Using UAVs and Laser Scanners at RIEGL - Interview with Philipp Amon

Philipp Amon is Product Manager for RiCOPTER at RIEGL Laser Measurement Systems GmbH located in Horn, Austria. He graduated from a higher-level secondary college for industrial engineering and is currently working on his BSc in Industrial Engineering from the HFH Hamburg. His publications are focused on UAS/UAV applications of laser scanning, but also related to terrestrial and mobile laser scanning, and applications of laser scanning and photogrammetry.

Geomatics World: Do you see an increase in the use of laser scanners mounted on a UAV platform and what is the main application of this type of scanning?

Philipp Amon: The answer is clearly yes and for several reasons. While some years ago, due to payload limitations, most survey tasks were carried out based on imaging sensors, now more UAV platforms with higher payload capacity are available and so are different types of dedicated laser scanners. While photographic capture and photogrammetric survey do have many merits, not least due to the large number of smaller, lighter and less expensive products available in this market, professional laser scanning provides data that goes way beyond surface information. The ability to penetrate dense vegetation, and to acquire data down to the ground, enables reliable object analysis and terrain modelling.

The full advantage of LiDAR technology comes into play in vegetation mapping such as forest inventory, agricultural applications, natural habitat monitoring or vegetation control in infrastructure maintenance. LiDAR excels also in all sorts of extremely difficult situations of poor light conditions, at night or in dusty, foggy, or smoky environments.

GW: Can you give examples of fields of applications you are expecting an increase in the use of?

PA: Apart from the above mentioned applications in vegetation mapping, we do have many customers in the context of public infrastructure maintenance and energy providers, who for both safety and production efficiency, must monitor their networks closely and on a regular basis. Furthermore, we are involved in research projects regarding disaster management, where the use of LiDAR, especially in combination with other sensors such as thermal cameras in a multi-sensor-system setup, can provide critical information for first responders in real time.

GW: Please give us an overview of your laser scanners that can be used on a UAV?

PA: We started out with the RIEGL VUX-1UAV in early 2014 as the first survey-grade laser scanner specifically designed for integration in UAVs and we offer this scanner as a stand-alone LiDAR engine or in the system set-up, RIEGL VUX-SYS. We presented the first turnkey solution in autumn 2014, the RiCOPTER with VUX-SYS, a high-performance, electrically-powered multicopter with a completely integrated LiDAR and camera system. These were followed shortly by the sister LiDAR sensor types, RIEGL VUX-1LR and RIEGL VUX-1HA, to meet specific demands needed for long range and high accuracy.

We also provide solutions for smaller UAVs with limited payload capacity or for a set-up in multi-sensor-platforms: the miniature RIEGL miniVUX-1 series – either the miniVUX-1UAV or its sister type miniVUX-1DL, which is especially adapted for corridor mapping with a downward oriented field of view. Again, we do offer a complete system set-up for these sensor types, the miniVUX-SYS.

For bathymetric UAV applications, we have created the RIEGL BDF-1, being the first laser depth finder for bathymetric profiling applications.

GW: Is there a future for bathymetric survey from UAVs?

PA: The domain of bathymetric survey is currently insistently looking for UAV-based solutions to complete airborne large-zone water surveys in complex zones or close to the shore. With the RIEGL BDF-1 integrated onto the RiCOPTER UAV, we introduced a first solution for this demand. Operation from a low flying UAV, and therefore close to the water surface, allows data capture up to 1.5 secchi depth into the water. The bathymetric market is one that will develop strongly in the UAV sector in years to come.

GW: Do you see an extension of RIEGL software to extract features from a point cloud?

PA: RIEGL offers a wide range of software products and tools for data acquisition and processing. Our software packages provide filtered, georeferenced, well-aligned and adjusted point clouds with optionally available colour information as the final result of our processing chain. The correct georeferencing of scan data and images is crucial before the data is ready to be exported for further analysis, modelling, extraction or other processing tasks. The RIEGL software suite for terrestrial and kinematic scanning does not offer in-depth feature extraction as 3rd party software packages providing these solutions are widely available on the market for every specific need; for example: CAD programs and their plugins, GIS-based software or independent solutions, just to name a few. We ourselves focus on preparing a reliable basis for the large variety of potential end results by providing a clean and georeferenced point cloud ready for further extraction.

GW: What do you see as the big development in surveying with UAVs?

PA: For us at RIEGL, ULS (UAV-based laser scanning) has, from its beginning, been considered as both a gap-closing method between terrestrial laser scanning and airborne laser scanning, as well as a new option altogether. This evaluation is also mirrored by our customers: both existing customers expanding their portfolio into UAV survey and also a new clientele with a totally different background for whom ULS is a first step into LiDAR-based surveying.

Clearly, UAVs promise is to conquer new terrain in surveying, but it is not only the place of operation that counts. Very importantly, in considering the new perspectives attainable by ULS, a considerable gain in data quality can be stated.

GW: What is the biggest challenge that needs to be overcome to grow surveying with UAVs?

PA: There's the ongoing quest for designing even more lightweight and even higher performing laser scanners and systems, as well as to find even more ideal means of integration into different types of UAVs and adaptations for key applications – that's the technical challenge that we are more than happy to meet.

On the other hand, the use of UAVs is, of course, regulated by authorities and these regulations have to be respected in order to guarantee responsible-minded safe use. As regulations, at this moment, are not yet harmonised on an international level, it is sometimes quite a challenge to comply with specific demands or to assemble the necessary documentation. This concerns us as a manufacturer and operator of LiDAR systems and UAVs, as much as in consulting our customers when considering integrations and planning projects.

GW: What will be the most important job in the range of professionals working with UAVs?

PA: I wouldn't like to call one job the most important one. We've made the experience one that is a safe and efficient operation relying on smooth teamwork between pilot and operator, for example, an "operation" includes the whole planning phase, considering the aptitude of aircraft and sensor for a specific application.

There are a number of jobs emerging in the UAV context: from aircraft, sensor or flight management-system designers and developers to flight-safety and maintenance engineer, UAV pilot trainer or seemingly more peripherally related jobs in assurance and dedicated aviation law expertise – all these play a crucial part for defining the framework for professional use of UAVs.

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