

## ASK THE SPECIALIST

# What Are the Main Issues to Consider before Using UAVs for Land Administration Projects?



For our 'Ask the Specialist' features, we invite readers to send us their burning questions about geospatial surveying. We pass the questions on to relevant industry experts who provide comprehensive and detailed answers to point geospatial professionals in the right direction. This time, one of our readers asked about the

key considerations before using unmanned aerial vehicles (UAVs) for land administration projects. Rohan Bennett and Mila Koeva share their advice.

The almost ubiquitous UAV has been a key technology inspiring new thinking and disrupting land administration practice over the last decade. The flexibility and affordability of UAVs make them an efficient bridge between more expensive and time-consuming (but highly accurate) field surveys, and classical aerial or satellite photogrammetry. UAVs deliver tailored orthoimages from which spatial data – including visible parcel boundaries, building outlines and coordinates – can be derived. Many geospatial technology companies now offer high-tech UAV-based solutions, and many

new hardware and software providers have also entered the market. Thanks to falling prices of UAVs, many land surveyors are now either experimenting with UAVs or already using them on a daily basis. So, what are the key questions that need answering before deciding to adopt a UAV in your next land administration project?

### Local laws and regulations

First up, knowledge of local laws and regulations is crucial. There are two different sets of laws to consider: i) laws relating to cadastral surveying, and ii) laws relating to the use of UAVs. Surveyors already know the first set well. Those laws are long standing and tell us, amongst other things, what needs to be surveyed, who can do the surveying, what the data quality and procedural requirements are, what features can be used to demarcate boundaries, and the legal status of the cadastral plans and maps. If the local laws allow the use of physical boundaries that are visible in imagery, then UAVs can be a solution. Likewise, if the laws are not prescriptive about the surveying tools and methods, or are performance based, then UAVs remain an option.

Many land surveyors are already using UAVs on a daily basis.

Meanwhile, laws relating to the use of UAVs, both for hobby and professional users, have been developing rapidly. A key

challenge in developing regulations is finding the right balance between the demands of different actors. Government institutions and regulatory bodies, even though often supportive of technical advancement, are aimed at ensuring public safety and security. The R&D sector strives for innovation. Commercial companies aim to sell products. Surveyors from any of these sectors wishing to use UAVs therefore need to be acutely aware of, and keep up to date with, local UAV regulations, and also be aware of the local actors and administering authorities (e.g. civil aviation authorities). Where there are country-wide legal bans on UAV flights, surveys might be impossible in the short term. Other contexts will require permission on a case-by-case basis, as authorities take into account the local situation. More mature contexts will call for the registration and identification of UAVs, and licensing of pilots (and/or of the operating organization). Careful preparation of flight planning will be needed. This will also include ensuring the proper selection of the flying height, image overlap issues, and the necessary ground sampling distance. The more mature approaches make it easier for surveyors to plan and complete flights, and also support more accurate results.

## Project characteristics

Secondly, the land administration project characteristics need to be assessed against the capabilities of UAVs. Like all other surveying tools, UAVs will be highly suited to some applications, but not all. If the project scale is national or regional, then satellite imagery or conventional aerial imagery will probably be more appropriate. If the work involves only a few parcels and demands high accuracy, then ground-based survey methods, using GNSS, are likely still a great option. Fixed-wing UAVs are highly suited to community, village, corridor or even municipality-scale mapping tasks. They are increasingly becoming like conventional aircraft; they can perform longer flights, but still require basic motion for their aerial mission and wider space for take-off and landing. Rotary-blade UAVs are generally suitable for smaller, more complex areas, having the ability to remain stationary in the air, and are therefore great for 3D modelling of cadastral volumes, buildings and infrastructure. Either way, UAVs are likely the quickest way to obtain near-real-time imagery at a low cost and the desired quality. If these characteristics are inherent and important in the project, UAVs might be the way to go. UAV technologies are always advancing – flying parameters and duration, sensor characteristics and positioning approaches are always improving – so keep an eye on that too.

UAVs enable mapping professionals to produce high-accuracy cadastral maps quickly and easily.

## Financing, partnerships and capacity

Thirdly, if UAVs still seem promising at this point, it's time to move on to concerns about financing, partnerships and staff capacity. UAV solutions vary greatly in price; surveyors should therefore decide which options are optimally 'fit for purpose' – both for the job at hand and future jobs. UAV insurance and training costs also deserve consideration. And it is worth thinking about whether the UAV work should actually be done in-house at all. Could you form partnerships or reach outsourcing arrangements with specialist UAV companies instead? If an in-house capacity is needed, who will be trained and how will the upskilling occur? Many surveying and geodesy education providers already offer UAV training courses.

### Further Reading

Koeva, M., Stöcker, C., Crommelinck, S., Ho, S., Chipofya, M., Sahib, J., & Cromptvoets, J. et al (2020). Innovative Remote Sensing Methodologies for Kenyan Land Tenure Mapping. *Remote Sensing*, 12(2), 273.

Stöcker, C., Bennett, R., Nex, F., Gerke, M., & Zevenbergen, J. (2017). Review of the current state of UAV regulations. *Remote sensing*, 9(5), 459.

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<https://www.gim-international.com/content/article/what-are-the-main-issues-to-consider-before-using-uavs-for-land-administration-projects>

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