

Airplanes Land on Safe Pavement Thanks to Inspections

“Is that a collapsible unicycle?” asked a Transportation Security Administration agent to Mark Kray while Kray recently checked a measuring wheel through airport security.

Mark Kray (from left, bottom photo) and Eli Sesolak use a measuring wheel (right photo) and other instruments during airport pavement inspections.



Kray gets these comments frequently while crisscrossing the country with Eli Sesolak to inspect airport pavement conditions.

The two work for Applied Pavement Technology (APTech), which contracts with INDOT and other state DOTs to conduct inspections using a pavement condition index (PCI) survey procedure. The PCI procedure is the standard used by the aviation industry to visually assess airport pavement, providing engineers with a consistent, objective, and repeatable tool to represent overall pavement condition.



Inspectors check runways, taxiways, ramps, and connector taxiways. They use a unicycle-like measuring wheel and a rutting gauge, but their most valuable tools for inspecting are their eyes. After photos are taken, information is gathered and entered into pavement management software on a tablet PC. This enables them to review and confirm preliminary results in real time while still at the airport.

“During a PCI survey, visible signs of deterioration within a selected sample unit are recorded and analyzed, as are distress type, severity, and quantity,” said INDOT Office of Aviation Planner Marcus Dial,

who, along with INDOT Chief Airport Engineer Mike Buening, oversees the work of APTech’s inspectors.

The results of a PCI evaluation provide an indication of the structural integrity and functional capabilities of the pavement. Only the top layer of the pavement is examined, and no direct measure is made of the structural capacity of the pavement system. Still, the PCI provides an objective basis for determining pavement maintenance and repair needs as well as for establishing rehabilitation priorities in the face of constrained resources.

Also, the results of repeated PCI inspections over time can be used to determine the rate of deterioration and to estimate the time at which certain rehabilitation measures can be implemented.

“There are big investments going on at these airports, and we want to make sure that the money is being spent properly and not carelessly, so we know the exact shape of all these pavements and

what condition they're in and we make sure the neediest projects and the worst pavements get prioritized," said Dial.

APTech is currently in the third year of a three-year contract with INDOT to inspect 67 airports. After inspecting 45 Indiana airports in 2019 and 2020, the firm inspected the remaining 22 contracted airports in October 2021.

"Indianapolis International Airport is not included because it's a medium-sized primary hub," said Dial. "But, for the first time, we added the non-hub primary airports of Fort Wayne, Evansville, and South Bend. Fort Wayne was inspected in 2019, followed by Evansville in 2020, and South Bend this fall."

Most airports are inspected in a day, but non-hub primary airports feature runways nearly 2 miles long with large areas of pavement and may take multiple days to complete. Areas are divided into sections based on construction date, layer thickness, and other details on record. Once sections are established, sampling is based on area.

"A small section, such as a connector between a runway and taxiway or a small concrete fueling pad, may have 100% of its area evaluated," said Kray. "As the size of the area increases, such as a 9,000-foot-long runway that is a single section, the sampling density decreases. The sample rate is designed to produce a statistically valid representation of the pavement condition. During the inspection, we look at 100% of the pavement surface to make sure the samples selected for inspection are representative of the overall condition of the entire section; however, we perform the detailed inspection and collection of distress data only within the selected sample units."

Kray added that aerial imagery is used primarily to determine paving extents and geometry.

Pavement defects are characterized in terms of type of distress, severity level of distress, and amount of distress. This information is then extrapolated to develop a PCI that represents the overall condition of the pavement in numerical terms, ranging from 0 (failed) to 100 (excellent). Outlier cases (example: there is a huge crack in one spot, but all the other areas nearby are perfect) are not included in the extrapolation; instead, they get their own sample units.

Pavements with relatively high PCIs that are not exhibiting significant load-related distress will benefit from preventive maintenance actions, such as crack sealing and surface treatments. As the PCI drops, pavements may require major rehabilitation, such as an overlay. In some situations where the PCI has dropped low enough, reconstruction may be the only option.

For asphalt, Sesolak and Kray use the measuring wheel for linear measurements. The inspectors don't use the measuring wheel on concrete sections. Instead, they measure on a slab-by-slab basis, looking for distresses and if joint seals are still bonded and pliable.

An October inspection of Indianapolis Executive Airport in Boone County included examining the grooved concrete Runway 18-36. One section appeared nearly flawless,



Cracked and delaminated concrete appears next to a small area on Runway 18-36, which had been previously patched.

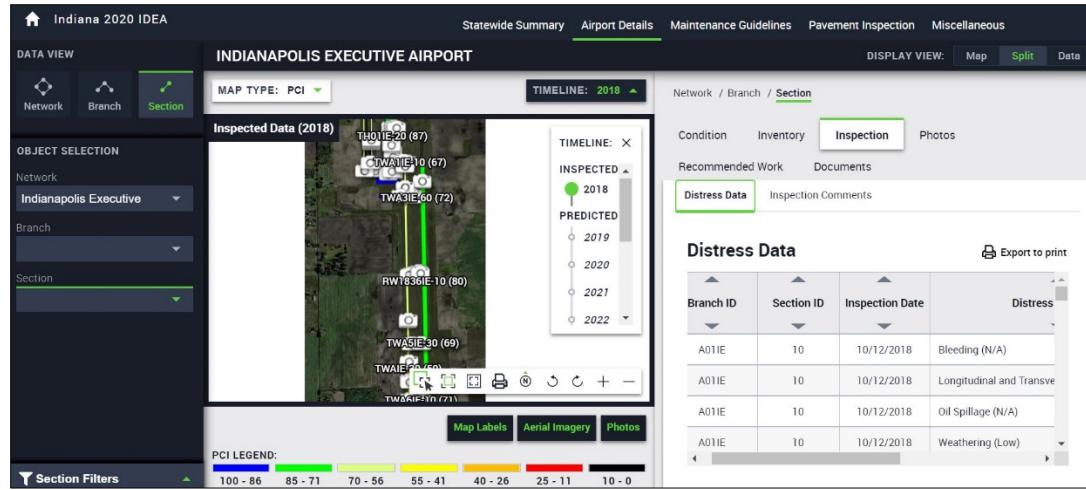
but, finally, the duo encountered some foreign object debris (FOD).

“FOD means anything loose on the runway,” said Sesolak. “We found this small area, about 2 feet by 1 foot, that had been patched due to previous problems, and now there was spalling next to that area, with loose pieces as the concrete cracked and delaminated from the substrate.”

To see a Cirrus Aircraft Vision Jet land on Runway 18-36, click [here](#).

Besides making accurate assessments, APTech’s other main attribute, according to Dial, is the [website](#) it produces for INDOT.

“The finished product is on our Aviation website,” said Dial. “It’s interactive and overlays all the



The website includes all kinds of data about Indiana airport pavement inspections.

conditions. You can zoom in, like a Google Earth overlay, and click on each of the features, such as runways and taxiways, and find out the details. It includes all the construction history, inspection details, photos, and more.”

To watch a video of some of the website’s functions, click [here](#).

To see more photos of the inspection of Indianapolis Executive Airport, click [here](#).

Pavement inspections are typically conducted at each airport in the Indiana State Aviation System Plan every three years, so next year will start a new cycle of inspections.