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Security Bulletin: Business risks posed by drones

Version 1 Published 2018

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1 Introduction

This briefing note is on the subject of drones (in this context, drones that fly, aka UAVs-unmanned aerial vehicles) – a topic widely discussed in the media and familiar to the public. Sales of these unmanned, remotely piloted aircraft are growing exponentially throughout the world. The risk of a drone coming into contact with the physical assets and/or personnel of a business, or other enterprise, grows by the day. For the majority of policyholders, risk of contact with a drone remains fairly remote at the present time but it seems likely that when an incident does occur, its business impact could well be more far reaching than the management had imagined.

The majority of drones in the air over the UK are inexpensive and being flown for recreational purposes. It may be argued that some are little more than toys, although in careless, reckless or malicious hands they are capable – irrespective of their size, weight and performance – of inflicting damage and injury, as well as causing anxiety.

However, for balance, it must be recorded that the positive uses of drones are very significant and have considerable economic and social benefits. Examples include:

- monitoring crop and weed development
- pipe and powerline inspection
- delivery of medicines to remote peoples in the third world

Some drone operations are of particular interest and possible application in the realm of insurance:

- fire fighting: eg directing hose streams to seats of fire concealed from firefighters operating at ground level
- policing: eg police helicopter tasks
- directing rescue operations, monitoring major incidents
- security: eg perimeter patrol of large sites
- inspection: eg building condition, solar panels, thermographic survey, roof surveys, rainwater gutter checks
- risk assessment: eg large or awkward building surveys (eg extensive greenhouses)
- claims: eg major incidents, area affected, damage assessment, cause/liability determination etc

The principal objective of this paper is nevertheless to examine the risks from drones that face commercial policyholders, particularly damage to property, loss of privacy, business continuity and the safety and morale of personnel on insured premises.

2 What are we up against?

These products come in a very wide range of sizes and designs for different markets. Viewed in terms of market segments, drones divide between the consumer and commercial markets.

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Consumer (recreational) drones

The drone flights of which the community at large is most aware are made by consumer or recreational drones costing between £100 and something over £1000. These generally weigh 1 to 5kg , have a battery life of 15 to 30 minutes, speeds of around 60kph, payload of 0.2kg to 0.5kg, and a theoretical range of 1 to 10km. Except for more exotic drones for specialist or military applications, electric motors are the motive power of choice for these products at present, so the drone itself presents no liquid fuel risk. Those in the sub-£250 division are little more than toys or aerial cameras. A myriad of manufacturers compete in the consumer segment, with one Chinese based manufacturer (DJI) having the lion's share of the market.

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Piloting a drone using VR goggles conflicts with the legal requirement to keep the drone in sight

Some drones can be controlled over a limited range by a smart phone app via mobile WiFi or Bluetooth, but control is easier using a separate control unit communicating via one of a number of radio frequencies with a maximum range in principle of up to 7km. The more expensive drones navigate using GPS and have sophisticated stabilisation, allowing them to be flown safely and accurately with minimal effort. They may have 'obstacle avoidance', a return-to-home feature or a 'follow me' feature, and those that are capable of autonomous control allow the user to program a flight plan, which the drone executes without operator intervention to within 1m accuracy. However, if as a result the user would not be able to keep the drone in sight and/or would not be in continuous control, an offence is committed. Similarly, the flying of a drone using VR goggles which provide 'first person view' – a real-time video stream with a drone's eye view – would also be in contravention of the requirement to maintain visual contact.

The majority of drones are fitted with a camera of some sort, typically a 4K still/video camera, often mounted on a rotating gimbal that keeps the image stable regardless of movement. This means that for all practical purposes, users of recreational drones should be observing not only the exacting CAA regulations for staying a safe distance from persons (see appendix) but also the CCTV Code of Practice. Note that the user of a recreational drone is not required at present to have liability insurance. Any cover they do have, eg under a household policy, may be limited.

Commercial drones

Most drones are quadcopters, but those used for commercial and professional purposes might be dualcopters, tricopters, hexacopters, septacopters, octocopters or even fixed wing. For simple inspection tasks a high specification recreational model can be used in a commercial application. A more specialist and demanding task might call for one of the models designed for the commercial market, which tend to be a little bigger, heavier, have a longer range, a higher ceiling, a higher payload capacity, longer flight/control range, are more versatile and, of course, more expensive. All drones flown for commercial purposes are required to have insurance.

3 What risks can be envisaged?

- property damage
- personal injury (including assault)
- panic/hysteria
- disruption
- espionage
- provocation/intimidation/extortion/blackmail
- stalking
- snooping/spying/voyeurism
- intrusive journalism
- antisocial behaviour
- political demonstration/agitation
- unwanted publicity

Some of these posited risks – those flowing from premeditated acts – might be viewed as fanciful, but with ever widening drone ownership and the likelihood of high profile exploits being mimicked, certain incidents already on record suggest the risks should be taken seriously. For example:

- a drone landed on the White House lawn, and drone flying in Washington DC is now banned
- a drone carrying radioactive material was flown onto the roof of the Japanese Prime Minister's office

- drones have been fitted with flame throwers for the legitimate purpose of burning rubbish off power lines, and at least one hobbyist has attached an operational firearm to a drone
- the Game of Thrones film set was buzzed by drone users, to obtain footage of forthcoming episodes to post on YouTube (one of many such incidents)
- an Airbus approaching Heathrow was struck by a drone at 1,700 feet, and there have been numerous near misses, with Gatwick Airport having to be closed on one occasion
- there have been a number of flights over French nuclear reactors
- a drone flew over a herd of 1,500 elk causing them to stampede

In the US drones have struck and injured guests at a wedding, a performer at a concert and a Gay Pride parade participant as well as incidents of drones crashing in public spaces too numerous to list, including public events, playgrounds, apartment developments etc, resulting in convictions for reckless endangerment.

So far at least, reported incidents – with a few exceptions – do not seem to stem from malicious intent. However, it must be a concern that the drone may well come to be seen as an effective weapon by criminals and terrorists. For example, no harm was done when pranksters dropped water balloons on competitors at a high school sports event, but the hysteria that would be generated in a crowd led to believe that drone(s) hovering overhead conveyed acid balloons or nerve agent can be imagined. The incident in December 2017, when shoppers in Oxford Street London were panicked by Twitter reports that there was an active shooter on the street, give credence to this.

The use of the drone as a terrorist weapon is being taken very seriously by the security services. It was reported that during the battle for Mosul ISIS flew over 300 drone missions, some of which were designed to deliver lethal payloads (IEDs). The vehicles were commercially available drones or adaptations, not military weapons. In April 2018 it was reported in the press that ISIS had posted on the internet that they would use drones to 'bomb' World Cup matches in Russia, and there were photographs of improvised drones carrying explosives. In 1991 the IRA launched homemade mortar shells at 10 Downing Street from a van parked 200m away, in an attempt to assassinate Prime Minister John Major and the Cabinet. These days such terrorists would have the option of a weaponised drone. A common speculation is that a swarm of drones could be used by terrorists to bring down civil aircraft. In 2016 US President Barrack Obama, perhaps unwisely, publicly commented that terrorists could use drones to spread highly radioactive material over a civilian area.

Despite these doomsday scenarios, one reported survey suggested that security managers are most concerned about privacy. Drone manufacturers have not seen a need to be overly concerned with cyber security. The video data captured by a drone camera is not normally encrypted, neither is the radio channel beaming data to the ground. This absence of cyber security also allows a hacker to take control of a drone without the user's knowledge.

4 Regulation

The regulations as they stand are exacting, challenging to enforce and probably misunderstood to one degree or another. They mainly seek to reduce the risk to persons and aircraft and prevent illegitimate breach of privacy (see appendix for details).

The UK is an active and influential participant in a revision of the European legislation which will clarify and tighten controls as well as simplify things by removing the inconsistent treatment of drones in different weight categories and introducing innovations such as e-identification. The UK will probably align itself with the new European rules, whatever the outcome of 'Brexit'.

Meanwhile the government is preparing to introduce legislation requiring recreational operator registration and competence testing. They have announced that they are also minded to technically restrict all drones from flying above 400ft and within the proximity of an airport. This will involve the mandated incorporation into drones of geo-fence technology, this being a virtual geographic boundary that prevents a drone from entering a defined zone. Announcements are expected as this briefing note is published.

5 Who is at risk?

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The risk from drones depends on the drone pilot's motivations and the sensitivity of the location

The behaviours and motivations of users who put property and persons at risk will be very varied: pranksters, exhibitionists, thrill-seekers, vandals, agitators, criminals, terrorists, industrial spies etc.

The degree to which an enterprise, organisation or other entity might be selected, and/or be damaged by the action of, a reckless or malevolent drone operator tends to hinge on the type of activity at the location. A widget manufacturer unlucky enough to be buzzed by a drone may represent no more than a nuisance factor, but the attentions of a drone operator at locations such as one of the following may have more serious consequences:

- critical national infrastructure
- controversial sites – animal welfare group targets etc
- commercially sensitive operations
- sites with military links
- iconic buildings
- ports, airports, airfields
- sites of industrial disputes
- event venues – sports, concerts, weddings etc
- filming locations
- political targets, embassies etc
- VIP presence

6 What practical countermeasures are available?

None that are legal or without a potential liability exposure, except possibly for the military and civil authorities who, in some situations, may have the option of jamming drone control signals. With current legislation, anyone can buy a drone and immediately operate it for recreational purposes without any training or other formality. Occupiers do not own, or have any rights over, the airspace above their location. Jamming is not a legal possibility for an owner or occupier of civilian premises. Leaving aside the legalities, the liabilities that might arise if control of a flying drone was taken over by someone capable of overriding the user's control can only be imagined.

Until the new legislation is introduced, the drone need not be registered and the user need not have undergone a drone safety/privacy awareness test. Pending a reliable test, the average user's grasp of the complicated rules must surely be in doubt!

However, if and when the new legislation comes in, the police might be allowed to demand registration documents, confiscate equipment if an offence is suspected and even take control of a flying drone. An app to assist a drone user fly safely, avoiding sectors within range wherein a drone could create a hazard, and causing the drone to be visible to other flyers and the authorities is already available.

There is proven technology for drone firmware to be designed to prevent flying in predetermined no-fly zones demarcated by GPS coordinates, and to exclude the drone from flying in, or taking off from, a zone bounded by a geo-fence field. However, whilst some leading manufacturers have incorporated no-fly zones and a geo-fence capability in their designs, they are doing so voluntarily at present.

Without waiting for new legislation, it is assumed that an occupier would already be entitled to request police intervention if there was a drone close to the premises, and the person apparently in control was in sight. Indeed, the Civil Aviation Authority (CAA) suggests that occupiers concerned about drones in their area should contact their local police on 101.

There are products available that claim to be able to raise an alarm when drone control signals are detected nearby but, given the radio noise prevalent in a built-up environment, the results are thought to be unreliable. Operators of airfields cannot rely on conventional radar as the targets are so small, but special radars are available for operators looking for the best chance of having some warning of drone approach. There are all sorts of possibilities for neutralising drones apart from jamming the control and GPS signals – devices that capture a drone in a net, 'good' drones that capture 'bad' drones, birds of prey etc. However, legal advice is that in this country interfering with and damaging a drone might expose the perpetrator to a charge of criminal damage.

7 Where does this leave enterprises that could be at risk from drone users?

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Even assuming the new legislation is introduced this year, the stated position of the government is that the UK should embrace and encourage drones for the benefit of those sectors in the drone business, notwithstanding that officials recognise that there will be those in the community wishing to use drones to cause harm. There must be some doubt that such ill intentioned people will be deterred by what the government has proposed so far.

In reality, with meagre legal and practical remedies available, the options for those who could be at risk from drones seem limited to:

- making a point of bringing in the police whenever a drone is close, and thus representing a danger to buildings or persons in contravention of aviation law
- heightening the awareness of personnel to the possibility of drone flights that may be controlled by a user within clear view, so that the police can be notified of the pilot's actual location and intervene more effectively
- reviewing whether there are assets or activities at the location, such as items stored in areas previously thought to be out of sight (eg in rear yards or on roof tops), that the enterprise would not wish to have exposed to espionage or sabotage by a drone, and taking suitable action to provide the necessary cover, camouflage or other protection
- for those enterprises with a high profile, sensitive or controversial role in the community, revisiting its 'public face' to review whether the public availability of its location and activities (eg website) would be better concealed or modified

Appendix: Regulation

Before looking at regulation it is worth noting that the advice available for good/safe drone operation, including that of official bodies such as the Civil Aviation Authority (CAA), is not rigidly matched by today's actual national legislation – some elements of the guidance amount to exhortation as opposed to enforceable requirements.

At the present time, when it comes to hard and fast regulations as opposed to recommended practice, drones weighing less than 150kg are subject to UK aviation regulation, in particular the Air Navigation Order 2016, and the following apply:

Machines with a maximum take-off mass (MTOM) of less than 20 kg:

In summary, the restrictions on recreational use are:

- the drone must be flown in a safe manner
- the drone must be kept in direct sight to ensure that it does not collide with anything, eg other aircraft (in practice, this means that the drone should not fly further away than 500m)
- the drone must not be allowed to endanger persons or property
- nothing must be dropped from the drone

Additional rules apply:

1. If the drone has a mass of more than 7kg; it must not fly in restricted airspace such as around airfields and or higher than 400ft
2. If the drone is fitted with a surveillance device such as a camera (the majority are); the operator must observe the guidelines for drones in the CCTV Code of Practice published by the Information Commissioner's Office (ICO), and must not fly:
    - over or within 150 metres of any congested area
    - over or within 150 metres of an organised open-air assembly of more than 1,000 persons
    - within 50 metres of any vessel, vehicle or structure
    - within 50 metres or, during take-off or landing, within 30 metres, of any person other than the person in charge of the drone

Commercial applications

Operators of drones used for commercial purposes must comply with the above, satisfy the CAA that they are competent and describe the commercial operations involved in order to obtain the CAA's express permission.

Machines with a maximum take-off mass (MTOM) of more than 20 kg: these require airworthiness approval and there are restrictions on where they can be flown.

Machines that have a maximum take-off mass (MTOM) of 150kg or more: these are governed by the European rules of the European Union Aviation Safety Agency (EASA). At this weight, these are very 'serious' machines, possibly fixed wing and for a market outside the leisure or typical commercial user sector. Stringent requirements, akin to those for piloted aircraft, apply.

RISCAuthority

administered by FPA Fire Protection Association

Fire Protection Association
London Road
Moreton in Marsh
Gloucestershire GL56 0RH
Tel: +44 (0)1608 812500
Email: info@riscauthority.co.uk
Website: www.riscauthority.co.uk