

# Real-Time Awareness

Non-ATC users find innovative applications for surface surveillance technologies.

BY WAYNE ROSENKRANS

Evolving ways to leverage airport surface surveillance technologies — building on those already adopted by air traffic control (ATC) — primarily enhance operational efficiency. Yet some non-ATC users also report positive influence on safety, according to a U.S. airport user of the Aerobahn system and Saab Sensis Corp., the system's manufacturer.

Aerobahn, a browser-based surface management system, provides diverse airport stakeholders a common surveillance and communication

platform for managing operations, says Dan London, director of airline and airport automation for Saab Sensis. Worldwide, the predominant users are airports, airlines and air navigation service providers.

“We advise people that Aerobahn has been designed as an efficiency system, and that is how it should be used,” London said. “However, our customers are finding benefits that go beyond just efficiency. Aerobahn is not a safety tool; however, some of our customers use it for potentially safety-related applications.”

Uses of Aerobahn by airports and airlines mainly revolve around operational use and decision making. However, benefits are also derived from capabilities pertaining to data analysis for reducing surface traffic congestion, measured use of specific taxiways and other aspects of facility utilization, he said.

“Almost all core business-case utilizations of Aerobahn and how its procurement is justified are based on cost savings, enabling airports to use their resources more efficiently, and

airlines to burn less fuel and improve the customer experience,” London said.

### Highly Accurate Sources

For an advanced surface movement guidance and control system (A-SMGCS) — such as airport surface detection equipment, model X (ASDE-X) at 35 major airports in the United States — the fusing of multilateration and surface surveillance radar typically becomes the source of the surveillance data for Aerobahn users.

“The same surveillance feed and the bulk of the technology in ASDE-X are also capable of feeding Aerobahn,” London said. Under specific data-access policy requirements, the U.S. Federal Aviation Administration (FAA) shares with the industry “highly accurate, reliable information about what is out on the surface, so an Aerobahn system is capable of displaying the same track data used for ATC, similar to that used on ASDE-X,” he said.

How the *industry* should use the technology does not compare with how the *FAA* primarily uses the technology for safety. “Make no mistake, in the airport control tower, one of the core safety systems is ASDE-X,” London said. “Aerobahn in no way is being used by U.S. air traffic controllers — either directly or as a supplemental advisory — to ASDE-X.”

ASDE-X produces one type of surveillance feed — primarily using complementary capabilities of airport surveillance radar, surface movement radar and multilateration — from which the private sector can create secondary benefits for the aviation industry. “The three primary surveillance feeds in ASDE-X are fused together into one comprehensive flight data object track around which we can build safety logic to provide alerts

to ATC about a potential collision or incursions,” London said. “Saab Sensis, for example, can make use of that same high-quality track output to Aerobahn, providing rich information that can be used for either safety-related analytics or for efficiency purposes.”

### Perspectives From Atlanta

Providing virtually real-time information for aircraft rescue and firefighting (ARFF) personnel has been one of many uses of Aerobahn at Hartsfield-Jackson Atlanta International Airport (ATL), says Paul Meyer, the airport’s director of operations. For the time being, the department has an Aerobahn display at one station, which enables relaying to the firefighters on scene — and to more than 300 other local users — both status notification and awareness of where all vehicles and associated personnel are located.

“Our ultimate goal is to add a laptop display in the fire chief’s vehicle so that when he is out on the field responding to an emergency, he can see in real time where all the ARFF trucks are rather than calling them by radio and asking them for their locations,” Meyer said.

The department is among airport stakeholders that can replay real events from Aerobahn to develop lessons learned and conduct training based on factors such as how quickly the ARFF vehicles responded and what route they took.

Meyer sees Aerobahn as a supplemental advisory tool, complementing established procedures for ARFF notification by ATC and other emergency networks. “For example, there may be 10 or 15 recently arrived airplanes out on the airfield when the flight crew of one calls ATC to report hot brakes, an engine fire or an emergency,” he said. “Sometimes, the ARFF responders

find five, six or seven aircraft in the same area, and they don’t know exactly which one it is. It could depend on how good a description they received from the control tower. With Aerobahn, a dispatcher, and possibly in the future, all drivers of ARFF vehicles can look up the flight number and tail number right on the vehicle’s moving-map display to see exactly where the airplane is.”

All vehicles that operate on the ATL movement area — including those for aircraft towing, airport operations, snow plowing and ARFF — carry proprietary 4.9-GHz transmitters designed for the airport’s independent Aerobahn multilateration system, which updates displays at the rate of once per second. Off the airport, airlines, FAA facilities and authorized users can access Atlanta’s Aerobahn displays as needed — such as during thunderstorm conditions — from almost any location in the world with a secure connection and login.

“Our multilateration surveillance system covers 100 percent of the movement area and 100 percent of the non-movement area, so all the gates and all the parking locations have surveillance coverage,” Meyer said. “So non-ATC users see the airplanes and vehicles with unique identification and function icons wherever they go on the airport.” The system also already accepts signals from automatic dependent surveillance–broadcast<sup>1</sup> (ADS-B) equipment on a growing number of aircraft, a technology the FAA also anticipates will be adopted voluntarily by U.S. airport vehicle operators for safety enhancement (ASW, 4/12, p. 34).

As at the country’s other ASDE-X airports, this Aerobahn system receives a feed of the flight data object track from the FAA. “This augments

our system as a redundant flow of information, but we don't feed any of the airport's multilateration data into ASDE-X," he said.

Typical Aerobahn displays that Meyer monitors show at a glance how long each aircraft has been taxiing, aircraft waiting to enter an occupied gate and similar metrics. "We can slice and dice the data up any way we want for practically any purpose. This information has become operationally critical to our ramp controllers and the airlines responsible for these flights," he said.

"Surface management has been a game-changer for Atlanta, and Aerobahn is a very

popular system. It makes everyone proactive — for example, to find a new gate for an airplane and to reduce the delays — and we know this ahead of time rather than when airplanes are showing up on the ramp. By then, everyone would be in a reactive mode. We had no idea about these things before we had surface management. The people in ramp control towers, with the windows all around them, then only had binoculars to try and find specific aircraft, and they did not have any idea how long they had been taxiing."

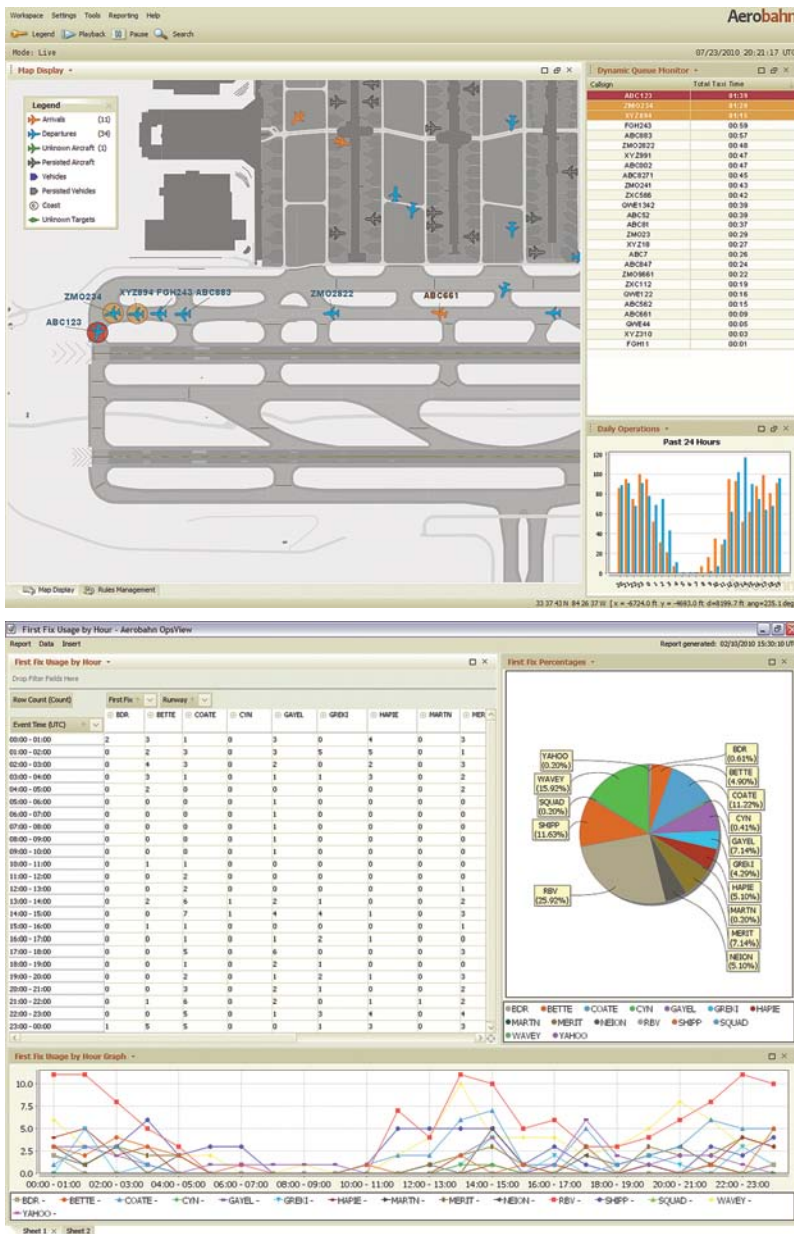
Replays of Aerobahn displays (p. 38) and analytical screens (below) have indirect safety uses.

### Creative Applications

Saab Sensis has learned from a number of U.S. Aerobahn users — including those in Atlanta — about applications that illustrate how the technology indirectly benefits safety without crossing the line into the safety-of-life applications for which the FAA is responsible. For example, the system assists some users responsible for non-ATC-related taxi route conformance of the Airbus A380, which operates only on taxiways and runways stressed for pavement strength and meeting other requirements.

"Within Aerobahn TaxiView, users can set up some alerting mechanisms to advise when an aircraft, such as an A380, is not on the appropriate taxiway," London said. "To be clear, that is not an FAA-approved use of Aerobahn, but it is an additional way in which a ground handler, a terminal operator and/or an airline would be able to know whether or not its A380 is on a predefined taxi segment."

Airlines and operators of deicing pads, which may be located inside or outside the airport movement area, use Aerobahn as an additional tool for remote awareness of deicing activity, anticipating the expiration of deicing holdover times and receiving automated alerts under defined conditions. "Aerobahn can be used as a very accurate timer," he said. "While designated individuals are responsible for tracking metrics such as elapsed time following application of deicing fluid, Aerobahn can be a supplemental system to recognize and log when the aircraft left the deicing pad, where it is on the surface, how



long it has been out there and, potentially, its predicted takeoff time. Saab Sensis is very clear that this is not the primary safety mechanism for determining holdover times, but this can and does add value. We state that Aerobahn is an advisory tool that people can use in a supplemental fashion to approved procedures.”

The system’s OpsView database allows subsequent analyses of deicing activity. This function supports efficiency reviews and, with caveats, safety reviews. “Users are no longer restricted to who has the best recollection of what happened,” he said. “They can actually see where the aircraft and/or vehicles were and, in a fully integrated fashion, perform post-event analyses. The caveat is that Aerobahn is only one data point and cannot be the exclusive source of information. Deductions cannot be made exclusively from an Aerobahn replay of an event.”

### Alleyway Choreography

At many U.S. airports, the city government handles ramp control and occasionally can share a ramp tower with tenant airlines. “In some cases, topographical issues of various elevations on the airport make aircraft hard for ramp controllers and airline personnel to see,” London said. “When they can’t see them visually, however, they can look down on their Aerobahn situational awareness display and see where an aircraft is coming into the gate area.

“They also need to know where aircraft are for movement in and out of the alleyways.<sup>2</sup> Congested alleyways impede pushbacks. So, to the extent these personnel can better manage flows in and out of the alleys, they reduce the probability of a pushback into an aircraft waiting in the alley. Aerobahn is not the ramp tower operators’ safety

system, but they use it in a way that improves the visibility of aircraft.”

Augmenting Aerobahn data with proprietary airline data opens the door to further sophisticated applications. “Instead of just knowing that Ship 3235 is out on the surface, this proprietary information can provide the crew on board, number of passengers on board, etc.,” London said. Several ways in which elapsed time affects operations also can be tracked.

“Some use Aerobahn to help them make better determinations about crew connections,” he added. “For example, an aircraft crew inbound on this flight is connecting to take that flight out. Management can make better decisions about getting a particular aircraft in to the gate and off-boarded so that the airline can move the crew on to its next flight. They can make determinations about aircraft crews that are out on the surface and intending to complete their route, and how that time will affect duty time. Aerobahn is not the safety system but rather a timer or an alerting mechanism that can point an airline to a potential issue.”

At New York’s John F. Kennedy International Airport (JFK) in 2011, TaxiView highlighted on Aerobahn displays the locations and status of hazards on taxiways and runways under construction. Such temporary annotations continue to be “pushed” simultaneously over the network to the entire user community. Later in 2012, the ability to display and record notices to airmen will be added to Aerobahn, he added.

“During the JFK Runway 31L-13R reconstruction, the Port Authority of New York and New Jersey required a fully integrated response by the community,” London said. Aerobahn served as one of the information-integration tools for “situational awareness and coordinated departure movements,” he said.

Aerobahn also provides insights into where to spend money on the airfield to get maximum return from pavement inspections and maintenance, London said.

“We take the map representation of the airport surface and ‘carve up’ all of the runways and taxiways into regions of interest,” he said. “Aerobahn monitors aircraft movements in and out those regions, and derives a dwell time for each. When the airport wants to know how frequently a taxiway segment has been used, the system produces a region-occupancy report containing the number of movements with the breakdown by aircraft weight type, four-main-gear versus two-main-gear aircraft, etc.”

Aerobahn users can consider their surveillance-based data to calculate the total gross weight that has transited a particular taxiway segment. This supplements estimates of pavement condition based on total gross weight from standard algorithms, taking core samples and other FAA-approved techniques, he added.

For the FAA itself, Saab Sensis researchers currently are studying new methods of analyzing surface surveillance data from ASDE-X to identify anomalous events on an airport that may or may not be precursors to aviation incidents. The aircraft-related data of interest include rapid decelerations, wide turns and route excursions, London said. ➤

### Notes

1. In the future, Aerobahn will be “a beneficiary of the ADS-B surveillance feed; it does not take much modification to tune a multilateration system to be ADS-B-compliant,” London said.
2. *Alleyways* and *alleys* refer to areas where aircraft parking at gates and pushbacks occur between adjacent concourses of one or more terminal buildings.