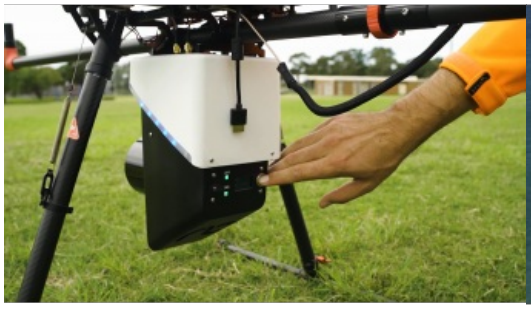
BETTER DATA ACCURACY THAN EVER BEFORE

Enabling UAV-Lidar to Fly Higher



Innovations in Lidar technology continue to change the way we see our world – literally. There's no denying that the Lidar sector is growing at an exponential rate. Research by Grand View Research indicates that the Lidar market overall will be valued at USD3.7 billion by 2027.

Beyond its applications for autonomous vehicles, Lidar technology is already yielding positive results in the agriculture, archeology and mining sectors. The feeling within the industry is palpable; this is just the beginning. Research institutions and developers around the world continue to engineer the potential of Lidar with exciting progress. One such developer is Nextcore, an Australia-based company who specializes in making Lidar systems mounted on unmanned aerial vehicles (UAVs or 'drones'). Established in 2012, Nextcore's solutions have been used in the mining industry by surveyors and environmental specialists all over the world.

Nextcore was ready to push the boundaries of UAV-Lidar

The team at Nextcore, a company driven by innovation, found themselves asking a simple question: How can we fly UAV-mounted Lidar at greater heights, whilst gaining more accurate data than ever before? At first glance it may sound like a lofty ambition. After all, while the capabilities of Lidar are more promising than ever, there is a recognized risk to the quality of data collected when UAV-mounted Lidar is flown at higher altitudes above ground level (AGL).

Lidar technologies have expanded rapidly in the last 60 years, with UAV-mounted Lidar making up a large portion of the rapidly growing market. From mapping more complex urban environments, to monitoring air quality, to studying subsurface properties of the ocean, UAV-mounted Lidar is set to deliver substantial dividends for both researchers and businesses. The potential that can be achieved with UAV-mounted Lidar is great, with the technology proving to be safer, more efficient and more accurate for surveying particularly challenging environments. However, as the scope of applications for UAV-mounted Lidar grows, the capabilities of the technology need to be able to keep up with the demand.

If there's one thing that defines the Nextcore team, it's their passion to continually improve the technology of UAV-mounted Lidar in order to make cost-effective, reliable equipment that is easy to use. This led to the RN80 project, a UAV-mounted Lidar payload that could be flown higher in the air and still deliver a survey-grade dataset.

Nextcore's RN100 ready for launch

The challenge: UAV-mounted Lidar to fly 80 metres AGL

Nextcore's RN50 UAV-mounted Lidar could previously only fly at 50m AGL, which ran the risk of colliding with vegetation. To avoid this, the team set the goal of increasing the altitude to 80m above the ground. Operation at this altitude not only reduces the risk of collisions with trees, but also enables surveyors to cover larger areas, thus greatly improving the solution's efficiency. However, this ambition came with increasing risk.

"The problem with flying a UAV-Lidar payload higher off the ground is that the higher you fly, the more inaccuracies you build into the Lidar dataset," says Ashley Cox, COO and co-founder of Nextcore. "The challenge was finding hardware we could put into the system that would allow us to achieve a survey-grade outcome even though we were flying our drones higher." Tom Simmons, technical officer at

Nextcore, adds that there is an added benefit of safety that comes with flying UAV-mounted Lidar higher: “We’ve got many clients navigating very mountainous terrain in Japan and Malaysia, and they need the ability to fly higher with their drone,” he says. “You’re really relying on your inertial navigation system (INS) accuracy at that point, and any inaccuracy that you’ve got in will be reflected in your Lidar,” he continues. “So any inaccuracies from the INS will be accentuated by flying higher, leading to a decrease in accuracy in your point cloud generation and it won’t be usable data for surveying metrics.” Keeping this in mind, Nextcore needed a top-class GNSS/INS solution that performed reliably in any conditions whilst remaining accurate to the centimetre.

The RN100 flying at 100 metres

The solution: Certus Evo MEMS GNSS/INS

After reviewing the different inertial navigation systems available on the market, the Nextcore team selected Advanced Navigation’s Certus Evo to be used in the RN80 payload, for the following reasons:

1. It was a highly accurate MEMS GNSS/INS, reducing any angular errors from flying higher
2. It was easy to integrate into Nextcore’s existing systems
3. It was cost effective, allowing Nextcore to pass the savings onto its customers.

Certus Evo provides accurate position, velocity, acceleration and orientation under the most demanding conditions. It combines ultra-high-accuracy temperature-calibrated MEMS accelerometers, gyroscopes, magnetometers and a pressure sensor with a dual-antenna RTK GNSS receiver. These are coupled with Advanced Navigation’s sophisticated fusion algorithm to deliver accurate navigation and orientation.

The Nextcore team had used Advanced Navigation’s Spatial Dual previously for their RN50 project, so they were naturally intrigued by the potential of the Certus Evo when it was released. Tom reflects that the Certus Evo’s specifications made it able to meet their ambitious 80m AGL flight height. “After doing some test flights, it met all of our requirements for the RN80 project,” he says. “This allowed us to leverage off the Spatial Dual integration and apply the Certus Evo as a drop-in replacement for that system. It really cuts down on development time there. It's also a very cost-effective sensor and it’s very competitively priced in the market, especially for an Australian-made product.”

Advanced Navigation's Certus Evo used in the RN100

The outcome: soaring above expectations

Upon completing the project, the Nextcore team were pleasantly surprised to find that the RN80 surpassed their expectations. “Based on our calculations, we expected we’d be able to fly 80 metres above ground level,” says Ashley. But in fact, the Certus Evo performed so well it enabled Nexctore to produce a UAV-mounted Lidar that operates at 100 metres above the ground, exceeding their initial goal. This became the RN100 UAV-Lidar, which allows Nextcore’s customers to fly more safely, cover a larger area and still achieve a survey-grade outcome.

As the potential for Lidar continues to develop, the outcome of the RN100 is now well suited to meet the demands of the growing market with a high-performance, accurate system. For Nextcore, this development has opened up an exciting window of opportunity. Ruminating on the RN100’s development, Tom attributes the project’s success not only to the highly accurate Certus Evo, but also to the ease of integrating it into their system. “Moving from Advanced Navigation’s Spatial Dual to the Certus Evo was a very easy integration project for us,” he says. As many manufacturers know, using a shared interface allows the development team to quickly integrate systems. “We’re able to leverage all of our existing development work, and quickly and reliably integrate it into our next full unit for a very quick release to the product,” reflects Tom. “So integrating the Certus Evo from Advanced Navigation allowed us to offer a higher-end product to our clients at an affordable price tag. And this has really opened up new markets for us, internationally and domestically.”

The future of UAV-Lidar

The potential of flying UAV-mounted Lidar is an exciting one. Using the Certus Evo, Nextcore has shown it is possible to fly at 100m AGL and still deliver the highest grade of survey data. To learn more about the Certus Evo, visit Advanced Navigation’s website and get in touch with the company’s expert team.

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https://www.gim-international.com/case-study/advanced-navigation-enabling-uav-lidar-to-fly-higher