Business & Technology Strategies

# TechSurveillance

# Opportunities for Unmanned Aircraft Systems (UAS) Use by Electric Utilities

BY **CHARLIE TOMS** AND **JOE WARREN**, POWER SYSTEM ENGINEERING
MAY 2016

## ARTICLE SNAPSHOT:

***What has changed in the industry?***
With all the attention unmanned aircraft systems or drones are getting, it can be difficult to separate the hype and excitement of this new technology from the reality of regulations, applications, and equipment. All this attention has both helped and hurt the UAS industry. On one hand, the media spotlight has helped draw attention to potential applications and has helped raise awareness, but at least initially, media has tended to focus mainly on the risk of UASs being used inappropriately or even illegally. Despite this initial sense of unease, UASs are being adopted for use by businesses, and rules and regulations are in place to minimize the risk. There is even increasing coverage in the press about the legality of using unmanned aircraft and the process of becoming properly certified.

***What is the impact on electric cooperatives?***
With greater deployment of UASs will come greater acceptance by the public, and there are many reasons that the utility industry may want to get onboard. UAS technology has potential for significant benefits in cooperative operations and maintenance, to provide safer approaches to tasks currently done by cooperatives staff, and/or to augment visibility and information from current processes and procedures.

***What do cooperatives need to know or do about it?***
This article explains the technology, current and anticipated future features, and relevant Federal Aviation Administration (FAA) rules. Cooperatives should remain aware of the development in this technology area, for consideration of how it might provide benefits. For cooperatives planning utilization of UAS technology, this article can assist in providing insights for development of an effective business case. Co-ops will need to be aware of state and local laws restricting the use of unmanned aerial vehicles.



NRECA America's Electric Cooperatives

**When applying for exemption, it is important to know from which regulations you are seeking relief.**

## IS IT A DRONE, UAS, OR UAV?

Although the most commonly used term for these aircraft is "drones," the FAA uses several other terms, and it is important to be familiar with them. Some of these terms include:

- UA (unmanned aircraft)
- UAV (unmanned aerial vehicle)
- UAS (unmanned aircraft system). In this case, "system" encompasses the entirety of the aircraft, the ground-based controller, and the communications connection that connects the two.
- sUAS (small unmanned aircraft system). This category encompasses aircraft under 55 lbs.

For practical purposes, and for the purposes of this article, there is not a lot of difference between these many terms. To keep things simple, we will use the terms UA or UAS, with the understanding that we are referring to aircraft under 55 lbs.

## POTENTIAL APPLICATIONS

The idea of getting a bird's-eye view of distribution and transmission lines without deploying a crew is obviously attractive to utilities. The use of a UAS to inspect lines, poles, and towers, or to collect ground coverage data, can be safer and more cost effective in many cases than using traditional climbing methods. Plus, it can even replace some tasks currently done with costly fixed-wing or helicopter services, while supplementing and adding capabilities to on-foot or manual inspections.

But for now, you will not be able to guide a drone from your office desk. Current FAA conditions and limitations require that UASs fly only within the pilot's line of sight and usually under 200 feet in height. However, even within this restriction, the use of a UAS can save time and money on many tasks — as long as you understand the limitations and use this technology where it can be effective.

Here are some examples of things that are being done today in the U.S. using a two-person crew (one certified pilot and one observer) and a capable UAS. These lists are not meant to be all-inclusive. The lists represent the most common applications that utilities will use at first. Co-ops will find unique one-off applications that provide value for their unique needs.

### Power Plant

- Pipe & pipe hanger support inspection
- Survey grade mapping
- Inventory of solid fuels, such as coal piles
- Inspection of ash ponds and other water features
- Inspection of exterior structures, such as stacks
- Inspect area after a leak or other mechanical failure to determine if it is safe for personnel to approach

### Transmission Line:

- HD video inspection
- IR evaluation
- Vegetation assessment
- LIDAR data collection

### Distribution Line:

- HD video inspection
- IR evaluation
- Vegetation assessment

NOTE: ROW & privacy concerns; needs public education campaign

HD = High Definition
IR = Infrared
LIDAR = Light Detection and Ranging
ROW = Right-of-Way

Current lack of automated systems for scanning HD video requires real-time or in office video viewing, which can be time-consuming.

## HIGH-DEFINITION (HD) VIDEO

It is possible to record video or still images using high-definition cameras mounted in stabilized gimbals attached to the UAS. These stabilized cameras provide high quality images and video. In most cases, it is also possible to view what the UAS camera is seeing in real time through monitors on the ground. This is useful for the pilot, but can also be shared to others using monitors, laptops, or even tablets, so they can make live assessments or give feedback safely from the ground. This is often referred to as First Person View (FPV). Currently, there is a lack of automated systems that can scan video and bring any potential issues to the attention of an operator. Video must be viewed in either real time or afterwards in an office, and this can be time-consuming. Systems that can automatically identify anomalies are under development and would enhance the usefulness of video.

## FLIR

Another application that is gaining popularity as hardware technology advances is thermal imaging using FLIR (Forward Looking Infrared), which uses a thermographic camera that senses infrared radiation and can provide useful temperature based information. In our industry, one popular application for this is to spot splices or insulators with an excessive heat signature which could indicate a problem.

At this time, there are no real official categories or classes defining the aircrafts themselves, other than the common types.

## 2D IMAGING

Other applications — like vegetation encroachment and surveying — are being done using 2D aerial imagery to create accurate geo-spatial mapping solutions. In some cases, they can provide high resolution Digital Elevation Models (DEM), Digital Surface Models (DSM) and Orthomosaic images, which can be used to complete specific tasks. The data is collected by the unmanned aircraft using specialized cameras, and that data is then processed using tools that turn the images collected into "3D" type models that can be explored on the computer as if the viewer were onsite. One common example is to use this technology to look at trees along power lines to see if there are areas that need attention.

## LIDAR

UASs can also be used to collect LIDAR (Light Detection and Ranging) data to map the landscape. This is somewhat specialized however, and — although it requires a great deal of understanding with the LIDAR equipment, GPS positioning, and adapting this to the aircraft — it can be done, and the data obtained can be leveraged for a multitude of uses.

## AIRCRAFT AND AIRCRAFT CATEGORIES

At this time, there are no real official categories or classes defining the aircrafts themselves, other than the common types like fixed-wing, multi-copter, helicopter, and others. The only real distinction in the eyes of the FAA is the weight of the aircraft — whether it is under or over 55 lbs. Unmanned Aircraft flying under existing regulations, as well those proposed in the Small UAS Notice of Proposed Rulemaking (NPRM), are required to be under 55 lbs.

Generally speaking, the vast majority of UASs sold now could be considered consumer or hobby grade, like those you can purchase at your local hobby shop or online at retailers such as Amazon. Aircraft that would be considered commercial or utility grade are less common, but do exist. Aircraft like the Lockheed Martin Indago or the Aeryon SkyRanger, for example, are designed to withstand harsh environments and have the endurance needed for practical use in industrial environments. The avionics packages, auto pilot, sensors, motors, propellers, etc. in units like this are more advanced and durable than what is found in typical hobby-grade equipment, which provides better reliability and flight performance. The price of commercial products like these can range from $30k to $60k, whereas high-end hobby

or consumer-grade aircraft can range from $1k to $5k. This difference in price is significant, but may be justifiable when you consider performance, endurance, and the critical nature of some of the proposed missions. These are things a qualified consultant can work through with prospective operators.

**The difference in price of commercial UAS to hobby grade is significant, but may be justifiable considering performance, endurance, and the critical nature of some missions.**

As technology advances, the UAS market will continue to grow, and along with the explosion of hobby or consumer-grade products, we anticipate rapid growth in the commercial-grade aircraft market. We also believe the number of devices designed specifically to be carried by UASs, such as specialty cameras, infrared sensors, LIDAR, and other ground sensing instruments, will increase.

Hobby-grade craft are not normally appropriate for business applications. They can be useful in emergency situations. However, most lack the sophisticated guidance, control, safety systems, and durability to make them dependable.

## PHYSICAL OR TECHNICAL LIMITATIONS

With the typical consumer-grade or even commercial-grade aircraft, there are things to keep in mind that impact operations. The majority of unmanned aircraft used for aerial photography and inspection are electric and powered by battery packs of different types. This is mainly for ease of use and reliability, but has the added benefit of making them quieter for use at the lower altitudes required. The combination of smaller size and simplicity of battery operated systems make them easy to transport and launch. The downside of smaller aircraft is stability in the wind. And, the downside of electric aircraft is flight time. There have been significant improvements in flight times of electric aircraft as battery technology improves, but flight time is still an issue.

**In order for the abundant data from UAS application to be useful to operations or engineering, it must be stored, easily retrieved, and analyzed.**

One of the more common configurations used for aerial photography and inspection is the multi-rotor or “quad-copter” design. The average consumer-grade quad copter carrying a camera or similar payload can only fly for 10 to 20 minutes before needing to land to be charged or have a new battery installed. It is common for operators to start the day with multiple battery packs charged and ready to go, because charging in the field can sometimes be challenging. Many commercial-grade aircraft are designed with a focus on endurance and are capable of longer flight times; for example, the Lockheed Martin Indago and Aeryon SkyRanger can both fly for approximately 50 minutes before needing to land.

Several researchers and companies are looking at systems that will use power harvesting to fuel the utility UAS of the future. These systems could hang from transmission lines and recharge or find their way to a home base inside a substation. These systems are still on the drawing board.

## DATA CHALLENGES

The operation of UASs for inspection will produce a tremendous amount of data. In the case of a simple one pole inspection, a few frames of video or a small number of still photographs may be adequate. A maintenance inspection of a section of line will produce a large amount of video, still photographs, or possibly LIDAR data. In order to be useful to operations or engineering personnel, this data must be stored, easily retrieved, and analyzed. In the case of a large utility, this system is likely already in place, especially if a manned aerial inspection program is already in use. However, cooperatives and smaller utilities may not have the systems in place to support the large amounts of data that will be produced. One tip to help manage this issue is to take care when collecting the data. If the team shooting video or collecting data takes some time to properly label and store data as they work, it can save time and help make the data processing tasks go smoothly. What you want to avoid is long hours trying to watch, clip,

and organize large video or image files. In some cases, data management services can be contracted out, much like IT or IS, if needed.

## DEVELOP YOUR OWN UAS PROGRAM OR OUTSOURCE?

If there is interest in using UASs at your utility, you will need to determine whether to develop a UAS program in-house or to outsource the equipment and operators.

…care is needed to ensure regulations are adhered to, and conditions and limitations are clearly understood.

Because the process for commercially flying a UAS following current regulations is complex, care is needed to ensure regulations are adhered to, and conditions and limitations are clearly understood. Therefore, although our goal is not to discourage anyone from developing a UAS program, outsourcing clearly has its benefits. For example, a UAS pilot must hold, at a minimum, a current Sport Pilot Certificate, a visual observer must also be present at all times, and flights can only be conducted within line of sight of both the pilot and observer.

Another often overlooked issue is the location of the lines, towers, or other infrastructure you want to inspect in relation to private homes, businesses, and other structures. This is important because flying over lines or poles near highways, airports, or in towns may not be allowed based on current restrictions. Other factors like training pilots and performing maintenance and repairs on the aircraft themselves, as well as risks such as public perception and liability for accidents, can make outsourcing an attractive option for utilities.

Performing routine UAS operations in-house while outsourcing the performance of large projects may prove cost-effective for some co-ops.

For cooperatives looking into a UAS program, it may be wise to start by contracting out services to companies that specialize in UASs and are familiar with power utilities. This allows you to gauge the success and usefulness of the process and get a feel for what can realistically be accomplished. If you then decide to develop a UAS program within your organization, a consulting firm can help walk you through the FAA process for getting your own program up and running correctly.

One utility, Southern Company, was among the first utilities in the nation granted the section 333 exemption and is exploring the potential benefits of using UAS. Southern Company is actively investigating the costs and benefits associated with both outsourcing UAS operations as well as performing them in-house, and while the ultimate mix is hard to predict at this point, Southern Company believes there will likely be a place for both structures. For example, it may prove more cost-effective to outsource the performance of large projects while performing more routine UAS operations in-house. This could be done by a dedicated, centralized UAS group within Southern Company or by properly trained individuals in business units across the company. These options will be further evaluated as the UAS regulations are developed and mature. An initial subgroup within the operations group of the company may further diverge, with day-to-day maintenance and troubleshooting UAS equipment eventually being operated by trained line crew personnel, while larger patrol and inspection tasks may be handled by a centralized, dedicated UAS group. While Southern Company has a strong commitment to having an internal UAS program, this utility admits that they would almost certainly outsource some UAS operations. It is likely this model would also be scalable to address to the needs of cooperatives and smaller utilities.

We have found that developing an in-house UAS program is likely to appeal to larger utilities, especially those that currently have a corporate flight department operating conventional, manned aircraft for operations or personnel transport. These flight departments would have, at a minimum, commercial pilots familiar with airspace regulations and safety programs

required for safe flight operations, and their certifications as a pilot allows them to operate the UAS under the current FAA regulations. Certified aircraft maintenance personnel are often part of a corporate flight department as well, and these personnel can assist with maintenance and compliance with airworthiness regulations. In addition, these departments will have an overall familiarity with aviation record keeping, logs, and reporting, some of which is required according to the conditions and limitations in Section 333 exemptions that are granted. Southern Company is operating UASs under their section 333 exemption with cooperation from their corporate flight department pilots, as example.

**The major issue in the U.S. is how to integrate unmanned aircraft use into the National Airspace System (NAS).**

Since most cooperatives and smaller utilities are unlikely to be operating conventional manned aircraft today, they will want to be sure they fully understand the work involved in maintaining repair, incident, and maintenance logs for their unmanned aircraft, as well as recording and reporting all necessary flight logs. Much of this would be new to cooperatives and smaller utilities — so some may choose to outsource all UAS operations, at least until the new UAS operating requirements are in place and these things can be reevaluated.

**The most significant changes upcoming will be related to flying or operating limitations, and in pilot or operator certificates.**

## REGULATIONS AND OPERATOR REQUIREMENTS

The major issue in the U.S. is how to integrate unmanned aircraft use into the National Airspace System (NAS). The FAA knows it must address this issue and is getting increased pressure from all sides as the popularity of unmanned aircrafts grows. They have been working on new regulations, including a Small UAS Notice of Proposed Rulemaking (NPRM) and the recent creation of a task force to develop recommendations for a registration process for UASs.

In the next year or two, we should see changes in these regulations. Most of the significant changes will be related to flying or operating limitations, and in the pilot or operator certificates needed to fly. For example, the FAA may require the operator to pass an initial aeronautical knowledge test and then re-take the test every 24 months going forward, as well as obtain an unmanned aircraft operator certificate with a small UAS rating. This could replace the current requirement that the pilot of a UAS hold a minimum of a sport pilot certificate. This would mean training or testing programs would need to be developed.

We had a chance to sit down with Dr. Chris Johnson at the University of Wisconsin in Madison (UW) and discuss what this would mean. Dr. Johnson is the Director of Aviation Research and Education at UW. He holds FAA Commercial Pilot, Flight Instructor, Flight Instructor-Instrument, and Multi-Engine Instructor certificates, and he specializes in aviation safety, Human Factors and Ergonomics. We asked him what UAS-specific training might look like.

---

### Insights from Dr. Chris Johnson, University of Wisconsin

*I teach pilots how to fly manned aircraft, and much of the emphasis on manned flight training involves teaching the pilot-in-command about all of the systems that could break during flight, placing the pilot and passengers in danger and requiring the pilot to think quickly to find a safe alternate landing location while simultaneously trying to troubleshoot the malfunctioning system(s) to, hopefully, keep the aircraft in the air longer.*

*On the other hand, with drones, the risk to humans aboard the aircraft is eliminated, so much of that training becomes obsolete, and the remaining risk resides with nonparticipating*

*persons, vessels, and structures, which must be protected, albeit from a much smaller "thing" coming down from out of the sky.*

*However, drones by their very nature are flying data-collection tools, while manned aircraft are not necessarily so (some do collect data, but their primary utility is passenger transport), and that brings about the privacy concerns that we've read about so much in the news. The data-collection value proposition that made drones so popular also brings about a need to train drone operators about data integrity and security.*

**The data-collection value proposition that made drones so popular also brings about a need to train drone operators about data integrity and security.**

*– Dr. Chris Johnson, University of Wisconsin*

*Specifically, for commercial purposes, the point of flying a drone is to collect data that is relevant to the given use-case (e.g., collecting imagery of damaged property, crops, new construction, or infrared/thermal signatures of power lines and other utility resources). Therefore, commercial drone operators are going to need to be trained to collect quality data of only the elements of interest, while ignoring or, potentially through the use of technology, scrubbing extraneous data such as faces, license plates, house numbers, and street names.*

*I believe that the collection of quality data that is relevant to a given commercial use-case will be the responsibility of the operator who stands to gain commercially from the data, while the responsibility of ensuring that operators ignore/scrub irrelevant and potentially intrusive data will reside with government.*

*I can say for certain that a significant majority of the knowledge that is taught to a private pilot is unnecessary such as aerodynamics, weight and balance, performance, aircraft structure, mechanics and aircraft systems (e.g., how does a reciprocating engine work), aircraft instruments and avionics, navigation, weather theory, aeromedical factors, and aeronautical decision-making. State-awareness technology, such as GPS, inertial measurement units, LIDAR, and sonar sensors, have allowed engineers to build highly autonomous drones that require very little, if any, human input, so they are very easy to fly. Again, there will be no need for pilots to quickly diagnose and try to recover from a system failure, but if a UAS does fail, the pilot will need to execute evasive maneuvers to minimize damage to nonparticipants. Furthermore, the flight operations will be localized and much more autonomous, so much of the planning and navigation effort required to pilot a manned aircraft is removed from the operation of UAS.*

*However, UAS pilots will definitely need to know the structure and regulations pertaining to the national airspace system (NAS), and they will likely be tested biennially over the regulations that are bound to be highly dynamic for quite some time, as the FAA adapts their legal oversight to account for the safety and privacy-related concerns that will crop up over the next decade and beyond.*

---

The proposed changes would also impact where you can fly and how. The changes for aircraft between 4 lbs. and 55lbs look more appropriate for unmanned aircraft and contain more realistic restrictions for operating near people and property, etc. One change replaces the current "5 miles from any airport" rule and instead relates to each individual airport and its airspace class. Another potentially significant proposed change comes in the form of a new class of aircraft called microUAS. This class would be under 4 lbs. and would have fewer general restrictions. This would help address the issues of applying all unmanned aircraft rules to toys that fly.

Until new regulations are in place, you need to know how to navigate the current manned aircraft system for obtaining proper certifications and authorization to operate your UAS legally.

**How a UAS is used or what it is used for determines what FAA rules or guidelines you need to follow.**

How a UAS is used or what it is used for determines what FAA rules or guidelines you need to follow. The type of use also determines who can pilot the aircraft and where. The FAA currently has three types of UAS operations (see **Table 1**).

**TABLE 1: Types of FAA UAS operations**

| Category | Definition |
|---|---|
| Model Aircraft (Hobby or Recreation Only) | Model aircraft operations are for hobby or recreational purposes only. |
| Civil Operations (Non-Governmental) | Any operation that does not meet the statutory criteria for a public aircraft operation is considered a civil aircraft operation and must be conducted in accordance with all FAA regulations applicable to the operation. |
| Public Operations (Governmental) | FAA issues a Certificate of Waiver or Authorization (COA) that permits public (government) agencies and organizations to operate a particular aircraft, for a particular purpose, in a particular area. The FAA works with these organizations to develop conditions and limitations for UAS operations to ensure they do not jeopardize the safety of other aviation operations. |

**The FAA's website and their recent work with industry associations aim to alleviate common confusion around application rules, regulations, and certification.**

Each of these types has its own regulations and guidelines.

What often causes confusion is determining which operational type a particular usage falls under, what regulations apply, and how to obtain approval. To help with this, the FAA has updated their website and is partnering with several industry associations to promote an educational campaign called "Know Before You Fly." The updated website and "Know Before You Fly" campaign are designed to help people find the rules and regulations that apply to them and guide them through proper certification or authorization. The FAA has also developed a smartphone app called B4UFly, which is available for both Android and iPhone users that can be used to help make sure you are aware of airports or restrictions in an area before you fly.

**As soon as you use an unmanned aircraft for commercial or non-recreational use, it puts you into the Civil Operations, non-recreational operation type.**

FAA issues a Certificate of Waiver or Authorization (COA) that permits public (government) agencies and organizations to operate a particular aircraft, for a particular purpose, in a particular area. The FAA works with these organizations to develop conditions and limitations for UAS operations to ensure they do not jeopardize the safety of other aviation operations.

## WHAT FAA APPROVALS WILL I NEED?

For this discussion, we are going to focus on operating a UAS as part of a business or for commercial use. This is a very important distinction, because as soon as you use an unmanned aircraft for commercial or non-recreational use, it puts you into the Civil Operations, non-recreational operation type. For example, using a UAS to take photos for your personal use is recreational; using the same device to take photographs or videos for compensation or business use would be considered a non-recreational operation and now requires a certificated and registered aircraft, a licensed pilot, and operational approval from the FAA.

Requesting operational approval from the FAA to fly a UAS for non-recreational purposes can be done by completing the Section 333 Exemption process and obtaining a Certificate of Waiver or Authorization (COA), which is issued by the Air Traffic Organization to the operator for a specific UAS activity and will contain any provisions or limitations. It can also be done by obtaining a Special Airworthiness Certificate (SAC), but in most cases, utilities would be seeking the Section 333 exemption process and COA.

As of March 23, 2015, Section 333 grants of exemption are automatically issued with a "blanket" 200-foot nationwide COA with certain restrictions around airports, restricted airspace, and other densely populated areas. This recent change has greatly increased the number of approved exceptions and decreases the amount of time it takes to get approval. Details are available at: **http://www.faa.gov/news/updates/?newsId=82245.**

An operator who wants to operate outside the parameters of the blanket COA (for example, someone that wants to fly higher than 200ft) is eligible to apply for a separate COA specific to the airspace required for their operation. Applications for these COAs must be submitted through the UAS Civil COA Portal.

**Section 333 exemption process allows a person or company to petition for exemption or relief from regulations that are unrealistic or prohibitively costly to meet.**

## WHAT IS SECTION 333?

As described by the FAA:

> *Section 333 of the FAA Modernization and Reform Act of 2012 (FMRA)* grants the Secretary of Transportation the authority to determine whether an airworthiness certificate is required for a UAS to operate safely in the National Airspace System (NAS). This authority is being leveraged to grant case-by-case authorization for certain unmanned aircraft to perform commercial operations prior to the finalization of the Small UAS Rule, which will be the primary method for authorizing small UAS operations once it is complete.

It is unrealistic to expect a small unmanned aircraft operation to comply with many existing aviation regulations. The process known as the "Section 333 exemption process" allows a person or company to petition for exemption or relief from regulations that are unrealistic or prohibitively costly to meet.

## CERTIFICATE OF WAIVER OR AUTHORIZATION (COA) AND CONDITIONS THAT CAUSE LIMITATIONS

There are several conditions currently placed on UASs that significantly impact how they can be used in the real world. It is great to think of all the cool things these aircraft could do for us, but the reality is that the current regulations restrict some of what might be possible. Here are a few conditions taken from a recently granted COA and how these conditions affect things:

- *All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times.*

  This condition means there must be two people for each aircraft during flight. One is the Pilot in Command (PIC) and the other is the Visual Observer (VO) who is responsible for watching the surroundings and the aircrafts position related to obstructions, etc. Also, the aircraft must stay close enough that the pilot and observer can see it. This restricts the ability to do long range flights. For example, to do a visual inspection flight of a mile of distribution poles to record HD video images would take two people and you may have to stop, land, and relocate a few times. This makes the use of a UAS somewhat less efficient.

- *All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures.*

- *All operations shall be conducted over private or controlled-access property with permission from the property owner/controller or authorized representative before each flight.*

  These both impact where you can fly, because you need permission to fly within 500 feet of people, vehicles, or homes, and you need to get permission each time you fly.

- *The UAS may not operate within five nautical miles (5.75 miles) of an airport.*

  This also limits where you can fly.

- *PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate.*

  The obvious issue here is that there are not that many certificated pilots available within many organizations and of those available, not many have the skills needed to safely operate a UAS.

## PETITIONING FOR EXEMPTION

This process is outlined on the FAA website www.faa.gov/uas with specific links to guidelines and frequently asked questions, as well as helpful checklists. Take advantage of the checklists and examples they provide and prepare your petition, once it is complete it can be uploaded electronically or mailed to the U.S. Department of Transportation.

**When applying for exemption, it is important to know from which regulations you are seeking relief.**

This process can be time-consuming and does require knowledge of current aviation regulations. When applying for exemption, it is important to know from which regulations you are seeking relief. The good news is that, as of the day this was written, 2,518 petitions have been granted, and all of these are available online for review as examples.

**Choosing aircraft that have already been approved in other exemptions, and purchasing aircraft in the U.S., can speed up the process.**

## HELPFUL TIPS

It may be wise to start with a simple Section 333 exemption and accept the "blanket" COA limitations. This will speed up the process and allow you or your company to begin operations more quickly. The height restriction of the blanket COA is 200 feet, and that is usually more than enough to perform many of the tasks a typical utility may want to do.

The exemption needs to be written for specific aircraft. You can include multiple aircraft in the same exemption. It is recommended that you choose aircraft that have already been approved in other successful exemptions. This will speed up the process and avoid having to provide documentation and get approval for an unapproved aircraft. It may be smart to list several aircraft, including those you may wish to purchase in the near future.

The aircraft you use need to be registered as if they were full-size manned aircraft. However, there are details in the registration process specific to sUAS that must be followed. It is also recommended that the aircraft be purchased in the United States. Aircraft purchased outside the U.S. have to include proof that the aircraft has not already been registered in the country it is from, and this can be difficult to obtain. It is important to note that this is different than the process recently announced by the FAA for registering model aircraft. The recently announced process only applies to model aircraft flown for personal use under the Recreation or Hobby operations type. All aircraft flown commercially or under the Civil Operations type still need to follow the standard procedure for aircraft registration.

## CONCLUSION

Clearly, there is a lot to think about when implementing a UAS program at your utility, but the benefits of using unmanned aircraft means that UAS use will become more common, cost-effective, and user-friendly as time goes on. Remembering to take your program one step at a time (i.e., start small) and to closely watch the regulations as they evolve will help make your utility's UAS program more manageable. ■

## MINI REAL-WORLD CASE STUDIES

Several organizations shared an overview of their current use of Unmanned Aircraft or their plans to use them in the future. The mini case studies below give a glimpse into the up-and-coming world of UAS use at utilities.

Company: **KAMO Electric Cooperative, Inc.**

Type: Generation and Transmission (G&T), serving distribution cooperatives in northeast Oklahoma and southwest Missouri.

Scale: 1,996 miles of Transmission Line and 250 Transmission and Distribution Substations

Summary: At this time, KAMO feels their current method of flying and inspecting the lines by manned helicopter is still the best option. They feel they obtain sufficiently detailed data, so there is no immediate need to replace the current process, especially given the limits of what can be done with unmanned aircraft today due to FAA regulations. Currently, the manned helicopter operation can do visual inspection of around 100 miles of transmission line in a day, which is good deal more than is possible with a UAS under current FAA regulations. They do, however, feel there may be a business case around using UASs as part of their current foot patrol inspection of the lines, which takes place each year. They feel it may enhance the current process by allowing the crew to capture images, video, and infrared "thermal" images from angles other than from the ground. They feel the UAS could be a useful tool for a Lineman, but this would require a change in regulations because currently only certified pilots are allowed to operate unmanned aircraft in civil operations.

Company: **East Kentucky Power Cooperative (EKPC)**

Type: Generation and Transmission (G&T), serving distribution cooperatives located in Central and Eastern Kentucky.

Scale: 2,800 miles of Transmission Line and 4 major power plants

Summary: EKPC has done some investigation into the use of unmanned aircraft in their organization. With nearly 3,000 miles of transmission line in rural locations and large right of ways, they understand they would be good candidates for the use of UASs for inspection and other services. However at this time, they feel there is limited value due to current FAA regulations and limitations, and have decided to hold off on creating their own UAS program. This may change in the future depending on how the new FAA rules and regulations turn out, and as technology advances, more automation will become possible and the use of UASs may become more realistic.

*Continued*

## MINI REAL-WORLD CASE STUDIES (CONTINUED)

Company: **Southern Company**

Type: Electric Utility Holding Company — Alabama Power, Georgia Power, Gulf Power and Mississippi Power

Scale: 27,000 miles of transmission lines, 3,200 substations, 300,000 acres of right of way and approximately 76 power plants

Summary: Southern Company is currently operating a UAS research and development program, and plans to add additional aircraft in the near future. After completing the FAA section 333 exemption process, the company began to evaluate the use of UAS in different situations to understand where it could be best utilized, such as for assessing weather-related damage to power lines and for routine power line and infrastructure inspections. The company plans to experiment with using the UAS to fly several miles of line to gauge the cost and time implications compared to current manned aircraft flights, given the current UAS regulatory limitations. With current FAA regulations allowing UAS flights to only occur within line-of-sight of the operator, UAS currently seem best suited for what they call "local" operations; for example, the inspection of a single communications tower. Southern Company plans to continue testing UASs and is prepared for the upcoming changes in FAA regulations. They would like UAS to replace current manned aircraft operations in some cases, noting that safety, maintaining the integrity of infrastructure, increasing reliability, and reducing the duration of storm-related outages are strong drivers for this.

### About the Authors

**Charlie Toms**, Communications Consultant, Power System Engineering, Inc. Mr. Toms has 18 years of experience in the wireless industry performing technical planning, project management, system design, system performance evaluation, and deployment with a strong focus on special or complex projects. As a SME Communications Consultant at PSE, he performs a variety of specialized wireless and fiber communications tasks for utility clients. This professional experience, combined with 15 years of experience in the world of radio controlled aircraft, gives him a strong understanding of the growing utility movement toward unmanned aircraft (drones).

**Joe Warren**, Utility Communications Design Consultant, Power System Engineering, Inc. Mr. Warren earned an Associate degree in Electronic Engineering Technology from New Brunswick Community College at Moncton, New Brunswick. Joe has over thirty years of experience with wireless, wireline, and optical fiber communications systems. Joe is also an aviation enthusiast and holds both FAA and Transport Canada Private Pilot Certificates. His unique background has enabled him to propose innovative solutions utilizing his understanding of clients' challenges.

## Questions or Comments

- Brian Sloboda, Program and Product Line Manager, NRECA Business and Technology Strategies, Brian.Sloboda@nreca.coop
- Business and Technology Strategies **feedback line**.
- To find more *TechSurveillance* articles on business and technology issues for cooperatives, please visit our **website archive**.

**BUSINESS AND TECHNOLOGY STRATEGIES**
**TRANSMISSION AND DISTRIBUTION STRATEGIES WORK GROUP**

**The Transmission and Distribution Strategies Work Group**, part of NRECA's Business and Technology Strategies team, is focused on identifying opportunities and challenges associated with efficient, reliable electricity delivery by cooperatives to consumers. *TechSurveillance* research relevant to this work group looks at the various aspects of transmission and distribution grid infrastructure technology and standards. For more information about technology and business resources available to members through the Transmission and Distribution Strategies Work Group, please visit **www.cooperative.com**, and for the current portfolio of work by the Business and Technology Strategies department of NRECA, please see **www.nreca.coop/what-we-do/bts**.

## Legal Notice