## 5 QUESTIONS TOÂ€¦MICHEL STANIER

# Sensor Technology Evolving in Many Directions

*As Lidar is a hot topic in the geomatics industry with numerous fields of applications,* GIM International' *decided to ask Michel Stanier, chief operating officer of Teledyne Optech, to answer five questions in the context of airborne Lidar.*

**Lidar has been developing rapidly over the last couple of years. Can you give us an update?**

Indeed, airborne Lidar is developing rapidly in several directions. The unmanned aerial system (UAS)/remotely piloted aircraft system (RPAS) platforms are driving a continued reduction in sensor size, weight and power. However, for commercial data providers, the primary focus remains on collection efficiency and lower operating costs to increase competitiveness. Teledyne Optech has led the charge by developing unique, innovative solutions such as SwathTRAK's adaptive field of view (FOV), which eliminates the inherent inefficiency of fixed-FOV sensors in changing terrain elevations. The net result is a sharp reduction in flight/processing time and a constant point density even in highly variable terrain. We are continuing to push the efficiency envelope with more major improvements to our Galaxy platform, the most compact and versatile sensor in the marketplace.

Other significant Lidar developments we have pioneered are the Eclipse – the first low-cost, autonomous sensor – and the Titan, which is the first multi-wavelength, multi-application sensor. The Eclipse is the ideal entry-level sensor for data collection up to 3,000 feet, whereas the Titan supports numerous applications – simultaneous high-resolution topography and/or bathymetry and enhanced classification capability – in a single-sensor configuration, letting service providers differentiate and grow their addressable market.

**What are the most relevant applications of your products?**

We see two distinct Lidar sensor categories. The first category is one of generalist sensors that offer flexibility and diverse applications, enabling different project types with a single sensor investment. This includes our Galaxy, a high-performance mapping sensor that delivers unparalleled collection efficiency for wide-area mapping projects, but is also excellent for low-altitude, high-precision corridor work from smaller platforms thanks to its compact size and variable power feature. The multispectral Titan is another generalist sensor that can handle high-resolution topographic and bathymetric surveys simultaneously. Finally, our new Polaris terrestrial laser scanner (TLS) doubles as a high-speed indoor scanner for building information modelling (BIM) initiatives and a long-range outdoor scanner for geomorphic hazards or infrastructure mapping. The second category is one of application-specific sensors such as the Eclipse – totally autonomous mapping Lidar used primarily for corridor and small-area surveys on smaller platforms.

**One promising recent advancement for mapping applications is photon Lidar (also known as Geiger-mode Lidar). What are your expectations for this?**

As I mentioned earlier, efficiency is a critical driver in the Lidar mapping market, and this new technology strives to collect large swaths of data from high altitudes. While Geiger-mode Lidar seems attractive, it has some practical, real-life limitations – such as cloud cover – that often prevent high-altitude operation. As a result, it falls well short of its maximum efficiency in many regions where it must fly much lower. Moreover, it is inherently noisy (low signal-to-noise ratio [SNR]) and relies on extensive smoothing to achieve the high accuracy expected in mapping applications. Complex targets like vegetation are particularly challenging. Finally, its high price point and complex data processing are also limiting factors. In contrast, high-SNR sensors such as the Galaxy have many more collection opportunities throughout the year in areas where clear skies are rare. They are simpler to deploy and operate, and are rapidly closing the gap in collection efficiency while delivering inherently and increasingly more accurate single-shot data. We expect Geiger-mode Lidar to do well in some regions and applications, but believe it will not replace high-SNR sensors.

**A combined oblique imaging and Lidar sensor seems to be the latest trend. Is Teledyne Optech offering similar solutions?**

Indeed, most sensor deliveries include an integrated camera – RGB, infrared (IR), thermal – and frequently more than one.

These cameras are mounted in a variety of ways depending on application requirements. Our standard Lidar/camera mounting systems are very flexible and scalable so clients can fit multiple cameras in various orientations alongside their Lidar systems. Our available mounting options include gyro-stabilised and fixed-mount solutions for aircraft or helicopter pods. We also offer an oblique imaging solution on a carbon fibre frame for urban mapping initiatives.

**What other developments do you foresee in the near future?**

Sensor technology is clearly evolving in many directions. There is a strong push to develop very compact, low-cost Lidar sensors for unmanned aerial vehicles (UAVs) and even more so for cars. There is also a trend towards ever-higher point density as we strive to achieve blanket coverage of the world around us. Finally, there is the age-old drive for greater efficiency in data collection and processing. The latter is a very important factor in terms of development. Certain industry assumptions, such as the need for a highly skilled sensor operator, are being challenged by autonomous sensors such as the Eclipse and Polaris. These sensors can be programmed to execute survey plans generated at the office without human control. Similarly, data processing is becoming very streamlined, and rapid advances in artificial intelligence (AI) enable increasing automation of high-quality data processing, even in challenging conditions. Finally, the integration of multiple sensor types and high-performance data fusion algorithms, often in real time, is also opening up new applications and opportunities.

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