

FIELD NOTES



Topographical Survey: Airport Tarmac Analysis

In the past, topographical surveys have been dominated by total stations, theodolites and, more recently, GPS systems. However, these traditional methods record a limited amount of measurement points compared to lidar technologies. Additionally, these methods are labour-intensive, costly and inconvenient. In many cases final products or deliverables lack key information, vital points and the co-ordinates required to accurately complete the task at hand.

In May 2001, the Greater Toronto Airport Authority (GTAA) contacted Toronto-based Northway-Photomap Inc., a survey and mapping company employing Optech's ILRIS-3D lidar scanner, to complete a survey of Pearson International Airport's Terminal 3 tarmac (apron). A safety issue had arisen at the airport when it was noticed that travelers embarking or disembarking a plane would often sidestep puddles or wet areas on the ground, potentially stepping into hazardous jet exhaust or propellers.

As Pearson is one of the busiest airports in Canada, clearing the apron for a survey was extremely difficult. Because of this the GTAA needed a quicker and more efficient method to detect the low-lying areas causing puddles. Both the GTAA and Northway-Photomap felt the process could be significantly improved using the ILRIS-3D laser scanner. The methodology of the project was:

1. Use ILRIS-3D to collect a significant amount of xyz data by "painting" the scene with laser shots.
2. Complete a survey using a GS50+ Dual Frequency GPS System to position the data in the NAD 83 Co-ordinate System.
3. Generate contours depicting the low-lying areas.
4. Deliver the project data to the GTAA in an understandable, clearly defined format.

Terminal 3 Results

Four scans of approximately 14 minutes each were completed with an xyz point total of 1,680,000 points per scan. The data points were spaced 10 mm apart based on a mean target distance of 55 m. The individual scans were aligned together as a single scene, resulting in a file with 5,794,322 survey points. GPS survey data was collected and used to position scans through a co-ordinate transformation to an

absolute reference to the NAD 83 Co-ordinate System. The data above the ground was removed partly by software



Top and bottom:
An aerial orthophoto
of Terminal 3.
Left: A point cloud image
of Terminal 3 containing
four scans with >1.6
million points.
Images courtesy of
Northway-Photomap Inc.

processing and partly by manual editing. Owing to limitations in present contouring software, the data was re-sampled (decimated) to produce a smaller collection of data points to a final output of 974,320 points. Terramodel[®] software was used to produce a normal 10-cm grid of data points on the ground surface. The final output and end-deliverable was a digital orthophoto image (from archives) draped with a 1-cm contour.

Results on reverse side

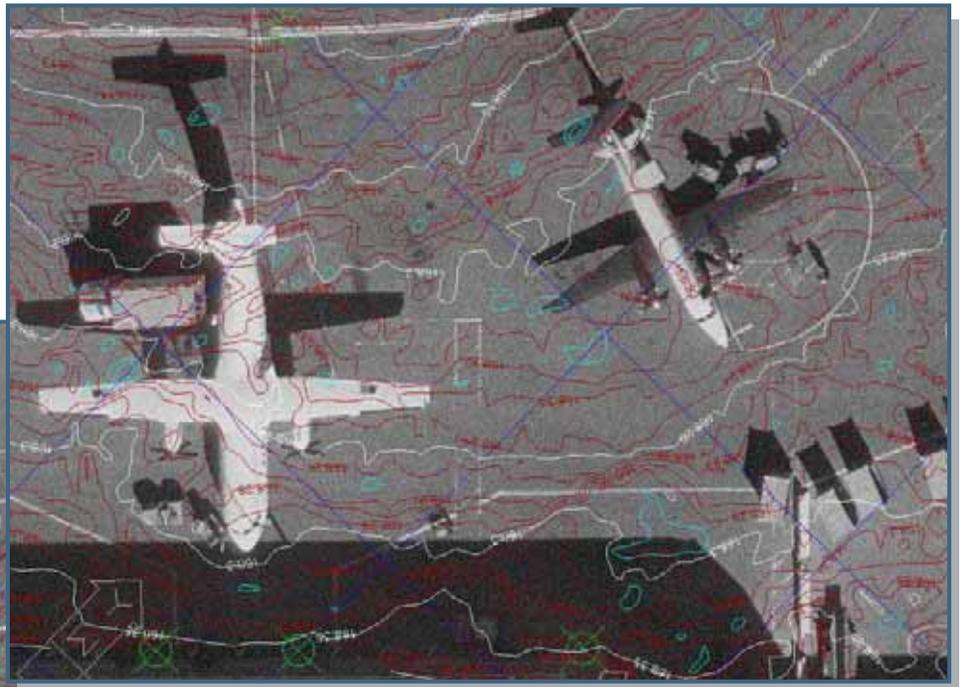
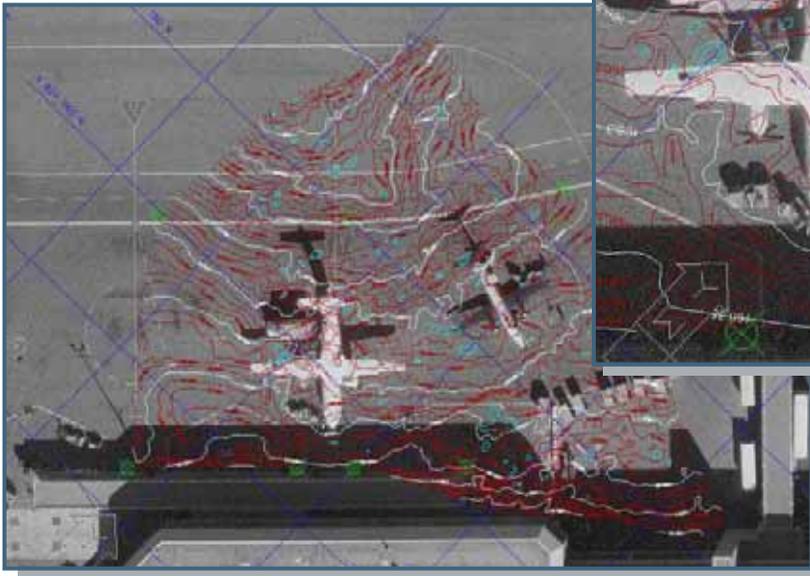


Resulting Product on Terminal 3 Time Requirements

Stage	Time
ILRIS-3D - Four scans including setup	4 hours
Processing time, (edit and alignment)	3 hours
GPS survey	4 hours
Orientation of scan data to NAD 83 Co-ordinate System	2 hours
Production of contours and final product	2 hours
Total Time	19 hours



ILRIS-3D was able to collect more than the minimum required information in the time allotted, without closing the apron, achieving substantial time and cost savings.



*Aerial orthophoto of Terminal 3 draped with geo-referenced 1-cm contour lines.
Image courtesy of Northway-Photomap Inc.*

**Passenger and ground personnel safety was enhanced
with higher density apron profile data.**



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