NAVIGATE GRID CHALLENGES WITH AERIAL MAPPING TECHNOLOGY

By Mark Treon, Geospatial Manager, Westwood Professional Services

WITH AN UNPREDICTABLE ENVIRONMENT, complex terrains and strict timelines, geospatial crews rely on advanced aerial mapping technologies to access assets and keep crews safe while supporting projects.

There are options when it comes to collecting geospatial data. With the use of drone technology, a survey team can efficiently collect datasets such as LiDAR, high resolution inspection imagery, video, thermography, traditional photogrammetry and hyperspectral imaging, just to name a few. These technologies all have their distinct advantages and can be the right solution for common challenges utilities and developers face during evaluation, design and construction.

ADVANCEMENTS IN AERIAL MAPPING CERTIFICATIONS AND TECHNOLOGY

Nimble and cost-effective, Unmanned Aerial Systems (UAS)/drones are a rapid deployment solution for gathering site data and monitoring construction activities. According to the Electric Power Research Institute, we can expect "a future where utilities use UAS in an automated way to support the next generation of inspections and assessments."

With the ability to perform commercial drone flights across the country, Federal Aviation Administration (FAA) Part 107 certified pilots can deliver safe operations and quality end results. Recently, the FAA published new rules under the Part 107 regulations that further pave the way for commercial UAS operators to provide even more value and greater efficiencies. As this technology becomes more widely available and user interfaces become easier, it is prudent that UAS services are supported by an experienced and qualified team to help ensure utilities receive professional deliverables, while preventing costly accidents.

As regulations evolve, drones can be used to collect many types of data. For the power industry, the focus is on three primary functions:

LiDAR

Over the past several years, the advancement of lighter and more powerful LiDAR sensors has made it one of the most popular technologies to use on drones. The technology is a go-to tool in areas of dense vegetation or above-ground obstructions, such as existing power lines, where very detailed information is required. The high-density, georeferenced points are excellent for providing teams with in-depth looks at existing features, vegetation management, clearance issues and infringement identification.

Inspection

Drones are increasingly being deployed for inspection services, most commonly to view existing infrastructure to ensure compliance with today's design and setback standards. Additionally, it is used to conduct day-to-day preventive maintenance and post-incidence quantification of damage.

The sensors deployed for this work may be a single RGB camera or multiple sensors combined to collect complex datasets in a single flight. High quality sensors and lenses are essential for inspection work. Utilizing this technology, teams can collect extremely detailed images and datasets from a safe distance, thus avoiding potentially unsafe situations.

Traditional Photogrammetry

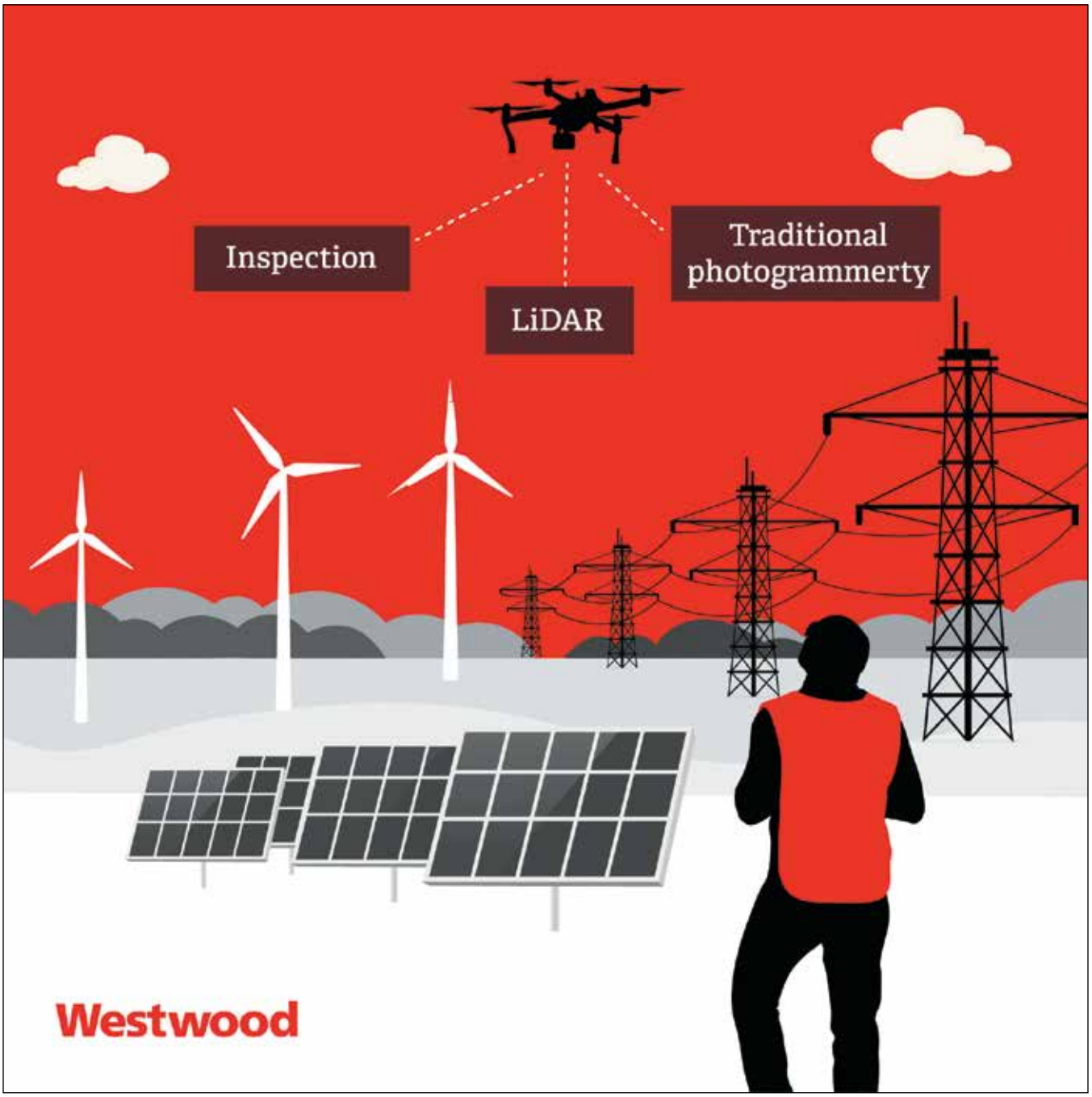
Traditional photogrammetry is used less often as a single solution due to the advancements in LiDAR technology; however, it still provides a great solution when project imagery is needed. Traditional orthomosaic imagery alone allows designers to assess multiple corridor options, study planned ROW access and adjust routes. The imagery is georeferenced, highly accurate and scalable, making it an excellent design tool.

DRONE-BASED SOLUTIONS SUPPORTING GRID MODERNIZATION

Grid developments and updates to support new energy sources will undoubtedly face environmental and design challenges. To get the job done in an efficient and safe manner, drones are an excellent option. Access challenges, tight schedules and potential safety risks are just a few reasons to look to the sky for a solution.

PRIORITIZE SAFETY

Utilizing drones has quickly become one of the safest, most efficient ways to gather project



data. By flying drones along transmission lines or in areas of heavy vegetation, injuries related to extreme heat or cold exposure, uneven terrain and fence crossings are reduced when compared with traditional inspection methods. Drones can eliminate the need for ground crew to climb up poles for inspections by flying and capturing imagery without ever leaving the ground. Additionally, at the onset of the COVID-19 pandemic when travel was restricted, local drone crews captured imagery that would have typically been gathered by large teams performing line walk downs or micrositing. Due to the success of drone crews during this time, the service is likely to continue well beyond the end of the pandemic.

ACCESS THE IMPOSSIBLE

Lengthy transmission lines with dense vegetation, limited land access and tight timelines are a few reasons to leverage drone technology. For example, if tasked with a 25-mile transmission line upgrade, utilities can delegate inspections from a ground crew to an aerial mapping specialist and eliminate the complications and time-consuming efforts of manual groundwork. In the end, utilities receive fast, reliable imagery for inspections.

Another common access issue is when a ground crew is faced with dense vegetation, high elevations, swamps, or above-ground obstructions. To combat the limited walking access to the land, drones can be flown in line of sight to streamline the inspections with a more accurate view of the location and existing infrastructure.

CRITICAL DESIGN DATA

Often, during the design process, the engineering team identifies the need for more detailed or more accurate design data. Drones are an effective tool to help teams gather time-critical data. Recently on a project in Texas, a design

team was tasked with upgrading eight miles of an existing public road that was critical to access the project substation. The public road was flanked by non-participating landowners that would not provide access to their property and initially could not be altered in any way. Conventional surveying would have been time consuming and limited by the non-participating parcels. The geospatial deployed a drone to collect site topography along with high definition aerial photography. The topography was used to engineer a detailed grading plan and the aerial photography was used to identify the location of fences, power poles, existing driveways, culverts and traffic signs.

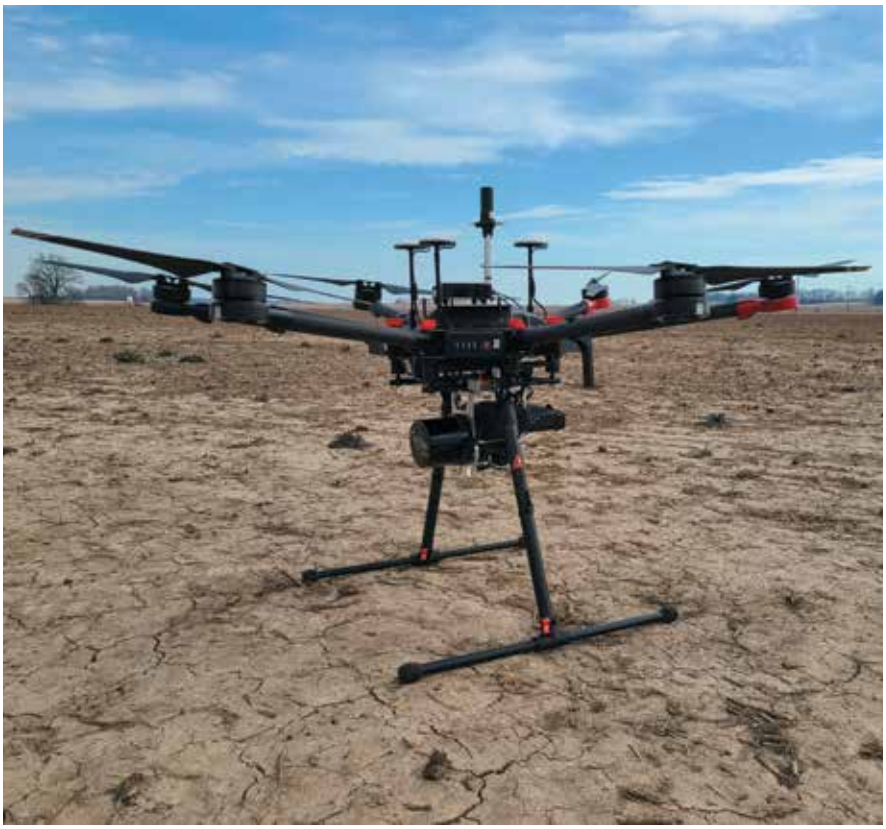
A Westwood project manager expressed, "Even with hurdles like bad weather delays and drone equipment being misplaced by the shipping company, they were still able to deliver on time. The final product was an exceptional topographical surface that we could use for design, and incredibly detailed aerial photography that defined existing features that would have been missed using the typical project data available." He continued, "In the end, we were able to identify areas where the design impacted non-participating parcels so the client was able to show them the impacts and work out agreements to perform the necessary work."

IMAGERY FOR PROGRESS AND CONSTRUCTION MONITORING

To provide confidence that a project is meeting all contractual requirements, geospatial data can support more in-depth monitoring with an enhanced geographic information systems (GIS) experience. With weeks, months and years of project data, today's developers leverage the latest advancements in GIS to support collaboration during all phases. By utilizing aerial footage in their GIS system, developers can view current interactive web map imagery of their project versus relying on Google Earth, which can have outdated imagery. With a current interactive web map, developers can watch the progress of their project with overlay maps to make sure all compliances are met. From site boundaries to silt fence lines, developers can use the data uploaded from the field to confirm disturbance limits are met and environmental barriers are present. At the end of the day, end users have access to 360-degree views of a project site, can zoom in and move around the construction zones, and see it in high resolution imagery.

WEATHERING THE STORM

Extreme weather events are becoming more common, leading to an increased need in evaluations after a storm to see how the grid held up. With aging infrastructure in a vulnerable state, the gathering of data becomes incredibly time sensitive and vital to the surrounding communities that depend on the electricity. Drones are increasingly being deployed to provide detailed damage surveys and help direct repair crews. Imagery can provide utilities with locational data of fallen trees, damaged power poles, floods bordering solar fields and ice coming off wind turbines—all in a matter of hours.



A NEW TOOL IN THE TOOL BELT

In addition to traditional GPS and total stations, today's surveyors are more frequently leveraging drone technology, especially in terms of creating traditional topography maps. Surveyors no longer depend on data collection only from the ground, now they can gather data with drones in areas that may have been difficult to access in the past, but were also too small to justify a manned aircraft.

This technology is incredibly advanced when creating topographic maps or collecting detailed data to support the creation of record drawings. It is done faster, safer and oftentimes with greater accuracy. LiDAR data and imagery can be used to capture existing infrastructure and is frequently integrated with onsite weather stations to record detailed information in short intervals to better understand how the environment and current loads impact the power line. Additionally, drone-based LiDAR coupled with detailed weather data can support hypothetical environmental situations for more exact design needs such as wind or ice loading. Engineers can visualize the effects of iced lines and develop plans with added resiliency. From the use of LiDAR for understanding the lay of the land, to detailed record drawings, engineers can perform their designs and analysis with greater confidence.

FLYING FORWARD WITH RELIABILITY

Geospatial data collected utilizing drone technology is often faster and more reliable than data captured using traditional means. To optimize future projects, involve the right professionals early to ensure the project specifications are met with the best technology from the start. Whether it is advanced LiDAR mapping or high definition imagery, aerial mapping can streamline the design of the most complex energy projects by providing full area access, maximizing efficiency, delivering results fast and keeping the workers safe. EE

Westwood Professional Services is preferred nationally for aerial mapping and LiDAR solutions.