the airport functioning for takeoffs and landings during that time," he emphasizes.

## Funding & Phasing

The initial development and subsequent extension of SFB's primary runway required the airport to separate most of its flight training aircraft from its air carrier runway, 9L-27R. Doing so provided a safer environment for both populations, Dale explains, and allowed crews to begin the next major task: extending the runway from 9,600 feet to 11,000 feet.

Planners determined that the extension would immediately increase operators' capacity to carry cargo, passengers and fuel, which will greatly enhance the efficiency and profitability of their operations at SFB.

Following a benefit cost analysis and environmental assessment, the FAA deemed the runway extension a viable project, and more than $40 million worth of grants were awarded by the FAA and Florida Department of Transportation for the design, construction and associated land purchases for the project. CPH Engineers, lead engineer for the project, enlisted the services of AVCON to design and oversee the electrical and Navaid work, and CDM Smith to design and oversee the paving.

Planners broke the large project into two primary phases. Phase 1 included work outside the existing runway safety area to limit interruptions to the airport operations. During Phase 2, crews shortened Runway 9L-27R to 7,754 feet and created a temporary turn-around. In addition to being an important regional airport, SFB's location makes it ideal for international charter flights and scheduled service. By extending the runway and relocating the instrument landing system/medium-intensity approach lighting system with runway alignment indicator lights, the airport allows its transatlantic operators to significantly increase their carrying capacity and operating efficiency.

## Airfield Systems

Much of the project focused on installing and upgrading electrical components and Navaids. Individual elements included runway and taxiway lighting improvements associated with the extension, such as new runway edge lighting, threshold lighting, LED signs, LED taxiway edge fixtures and a new internally lighted wind cone.

"We used energy-saving LED light sources to the greatest extent possible," says AVCON Senior Aviation Lighting Specialist Carl Johnson. "We worked diligently with the airport's maintenance department to provide a reliable airfield lighting system that is easy to maintain and energy efficient."

Carl **Johnson**

SFB's spring runway extension included new glidescopes, LED signs and localizers.


According to Johnson, SFB has been using LED signs for about four years with great results. "The LED signs require significantly less maintenance than a sign with incandescent lamps," he explains.

Crews also installed new sign panels and LED signs at locations where existing taxiways were renamed. Seven connector taxiways between Taxiway B and Runway 9L-27R were renamed as part of the runway extension project, notes Johnson. The physical sign panel changes to support the taxiway name changes were closely coordinated with Sanford Airport Authority operations, FAA air traffic control, the contractor and engineer, he adds.

"For obvious reasons, temporarily having two taxiways with the same name was not an option," explains Johnson. "The renaming effort had to be completed in one night during a five-hour window. The new signs, conduit, cable and other components were installed prior to the renaming activity. New signs were kept covered until the name change took place. The entire team worked well together, and the taxiway name changes were a seamless operation."

The project was further enhanced with new FAA instrument landing systems and visual Navaids, which were designed in conjunction with the pavement improvements. Coordinating with the FAA on their design was critical, notes Dale. Having FAA engineering personnel on site during construction allowed the design team to respond to construction challenges immediately, notes Johnson.

On Runway 27R, improvements include a new medium-intensity approach lighting system, new precision approach path indicator (PAPI), relocated glideslope facility and updated localizer facility. On Runway 9L, improvements include a new glideslope facility, localizer facility and PAPI system.

"The compressed schedule required close coordination of all ILS and Navaid activities," recalls Johnson. "With everyone's cooperation, the ILS and Navaids were powered and ready to go on opening day."

In addition, a new transmission system was designed to provide communication between the Navaid facilities and tower on a fiber optic network. The project also integrated the reconfiguration of lighting controls to the tower, which required detailed phasing to maintain Navaid operation during construction and minimize overall outage time.

In accordance with FAA Engineering Brief EB-79, Navaid items not fixed by function were located outside the runway safety area and object-free area. For the two PAPIs, AVCON coordinated the new standard with the FAA and equipment suppliers to locate the fused disconnect and transformer outside the runway's object-free area and the power control unit outside the runway safety area, as permitted by equipment design limitations. According to AVCON, this is one of the first new systems installed to EB-79 standards.

## Happy Ending

Crews finished the multi-phase project on time and within budget, allowing the airport to reopen the runway on March 31, Easter Sunday. In addition, Sanford Airport Authority received the Airport Project of the Year award from the Florida Department of Transportation at the Florida Airports Council annual conference in July. In August, the FAA Airports Division presented the Airport Safety Mark of Distinction Award to SFB for the "safe and successful oversight" of its runway extension project.

Beyond the awards and on-time completion for SFB's busy season, Dale is also pleased about the project's "green" components. "We worked with the St. Johns River Water Management District so that the design of the runway extension did not require the usual installation of a master storm water pond for the improvements," he explains. "The designers were able to show that sufficient treatment was performed by overland flow treatment to meet (the district's) requirements. Extensive modeling was performed to show the discharge rate requirements were met. This analysis also included a nutrient review of the improvements, which also showed a reduction in nutrient pollutants from the site after the improvements were put in place."

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# Caution: Big Changes Ahead

On Sep. 28, 2012, the ground began shaking at the FAA. That is when its Airports Division published AC 150/5300-13A, *Airport Design*.

The new AC is not simply a revision; it's a re-write of a 23-year-old design standard. And it contains many significant changes that will affect your airport, including new classifications of taxiways, changes to taxiway geometry and a greater requirement for paved shoulders. Many of us in the airport planning and design business are reeling from the far-reaching implications of the changes.

Clearly, the FAA is stone-cold serious about the safety of aircraft ground movements and reducing runway incursions. It has invested heavily in upgrading runway safety areas the past few years, and you can expect the same for taxiways connecting to runways in the next few years.

One change, in particular, deserves your full attention: It will no longer be OK to taxi an aircraft straight from a parking apron to a runway. Yes, the shortest distance between two points is still a straight line, but it is not the *safest* route, according to FAA officials. And they have substantial data to prove it. In the same vein, it is also no longer acceptable to have large areas of pavement where aircraft can taxi without physical separation, markings, edge lighting and guidance signs.

Here is the upshot: The next time you want to improve a taxiway or apron that is in the old, configuration, you must change it to meet the requirements in the new AC. This could cause major reconfigurations in the busiest ground movement areas of many airports. And such reconfigurations will almost certainly affect operational efficiency. Simply put, it will take aircraft longer to taxi to runways if they have to make turns. And that is exactly what the new standards require. You can find details in Chapter Four of the new AC.

This change is being tested at airports as we speak. Aviation Director Frank Miller, who fosters an industry-leading safety culture at San Antonio International Airport, has a clear understanding of how to operate an airfield efficiently. When consultants undertook improvements to taxiways surrounding the terminal apron this year, they utilized the airport's progressive safety review metrics to ensure safety was built into the concept — balanced, of course, with operations. This is obviously the best way to approach a project like this. In the end, the airport had to modify the design to satisfy strict compliance with the FAA's new rules. It is not the preferred operational layout, but it prioritizes the new taxiway safety guidelines.

Long Beach Airport in California has the benefit of having an airport director, Mario Rodriquez, who understands these issues well. You see, he used to design taxiways for a living. When planners there set out to improve the airfield, Mr. Rodriguez and his staff had the foresight to initiate a study to determine what the final configuration of the airfield should be to meet new design requirements. It can't all be done overnight, but now he has a roadmap to follow; and the airport is working closely with the FAA on the effort. Agency feedback indicates this may well be the model for addressing changes. Smart airports and their consultants will follow suit.

Do not expect the FAA to hand out "modifications to standards" or grandfather your airfield just because it has before. If you touch any airfield pavement, you should expect to fix it to the new standards. And, you should plan for a lot more interaction on this issue with your FAA Airports office than you may be used to.

Right now the ground is shaking. But when it stops, America's airports will have safer ground movements and safer runways. Let's work together to protect operational efficiencies while we modify our taxiways to fit the new FAA ideal.

**Loy Warren**

*Loy Warren is Kimley-Horn's national aviation practice leader and has more than 30 years of design and construction experience. His responsibilities include business management, technical direction and quality assurance. Warren's expertise covers all aspects of airport development, including planning, program management, design and construction.*

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“ONE MUST CHANGE ONE'S TACTICS EVERY TEN YEARS IF ONE WISHES TO MAINTAIN ONE'S SUPERIORITY.”

Napolean Bonaparte

Now we don't
plan to start riding around
on horses or wearing funny hats,
with our hand stuck in the front of our coats.

But, the more we think about it, the more we realize
that Mr. Bonaparte was on to something.

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