



# Baltimore/Washington Int'l Optimizes Baggage Handling System

By Carroll McCormick



## factsfigures

**Project:** Checked Baggage Inspection System Optimization & Upgrade

**Location:** Baltimore/Washington Int'l Thurgood Marshall Airport

**Terminal:** A/B

**System User:** Southwest Airlines

**Airport/System Owner:** Maryland Aviation Administration

**Project Budget:** \$4.5 million

**Timeline:** May 2011 - April 2012

**Design/Builder:** Vic Thompson Company

**Mechanical & Electrical Subcontractor:** G&S Mechanical USA

**Controls Engineering Subcontractor:** Alliant Technologies

**Benefits:** Doubled system throughput, enhanced security & provided reporting system & Checked Baggage Resolution Area improvements

**Key Elements:** New queue conveyors, diverters, variable frequency drive motors & sort controller; new tables & human/machine interfaces

After Southwest Airlines acquired AirTran Airways last year, its Checked Baggage Inspection System (CBIS) at Baltimore/Washington International Thurgood Marshall Airport (BWI) went from taxed to overloaded. "Our flights peak at 199 flights per day, and AirTran was running 48 flights per day," recalls Jimmy Dickerson, manager of federal airport security technology for Southwest. "Our CBIS could not by itself handle the combined baggage for the two carriers."



Jimmy Dickerson

Beginning in May 2011, design/build firm Vic Thompson Company led a team through a three-phase, one-year project that doubled the throughput of the system, upgraded the computer control systems and completely renovated the TSA's Checked Baggage Reconciliation Area (CBRA). The team achieved all this while Southwest continued to operate and without changing the configuration of the CBIS.

The project marks the first airport in a TSA program to upgrade CBRAs to current standards at targeted legacy airports. "This will allow for better ergonomics and better bag flow

through the updated [screening] process and [using] current technologies," explains Terry Spradin, TSA's North East regional deployment manager for electronic baggage screening programs.

Given the luxury of time, Vic Thompson Company would have upgraded the sortation allocation controller before making changes to the CBIS. But to meet Southwest's requirement of vastly improving CBIS throughput by the Thanksgiving holiday, the firm left the computer upgrade until last.

The CBIS in Terminal A/B, where Southwest operates, previously processed about 1,200 bags per hour. These days, it processes more than twice that amount when operating at peak.

## How They Did It

The CBIS, which was originally commissioned in 2005, has six explosives detection system (EDS) machines and is divided into two, three-EDS pods that can be operated independent of each other. In preparation for Phases 1 and 2, when the West and East pods would be sequentially shut down and optimized, Southwest built a 20-foot x 30-foot drop-and-go baggage area to take up the slack. The carrier located it in the lobby near an abandoned ticket counter,





Variable frequency drive motors allowed crews to increase belt speeds after replacing other electrical and mechanical equipment.

and TSA equipped it with three Reveal Imaging Technologies CT-80 EDS machines.

While one pod was shut down, TSA processed checked bags in the drop-and-go area, then put them on the ticket counter belt that took them to a baggage make up area. There, they were placed on carts and transported to Southwest planes. "The drop-and-go solution demonstrated the willingness of the partnership with TSA and the airport," Dickerson emphasizes. "The local TSA had to retrain their folks to be recertified on the temporary machines. This is not an easy thing to do."



Jim Goertz

G&S Mechanical USA replaced 118 conveyor drive motor/reducer packages with variable frequency drive (VFD) motors manufactured by SEW Eurodrive. Because the VFD motors can be easily adjusted to different speeds, G&S replaced the drive packages and left the conveyors running at the original belt speeds. After replacing the other electrical and mechanical equipment required for the optimization, crews simply adjusted the VFD motors to increase the belt speeds, explains G&S vice president Jim Goertz.

In Phases 1 and 2, Alliant Technologies performed control system work while G&S replaced electrical equipment. G&S also supplied and installed 12 queue conveyors and a section of general transport conveyor. According to Goertz, its conveyor equipment centers bags on



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the belts more effectively and requires less maintenance than the old conveyors. G&S also replaced seven Siemens HSD I diverters with new Siemens HSD II diverters.

The new equipment is able to divert baggage without causing them to turn and lose orientation — a critical factor in proper functioning of the sensitive baggage tracking system. If, for instance, a 28-inch x 18-inch bag turns, the spacing between it and the bag ahead of it changes. This could cause the system to misinterpret the actual length of the bag and consequently lose it. Lost bags go to CBRA for manual screening, a frequent occurrence that was overwhelming TSA staff and shutting down the former CBIS.

Terminal A/B was not originally designed to accommodate a CBIS. Rather, it was shoehorned into a space too small for forklifts, so G&S had to disassemble the existing diverters and queue conveyors and remove them in pieces, along with the old electrical conduits. Crews then brought in the new equipment and assembled it in place in reverse order.

After Phases 1 and 2 were completed, G&S increased the VFD motor speeds to feed baggage more quickly into the EDS machines. The peak throughput rate is now 2,448 bags per hour, safely above Southwest's peak requirement of just over 2,000 bags per hour.

The higher throughput, however, resulted in increased network traffic that dangerously challenged the already fragile upper level sortation allocation controller (the brain). "The upper level control system was already prone to failure and was causing the whole system to fail," recalls Jonathan Hill, project manager and lead designer at Vic Thompson Company. "It was a big issue: At a certain baggage volume, the sort controller brain would fail, causing the system to gridlock, and bags would start missing flights."



Jonathan Hill

Keeping the old sortation allocation controller from melting down until it could be replaced required significant teamwork, communication and vigilance. Hill notes that cleaning the former sort controller and optimizing its memory helped, but working with Southwest and TSA to identify and address problems as they arose was even more important. "Understanding the breaking point of the CBIS as associated to baggage volume was important," he explains. "We reduced surprise failures by knowing when peak days and equipment failures coincided and when to run the drop-and-go system [to ease the strain on the sortation allocation controller]."

### Almost Finished

In Phase 3, scheduled for completion this April, Vic Thompson Company installed a much more robust control system. In the new system, the Programmable Logic Controllers do all of the "heavy lifting" and are less prone to failure, they explain. This, in turn, greatly reduces the burden on the upper level system.

"A major feature of this project is replacing the sort controller to improve diagnostic features such as enhanced reporting, which gives us the ability to better monitor system performance," Hill relates. "This also provides the system operator with the tools to troubleshoot problems that may impact system performance — for example, loose photo eyes or slipping belts." The additional reporting features help the new CBIS comply with the TSA 4.1 Planning Guidelines and Design Standards (PGDS) for Checked Baggage Inspection Systems, he adds.

Phase 3 also included the renovation of the CBRA. The updated design added new PGDS-compliant stainless-steel search tables, new bag tag readers and a motorized security door that improves bag loading ergonomics for TSA personnel. Vic Thompson Company also replaced obsolete Baggage Removal Point and Baggage Inspection Table human-machine interfaces with PGDS 4.1 compliant VersaView interfaces. Adding E-stop control stations as well provides the TSA with a safer, more functional working environment.

"A project like this is never easy, but this is a great example of how well a plan comes together when everyone is working toward the same goal," Hill emphasizes. "There is always a concern when you are modifying an operational system, but Southwest Airlines, Maryland Aviation Administration and the Transportation Security Administration all worked together to get this done." ✈️

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