

Spatial Accuracy Should Not Be Compromised In Aerial Photography

For more than four decades, the City of O’Fallon, Illinois, has been one of the fastest-growing cities in southern Illinois. To track this expansive growth, the city purchases aerial photography for their 100 square mile utility service area every three years. It is a very expensive process and the aerial photography is typically six months to a year old when the City of O’Fallon receives it. Due to the expense, in the past they have not conducted any aerial photography collection during the in-between years.

Yet, because the city is growing so fast and neighborhoods have been popping up so quickly, the city is wanting to supplement their expansive aerial photography collection by having VerticalGeo collect new neighborhood images during the off years. A service-disabled veteran-owned small business that excels in Geographic Information Systems (GIS), aerial and architectural photography, VerticalGeo is a firm the City of O’Fallon has previously contracted for their aerial mapping campaigns.

In 2019, VerticalGeo photographed and mapped five neighborhoods for the City of O’Fallon using a DJI™ Mavic. In addition to collecting the aerial photography, the city has asked VerticalGeo to digitize a sidewalk layer and a building footprint layer on top of the photography in a GIS geodatabase layer. In this way the building footprints and sidewalks layers can be used as layers for other projects and can be used upon the project completion of their entire utility service area sometime in the next couple of years.

While the Mavic produced aerial photography that looked good aesthetically, the poor GPS accuracy of the Mavic’s images meant that the sidewalks and building footprints layers would need to be updated after the utility service area aerial photography project was completed—adding additional time and expense to the project. As a result, the team at VerticalGeo went looking for an alternative system that would overcome these shortcomings. In their search they discovered a white paper titled, “*Surveying and Mapping with Fixed Wing UAS – A Fly-Off Between Leading UAS Providers,*” published by Black Swift Technologies.

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The paper provided direct comparisons of three leading photogrammetry platforms (SenseFly Ebee, Trimble UX5 HP, and Black SwiftTrainer/S1 UAS), with data sets obtained over the same area of interest and within one day of each other. The fly-off was hosted by CH2M Hill and conducted by independent contractors rather than the aircraft manufacturers for a more realistic assessment of the quality that can be expected through normal operation of each platform. The paper concluded that, based on the quantitative comparison of the data produced, the Black Swift S1 UAS (Figure 1) outperformed both the Trimble UX5 HP and the SenseFly Ebee while coming in at a significantly lower price.



Figure 1: Black Swift S1 UAS ready to fly.

After assessing the costs of a variety of UASs (or drones) and researching the accuracy of their resulting datasets, the team at VerticalGeo was convinced that Black Swift Technologies offered the best photogrammetry solution for the money, and they purchased an S1 from BST.

“Earlier this year, in 2020, the City of O’Fallon awarded us seven new neighborhoods to map,” says Rick Marshall, PhD, GISP, President of VerticalGeo. “This would be a great opportunity to validate our decision to purchase the S1 as we feel it is a much better platform for this type of aerial photography work”.

Initial results proved their assumptions correct. “The Sony camera installed on the S1 is much better than the camera on the Mavic,” Marshall notes. “Tone balancing is nice and the resolution of the photos is exceptional.”

In addition, Marshall and his team's decision was further supported by the enhanced accuracy that the Black Swift S1 delivered versus the DJI Mavic. They found that the basic GPS in the S1 was much more accurate than the GPS in the Mavic (Figure 2), and with the optional RTK system offered by BST, the S1 delivered even more impressive results (Figure 3).



Figure 2 : 2019 photo taken with the DJI Mavic showing the Mavic's spatial inaccuracy (4-6 feet off).



Figure 3: 2020 photo taken with BST's S1 showing spatial accuracy within 1 foot of actual position.

"This means that not only does the imagery look great but the sidewalk and building footprint layers we create will be accurate enough to be used again on the utility service area aerial photography without adjustment," adds Marshall. "We also found that Black Swift's SwiftCore Flight Management System (FMS), which took us a while to get comfortable using, has proven to be a very powerful and capable FMS that we really like".

Marshall is quick to point out, "Accuracy doesn't seem important for an isolated area, but as you tie that neighborhood into the larger environment it becomes much more critical. When you add new infrastructure layers to the map that include roads, utilities, stormwater drainage, sewers, parcel map boundaries, and other features, accuracy becomes essential".

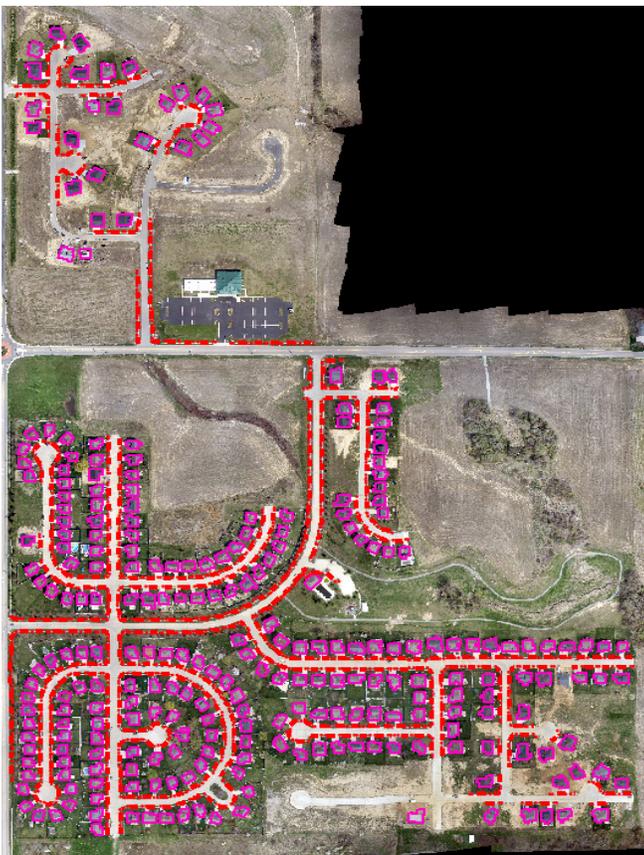


Figure 4: The photo mosaic resulting when 775 individual photographs are stitched together.

The final deliverable VerticalGeo provided to the City of O'Fallon represents two neighborhood photos comprised of approximately 775 individual images that were collected by the S1 over a 2-hour time period. These photos were stitched together using Black Swift Technologies' SwiftCore FMS to create a seamless, and very accurate, photo mosaic of both neighborhoods (Figure 4).

Icing on the Cake: Made in the USA

"In the end, we were tired of flying cheap foreign UAS and wanted to fly something made in America. We wanted to fly a UAS that we knew the builder would provide support for. We wanted to be able to call the manufacturer and talk with them about any issues or questions we might have, and no one can help like the person who actually built the UAS or wrote the software." Marshall summarizes, "We couldn't have been happier with the way the system worked and the customer support provided by Black Swift Technologies. We were looking for a teammate and Black Swift Technologies has done a great job exceeding our expectations. We plan to use this system extensively in the future for similar work."

When all is said and done, results speak louder than words. "All you have to do is look at the images to see the differences we experienced comparing these two platforms," emphasizes Marshall. "Not only are we happier with the results, the City of O'Fallon is equally pleased. That's a win-win for both of us, wouldn't you agree?"