

The project title: Acquisition of Leica BLK2FLY 3D Laser Scanning Drone to Advance Education, Research, Industry Partnerships, and Community College Collaboration in Civil Engineering, Surveying, and Construction Management

Proposal Team: Charlie Zhang, Ph.D., P.E., Associate Professor, CAECM; Anthony Denzer, Professor & Department Head, CAECM

The total amount requested (\$): This proposal requests \$79,884 in one-time funding from the College of Engineering and Physical Sciences Dean's Office to acquire a Leica BLK2FLY 3D Laser Scanning Drone. This equipment will replace outdated technology, enhance undergraduate and graduate education, and support advanced research and collaboration. The acquisition aligns with the goals of the Tier 1 Engineering Initiative, contributing to excellence in education, cutting-edge research, productive partnerships, and supporting the economic and cultural development of Wyoming.

Project Description

The Leica BLK2FLY 3D Laser Scanning Drone is the world's first fully autonomous flying laser scanner, developed by Leica Geosystems (<https://leica-geosystems.com>) to revolutionize the way spatial data is collected. Equipped with advanced LiDAR technology and obstacle avoidance capabilities, it is specifically designed to create accurate digital twins of buildings, infrastructure, and landscapes, making it an indispensable tool for education, research, and industry applications.

This new equipment setup will address the multiple needs in the College, including the modernization of outdated scanning tools, the enhancement of research capabilities, and the alignment of academic programs with industry standards. The existing scanner, a GLS 2000 Topcon, is over a decade old and no longer meets the demands of modern education and research. Its high maintenance costs and limited software functionality hinder its effectiveness in supporting coursework, research projects, and industry collaborations. The Leica BLK2FLY offers a cost-effective, user-friendly, and high-performance alternative that will significantly enhance the College's ability to deliver cutting-edge education and conduct impactful research. It will enable students and researchers to tackle a wider range of projects, such as architectural design, infrastructure monitoring, and environmental studies. Together, these technologies will modernize teaching, advance research, and solidify the College's position as a leader in geospatial capabilities. Their versatility will enable a wide range of applications including:

Educational Applications

The Leica BLK2FLY will play a transformative role in undergraduate and graduate education, as well as K-14 STEM outreach, by introducing students to cutting-edge technology that aligns with current industry practices. It will be seamlessly integrated into academic programs across civil engineering, construction, and architectural engineering disciplines, offering a practical, hands-on approach to learning. Students will engage with the drone in a variety of courses, including surveying, construction technology, and architectural design, where they will learn to plan and execute real-world scanning missions, analyze data, and apply their findings to solve complex engineering challenges. By providing direct experience with advanced equipment used in the field, the Leica BLK2FLY will prepare students to confidently navigate the demands of professional practice. The ability to create high-resolution 3D models of buildings, infrastructure, and landscapes will enhance their understanding of concepts such as spatial analysis, project

monitoring, and design validation, ensuring they graduate with highly competitive industry-relevant skills.

Moreover, the equipment will support K-14 STEM education initiatives, expanding outreach to younger students and inspiring future engineers. Integrated into the College's existing STEM outreach programs, such as Engineers Week, and National Surveyor's Week, the drone will be used for hands-on demonstrations, workshops, and field experiences. These programs will help K-14 students explore applications in surveying, geospatial analysis, and infrastructure assessment, fostering an early interest in STEM fields. By exposing students of all levels to real-world drone technology, the BLK2FLY will strengthen the STEM pipeline, encouraging engagement in engineering disciplines and broadening educational opportunities in Wyoming.

Research Applications

The Leica BLK2FLY will support diverse research areas, including:

- Structural health monitoring of infrastructure using high-resolution 3D scans.
- Geospatial analysis for environmental, geotechnical, and construction projects.
- Advanced construction technology research, such as validating design models and monitoring project sites.

The advanced capabilities of this setup will promote interdisciplinary research and innovation, allowing faculty and graduate students to explore new frontiers in engineering and technology.

Collaborations and Economic Impact

The drone will significantly strengthen collaborations with industry and government partners by providing reliable, high-accuracy spatial data that supports advanced decision-making and innovative solutions. Its capabilities will position the University as a preferred partner for projects requiring cutting-edge geospatial technology, fostering relationships with organizations in construction, transportation, and environmental management. Additionally, it will enhance the University's competitiveness in securing external funding from agencies such as the National Science Foundation, Department of Transportation, Department of Energy, and other public and private entities by showcasing its commitment to integrating advanced tools into research and development. Beyond academic and research collaborations, the Leica BLK2FLY will contribute directly to Wyoming's economy by supporting local industries, including construction, mining, and infrastructure development, through more efficient project execution and resource management. Students trained with this technology will graduate with skills that align with current industry demands, making them valuable assets to the workforce. This alignment not only addresses local workforce needs but also attracts businesses to collaborate with the University, driving regional economic growth and technological advancement.

Cultural and Historical Preservation

The Leica BLK2FLY's ability to capture detailed 3D scans will support Wyoming's cultural and historical preservation efforts. By documenting landmarks and heritage sites, the drone will contribute to maintaining the state's rich history for future generations.

Budget Description and Justification

S.N.	Item	Quantity	Unit Price	Price	Remarks
	Leica BLK2FLY, box including				
	1) Leica BLK2FLY Flying Laser Scanner				
	2) GEB374 BLK2FLY Smart Battery				
1	3) GKL352 BLK2FLY Single Battery Charger	1	\$63,400	\$63,400	
	4) GEV288 USB-C Cable, 1.5m				
	5) Leica BLK2FLY Propellers CW & CCW				
	6) Cleaning Cloth				
2	GEV288 USB C data transfer cable	2	\$43.5	\$87	
3	GKL351 BLK2FLY smart multi-charger	2	\$1,800	\$3,600	
4	GEB374 BLK2FLY smart battery	10	\$585	\$5,850	Additional
5	BLK2FLY Propellers CW and CCW	8	\$64	\$512	Additional
6	GKL352 BLK2FLY Single Charger	1	\$335	\$335	Additional
7	GVP745 BLK2FLY Transportation Case	1	\$1,240	\$1,240	
8	Leica Cyclone REGISTER 360 PLUS	1	\$4,860	\$4,860	1 year subscription
9	Shipping cost	1	\$0	\$0	*
Total				\$79,884	

*Free shipping option is provided by the vendor.

The proposed budget of \$79,884 is carefully designed to ensure the effective acquisition, operation, and deployment of the Leica BLK2FLY 3D Scanning Drone to enhance educational and research capabilities within the College of Engineering and Physical Sciences, University of Wyoming. The primary component, the Leica BLK2FLY Box, costing \$63,400, includes the flying laser scanner, a smart battery, a single battery charger, a USB-C cable, propellers (Clockwise-CW and Counterclockwise-CCW), and a cleaning cloth. This package forms the foundation of the scanning system and is essential for achieving the intended educational and research objectives.

To support extended operations and efficient data transfer, two additional USB-C data transfer cables are included at a cost of \$87, along with two BLK2FLY Smart Multi-Chargers priced at \$3,600, enabling the simultaneous charging of up to 10 batteries to minimize downtime during fieldwork. Additionally, 10 Smart Batteries, totaling \$5,850, have been included to account for the drone's flight time of approximately 30 - 35 minutes per battery. These extra batteries are critical to sustaining operations for extended periods, particularly during research projects or teaching activities that require back-to-back flights or operations in remote areas without immediate charging options. The additional batteries ensure uninterrupted workflow and allow the drone to remain operational throughout longer sessions.

To maintain safety and continuity, eight additional Propellers (CW and CCW) are included for \$512, providing ample spares for replacement in case of wear or damage. An extra Single Charger is also included for \$335 to serve as a portable and backup charging option, ensuring flexibility during field operations. The BLK2FLY Transportation Case, priced at \$1,240, guarantees the safe storage and transport of the drone and its accessories, which is crucial for protecting the equipment during travel or between locations. The budget also includes a 1-year subscription to Leica Cyclone REGISTER 360 PLUS software for \$4,860, an important tool for processing and managing the 3D spatial data captured by the drone. This software enhances the utility of the BLK2FLY for high-precision projects and integrates seamlessly with its ecosystem, supporting advanced data registration, visualization, and analysis.

The vendor has provided free shipping, allowing the entire budget to be allocated to essential equipment and software without additional logistical costs. This well-thought-out plan ensures that the College acquires the drone and all necessary accessories, software, and spares required for efficient and effective usage. The total budget has been designed to fully utilize the allocated \$80,000 for essential equipment and software while ensuring cost efficiency. This investment will significantly enhance the education at all level, facilitate advanced research, and promote collaborations with industry and community partners, aligning with the goals of the Tier 1 Engineering Initiative.

Charlie Zhang

From: Joe Rovani
Sent: Friday, January 3, 2025 4:47 PM
To: Charlie Zhang
Cc: Anthony Denzer
Subject: RE: Equipment budget justification for one time funding request

Hi Charlie,

Thank you for contacting me. I looked up the drone on the Leica website: there are many examples of how it can be used to map buildings, infrastructure, outdoor structures, even indoor mapping. I see the following info for the rechargeable battery-

Battery:

Li-ion 14.8 V, 6.75 Ah, 99.9 Wh

I agree that no special office, room, or laboratory upgrades are needed for recharging. Here's an NFPA link to consider for Li-ion battery safety:

<https://www.nfpa.org/education-and-research/home-fire-safety/lithium-ion-batteries>

Good Luck with your proposal!

Best,
Joe

Joe Rovani

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From: Charlie Zhang <Chengyi.Zhang@uwyo.edu>
Sent: Friday, January 3, 2025 4:28 PM
To: Joe Rovani <Rovani@uwyo.edu>
Cc: Anthony Denzer <TDenzer@uwyo.edu>
Subject: Equipment budget justification for one time funding request

Dear Joe,

I am reaching out to request confirmation that the necessary space, power, and other facility requirements are met to support the planned purchase of the Leica BLK2FLY 3D Laser Scanning Drone for the College of Engineering and Physical Sciences.

As part of the budget justification process in "CEPS Engineering Initiative Request for Proposals-Fiscal Year 2025 One-Time Funding", I need to include confirmation from you that the College has the appropriate infrastructure to accommodate this equipment. The Leica BLK2FLY is an autonomous flying laser scanner that will be used for teaching, research, and industry collaborations. For reference, the drone has a compact design with dimensions of 600×530×160 mm (23.62 × 20.87 × 6.3 inches) and weighs 2.6 kg (5.73 lbs.) including the battery. It does not require a special power supply and is compatible with existing electrical infrastructure. Each battery recharges in

approximately 60 minutes and only requires a standard outlet in a well-ventilated space for safe operation. I want to assure that the additional arrangements or facility modifications will not be needed, as this equipment setup can be stored in the Construction Research and Innovation Lab office (Room 1042) or in the Survey Room.

Could you please review the requirements and provide confirmation for documentation purposes? If any further details are required, I would be happy to provide them.

Thank you for your time and assistance. Have a good weekend!

Best,
Charlie

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