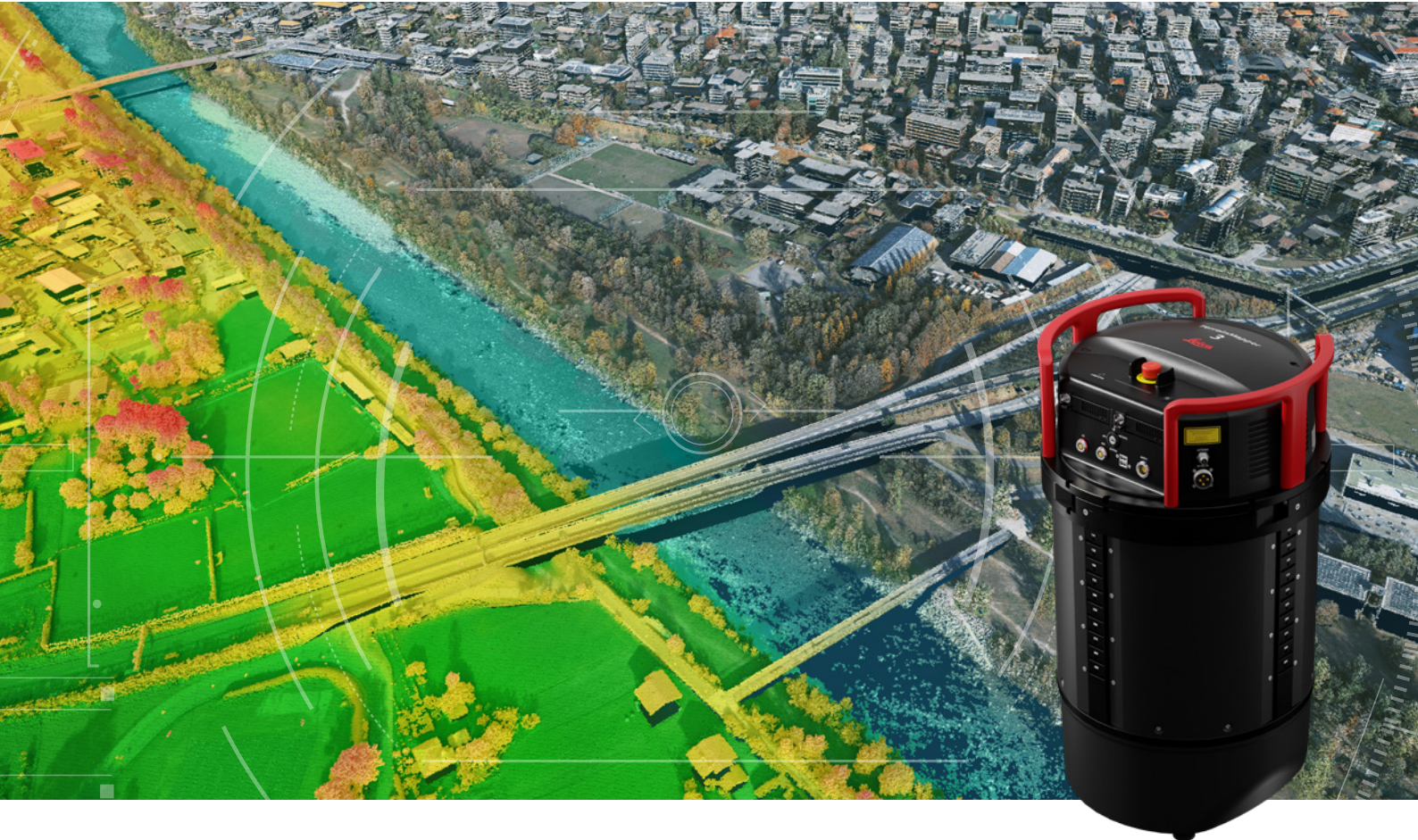# Leica TerrainMapper-3

One system, multiple LiDAR applications

Maximum Flexibility

Leica TerrainMapper-3 features configurable scan patterns, flexible field of view in circle, ellipse, and skew-ellipse options for optimised data collection in vegetated areas, steep landscapes, and urban environments. Performance metrics are based on real-world atmospheric conditions, capturing low reflectance features in full sunlight.

Quality & Efficiency

The system delivers superior sensitivity, capturing low reflectance features without sacrificing point density or altitude. It offers enhanced accuracy, faster scan speeds, and a 10° to 60° adjustable field of view, maximising data collection with fewer flight lines. Paired with the Leica MFC150 4-band camera, it ensures consistent data with 60° coverage.

Accurate & Intelligent Data

Reduced beam divergence improves planimetric accuracy, and the new MPIA (Multiple Pulses in Air) handling allows fewer flightlines in steep terrains. The sensor introduces waveform attribute and full waveform recording at maximum pulse rate, and for up to 15 returns, opening new opportunities for advanced and automated point cloud classification.

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Leica Geosystems

Leica TerrainMapper-3 product specifications

LEICA TERRAINMAPPER-3

TerrainMapper-3	14,192x 10,640 pixels RGBN Image FOV 61.3° LiDAR FOV 10° - 60°
RGB : NIR ratio	1 : 1

Collection parameters

	Imaging performance				
Image GSD (cm)	5	10	20	25	50
Flying height (m AGL)	600	1200	2400	3000	6000
LiDAR performance [1,2]					
Point density (m²)	50	20	10	5	1
Flying height (m AGL)	700	800	1600	3200	5900
Collection rate (km²/h)	95	231	462	924	1703

Dimensions	Height 757 mm Diameter 408 mm (bottom) / 435 mm (top)
Weight	47 kg

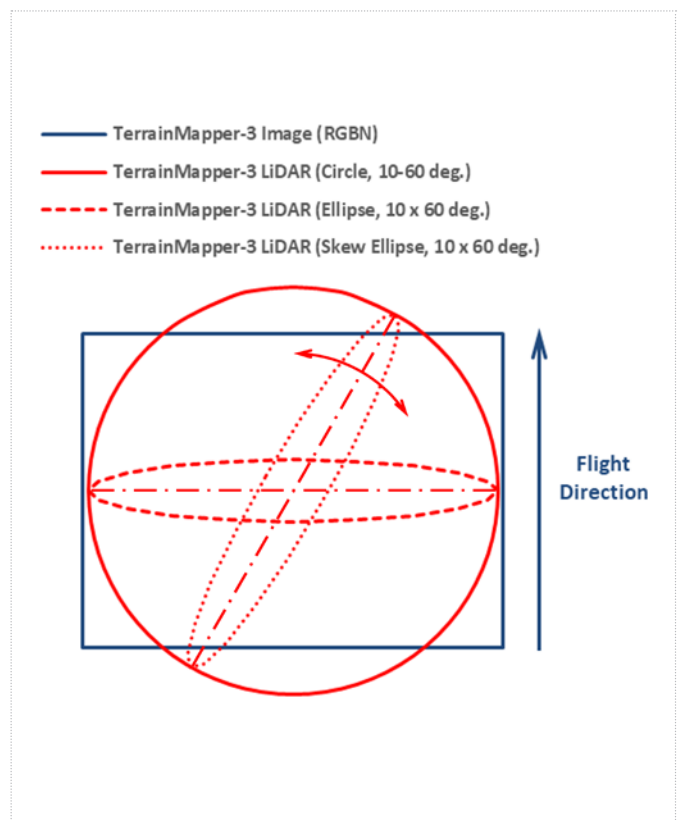## INTEGRATED GNSS/IMU SYSTEM

IMU	SPAN CNUS5-H, Class 5, 500 Hz, FOG no export license required US ECCN 7A994
GNSS	NovAtel SPAN OEM7, 555 channel multi constellation receiver with 10 Hz GNSS data rate
Additional features	Real-time deeply coupled solution for position and attitude at highest accuracies, fully integrated and embedded solution
Position RMS DGNSS	Post-processed (specification): X,Y ≤ 3-5 cm, Z ≤ 5-7 cm Post processed (typical): X,Y ≤ 2-3 cm, Z ≤ 3-5 cm
Attitude RMS	Post-processed (specification): R,P ≤ 0.005°, H ≤ 0.008° Post-processed (experienced): R,P ≤ 0.003°, H ≤ 0.004°

IMAGING SPECIFICATIONS

|	
Sensor Type	BSI CMOS
Dynamic range	83 dB
A/D conversion	14-bit
Motion compensation	Mechanical forward-motion-compensation (FMC)
Min. frame interval	0.7 sec
Spectral bands	R (580 - 660 nm) G (480 - 590 nm) B (420 - 510 nm) NIR (720 – 850 nm, monochrome)
Shutter	Mechanical central shutter, designed for up to 500,000 cycles, field exchangeable
Aperture	Automatically controlled aperture 7 half f-stop steps
Real-time processing	• Data compression • Georeferenced thumbnails for in-flight visualisation and post-flight quality control

LIDAR SPECIFICATIONS

Field of view	10 - 60° programmable
Scan speed	33 - 166 Hz , programmable 66 - 333 scans per second
Scanner pattern	Circle scanning Ellipse scanning [9] Skew ellipse scanning [9]
Pulse repetition frequency	Up to 2.0 MHz (height dependent)
Laser divergence	0.12 mrad (1/e) nominal 0.17 mrad (1/e²) nominal
Laser wavelength [3]	1,064 nm
Laser classification [3]	Class 4
Operation altitude [4]	300 m minimum AGL 6000 m maximum AGL
Return pulses	• Programmable up to 15 returns at all pulse rates, including intensity (14-bits digitisation) • Gateless Multiple-Pulses-in-the-Air (MPiA), zone independent operation • Waveform recording for each shot • Waveform attributes for each return
Min. vertical separation	0.5 m
Vertical accuracy [5, 6, 7]	< 5 cm 1 σ
Horizontal accuracy [5, 6, 7]	< 13 cm 1 σ

TerrainMapper-3 footprint

PERIPHERALS

|	
Mass memory [8]	• Leica MM60 solid state drive,15,360 GB, 0.4 kg • Removable and portable • Two MM60 required, recording time about 8.0 hours
Operator console	Leica OC61 12.1" screen 3.9 kg
Pilot display	Leica PD61 6.3" screen 1.0 kg designed for cockpit mounting
Display stand	IS40-LW stand for Leica OC61 operator console 3.2 kg
Sensor mount	Leica PAV200 gyro-stabilised sensor mount for high-performance data acquisition
Weight Compensation range	36.0 kg Roll -7° to 7° Pitch -8° to 6° Drift -30° to 30°
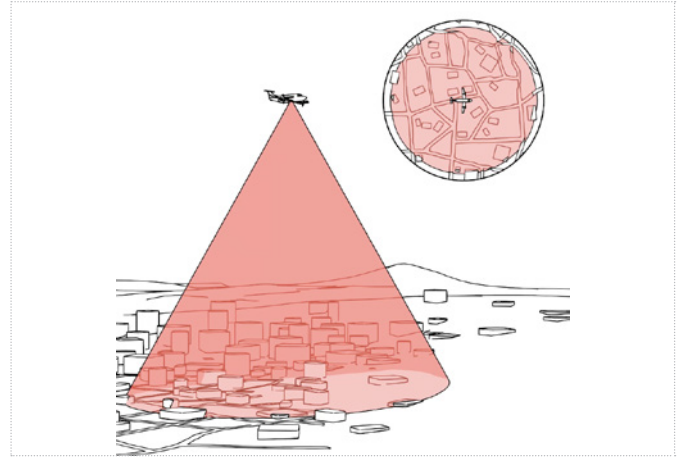
ENVIRONMENTAL

Pressure	Non-pressurised cabin up to ICAO 25,000 ft
Humidity	0% to 95% RH according to ISO 7137 (non-condensing)
Operating temperature	-10°C to 35°C
Storage temperature	-10°C to 70°C

ELECTRICAL

Max. avg. power consumption of complete system	800 W / 28 VDC
Max. peak power consumption of complete system	1000 W (<60s) / 28 VDC
Fuse on aircraft power outlet	1 x 50 A recommended
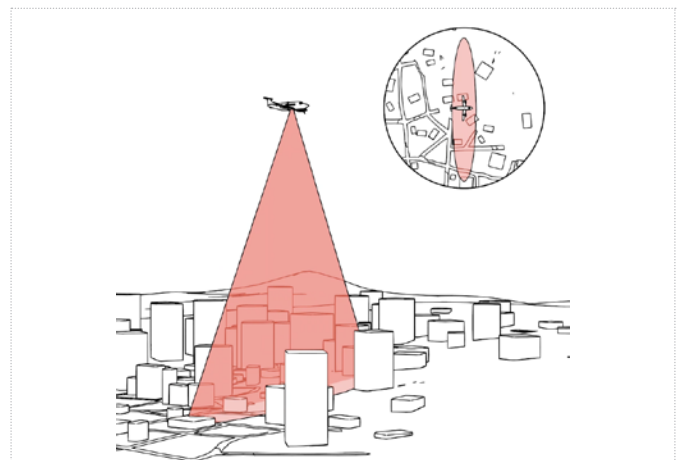
SYSTEM WEIGHT

System installation	< 97 kg

SOFTWARE

Mission planning	Leica MissionPro
Flight navigation & sensor operation	Leica FlightPro
GNSS/IMU processing	NovAtel Inertial Explorer
Point cloud/image processing	Leica HxMap

STANDARDS

RTCA DO-160G, EUROCAE-14G, USA FCC Part 15, ISO 7137, EN/IEC 60825-1:2014

[1] 10% to max. 20% reflectivity targets at 150 knots ground speed and 23km visibility in sunlight conditions. Collection rate calculation includes 20% side overlap.

[2] 10-50 ppm/2 densities conform to USGS QL0 accuracy requirements.

[3] Invisible laser radiation, avoid eye or skin exposure to direct or scattered radiation. Class 4 laser product in accordance with EN/IEC 60825-1:2014.

[4] Maximum operating altitude is specified for 90% detection at 20% reflectivity (e.g., old dry asphalt), target larger than laser footprint, 100% laser output at 60 degrees FOV.

[5] Accuracy stated is acquired @1,000 m AGL, max. FOV and, 150 knots aircraft speed.

[6] The standard deviation σ represents the 68% confidence interval. Typically, the RMSE value represents 1σ.

[7] Stated vertical and horizontal accuracies after calibration and registration using Leica HxMap workflow and with an assumed GNSS position error of 4 cm.

[8] Data collection is based on typical image and LiDAR recording modes.

[9] Ellipse and skew ellipse scanning can't be used with optical port glass and PAV. Circular scanning in combination with a special coated port glass and with FOV > 25°, allowed but not recommended.

Circle scan pattern

Ellipse scan pattern
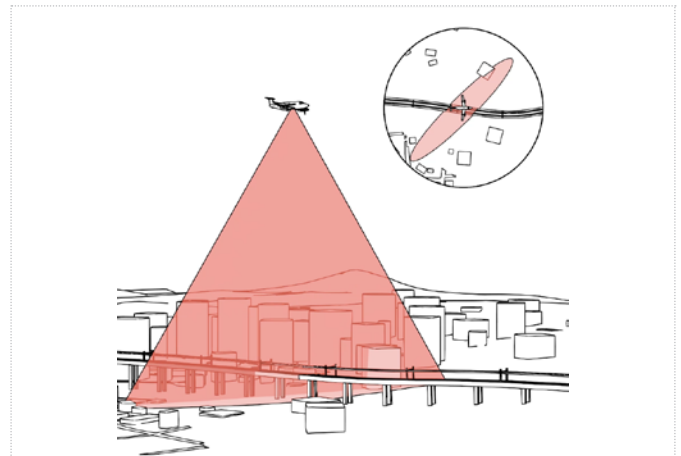
Skew ellipse scan pattern

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