GETTING THE BLUE OUT

New airport runway project in rural Georgia utilizes stakeless grading precision

By Don Talend

One type of pavement that has critically tight smoothness specifications is airport runways, for obvious reasons. One might argue that, in rural Georgia, runway smoothness is even more important than in most other parts of the country because the state government has made airports there a key component of economic development.

In July 2007, Governor Sonny Perdue announced the launch of the Airport Initiative in Rural Georgia (AirGeorgia), which integrates airport infrastructure improvements into the overall plan for rural economic development within the state's OneGeorgia rural economic development initiative.

One airport that is benefiting from the AirGeorgia program is the Brantley County Airport near Nahunta in east-central Georgia. The facility underwent a runway lengthening to 4,000 feet and a widening to 75 feet compared with its previous dimensions of 3,000-by-50 between December 2008 and June 2009.

The subcontractor on the project that handled the fine grading was Ricketson Construction Company, which met extremely tight tolerances inherent in airport runway projects with a combination of Global Navigation Satellite System (GNSS) and laser technologies. Although this technology in general is becoming familiar to contractors in North America for rough grading, the use of a combination of laser and advanced GNSS technology in a "blue-topping" application is new.

Photo courtesy of Don Talend.

Using a combination of laser and Global Navigation Satellite System machine-control technologies for fine grading allows Ray Ricketson and Ricketson Construction, Douglas, Georgia, to do fine-grade paving in about ⅓ the time of conventional site-preparation methods.

STAKELESS FINE-GRADING

Traditionally, fine grading work such as that required for the runway at the Brantley County Airport has involved the use of stakes placed on grade every 50 feet to mark the centerline and edges of a pavement. The tops have been marked with blue paint to signify the desired elevation of the finish course. The elevation of these stakes would be determined by a control point adhering to the official survey and the grader operator used the blue markings as a visual reference in grading the finish course. The elevation of these stakes would be determined and set by the surveyor or field engineer in accordance with the blueprints, plans, or site design. String lines would be used to mark the grade differential between the pavement centerline and edges, as well as to check the graded differential between the centerline and edge.

Increasingly, blue-topping is being replaced by automated fine-grading, where a grader operator uses the blade, without the aid of wooden stakes and string lines, to finish grade. In rough or subgrade work, GNSS already has made a major impact. A GNSS machine-control system uses a rugged antenna mounted to a shock-absorbing, vibration-damping pole along with a GNSS receiver box mounted in a secure location on the machine. Satellites send positioning data to another antenna/receiver combination at a stationary base station. The base station then sends a three-dimensional position and 3D corrections via radio to the mobile or machine-control receiver. Positioning data is also sent to the machine. The stationary base and machine work together to provide real-time kinetic (RTK) position information, revealing the machine's three-dimensional location on the site. Software compares the machine's

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position to the design grade, which was determined using site plans, at a given location. The system also provides visual guidance for machine operators by displaying a site model on an in-cab color monitor, or it automatically adjusts the needed elevation and desired cross-slope of the blade as the operator guides the machine forward.

The Topcon Millimeter GPS+ is a variation on the machine-control theme by combining GNSS and laser; this "Lazer Zone" combination provides grading control accuracy to within one-quarter of an inch. The combination of the laser's high vertical accuracy and the three-dimensionality of the GNSS 3D reportedly increases grading accuracy over existing 3D GNSS-enabled machine-control systems, which typically achieve rough-grading precision to within 1/10 of a foot.

SUBCONTRACTOR PROVIDES NEEDED PRECISION

In spring 2009, Ricketson walked onto the runway base, which had a few blue-topped stakes protruding from the surface along the centerline. He met up with Donald Pate of Statewide Engineering Inc., the construction manager on the project. The control box and GNSS receiver were installed on the grader so that grading could continue. Pate pointed out that the general contractor, Folsom Construction, had torn out an old asphalt runway pavement that had become badly cracked and deteriorated and then raised the runway by an average of 6 inches—and up to 3 feet in some areas—to allow better drainage for a new asphalt pavement. The dirt was excavated from alongside the runway.

"We're going to put a single-surface treatment on top of the base and then 2 inches of asphalt," Pate says. "The single-surface treatment is there to prevent those cracks. When you put that single-surface treatment on, you've got some expansion under there, but it's going to make that asphalt stable."

The ¾-inch, single-surface treatment was to be applied with a chipsreader once the fine grading was complete. For now, the grader was making pass after pass and grading the finish course with ¼-inch precision, thanks to the PZL-1 laser transmitter and HiPer Ga base station that were both deployed alongside the runway, about 50 yards from the edge of the runway. The laser transmitter and base station worked in unison to provide to the grader the proper blade elevation while it cut swaths through the finish course. In about 2 more weeks, Pate anticipated, the new runway would be paved and ready for air traffic. Security fencing had already been installed to keep out trespassers and the occasional deer that eventually would find its way to the runway. Eventually, when further funding became available, a taxiway and hangar would also be constructed.

To that point, Ricketson reported that the new system was a major reason why the new runway soon would be completed. Using conventional site-preparation methods like stakes and string lines "would be a lot more labor-intensive," he says, adding that using the new system took about ⅓ as much time as the conventional site-preparation methods. ■