

ENHANCING UNMANNED LASER SCANNING SOLUTIONS – THE *RIEGL* UAV PRODUCT RANGE

With a broad line of ultimate survey-grade airborne scanners especially developed for UAV/UAS/RPAS-based applications, *RIEGL* provides first-class technique for this new dynamic topic of the commercial and civil market.

by Philipp Amon



With a broad line of ultimate survey-grade airborne scanners especially developed for UAV/UAS/RPAS-based applications *RIEGL* provides first-class technique for this new dynamic topic of the commercial and civil market. Laser scanning utilizing high-end unmanned airborne platforms provides the great possibility for data acquisition in hard-to-reach and/or dangerous areas with an excellent cost-to-benefit ratio for a variety of applications in surveying such as corridor mapping, pipeline inspection, mining, forestry, monitoring or archaeology.

Now *RIEGL*'s VUX-Series with a focus on unmanned laser scanning has been expanded. With the *RIEGL* VUX-240, a new airborne LiDAR sensor with less than 3.8 kg of weight and a refined and sophisticated design offering a 75° field of view, is now ready to be integrated on small unmanned aircrafts, especially fixed-wing UAVs. The extremely fast data acquisition rate of up to 1.8 MHz is the perfect base for high point density corridor mapping applications as well. The advanced measurement rate of up to 1,500,000 measurements per second and a fast scan speed of up to 400

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lines per second are the basis for high scan efficiency especially in applications like power line, railway track and pipeline inspection or topography in open-cast mining. Interfaces for IMU/GNSS system integration and up to 4 optional external cameras are further convincing key features of this new scanner. The scanner offers a 1 TB data storage capacity. WLAN enables direct access to the laser scanner, if there is a need to change on configuration settings or to check the system status. Using RIEGL's unique Waveform-LiDAR technology, the VUX-240 allows echo digitization and online waveform processing. Multi-target resolution is the fundamental element for penetrating even dense foliage.



Figure 1. RIEGL VUX-240 UAV LiDAR Sensor.

A second new airborne RIEGL laser scanner, the VQ-480-II, is also an appropriate solution for integration in unmanned aircrafts. It captures the user's data with a refined design defining the new standard of performance and user-friendliness. With a pulse repetition rate of up to 2 MHz, an effective measurement rate of up to 1,250,000 measurements per second, and a wide field view of 75°, the instrument is ideally suited for corridor mapping, city modelling and applications in agriculture and forestry with a demand for high point densities. The low weight of only 11kg allows an effortless application onto unmanned UAVs with increased payload capacity, but also small manned aircraft and helicopters. The VQ-480 II is prepared for IMU/GNSS integration, offers interfaces for up to five optional cameras and is equipped with an easily accessible CFast removeable data storage card.



Figure 2. RIEGL VQ-480II Airborne Laser Scanner System.

Besides these new developments, additionally already proven solutions allow the users to find the right solution for their application in question. The widely used VUX-1UAV is a very lightweight and compact UAV laser scanner fulfilling the requirements of the demanding market of UAS/UAV/RPAS applications concerning measurement performance as well as system integration. Paying attention to specific constraints and

flight characteristics of the unmanned aerial systems, the VUX-1UAV can be mounted in any orientation even under limited space and weight conditions. With a modest power consumption, the scanner requires only one single power supply. Having a measurement rate of up to 500,000

measurements per second, a wide field of view of up to 330° and an operating flight altitude of more than 1,000 ft, the instrument can be applied in a variety of endeavours regarding agriculture and forestry, corridor mapping, mining and topography or resource management.

The VUX-1UAV is also the main component of *RIEGL*'s RiCOPTER, the first unmanned aircraft system developed and manufactured by a LiDAR manufacturer. For surveying missions, the RiCOPTER offers a payload capacity of 16 kg. The lightweight carbon fiber main frame, foldable propeller carrier arms and shock absorbing undercarriage enable safe flight, safe landings and handy transportation. Equipped with the *RIEGL* VUX-SYS comprising the VUX-1UAV LiDAR sensor, an IMU/GNSS unit, a control unit and up to two high-resolution cameras a fully integrated airborne surveying platform is ready for take-off.

For UAVs with restricted space or less payload capacity, the *RIEGL* miniVUX-1UAV and the miniVUX-1DL ("Downward-Looking") with a small and sophisticated lightweight design convince as an appropriate solution. With only 1.5 kg weight, the miniVUX-1UAV makes use of *RIEGL*'s Waveform-LiDAR technology and provides a 360° field of view and a measurement rate of up to 100,000 measurements per second. In addition, the scanner's wavelength is perfectly suited for the measurement of snowy or icy terrains. An easy to remove SD storage card for data acquisition, and/or the option for streaming the scan data via LAN-TCP/IP interface are further key features of the scanner. The miniVUX-1DL with its 2.4 kg is specifically designed for powerline and pipeline surveillance or for infrastructure inspection as in highway or railway monitoring due to the specific wedge prism scanner construction that offers a 46° field of view. The circular scan pattern produces a very high point density with excellent point distribution.

To enhance the miniVUX-1UAV and the miniVUX-1DL even further, the *RIEGL* Integration Kit 600 as an add-on serves as the excellent solution to integrate the instrument with a multi-rotor UAV, e.g. a DJI Matrice M600. The package comes with an appropriate, shock absorbing

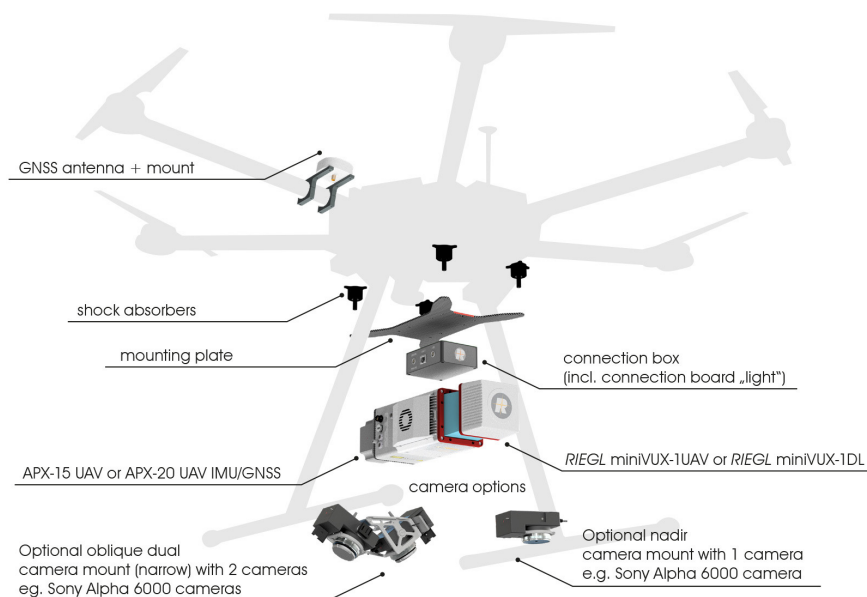


Figure 3. *RIEGL* miniVUX Integration Kit Drawing Setup.

mounting kit, a GNSS antenna with its mount, power supply module integrated in an easy to use interface board, the necessary cabling for a quick and straightforward integration as well as an expansion board for the remote controller to be able to trigger the scanner remotely.

RIEGL is also proudly presenting their brand new solution for combined topo-and hydrographic surveying applications. The VQ-840-G is a lightweight airborne laser scanner which is an efficient and user-friendly instrument for high resolution small to mid-scale coastline and shallow water surveying and is also applicable onto various platforms including UAVs. The VQ-840-G carries out laser range measurements for high resolution surveying of underwater topography with a narrow, visible green laser beam. At this particular wavelength the laser beam penetrates

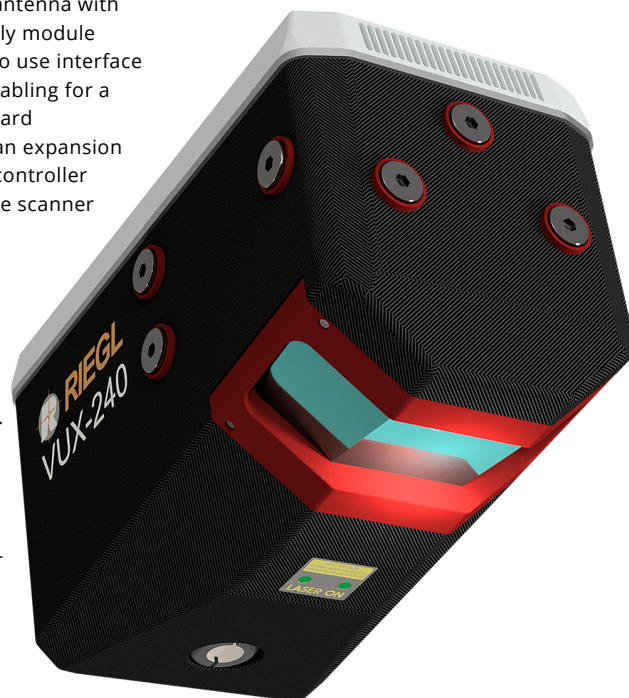


Figure 4. *RIEGL* VUX-240 UAV LiDAR Sensor.

the water in a way that the measurement of submerged targets is possible and offers up to 1.5 Secchi depth water penetration. A measurement rate of up to 200 kHz

and a scanning speed of up to 100 scans per second are the keys for delivering high spatial resolution and a fast acquisition of feature-rich topobathymetric surveying data. Straightforward integration is aided by an integrated inertial navigation system. Moreover, supplementary data can be acquired through an optional high-resolution digital camera or an infrared laser channel.

With these instruments in the substantial line-up of *RIEGL*'s unmanned laser scanners and systems, customers will meet the demanding future requirements of their markets perfectly while they can calmly rely on *RIEGL*'s well established technologies.

From the first inquiry, to purchase and integration of the system, as well as training and support, *RIEGL* maintains an out-standing history of reliability and support to their customers. In addition to the headquarters in Austria and the well-established main offices in the USA, Japan and China, now a new office, *RIEGL* Australia, in Melbourne brings all of the technology and developments even closer to the Australian and New Zealand markets.



Figure 5. *RIEGL* VQ-840-G Topo Bathymetric Airborne Scanner.

Find more details on the broad *RIEGL* product range for laser scanning

applications in surveying at www.riegl.com.

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