

Digitizing Vienna for Widespread City Planning

The need for accurate and detailed spatial data for city planning increases with the rising demand of new properties for a growing population. Taking stock of historic buildings, adhering to construction regulations, and developing evacuation plans for catastrophes require geo-referenced survey data of high resolution and accuracy.

Airborne LiDAR was the preferred choice of Vienna, Austria's surveying office for generating a database that meets the requirements of numerous applications. The city required an evenly distributed point pattern of 8-9 points per square meter acquired with a "full waveform" laser scanner covering 454 square kilometers of Vienna with an accuracy of 30 centimeters.

Diamond Airborne Sensing (www.diamond-air.at), provider of the first integrated and EASA-certified surveying aircraft equipped with an LMS-BP560 airborne laser scanner from RIEGL (www.riegl.com), seized the opportunity.

"It is necessary to prove the promised cost efficiency together with the high applicability of our turnkey surveying system to convince future customers," explained Wolfgang Grumeth, CEO of Diamond Airborne Sensing. "The demands of the project are complex, and the target area is located practically at our doorstep. Vienna is a famous city, and we are proud to demonstrate our system's capabilities with this project."

Mission Planning

The Diamond Aircraft multipurpose platform (MPP) included the RIEGL LMS-Q560, offering 200 kHz pulse repetition rate. More than 600 flight lines at an altitude of 450 to 500 meters

and attitude data acquired by the on-board inertial measurement unit (IMU)/GPS system. A network of six GPS receivers was distributed inside the target area.

Project Details

Eighty flying hours were needed to cover the region. The system integrity and stability was checked by acquiring scan

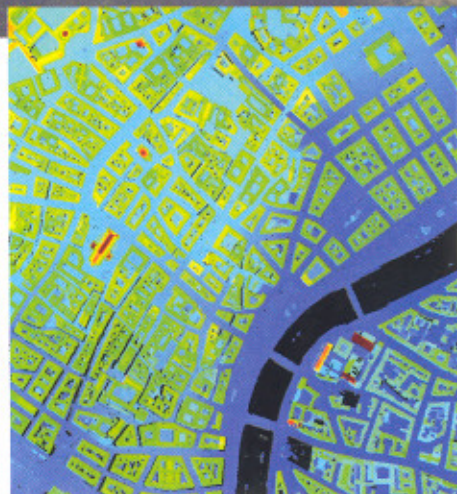
The full-waveform capability of the RIEGL LMS-Q560 led to higher point density than expected from mission planning.

data over a village near Vienna. The data acquired during this procedure was used for the system's boresight calibration process, carried out with RIEGL's RiPROCESS software.

Data processing was accomplished in three major steps:

1. Processing the position and attitude information to the highest accuracy.
2. Analyzing the full waveform data, combining scan data with the position and attitude information, and processing strip lines adjustment with RiPROCESS to create a point cloud in the WGS84 (ETRF89) coordinate system.
3. Coordinating transformation and projection from WGS84 (ETRF89) to the Austrian local Gauss Krueger coordinate system.

The final result—10 billion measured points—realized an average point density of 20 points per square meter for three quarters of the area, and the remaining area had a point density according to the specifications. The position accuracy of the data was better than 11 centimeters standard deviation. The full-waveform capability of the RIEGL LMS-Q560 led to higher point density than expected from mission planning.



Diamond Aircraft's HK36-MPP, equipped with a RIEGL LMS-Q560 laser scanner, collected 454 square kilometers of Vienna with an accuracy of 30 centimeters.

AGL were planned at a speed of 80 knots.

The challenge of the Vienna airborne survey was complicated due to air traffic from the international airport. To manage this, the target area was split into seven blocks, with individual flight paths. Mission preparations were realized with AREA Vermessung (www.area-vermessung.at), an Austrian surveying company responsible for data processing. A terrestrial Global Positioning System reference station network was prepared for the position

Vienna Laser Scanning Survey 2007

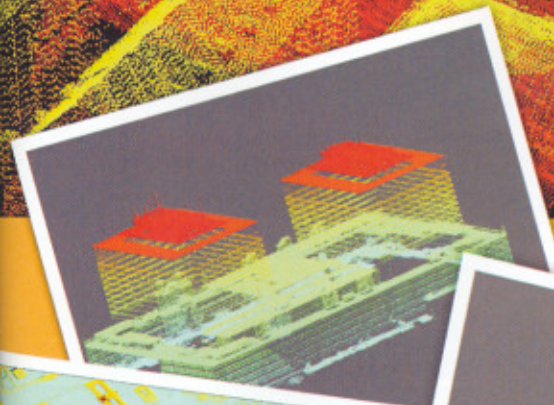
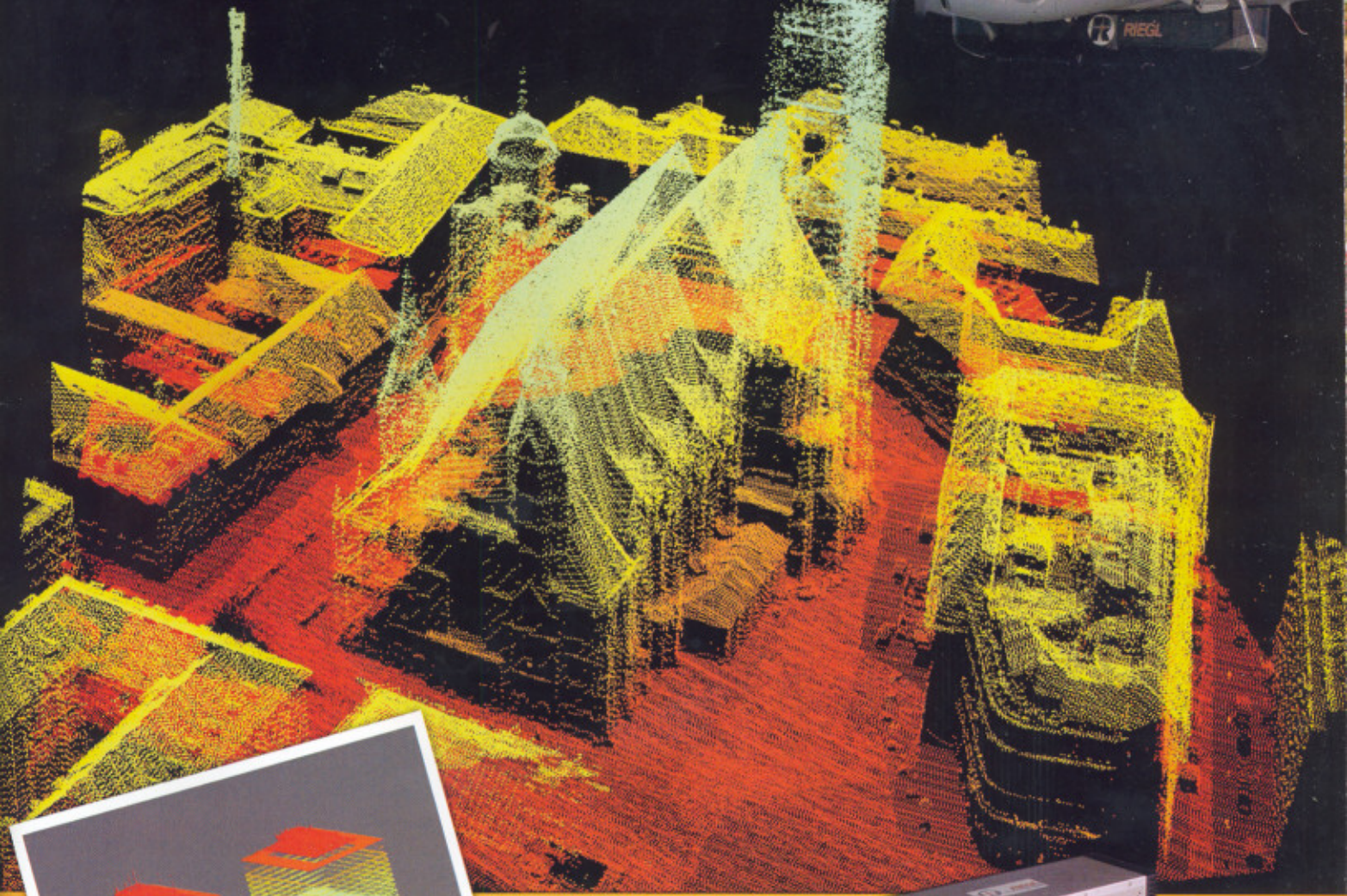
Area	454 km
Number of Flight Lines	648
Point Count	10 billion
Point Density of the Survey Area	20 pts/m
Absolute Accuracy	11 cm
Measurement Altitude	450-500m AGL
Laser Scanner	RIEGL LMS-Q560
Pulse Repetition Rate	200kHz

"The data are the perfect starting point for modeling the detailed roofscape of the city," said A. Zöchling, head of Vienna's municipal department responsible for geographical data. "The exceptional high resolution and accuracy of the data guarantee a long-lasting basis for many applications to be developed in the next years."



RIEGL USA

www.rieglusa.com



Airborne
Scanner

LMS-Q560

- Measurement Rate 160kHz
- Class 1 Eyesafe
- Full Wave Form
- Accuracy up to 20mm
- High Accuracy Discontinuity & Breakline Detection