High-performance Airborne LiDAR Sensors
Made in Germany

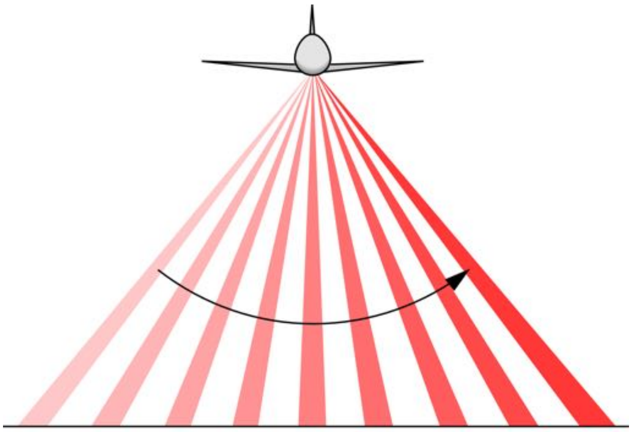
Product Information

Rev. 2023-10-07

GeoLas Systems GmbH
Bernauer Str. 37a, D-83229 Aschau, Germany
Phone: +49 8052 178 1485 Fax: +49 8052 178 2020

Managing Director: Dr. Christoph Hug
Commercial registration: HRB 28319, Amtsgericht Traunstein
E-Mail: systems@geolas.com URL: www.geolas-systems.com

ELMAP Airborne LiDARs are a series of compact, high-performance laserscanners designed for cost-effective airborne laser mapping with fixed-wing and helicopter aircraft. They provide highly accurate measurements in a compact and lightweight package that can easily be installed even on small survey aircraft. ***ELMAP*** systems make advanced airborne lidar technology affordable also for smaller photo-grammetry and survey firms and organizations. They are the ideal choice for replacing outdated or updating older systems with state-of-the-art performance.



ELMAP lidars feature

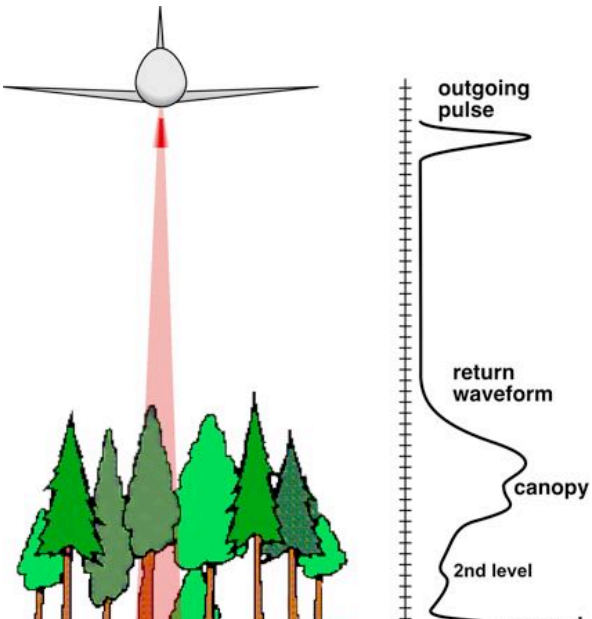
- an industry-leading large scan angle of up to 80° (±40°) for efficient wide-area mapping
- high ranging capability for mapping of mountainous terrain
- high effective measurement rates for high-density mapping
- waveform digitization with a market-leading 14 bits-per-sample radiometric resolution for high-accuracy ranging and surface modelling
- captures *every* return of each shot, providing detailed information about vertical structure, surface reflectance (intensity), and surface slope/roughness (pulse width) information
- integrated removable data storage with standard high-capacity SSDs for unlimited data acquisition during flight and rapid post-flight data transfer
- compact size and lowest power consumption (max. 125W) of their class, facilitating installation and operation on small aircraft
- single-handed operation in pilot-only environments and autonomous operation in unmanned airborne vehicles

Waveform Digitization Benefits

ELMAP systems provide state-of-the-art echo waveform digitization and recording for *every* laser shot. Echo waveforms carry a wealth of information about the vertical surface structure, and only digitizing waveform technology is able to make this information available for processing.

Not only the heights of the first or last reflecting surface as with conventional (discrete return) lidars but also detailed insights into the vertical structure of the surface cover become available, for instance the vertical density distribution of tree crowns, the vegetation density at different height levels, or the roughness and slope of the surface on a per-return level. Even returns from very close surfaces like low vegetation and ground can be distinguished, providing additional cues for automated point classification.

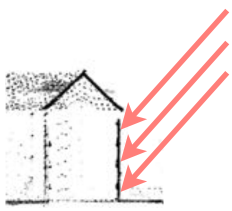
Waveform processing improves ranging accuracy in difficult surface conditions and more reliably eliminate slope and intensity dependent range walk than is possible with conventional approaches. Also, for each height level at which the laser pulse was reflected information about the surface reflectance in the near infrared is available allowing for example to discern a paved road surface from an unpaved path below the forest canopy.

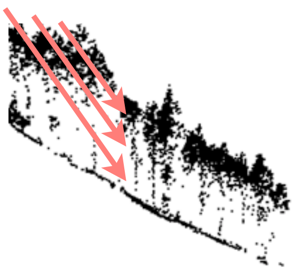


Wide-angle Field-Of-View Benefits

ELMAP systems are able to collect returns in an exceptionally wide field-of-view. This makes highly efficient wide-area mapping possible (up to 600 km^2 per hour at maximum flying height, 110kts flying speed and 30% strip-to-strip overlap). But even when data acquisition is not possible at the maximum flying height due to cloud cover, the ***ELMAP***'s large FOV offers maximum flexibility by providing the widest possible swath when flying below the cloud base. Wider swath means fewer flightlines and more efficient surveying also under such conditions.

Additionally, measurements at lower angles of incidence towards the swath edges (oblique views) can provide important information not available from systems with small scan angles.



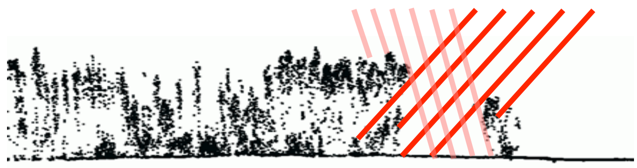


Vertical surfaces like building facades, tower structures, and tree stems will be detected, benefiting building modeling in urban mapping applications, powerline modeling, and tree classification in forestry applications.

Similarly, lower angles of incidence allow ground measurements below overhanging structures like bridges and roofs, improving ground modeling in these situations.

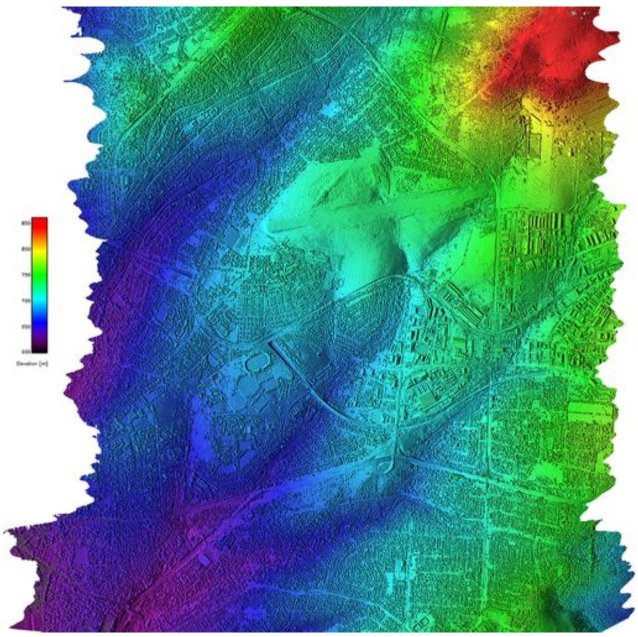
ELMAP's large FOV matches that of wide-angle digital photogrammetric cameras so that planning of combined lidar + camera flights is simplified and can be optimized for digital imagery requirements.

Finally, due to the larger swath width projects may be flown with a larger strip overlap without penalty to flight effort compared to systems with smaller FOV. For instance, with a flightline spacing that a 60° FOV lidar requires to achieve a 30% strip overlap, the ***ELMAPs*** provides more than 50% strip overlap. Every surface segment is thus viewed from at least two different directions.



Multi-aspect coverage minimizes shadow gaps, increases the penetration probability of vegetation for ground detection, and improves modeling of complex canopy shapes for automated tree species classification and other forestry applications.

Elevation



Surface Reflectance

4200m wide single-pass swath acquired from 2800m AGL flying height, avg. point spacing: 1.6m

ELMAP

The **ELMAP** sensors are designed for installation

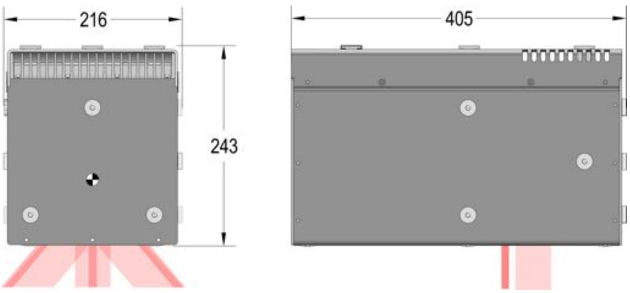
- in fixed-wing aircraft with conventional (large diameter) ports for photogrammetric cameras,
- on helicopters with external load mounts,
- on gyrocopters and ultra-light aircraft,
- on heavy-lift UAVs.

Due to the horizontal layout and a low instrument height they are also well suited for mounting in wing- and helipods.

EL-MAP installation on Cessna 337

The **ELMAP** sensors have 6 mounting points on the base for installation on the cabin floor or inside a pod, and 5 mounting points on the top for overhead attachment to a helicopter load mount. 3 mounting points each on the front and back as well as each side are provided for attaching external IMUs and digital cameras directly to the instrument.

Optionally, two types of high-end MEMS IMUs may be factory-installed inside the instrument.



ELMAP-V

The **ELMAP-V** sensors are optimized for installation

- in fixed-wing aircraft with *small* camera ports,
- in stabilizing camera mounts,
- in nose pods.

The vertical layout lends these instruments a small footprint which allows to insert them into small-diameter camera well. With the aperture window close to the aircraft skin the **ELMAP-V**'s full scan angle of 80° is thus available even with camera port diameters as small as 20 cm.

EL-MAP-V installation on Glasair Sportsman

The **ELMAP-V** sensors feature a large IMU compartment which will house a variety of IMUs ranging from MEMS-based units to high-end FOG IMUs. For installation, IMUs are attached to a carrier plate which can easily be inserted into the IMU compartment, and provides a mechanically well-defined and rigid attachment to the instrument, once installed.