

QUICKNOTES

Unmanned Aircraft Systems and Planning

The term *unmanned aircraft system* (UAS) refers to an unmanned aerial vehicle (UAV or “drone”), its remote controller, and (unless fully autonomous) its remote pilot. Because these systems can provide real-time visual or spatial information at a fraction of the cost of manned aircraft, a growing number of communities are exploring opportunities to integrate drones into their planning processes.

Background

Unmanned aircraft date back over a century. Samuel Pierpont Langley designed the first powered, heavier-than-air machine to attain sustained flight, the Langley Aerodrome No. 5, in 1896. The term *drone* comes from a pre-World War II U.S. naval officer inspired by the British biplane, the DH 82B “Queen Bee.” The widespread recreational and commercial use of drones followed the introduction of the Parrot AR Drone at the 2010 Commercial Electronics Show in Las Vegas. Less than a decade later, retailers sell millions of drones every year, with 500 commercial drones made for more than 400 professional applications. For city services, these uses include aerial reconnaissance, environmental assessment, construction monitoring, infrastructure inspection, mapping/surveying, and many others.

Drones come in all sizes and shapes. The most common types are *multicopters* with two or more propellers and *airplanes* with one or more propellers and wings. Multicopters have the advantages of hovering and maneuverability, making them ideal for site analysis. Meanwhile, airplane drones can cover wider ranges and sustain longer flights, making them better for mapping. The most common onboard equipment is a high-resolution camera capable of high-resolution photography and high-definition videography. Some drones include multispectral sensors such as forward-looking infrared (FLIR) for night and heat vision or Lidar for surveying and mapping. Most new commercial drones can be integrated with third-party software services for mapping and 3-D imaging. There are also numerous apps for remote pilots.

Drones are part of international efforts to develop and integrate artificial intelligence with aviation and robotics. They are part of the “Internet of Moving Things” (which includes driverless cars), an emerging component of Intelligent Transportation Systems, and an evolving feature of smart cities. Current technologies include 3-D imaging, autonomous flight modes and programming, GIS mapping, multispectral sensing (including forward-looking infrared and Lidar), obstacle avoidance, voice and physical commands, and new technologies on an ever-accelerating cycle of innovation.

Drone Regulation

The Federal Aviation Administration (FAA) claims sole responsibility for regulation of the National Airspace System. In 2016, the FAA issued rules governing small UAS (CFR 14 Part 107). These regulations define drone operations and safety requirements, such as maximum height (400 feet above ground level) and operating hours (daytime only). Currently, these regulations prevent more advanced drone applications that require flying at night or beyond visual line of sight, such as commercial delivery and emergency response. The most important consideration for all nonrecreational UAS operations is that the pilot *must* have an FAA remote pilot certification. Additionally, some states and local governments have adopted drone regulations specific to their interests, and remote pilots must respect these as well.

Beyond safety regulations, remote pilots must be aware of ethical and social considerations such as privacy, private property rights, and nuisance. Each of these issues is already regulated by state and

Image by Lars Nissen. Photoart on Pixabay



A quadcopter in flight.



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local laws, but some states have enacted legislation to address those of particular interest. In general, privacy is determined by considering “reasonable expectation.” For example, there is a reasonable expectation of privacy in a backyard or building interior, but not within the public right-of-way or other public space. Property rights do not extend indefinitely up within the property boundaries, but are often defined as “the immediate reaches of the enveloping atmosphere.” Drones may create a visual or auditory nuisance, and existing nuisance laws are applicable. It is largely for this reason that drones are prohibited in all national parks.

Drones Provide Perspective

Drones provide a unique aerial perspective for studying sites and development. Aerial photography depicts the geospatial relationships in land use that are critical for improved planning and design. Unlike high-altitude orthographic photos, low-altitude, oblique photos require little advance preparation and are easy to evaluate. These photos can also be layered with other data and photo-simulations to show various development scenarios. Aerial videography adds the dimension of time and motion, and can be a compelling visual aid. Multispectral sensors such as FLIR provide even more information such as identifying building heat loss or vegetation health.

Drones Show Relationships

GIS are key to creating smart cities, and drones provide the ideal platform for capturing timely and accurate mapping data. Programmed flight paths ensure comprehensive site coverage enabling not only accurate mapping but the ability to create 3-D models, project measurement, and quantities estimates. Although an airplane drone is the ideal mapping tool for large sites, a multicopter drone can accomplish the same task with multiple flights. Almost all commercial-grade drones have the ability to be used for mapping in conjunction with companies that manage the extremely large data files for analysis, 3-D imagery, and mapping.

Drones Save Lives

There are drone applications throughout all disaster response, mitigation, and recovery phases: identifying environmental and infrastructure risks, helping develop mitigation plans, conducting emergency response, and coordinating recovery. The increasing number and severity of disasters such as hurricanes, floods, and wildfires amplifies the potential importance of drone applications for pre- and post-disaster planning.

Conclusions

For many communities, there is an awareness of the value of drones, but insufficient information to move forward. Rather than relying on individual staff members to invest time and money to become proficient in drones, cities, counties, and regional agencies can integrate UAS into their current municipal programs. This may start by identifying relevant drone applications and developing a plan to integrate these with other services or activities.

There are new advances in UAS on a seemingly daily basis. As drones become more specialized, flexible, and programmable, uses will emerge that are not imaginable today. For planning, UAS technology will introduce sophisticated applications for code enforcement, physical planning, policy analysis, project management, urban design, citizen engagement, and others to come.

PAS QuickNotes (ISSN 2169-1940) is a publication of the American Planning Association's Planning Advisory Service (PAS). Visit PAS online at planning.org/pas to find out how PAS can work for you. Joel Albizo, FASAE, CAE, Chief Executive Officer; David Rouse, FAICP, Managing Director of Research and Advisory Services; David Morley, AICP, Editor. © 2019 American Planning Association, which has offices at 205 N. Michigan Ave., Suite 1200, Chicago, IL 60601-5927, and 1030 15th St., NW, Suite 750 West, Washington, DC 20005-1503; planning.org. All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means without permission in writing from APA.

FURTHER READING

Published by the American Planning Association

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Merriam, Dwight. 2017. “Your Launch Pad for Drone Regulations.” *The Commissioner*, June. Available at planning.org/planning/2017/jun/thecommissioner.

Other Resources

Federal Aviation Administration. 2018. “Unmanned Aircraft Systems.” Available at faa.gov/uas.

Stephens, Ric. 2014. *Drone Dictionary*. Available at aviationplanning.design.blog/unmanned-aircraft-systems.