



# Drones

## *Potential Use of Drone's in Property Risk Consulting*

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# Drones

## Potential Use of Drone's in Property Risk Consulting

### Summary of Findings

Use of drones or unmanned aircraft systems (UAS) is increasing as the technology keeps evolving.

A drone at the present time cannot replace a Property Risk Consultant in undertaking pre-loss property insurance surveys; however, there are some areas where they can provide some assistance. This paper has examined some of the potential uses and practical implications of using drones.

The following potential uses of drones within property risk consulting have been identified in this paper:

- Roof guttering inspections
- Photovoltaic (PV) panel inspections
- External security and yard storage inspections
- Wall and roof inspections

Drones are a fascinating piece of technology and in the future as the technology advances even further the number of potential uses within pre-loss property insurance surveys will increase; however they will need to be assessed on a case-by-case basis.

## *1. Introduction*

This paper examines through **the 'eyes' of a Property Risk Consultant** areas where a drone could assist them in undertaking property risk surveys (services typically undertaken by a property risk surveyor/consultant). It should be noted that a property risk consultant would typically be involved in surveying 'pre-loss'.

This comparison/analysis has been examined in 3 key stages of the property survey process:

1. Prior to the Survey – arranging the survey and informing a client of what the survey will involve.
2. During the Survey – gathering property risk information through inspection and interaction with the client.
3. After the Survey – Editing findings into a user friendly format for the client (and any other key stakeholders such as underwriter, broker, follow markets etc.)

This paper is primarily looking at pre-loss property insurance surveys of commercial/industrial properties; surveys undertaken by energy consultants on pipelines, claims adjusters/assessors after a loss etc. have not been examined in detail however their uses in these industries/applications has been stated in Chapter 3 - Drone Applications and Uses.



## 2. What is a Drone?

An unmanned aerial vehicle (UAV), commonly known as a drone is an aircraft without a human pilot aboard. UAVs are a component of an unmanned aircraft system (UAS); which include a UAV, a ground-based controller, and a system of communications between the two.

In the US the Federal Aviation Administration (FAA) estimates the combined total hobbyist and commercial UAS sales are expected to rise from 2.5 million in 2016 to 7 million in 2020 (data is according to the FAA Aerospace Forecast FY2016-2036)<sup>1</sup>.

Type	2016 (Sales in million)	2020 (Projected Sales in million)
Hobbyist UAS purchases	1.9	4.3
Commercial UAS purposes	0.6	2.7
<b>Total</b>	<b>2.5</b>	<b>7.0</b>

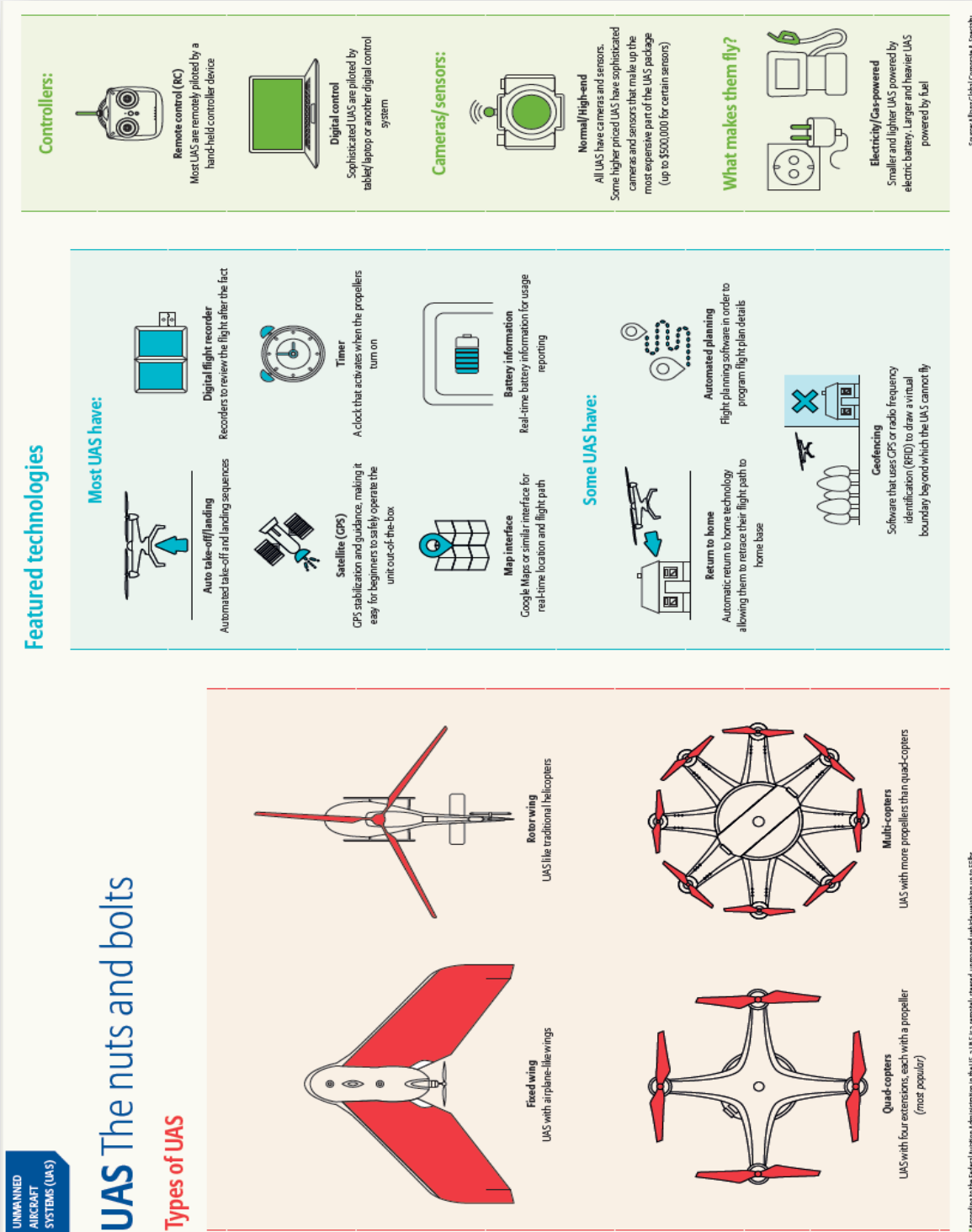
Drones are increasing dramatically due to their use in various different applications/tasks; hence it is important that one understands how they work, their typical applications and then be able to assess their potential use in assisting with pre-loss property risk surveys.

A typical unmanned aircraft is made of light composite materials to reduce weight and increase maneuverability. Drones are equipped with different state of the art technology such as infra-red cameras (military UAV), GPS and laser (military UAV). Drones can be controlled by a remote control system or a ground cockpit.

<sup>1</sup> FAA Aerospace Forecast Report Fiscal Years 2016 to 2036 (<https://www.faa.gov/news/updates/?newsId=85227> )



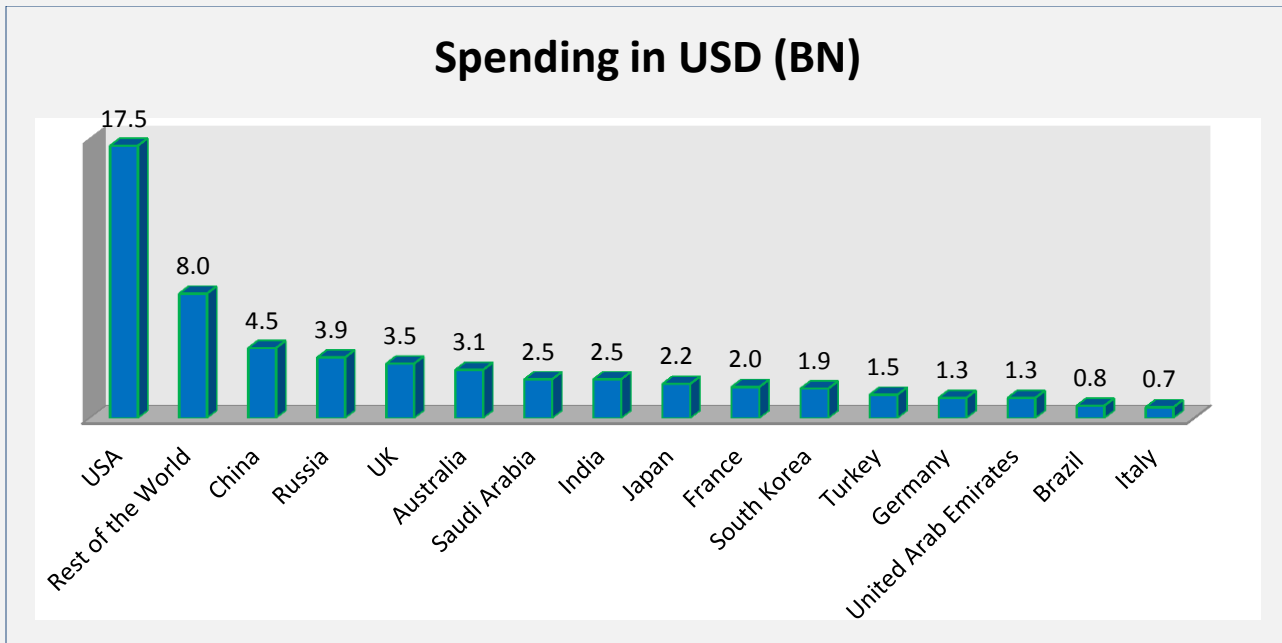
A high level overview of how drones work is shown below: **Figure 1 - UAS The nuts and bolts<sup>2</sup>**



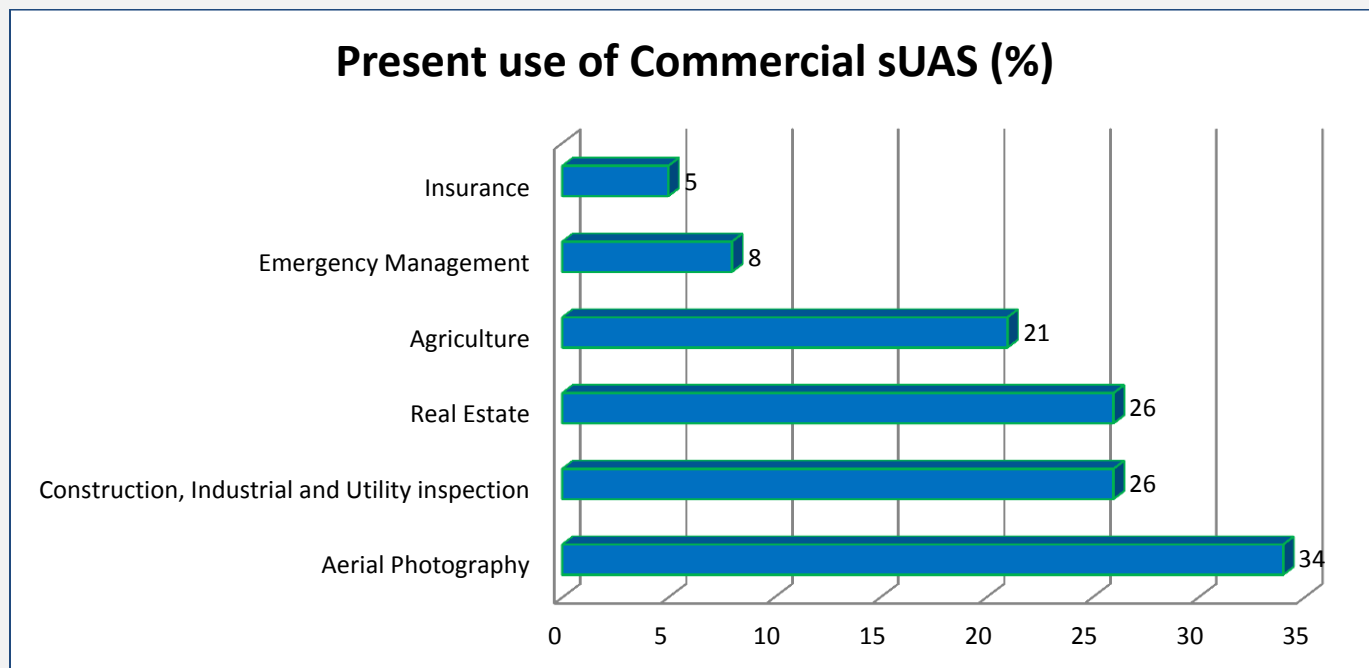
<sup>2</sup> Greg Dobie, 'Rise of the Drones', paper by AGCS



Across the globe spending for drone technology is increasing. **Figure 2: Estimated drone spending in USD, FY2017-FY2021<sup>3</sup>**



Commercial small UAS are presently used for numerous applications. **Figure 3: Over-all use of Commercial small UAS uses (2015-2016)<sup>4</sup>**



<sup>3</sup> Goldman Sachs Research (<http://www.goldmansachs.com/our-thinking/technology-driving-innovation/drones/> )

<sup>4</sup> FAA annual Aerospace Forecast Report Fiscal Years 2017 to 2037

([https://www.faa.gov/data\\_research/aviation/aerospace\\_forecasts/media/FY2017-37\\_FAA\\_Aerospace\\_Forecast.pdf](https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2017-37_FAA_Aerospace_Forecast.pdf) )

## Drones



Major applications of commercial small UAS are aerial photography (34%), construction, industrial and utility inspection (26%), real estate (26%) and agriculture (21%). Many of these UAS have multiple uses, and hence as per the FAA annual report the sum of the percentages in the above chart exceeds 100%.



### 3. Drone Applications and Uses

Drones have various applications and uses in today's world and some of these have been very briefly discussed below, please note that this list is not exhaustive:



#### Structural Safety Inspections

Drones can provide real-time inspection of power lines, oil and gas pipelines, transmission towers, buildings and bridges, wind turbines, photovoltaic panels and rotor blades enabling the inspector to access the information from a safer position.

These inspections provide the ability to view things in three dimensions; take thermal readings etc. which can greatly improve the infrastructure inspection. The quality of the images can have a very high resolution depending on how much detail is required.

#### Construction Sites

During construction projects a drone could be used to quickly model from above in 3D with increasing precision. This provides a means to check on the construction project, compare to plans, and could provide better coordination of materials on the job site. Further drones cut out the need for an access tower or scaffolding to undertake the inspection. However, drones on any construction site should only be used after thorough risk assessment has been completed.

#### Disaster Management

After a natural or manmade disaster, a drone could provide a quick means to gather information. Drone can have high definition cameras and radars hence they can give rescuers access to a higher field of view without



potentially having to use manned helicopters. Further, due to their small size, they can provide a close-up view of areas where larger aerial vehicles might struggle.

### Insurance Claims

Drones could provide fast documentation for insurance claims. For example, drone footage could indicate the extent of flooding on the property, roof damage, and the condition of the surrounding neighbourhood – all with a few aerial images.

Further, experienced operators could use thermography and photogrammetry hence allowing construction engineers for example the ability to identify exactly where structural sustained damage has occurred.

### Law-Enforcement and Public Safety

Drones could help with crowd surveillance and public safety and potentially help in monitoring criminal activity, crime scene and fire investigations. However it should be noted UK rules on flying drones have been drawn up by the Civil Aviation Authority (CAA) and anyone using a small drone needs to be aware of the regulations contained in the Air Navigation Order. Article 95<sup>5</sup> provides guidance on small unmanned surveillance aircraft, such as not being able to fly without permission issued by the CAA within 150m of any congested area, or within an organized open-air assembly of >1000 people; further not within 50m of any vessel, vehicle or structure which is not under the control of the person in charge of the aircraft.

There are concerns that UAS could be utilized to attack sports stadiums or other events where large crowds gather. One emerging peril is the potential terrorist threat from UAS targeting power and nuclear stations. Hence, the use of drones in crowd surveillance and public safety will need to be assessed on a case by case basis.

### Geographic Mapping

Drones can reach difficult-to-access locations like eroded coastline or mountaintops and acquire very high-resolution data to create 3D maps.

### Precision Agriculture

Drones can allow closer monitoring of crops to improve the management and yield; further they can use near-infrared sensors to detect crop health, letting farmers react and improve conditions locally with inputs of fertilizer or insecticide.

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<sup>5</sup> <http://www.caa.co.uk/Commercial-industry/Aircraft/Unmanned-aircraft/Unmanned-Aircraft/>



### Storm Tracking/Forecasting

Drones are heavily used by the National Oceanic and Atmospheric Administration (NOAA)<sup>6</sup> to collect data from dangerous or remote areas, such as the poles, oceans, wildlands, volcanic islands, and wildfires to help predict extreme weather more accurately – and better understand what’s happening.

### Journalism, Filming and aerial photography

Drones are starting to be used in sports photography and cinematography. Further, it provides journalists the ability to collect footage and information for use in live broadcasts. Aerial photography for the Real estate market is becoming more popular also; however the CAA rules mentioned earlier in the paper need to be adhered to.

### Shipping/ Delivery

Some company’s like Amazon, UPS and DHL are reportedly seeing the potential benefits of drone delivery. However there are limitations of where drones can be flown; further regulatory frameworks are changing fast, which can create logistical and compliance challenges for companies operating in multiple jurisdictions.

In Germany, a “general authorization”<sup>7</sup> for a drone can be obtained if it weighs 5 kilograms and will not be flown over:

- People and public gatherings
- The scene of an accident or where police/emergency services are operating
- Power plants, prisons, military bases, and other industrial facilities
- Prohibited or flight-restricted areas.

However, this does make it more difficult for certain use cases in the engineering and energy sectors. There is the possibility to apply for a “specific case-by-case authorization” if the drone is heavier than 5 kilograms or specializing in industrial inspections.

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<sup>6</sup> National Oceanic and Atmospheric Administration (<https://uas.noaa.gov/>)

<sup>7</sup> Trevor Wichmann, Senior Director of UAS Ops Consulting at Skyward (<https://skyward.io/>)

## 4. Property Surveying

Property Risk consultants would normally undertake pre-loss site property damage and business interruption surveys and perform comprehensive risk assessments. Exposures are identified and, where relevant, loss control solutions are proposed.

There are three key stages of the property survey process which have been examined further are:



### Stage 1 - Prior to the Survey

Typically the site to be surveyed will be informed about what the survey will entail so that they know what to expect and can make any necessary arrangements (this would normally involve a pre-survey letter being sent to the site).

The pre-survey letter:

- Outlines the purpose of the property survey, which is typically to gather information regarding a facility's general construction, occupancy/operations, hazards, protection, exposures, etc., for property insurance underwriting purposes.
- Requests a list of documents which the Property Risk Consultant would like to view (either prior to or during the survey) such as sprinkler system and fire pump inspection/testing records etc.
- Lists areas during the survey where the Consultant would like to inspect such as plant rooms, IT server rooms/data centres etc. Typically the Consultant may want to witness tests on fire protection systems.
- Explains to a client what this information will be used for – which is to evaluate the clients existing loss prevention and control measures, and develop any recommendations that will help reduce the client's exposure to property/business interruption losses.

Pre-survey work would entail gathering relevant information on the site prior to the survey such as the location of the site, Natural Catastrophe (NATCAT) and any third party exposures.

Consultants may use Google Earth which provides valuable information for the risk assessment.

### Stage 2 - During the Survey

The Consultant would do an initial introductory meeting to gather information on the risk; this also allows the Consultant an opportunity to assess the client's attitude to risk. This introductory fact finding/information gathering meeting is an important part of any survey.



Documents/test certificates etc. would be inspected and then there may be a discussion with the client to discuss any relevant risk issues that may arise.

The Consultant may witness testing of fire protection systems such as sprinkler pumps etc.

The Consultant would undertake the actual inspection of the site and any areas highlighted where improvements are required (recommendations) would be discussed with site.

- The Consultant may speak directly to the individual(s) responsible for the area where the recommendations have been stated. Hence, the Consultant is able to discuss the impact and importance of the recommendation directly with the client (individual responsible for that area) during the survey.
- Inspection of both internal and external areas, including plant rooms, ATEX areas, IT server/data centres, sensitive/confidential areas etc.
- Photos may be permitted during the survey depending on the occupancy however this is not always permitted.

The closing meeting provides an opportunity to discuss the findings with the site contact(s) and discuss how/when recommendations might be completed. The Consultant is also able to obtain information on any interdependent sites – this can be useful when one is trying to assess the contingent business interruption exposures at group/account level.

The opening/closing meetings and the actual site inspection allows the Consultant to build a rapport with the site/risk manager etc. and hence a long term relationship/partnership can be established.

### **Stage 3 - After the Survey**

After the survey the findings are collated and a risk assessment rating of the site in comparison to other similar occupancies can be determined. A detailed report with the key findings, loss estimates and key risk improvements is then sent to the client.

Recommendation updates would be requested after a period of time following a survey.

Clients can sometimes request that the consultant who undertook the survey, assists them in providing loss control guidance and support in future projects/expansions and/or any other major changes planned (these changes might have been discussed during the survey).

## 5. *Uses of Drones within Property Risk Consulting*

### Stage 1 - Pre-survey

There are many public concerns over UAS around issues of privacy, nuisance near-miss etc. Hence, it is imperative that detailed advice, explanation and maybe even a pre-visit by the experienced drone operator is offered to clients where a drone may be used. This could mean undertaking more site visits than would previously be the case, for example:

1. A pre-survey visit to view the site and discuss with the client.
2. Actual survey using the drone
3. Potentially a further visit may be required by the consultant if there are issues noted from the drone video and it is felt a face-to-face dialogue with the site contact is necessary. Further, it could be the case that the drone operator was not made fully aware of all hazardous processes on site and as such during the inspection was unable to view an area as it was an ATEX area (further discussion on ATEX is discussed later in the paper).

Hence, it is important that trained operators who understand ATEX regulations/areas etc. are used depending on the occupancy that is being surveyed.

Would the property risk consultant watch the video of the site during the drone inspection or would they watch it afterwards? If it is the former than one needs to bear in mind busy timescales, logistics could mean delays in setting up surveys as more diaries have to be coordinated. If it is the latter then issues such as the one highlighted above with ATEX could occur.

Drones have Wi-Fi and inbuilt GPS systems that can help them navigate around areas. However internal inspections can be more complex in comparison to external inspections.

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**It is important that where the drone is to be used that an appropriate risk assessment is undertaken prior especially for internal inspections, one should:**

- Ensure advance detailed planning and preparation is undertaken by obtaining detailed site floor plans, details of hazardous processes etc. prior to avoid near misses/incidents occurring during the drone inspection.
- It is important that explanation is clearly provided to a client (at each location being surveyed) on how the drone will operate and how the inspection will work so that the client knows what to expect (this could take more time than would typically be the case when using a risk consultant).

This risk assessment may need to be shared with the client prior and approved by them. This could further delay the survey process.

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Drones follow different Aviation Territorial laws, hence speaking to some drone operators they recommend using local operators in those territories. It should be noted that global property insurance programs can have clients with locations almost anywhere in the world; hence this could result in one using several drone operator companies worldwide. Ensuring that all the drone companies used worldwide for the inspections (for the same client) are consistent in their approach could be a challenge.



There are risks posed from sharing the same airspace as military and civil aviation operations. In many locations, there are few or no pilot training and maintenance standards.

### **UAS raise two priority safety concerns<sup>8</sup>:**

1. Mid-air collisions A UAS that cannot be controlled poses a significant risk to persons, property, or other aircraft. A mid-air collision could happen if the pilot cannot see and avoid manned aircraft in time. The manned aircraft that are most at risk are those that normally fly below 500 feet, such as helicopters, agricultural aircraft and aircraft landing or departing from airports.
2. Loss of positive control. Loss of control can result from a system failure and if the unit flies beyond the signal range or into an area where communication is interrupted.

According to a report from the UK Airprox Board<sup>9</sup> there were 70 near-misses between planes and drones in 2016 compared to the 29 incidents in 2015. As more people start flying drones as a hobby or for business, this number may grow unless authorities find a way to spot UAVs before they get too close to airports.

Hackers could potentially take control during flight, causing a crash in the air or on the ground resulting in material damage and loss of life. The term “spoofing” refers to attempts to take control of a UAS via hacking the radio signal and sending commands to the aircraft from another control station. This is a very real risk for UAS since they are controlled by radio or Wi-Fi signals.

To limit the exposure of a drone impact especially inside a client’s facility, some clients may ask the drone operator if they have adequate insurance in place and to ensure that adequate insurance is in place in all territories where the client sites are to be surveyed globally. There are various insurance companies who are offering drone insurance. The drone operator will need to ensure the client understands how near misses will be avoided during the site inspection. Further any adjacent neighbours would need to also agree that it is fine for a drone to fly within close proximity of their site also.

As drone technology is new and the potential use of it in Property Risk surveys is new also, trying to ensure that the client understands how the whole process will work will entail some substantial time initially; but with subsequent visits of the same site this may reduce. The drone operator will need to ensure that they maintain any client requests of not taking images/recordings of sensitive/confidential areas at a site. Further, due to the occupancy of a facility a client could ask that no images/recordings are taken what so ever of the entire site, in which case a Consultant would need to complete the survey without the drone. Introduction of any new technology/process can take time to implement and proper planning with a risk assessed approach will ensure that this is done smoothly.

Property risk consultants may use Google Earth to assess useful external views of a site prior to the site inspection. Hence, although a drone may potentially be quicker at obtaining external views of a site, one may

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<sup>8</sup> Greg Dobie, ‘Rise of the Drones’, paper by AGCS

<sup>9</sup> <https://www.airproxboard.org.uk/Reports-and-analysis/Monthly-summaries/2017/Monthly-Meeting-February-2017/>



already be able to obtain this similar data with Google Earth without the use of a drone. However, the Google Earth images could be outdated and further the image quality may not be sufficient to undertake an adequate external analysis in which case a drone image/video may be more suitable.

### Stage 2 – During a survey

Once all the planning work and if using a drone the necessary risk assessment/insurance coverage aspects have been dealt with the Consultant would conduct the insurance survey.

Typically at the beginning of an insurance survey there would be an opening meeting to gather information on the risk and also to get an idea of the sites attitude to risk. Further, the opening/closing and site visits are a good opportunity to build a relationship with the client so that they feel comfortable to discuss any key changes/expansions/projects that may be planned; hence using the expertise of the risk consultant for loss prevention guidance.

Historically the ability to discuss loss aspects/issues with a client during the face-to-face meetings and also during the insurance inspection itself is something that client's value immensely.

Documents that would normally be inspected during the survey could be emailed across to the Property Consultant prior to the survey if a drone was to be used. However, any issues would need to be dealt with during the closing meeting via WebEx or another similar medium.

Witnessing of protection system testing such as sprinkler pump(s) could be undertaken by the drone and then viewed by the consultant afterwards. However any issues that arise from the testing may result in the consultant having to address these after the survey; rather than dealing with the issue at the time of the inspection with the maintenance company (that is unless the Consultant is watching the drone image/video at the same time as it does the flight).

When performing an insurance inspection, being able to speak to various individuals on site including those in charge of various departments/areas can be very useful; especially if there may be a recommendation being stated in this area. For example if an issue of inadequate flammable storage is noted in area A one is able to speak direct to the manager responsible for area A, to explain/discuss the issue and get it resolved. Hence the person in charge of the area concerned would then understand why this is unacceptable from a loss control perspective.





**Face-to-face dialogue with the client and various individuals on site is a powerful tool!**

The Consultant has the ability to physically direct the client what they would like to inspect based on their experience of trade/industry exposures and what they see/hear and sometimes smell during the site inspection; for example a smell of solvent during an inspection could alarm an Consultant to see where this is coming from - being able to physically lift/pick up a lid off a container to ensure flammable rags/liquids etc. are not being stored inadequately can be done. Hence senses such as hearing and smelling are important in any inspection as well as just being able to see. As drone technology develops these other senses' could be incorporated and enhanced further in drone designs.

Speaking to various drone companies the cost of the drone inspection varied immensely depending on the detail of image/video required, the occupancy being inspected and the location of the site. Hence, any drone inspection would have to be assessed on a case-by-case basis bearing in mind the cost. The cost of transporting the drone and operator within easy reach to a client's site needs to be taken into account.

Property risk consultants may take photos where permitted during surveys; any areas where photos are not permitted the consultant can still sometimes view and make their comments on loss prevention. However if a client requests that no images/recordings are to be taken due to confidential/sensitive areas on site; this could make it more difficult to offer suitable loss prevention guidance (as nothing could be viewed of this area on the drone). Further, the drone during flight may capture images of employees; hence they might be asked to vacate the area before the drone undertakes the inspection. These issues will need to be carefully discussed with the client as part of the pre-survey work.

The drone operator would need to ensure that careful navigation around the site is undertaken. The operator would need to follow their prior risk assessment (that is if it has not changed during the time of the assessment and date of the drone inspection) to ensure that the drone inspection adheres to all relevant health and safety issues and also avoids any potential near misses. The potential loss of control of the drone is a real threat whether due to the signal range being lost or the communication for the drone getting interrupted. How a drone operator will overcome this issue is something that needs to be examined further. From a safety point of view, flying the drone near people or processes (with the potential for the drone communication being interrupted) and potentially having an accident/crash with them or an expensive/delicate process/machinery is something which would have to be adequately risk assessed and any client concerns property addressed.

Could a Consultant be trained in the use of drone and therefore use the drone to assist them in the site inspection? This would mean additional training being provided to Consultants. However, they would have the ability to use the drones to view the external guttering, PV panels, external roof cladding condition etc. and then undertake the internal inspection. How feasible this would be and the practicalities would have to be examined further. The benefits of being able to touch something as oppose to just being able to see it also needs to be weighed up.

## Drones



During pre-loss property surveys guttering may be inspected to ensure that it is not blocked or damaged – the Consultant would undertake a quick visual look from below or if possible a more detailed look by inspecting the actual roof closer up (pending suitable roof access is available at the time of the inspection). A Consultant would also complete an external inspection of the general building roof & walls (especially where combustible cladding is in place – the Consultant would check whether the combustible insulation was exposed in places). All these items could potentially be inspected by a drone which would capture images of the guttering, roof, walls and also any PV Panels and other equipment on the roof.

External security measures such as adequate fencing, external inspection of how items are stored in the yard (is there adequate storage of combustibles?) etc. could be captured by the drone.

Drones have some uses when it comes to external inspections, more so than inside commercial/industrial premises it seems. However, it's arguable whether Google Earth could provide the same image:

- What quality would the Google Earth image be?
- Would the image be a recent one? How would you know if it was recent or not?

Further, a Consultant would still need to complete the inspection internally of the site; hence timewise and from a cost point of view it's debatable how much benefit is actually achieved. Nonetheless, this is a potential use and with advances in the drone technology and reduction in price this use could become more viable.

During the closing meeting and during the site inspection by having open dialogue with the client a risk consultant is able to obtain not only site specific information but also details of other sites and any interdependencies between them. This additional information is useful in helping to analyse a client's contingent business interruption and supply chain.

Drones generally at the present time cannot be used in ATEX\* environments; with the exception of a French company that is offering ATEX-certified drones for use in potentially explosive environments.

*\*The ATEX directive consists of two EU directives describing what equipment and work environment is allowed in an environment with an explosive atmosphere.*

*ATEX derives its name from the French title of the 94/9/EC directive: Appareils destinés à être utilisés en ATmosphères EXplosibles.*

Zone	Definition
Zone 0	An area in which an explosive gas atmosphere is present continuously or for long periods
Zone 1	An area in which an explosive gas atmosphere is likely to occur in normal operation.
Zone 2	An area in which an explosive gas atmosphere is likely to occur in normal operation and if it occurs, will only exist for a short time.

The LE 4-8X Dual ATEX drone from Xamen Technologies<sup>10</sup>. is reportedly '**ATEX Zone 2 approved**' (Please see opposite for explanation of the zones). As drones develop further maybe within the next 5 years or more they could be used in Zone 1 or Zone 0 but at the present time further work is required.

It took 18 months collaboration with French Ex design consultancy CentrExpert to upgrade one of the company's existing drones and make it ATEX compliant. Changes included replacing carbon fibre propellers with wooden ones to reduce static risk, adapting all electrical and electronic systems and making modifications to the wiring.

Xamen Technologies reportedly put an emphasis on training and maintenance as high priorities, with all operators reportedly highly experienced UAV operators but also competent to operate in ATEX environments.

Training and experience are important when undertaking surveys. An experienced Property Risk Consultant would have trained a number of years to understand occupancy specific hazards/processes. It is important that the drone operator is clearly informed about areas which should be captured by the drone including any ancillary rooms or areas where the client may have forgotten to mention/show such as an electric or gas incomer, external flammable store, service riser etc. However by working together with the drone operator and the more surveys undertaken this would hopefully reduce the chances of this occurring. Further, the option of having Consultants trained in the use of drones and using them in tandem could be an option; for example a Consultant could be trained to fly a drone and potentially undertake the external survey via the drone and complete the internal portion themselves without the drone. The external inspection 'could' be completed quicker and therefore allowing the Consultant more time to focus on other areas. At the present time having this tandem approach is an expensive option; as drones develop further and legislation changes more options could become available to make this more cost effective.

### Stage 3 – After a survey

Typically after a survey the information is collated into a report which would incorporate the key findings, loss estimates and results in a user friendly format for the client to use. How and where the data from the drone would be incorporated into a survey report would need to be finalized. Whether or not a client would prefer a video/image(s) of their site operations with key hazards/recommendations etc. annotated on top rather than the typical report would need to be examined further.

The drone image/video recording (of the site operations) may be stored on the insurer/broker or on the client servers. This could be different for each client and therefore careful management of client data needs to be strictly adhered to. Further, when a drone is used for inspections one needs to take into account the potential

<sup>10</sup> <http://www.hazardonthenet.net/article/121803/Drone-operations-in-hazardous-areas.aspx>



threat of loss or theft of data security. Valuable recorded data can be lost during the flight when the device is transmitting information to the control station. Data can also be obtained by cyber-attack when it has been stored by the company gathering the data.

During a survey once a rapport has been built with a client, they may request that the consultant who undertook the survey, participates in future projects/expansions and/or any other major changes planned (these changes might have been discussed during the survey in either the opening/closing meetings or during the site inspection). Should a site be involved in a new construction project, then maybe a drone could be used to take measurements to entail any structural or sprinkler calculations to be performed. However, drones on any construction site should only be used after thorough risk assessments have been completed.

Some drones use GPS technology, and once a drone has been used at a location for a first survey, for future inspections/resurveys of the same site there could be the potential for the drone to simply follow the previous path. Hence, this could reduce the time taken for an inspection; however as is seen on many resurveys, sites can change immensely and therefore to prevent near-miss incidents etc. a detailed risk assessment by the drone operator would need to be undertaken every time they visit the same site.

If the drone was able to undertake the visual inspection portion or inspect areas which may be difficult for a Consultant to view such as guttering, roof cladding condition etc. this could allow the Consultant more time to discuss other value added services to clients such as business continuity etc. However, having both the drone and Consultant undertake an insurance survey at a site would not be very cost effective at this stage.

## 6. Conclusion

Drones are being utilized in many applications and with changing Legislation, health & safety improvements and technological advances it would be interesting to see how drone use develops further in the insurance industry.

Drones could potentially assist a Consultant in pre-loss property surveys by conducting:

### 1. Roof guttering inspections



### 2. Photovoltaic (PV) panel inspections



### 3. External security and yard storage inspection - external perimeter fencing, yard storage of any combustibles etc.



### 4. Wall and roof inspections – checking cladding (especially if combustible) to ensure the insulation is not exposed.



The above are potential uses discussed in this paper; however, the service & maintenance companies for the guttering, PV panels etc. would normally be undertaking their own inspections (in addition to the pre-loss property survey) also. Whether a separate detailed drone inspection would be required, rather than a brief visual check by the Consultant (alongside the Consultant checking the report from the maintenance company) needs to be looked into further.

It is worth asking the question how long would it take a Consultant to have a brief external inspection of the cladding themselves, for example – how much time would actually be saved by using the drone (bearing in mind a risk assessment would need to be completed for using the drone on site – managing near misses, avoiding neighbours properties, etc.)? Any potential use of drones would need to be assessed on a case by case basis.

Drones have some potential uses when it comes to external inspections, more so than internal inspections of commercial/industrial premises it seems. However, as per CAA rules adequate distance from third parties etc. would need to be strictly adhered to.



It's debatable whether Google Earth could provide the same image as a drone; but what quality the Google Earth image would be and whether it was a 'recent' accurate image is something that a client would have to confirm. Further, a Consultant would still need to complete the inspection internally of the site; hence timewise and from a cost point of view it's debatable how much benefit is actually achieved from using the drone for undertaking part of the site inspection.

It is important that any drone operator is adequately trained and certified. Consistency for drone operator training could be problematic, due to different territories having different jurisdictional rules/requirements and different rules depending on type of drone used. Development of a common international drone operator standard would be useful in reducing this problem, especially in cases where clients may have locations throughout the world and would prefer to have the same consistent drone/consultant survey approach across all their sites.

Drones have some use in property pre-loss insurance surveys however it depends on the industry and occupancy of the site being surveyed. Documentation produced by drones at the present time, can't substitute important information obtained by the Consultant such as the ability to assess the client risk attitude during surveys.

Drone technology is fascinating and very innovative; however whether the information gathered from a drone can provide the Consultant (or client) what they require as part of the insurance pre-loss survey is something that needs to be assessed on a case by case basis. The current property insurance pre-loss survey process is well established and understood by clients/brokers and insurers in the marketplace. It will be interesting to see how the insurance marketplace adapts to potentially using drones within the industry.

The issue of near-misses, adequately trained drone operators and cost implications are aspects that need to be addressed further. Whether a Consultant could be trained in the use of drones and potentially fly them could be an option; however how viable this would be and also the cost implications of sending both a Consultant and a drone to assist in a survey does not seem very cost effective at the present time.

Drones have more uses in external areas and applications such as claims management; structural safety inspections, construction projects etc. rather than specifically property pre-loss surveys (in particular inside premises).

It is concluded from the findings of this paper that there are limited potential uses where a drone could assist a Property Risk Consultant (due to cost and practicality), in conducting pre-loss property surveys of commercial/industrial occupancies at the present time.