



For years, unmanned aerial technology existed primarily for hobbyists to get outside and have fun. Today, Dynamic Remotely Operated Navigation Equipment can help government staff save time with applications ranging from monitoring wastewater treatment facilities to viewing the progression of construction projects. This change in usage all began when camera technology advanced and could be easily added to aircrafts. After simple-to-use image-processing software was developed to manage the photographs and produce video and topographic mapping products, the stage was set for a seemingly endless variety of cost-effective products and services.

A MULTITUDE OF USES

How exactly can DRONES be used? The short answer is “Wherever DRONE imagery and mapping-related products can add value.” Following are some examples.

- Inspection, observation, and progress monitoring of:
 - Equipment
 - Bridges
 - Turbines
 - Transformers
 - Towers
 - Dams
 - Building and road construction activities
 - Pipelines
 - Water treatment facilities
- Topographic contour and feature mapping for engineering site design
- Construction and volumetric determinations of earth and material stockpiles
- Orthophotography (which is accurately scaled digital photographs)
- Accident reconstruction
- Emergency management

The use of DRONE technology allows the observation and mapping of features at frequent intervals, providing documentation of the condition of a site, structure, or system over time. Proof of project progress may satisfy

the concerns of community members who can't otherwise see that work is consistently being completed. Photos can be shared on social media, the government unit's website, or distributed with public meeting agendas. Progress photos also aid staff managing these projects.

Having a portfolio of before and after documentation for projects is a great way for a community to demonstrate its, or its partners', hard work. Like progress photos, this can be helpful when conducting public relations. It can also be useful when seeking community, state, federal buy-in, and grant funding.

DRONE imagery can help prove or disprove pieces of information, such as a contractor's claim they couldn't complete the work on schedule because materials were not delivered on time. DRONE mapping can be used to efficiently determine the quantity of material a contractor has (or has not) moved at a project site. Material storage and staging areas at a site can usually be monitored using DRONES. Images and mapping can be shared with team members electronically for timely review, saving resources and money. All this work can be conducted without anyone having to physically visit the project area.

COSTS

Utilizing DRONE imagery can eliminate travel time for busy managers, such as checking the construction progress of non-motorized trails, water treatment facilities, road and bridge projects, or any site where a photo can provide useable information that allows the manager to see real-time conditions. In some cases, low-altitude aerial photography may be the only way to gather complete information. Hiring a company to provide images from a manned aircraft can be very expensive and funds for this approach are often limited to unique circumstances or large projects.

There is also a safety factor to be considered. The use of aerial imagery to complete inspections and make observations for a project site or structure often means a human does not have to make the inspections. Water tower, wind turbine, and bridge inspections are being conducted using DRONE-based imagery instead of putting people in harm's way. The photos (or videos) can also be reviewed by several key staff who may have an interest in the site conditions.

The old saying, "one must spend money to save money" applies to using DRONE technology. There is no simple explanation of the amount of money is needed to achieve time savings. A professional aerial photographic service provider familiar with both manned and unmanned systems will be able to provide the best answers regarding costs. To assist them with selecting the best system to complete the work, they may evaluate:

- The size and location of the project area
- The distance the site or sites are from a camera system
- The type of products and services needed
- The frequency of required services

Another important consideration in the use of DRONE technology involves the application of Federal Aviation Administration requirements. First, not anyone can conduct commercial DRONE services; only an FAA-licensed pilot with a remote pilot certification can perform this work. There are also restrictions on the use of DRONES in the controlled airspace surrounding large commercial airports. This does not mean DRONES are prohibited in these areas, just that the remote pilot will need to coordinate with the FAA and the local airport air traffic control personnel to execute projects in these areas.



Currently, MDOT has restrictions in place limiting the use of DRONE technology in road right of ways when working under contract with them. DRONE pilots will need to coordinate with the MDOT to determine the best practices for capturing images within the road right of ways while not actually flying within them.

THE LOGISTICS

Conducting aerial photography during generally clear and sunny weather is always preferred but is that more true for manned aircraft operations than DRONE operations? Manned aircrafts operate at elevations between 1,000 feet AGL to approximately 5,000 above ground level for the types of applications previously mentioned. There is a great potential for clouds and atmosphere to interfere with manned aircraft operations. The FAA restricts commercial DRONE flights to no more than 400 feet AGL. This allows DRONE photographic projects to be conducted so close to the ground that weather and sun conditions are not as restrictive. Another benefit of flying so low is that the image resolution of the photographs is very good. Generally speaking, each pixel in the image taken from a DRONE is about one-half inch to one-inch square. The detail in these images is amazing. The resolution from manned aerial camera systems is much less.

One system common in manned aircraft is LiDAR, which is an acronym for Light Detection and Ranging. LiDAR systems use sophisticated laser transmitters and receivers coupled with GPS and inertial measurement units to provide very precise terrain and object measurement. The use of LiDAR on DRONEs is increasing but is currently a very expensive option. If LiDAR services are required, a manned aircraft is probably going to be the most effective way of gathering this type of data.

The 21st century is a fantastic time to be able to see the world in a whole new way. Today's surveyors, engineers, managers, and decision-makers can now see their world from the comfort of their office, laptop, or handheld device in a way that was never possible before. How can the use of DRONE based imagery be of benefit? Look around, the opportunities are growing with each new project.

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