

Detailed surface from LiDAR collection.

A surface created from ground points with the trees kept in for visual.

## LiDAR: IT'S ALL IN THE DETAILS

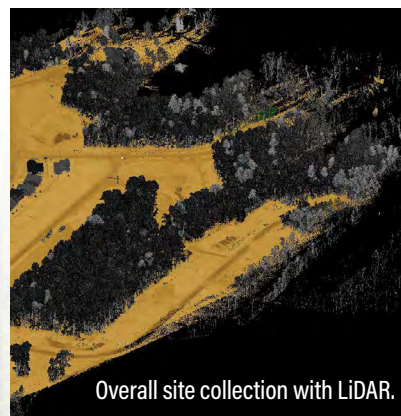
ESP Associates, an engineering design and consulting firm, is deploying the Microdrones mdLiDAR3000 to capture more detailed, accurate images for their clients.

by Renee Knight

When Brian Flaherty and his team at ESP Associates, an engineering design and consulting firm, started flying drones for clients in 2015, they didn't see the benefits they had hoped for. While the unmanned aircraft systems (UAS) did help save time on certain projects, the traditional photogrammetry they offered just didn't provide the accuracy the surveying industry requires.

That's why they decided to invest in the Microdrones md4-3000 with LiDAR last September. LiDAR gives them the accuracy they were missing, making it possible to penetrate through canopies to see the ground below in a lot more detail than with traditional imagery. They've completed about 30 successful flights since delivery, and Flaherty has been pretty happy with the results from the DL system, which uses the Riegl MiniVUX-1DL.

"LiDAR provides better accuracy than photogrammetry, especially under canopy. With photogrammetry, you're limited to how good a surface model is going to be. If there's



Overall site collection with LiDAR.

### The md4-3000

This rugged UAS is the largest Microdrones aircraft and offers up to 45 minutes of flight time, depending on payload. It maintains its performance at high altitudes and can handle harsh conditions. The system has the ability to carry a variety of payloads, including heavy LiDAR sensors, professional mapping grade cameras and multiple sensors.

a canopy you really can't model the surface. LiDAR penetrates through the canopy and collects a lot more information," said Flaherty, a licensed surveyor who oversees the UAV department for the North Carolina based company. "In North Carolina, we have a lot of canopy, and most of our projects fall in wooded areas. This system from Microdrones just seemed like the best tool for us."

### How They're Using the Technology

The team is mostly using the drone for land development, Flaherty said. Clients basically want to know if land they're interested in is feasible for a project, so ESP collects aerial imagery that allows the engineering group to complete a preliminary design, and then a final design if the client decides to move forward with the project.

Not only can they give their clients more detailed information with this system, they also can get it to them much faster than if they used the traditional methods that involve ground crews walking the area with survey equipment. Before, it might

take a month to collect the information they need to map a 200 acre site. With the Microdrones system, they can gather the same information in about two days.

"The turn-around time is much quicker and the accuracy is much better," Flaherty said. "With this system you're getting 100 points a square meter, where traditionally you'd get one point every 35 feet or so. You get a lot more information to interpret."

Using this technology, the team also can see their own field mistakes, such as a bad rod height, Flaherty said. If there's a branch in the way of one of their five foot rods, for example, the crew might extend the rod two feet so they can collect that point. If they forget to enter the change, the data collected will be off. The two foot difference will show up in the LiDAR-collected data, enabling them to account for the error.

There's also software being developed that will make it possible to use point clouds collected via LiDAR to obtain tree sizes and counts, which Flaherty describes "as a very big thing in development" that can be used during tree surveys.

The firm is interested in using the Microdrones system to look at canopy encroachments in right-of-ways as well, Flaherty said, and working with departments of transportation to collect information in areas trucks with mobile LiDAR systems can't get to. They've even done a few pilot projects for these types of flights, but they're not ready for prime time just yet.

### Incorporating the System

ESP has three trained pilots who fly the Microdrones system for clients, Flaherty said. The pilots fly at sites all over the country to support all of their offices. Flaherty also has a Part 107 license.

After the flights, the team handles downloading and processing the information gathered, Flaherty said. It takes about a day to process a day's worth of flying. They also still use ground crews to collect some of the data they need, so incorporating that information takes a little bit more finesse and time.

After deciding to implement drones, ESP also had to educate clients about the technology and how it can help them make better business decisions, Flaherty said. Some were a bit apprehensive at first, but now most are on board.

"It's aerial technology and some of our clients have gotten bitten in the past from doing topos (topographic maps)

from imagery," he said. "Now, we find most of our clients realize the benefits of time savings and accuracy from this type of technology."

### Why Microdrones

While Flaherty knew Microdrones developed rugged, reliable systems (he had used other models in the past) that wasn't the only reason he opted to invest in the mdLiDAR3000 last fall. He wanted to purchase a system from a company he could turn to with any questions or problems. He certainly found that with Microdrones.

"They support their product. Whenever there's an issue they get in there and fix it," he said. "With most of the other platforms we've dealt with, it was very painful to get support. It was a no-brainer to go with Microdrones mainly because of the support they offer."



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Brian Flaherty, UAV program manager, ESP Associates

### Details, Details

The ESP team recently flew a wooded area to provide a client with a topographic map. The client needed the map to determine if there was enough volume in their stock piles to fill in the basins there. The area was very dense with a lot of power lines, but because they used LiDAR, they were able to give this client exactly what was asked for.

This is just one example of a successful use case, all made possible by having the ability to deploy LiDAR on a UAS.

"We flew that 40 acre field in about three hours. It would have been a week's worth of work for a field crew," Flaherty said. "If you take out the trees, you can see the ground very well. You can see a lot of detail. It's pretty impressive. You would never get that type of detail with photogrammetry." 