

The Vienna Laser Scanning Survey 2007

Vienna, Austria digitized with average of 20 points per square meter.



Vienna DSM, coloured ellipsoidal heights

The necessity for accurate and detailed spatial data for city planning increases with the rising demand of new properties for the growing population. Stocktaking of historic buildings, adherence to construction regulations, and development of evacuation plans for catastrophes require geo-referenced survey data of high resolution and accuracy.

The tender

Airborne LIDAR was the preferred choice of Vienna's surveying office for generating a database which meets the stated requirements of the applications. They required an evenly distributed point pattern of 8-9 points per square meter, acquired with a "full waveform" laser scanner covering 454 square kilometres of Vienna with an accuracy of 30 cm.

Diamond Airborne Sensing, provider of the first integrated and EASA-certified surveying aircraft equipped with RIEGL airborne system LMS-BP560, seized the opportunity. "It is necessary to prove the promised cost efficiency together with the high applicability of our turnkey surveying system to convince our future customers. The demands of the project are complex, the target area is located practically at our doorstep, and, after all, Vienna is a world-famous city. We are proud to demonstrate the capabilities of our system by means of this project" explains Wolfgang Grumeth, CEO of Diamond Airborne Sensing.

The project

The *Diamond Aircraft MPP* ("multi purpose platform") included the RIEGL LMS-Q560, offering 200 kHz pulse repetition rate. More than 600 flight lines at an altitude of 450 to 500 metres AGL were planned at a speed of 80 knots. The challenge of the airborne survey in Vienna 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*, an Austrian surveying company responsible for data processing. A terrestrial GPS reference station network was prepared for the position and attitude data acquired by the on-board IMU/GPS system. This network of 6 GPS receivers was distributed inside the target area.

80 flying hours were necessary to cover the region. The system integrity and stability was checked by acquiring scan data over a village near Vienna. The data acquired during this procedure was used for the systems boresight calibration process, carried out with RIEGL's software RiPROCESS.

The data processing was accomplished in three major steps:

- Processing of the position and altitude information to highest accuracy.
- Analyzing the full waveform data, combining scan data with the position and altitude information, and processing strip lines adjustment - using RiPROCESS created a point cloud in the WGS84 (ETRF89) coordinate system.
- Coordinate transformation and projection from WGS84 (ETRF89) to the Austrian local Gauss Krueger coordinate system.

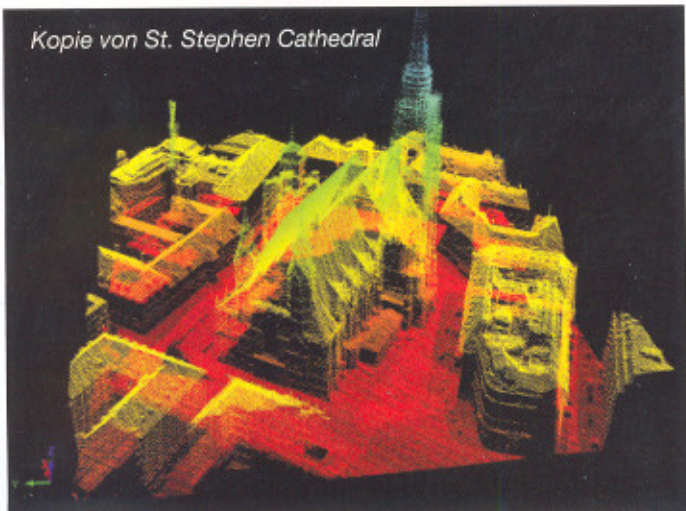
The final result of 10 billion measured points realized an average point density of 20 points per square meter on three quarters of the area; the remaining area with a point density according to the specifications. The position accuracy of the data was better than 11 cm standard deviation.

Area	454km ²
Number of flight lines	648
point count	10 ¹⁰ 9
point density on ¾ of the survey area	20 pts/m ²
Absolute accuracy	11 cm
Measurement altitude	450-500m AGL
Laser Scanner	RIEGL LMS-Q560
Pulse repetition rate	200kHz

Conclusion

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

Kopie von St. Stephen Cathedral



"The data is the perfect starting point for modelling the detailed roofscape of the city. The exceptional high resolution and accuracy of the data guarantee a long lasting basis for many applications to be developed in the next years" says Mr. Zöchling, head of the division "Digital City Map - Geographical Data", of the municipal department "urban surveyors" responsible for geographical data of the whole province Vienna.

PETER RIEGER is manager for airborne laser scanning activities at RIEGL Laser Measurement Systems. He holds a degree in telecommunications engineering from the Technical University of Vienna.



The Diamond Aircraft fleet: DA42-MPP and HK36-MPP with RIEGL LMS-Q560

CORPORATE PROFILE

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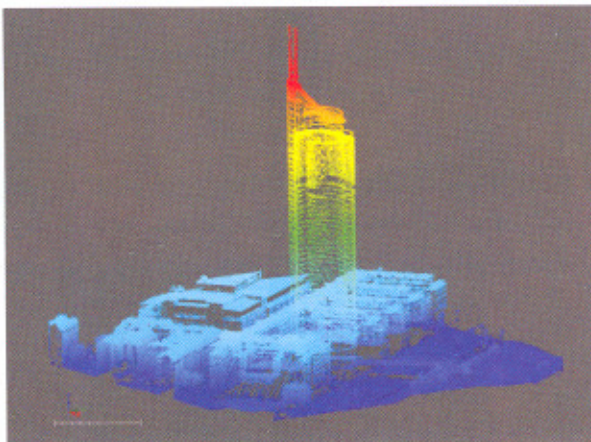
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Riegl Leads with Airborne LiDAR System utilizing Waveform Digitization

The Riegl LMS-S560 Airborne Laser Scanning System is the first commercial airborne LiDAR terrain mapping systems to utilize waveform digitization, thereby providing access to the full surface information content available from LiDAR measurements. Return waveforms can give detailed insights into the vertical structure of surface objects, surface slope, roughness, and reflectivity. By enabling the user to determine the target detection characteristics in post-processing, a more robust and accurate ground detection in areas with low vegetation becomes possible. For forestry applications, the vertical structure of the canopy and under story is revealed



Millenium Tower

facilitating the determination of species, vegetation health as well as forest structure and biomass.

Riegl is the global leader in the innovation of LiDAR technology for airborne survey. Its scanners provide high accuracy and efficient scanning with Sensor Integration. Portable and rugged Riegl scanners are unrivaled in reliability under demanding environmental conditions. During the last decade LiDAR mapping has gained general acceptance as an accurate and rapid method for three dimensional

surveying of the earth's surface. Riegl's research and development as well as dedication to the industry have revolutionized corridor and wide-area mapping of terrain.