



Don't ever say, "Close enough," to Mary Wohnrade, Principal Engineer/Owner, at Wohnrade Civil Engineers, Inc. As a Civil Engineer, she has dedicated her professional career to accuracy. "Close enough," isn't even in her vocabulary.



Mary Wohnrade, P.E.

A private pilot since 1983, Wohnrade has always loved aviation. It was natural extension of that passion that drew her to Unmanned Aerial Systems (UAS) or drones. Wohnrade began investigating this new, exciting technology by taking advantage of the resources found at the University of Colorado (CU) at Boulder. There Wohnrade met with Douglas Weibel PhD, a UAS Researcher and Aerospace Engineering at the University.

"My initial conversation with Dr. Weibel was to learn more about custom-built UAS's and their capabilities," Wohnrade recalls. "It was here that he referred me to Jack Elston PhD, at Black Swift Technologies (BST). Weibel and Elston had worked together on advanced UAS design and development as doctoral candidates at CU. While Weibel continued in research, Elston ventured off to start Black Swift Technologies."

Founded in 2011, Black Swift Technologies is a specialized engineering firm located in Boulder, CO that designs and develops precision UAS solutions comprised of an airframe, flight management software, application-specific sensor integration, and mission planning software.

"I purchased my first drone from Black Swift Technologies in March 2015, initially for marketing purposes," says Wohnrade. "A UAS was ideal for capturing high-resolution aerial photographs and 4K videography to showcase our larger civil engineering projects. They were also a lot of fun to fly!"

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Since her introduction to Black Swift Technologies and precision aerial mapping, Wohnrade Civil Engineers (WCE) has been at the forefront of developing precision aerial mapping, and then incorporating this mapping into civil engineering design. Only a handful of companies have demonstrated they are truly qualified to produce precision aerial mapping using UAS, and WCE is recognized as a member of this elite group.

"It wasn't long before I realized the incredible potential UAS technology had to offer, and the many benefits it could bring to the civil engineering and surveying professions," Wohnrade emphasizes. "I soon discovered that UAS provided an efficient way to collect topographic data on a large scale, which when processed correctly, can produce precision geospatial mapping that I could use to enhance my civil engineering design workflow."

The process of generating precision aerial mapping proved to be a daunting task that involves expertise in multiple disciplines including: aviation, surveying, photography, photogrammetry, ASPRS accuracy standards, geodesy, and finally engineering.

Wohnrade Civil Engineers spent months creating their own proprietary in-house workflow for accomplishing these very technical tasks. As Wohnrade stresses, “Our goal is to obtain geospatial datasets that are as close to survey-grade as possible. Meaning, that the horizontal and vertical accuracy of the data is approximately 0.10-feet in non-vegetated areas”.

High-resolution orthomosaic images serve as a design reference and have proven to be extremely useful. UAS topographic mapping provides a complete representation of the earth’s surface by generating hundreds of millions of points, with each point representing one square inch on the ground. This tool, which was unavailable until now, is only made possible by UAS.

Cost-Effective Solution

The use of UAS to generate reliable and precise ground surface models is very cost effective when compared to traditional ground and aerial surveys. Typical UAS aerial data collections can take less than an hour for sites roughly 100 acres in size, and up to four hours for a two square-mile area of interest (AOI), as compared to days and weeks when using traditional ground survey methods.

“We have accumulated a database for all of our projects, which includes actual costs for UAS aerial mapping versus traditional ground surveying,” Wohnrade states. “We have been able to document saving our clients roughly 40% on average versus traditional survey methods. In today’s world, that’s real benefits!”

Wohnrade Civil Engineering has also received national recognition of historic achievement as a result of their demonstration flight at the Great Sand Dunes National Park in October 2016. WCE collaborated with UAS Colorado, Black Swift Technologies, and the National Park Service to successfully map a 1-square mile area centered over the Star Dune, the tallest dune in the Park. In turn, WCE was recognized as the first FAA licensed operator to use a UAS to perform precision mapping in a National Park, an unparalleled achievement.



Not Willing to Rest on Their Laurels

“We are furthering our effort to provide precision mapping, even in the most challenging terrain,” said Wohnrade. “We are at the final stage in the development of a new multi-rotor platform with a payload that includes a 42.1 Megapixel RGB camera, onboard IMU and GPS, and a LiDAR scanner.”

This custom platform was designed by Wohnrade Civil Engineers and built by Black Swift Technologies, and is the perfect example of how WCE is expanding their capabilities to address the needs of the surveying and engineering professions. This platform was developed in response to the demand for UAS LiDAR technology, particularly from local surveyors that work in mountainous terrain in Colorado, and will be one of just a handful of LiDAR platforms in the state.

The development of precise geospatial data collections opens up new opportunities to address the needs of FEMA, the Colorado Department of Transportation (CDOT), and other agencies that demand high accuracy aerial geospatial data. For Mary Wohnrade and WCE, the sky’s the limit. Just watch and see!

About Wohnrade Civil Engineering

Wohnrade Civil Engineers, Inc. (WCE) is an FAA Section 333 Exemption Holder, as well as an FAA Part 107 Certified Operator. WCE has been performing aerial data collections since 2015, using the SwiftTrainer™ UAS platform (developed by Black Swift Technologies). WCE makes use of the SwiftTrainer™ to perform data collections, which are then processed using photogrammetry. WCE is at the forefront of delivering precision UAS mapping products in a variety of digital formats, which are then used for civil engineering design. Their UAS workflow has been vetted by industry professionals and meets strict standards set by the American Society of Photogrammetry and Remote Sensing (ASPRS).