Q&A on drones and safety management

By: Gareth Byatt, Principal Consultant || Risk Insight Consulting
Interviewee: Kurt Meyer, Co-CEO, RiskTalk, Principal of Meyer Advisory and Head
            OpRisk & Internal Control, AXA Switzerland

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Kurt,

Thank you for making the time to talk with me about the new and fascinating field of drones, and considerations of safety and risk management in this growing sector.

I wondered if you could start by outlining your involvement in the drones market, and some of the key areas you see in terms of how it is evolving.

Kurt: My pleasure. I am advising organisations on drones use as part of my risk consulting activities. It's a fascinating field of emerging technology that is expanding rapidly. It is very much in "start-up mode", and lots of things are still forming and taking shape. The different types of drones that are available come with different considerations of risk, which includes some important social and economic aspects that different stakeholders (including governments and regulators) are grappling with.

One of the key points that I'd like to stress to start with is that, for businesses and organisations looking to adopt and use drones, tailored risk management needs to be applied even if risk principles remain the same as those that we would use anywhere else.

Gareth: Thanks for this context, Kurt. Is the drones industry / market divided into broad areas or segments of operation, or is it treated as one overall market?

Kurt: There are indeed segmented areas in the market. You can broadly categorise drones into three main areas, based on their capabilities, size and cost. First, we have light and small drones, a few hundred grams in weight, small payloads and limited cost – mostly aimed at private usage. Second, we have larger mid-level drones, typically multi-copters up to about 25kg, payloads of a few kilograms and considerable cost. Third, we have fixed-wing drones, which are seen often in the largest and most capable category in terms of flight efficiency (reach and payload), and typically (at the moment at least), they are the domain of the military, not least because of the cost involved.

Gareth: Is there an "international drones association" being formed to help regulate use, similar to IATA in aviation, or is IATA the main international body?

Kurt: Well, most commercial drone businesses are start-ups. It is also "start-up" with governments, IATA and regulators. They are all learning as they move forward in this "new area". EASA[1], ICAO[2], JARUS[3] are all working on the regulation of unmanned aircraft. EASA has developed a proposal for regulation of operations in Europe for the "open" and "specific" categories, which was released as an EU-wide set of rules in June 2019. These rules (i.e. registration and certification of operations) will become mandatory by June 2020.

Gareth: Do different types of drone, with their size, weight and range of flying present us with different risks, including risks that have safety impacts?

Kurt: Yes, the different types of drones do present different risks.

I'll quickly mention the third category of drones first, the fixed wing drones. These are the large ones, mainly the military use. The aerodynamics are much better, therefore, they are more energy-efficient. There are future applications for them in logistics for longer distances, perhaps farming and agriculture and the like. Looking at logistic business you need an operations centre to run them (monitored, if they are autonomous, or flown by remote, from the ops centre). Therefore there is significant investment in control.

Let's now look at the first category, the light drones and then move on to talk about the second mid-range category of drones, which is probably where most of our discussion will take place.

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[1] European Union Aviation Safety Agency
[2] Civil Aviation Organisation
[3] Joint Authorities for the Rulemaking of Unmanned Systems

I mentioned that the small (first category) drones are typically just a few hundred grams in weight and they are small, and cheap to purchase. They are typically used in private environments by hobbyists, and sometimes for simple business purposes. The technology in these small drones is relatively simple, using telecommands that function for a limited distance. They are not autonomous, and they present limited safety risks – you certainly don't want one falling out of the sky, but if it does, you can hopefully warn people and it can crash harmlessly to the ground. Since they are light in weight, the risk of serious injury if they fall out of the sky is lower than with larger drones. However, they are increasingly common, and risk is there.

Gareth: Are the drones that businesses use for photographing sites, etc in this first category of "the small ones"?

Kurt: *Yes, I would say they are at the larger end of the scale in this category, perhaps up to a few kg in size, and they are for simple business purposes such as site photography from a short distance up in the air, with limited travel.*

For these types of drone, privacy risk is an important risk to consider. It is an area of increasing concern, with camera technology in them so good nowadays. How to manage this risk (whoever is using them – a business or a member of the public as a hobbyist) needs to be clarified, with clear guidelines available to drone pilots, so that they know the boundaries of what they can and can't do.

Environmental risks – particular in terms of waste – are increasingly important to consider with these small drones. Production and sales numbers are already significant and continue to grow. These small drones are cheap, increasing numbers are being bought, and they are creating an increasing amount of waste because they are disposable, not maintainable and many people see them as "throwaway items". I compare these small drones to electronic toys. They are seen as "the new toys on the block" and many people who own them do not think about recycling or the circular economy. With the huge number of sales, this market is creating a large amount of "tech waste".

Gareth: Are the disposable "first category" drones sent away to "electronic waste dumps" in developing countries? We've all seen these waste dumps in such places, with children picking through them to find scrap that may help them survive.

Kurt: I think it could be the case, similar to how other electronic devices such as computers, laptops etc get sent away to these places. However, they may also simply be dumped into a garbage bin, for local landfill or incineration.

Gareth: If I look at this from the UN Sustainable Development Goals (SDGs), I wonder whether authorities, and producers of these small, disposable drones can use risk management to think through responsible consumption and production (SDG 12).

Kurt: That's true. For example, drones bought in Switzerland today are treated the same way as any electronic device, in that sellers have to pay a fixed amount of money per drone sold which is supposed to help pay for responsible recycling. But the key question is this: is the mindset of those who buy them aligned to think about recycling these "disposable devices"? I'm not sure it is at the moment.

Gareth: What about the "second category" of drones – the one you mentioned that we may find ourselves talking the most about?

Kurt: The second category of drones are typically between 5kg and 25kg in weight, and they tend to be multi-copters (that is, multiple bladed devices, often in a quad type of format).

These drones have a variety of significant safety aspects to consider.

Before we talk about the safety aspects, let's start with some context to these drones, which will help to explain the safety aspects and hazards associated with them. Many of them are made to carry payloads. They can fly fairly longer distances, for example, for 30 minutes of autonomous flying (depending on their specific specs). They can be equipped with a variety of sensors, such as heat sensors, UV sensors.

They are much more expensive than the first category. They require maintenance and upgrades to elements such as motors, blades and software.

These drones are being used for an increasing number of commercial uses. For example, for logistics and transporting of goods (I am involved in such a project at the moment), and for detailed inspections of assets (as opposed to just taking photos of sites). Examples of this use are energy companies using them for power line inspections, detailed inspections of construction activities and the like.

Gareth: And are they licensed?

Kurt: *Well, this is a very complicated area. Every country has a different licensing system. The regulators are still learning. It should ideally be agreed between countries – we will see how things develop.*

In some countries, the weight of a drone determines whether its owner needs to pass a test to fly it, and/or whether there are restrictions on flying zones, such as flying up to a maximum height limit, and being banned from flying over airports and infrastructure.

Regulation is another key topic. Private use, line of sight drones are quite easy to regulate. Regulation that covers autonomous drones is harder. For example, in the US as in the EU, vehicle certification for commercial, autonomous drones is on its way. It is a complex process and requires significant resources.

Gareth: How is the risk of espionage being tackled?

Kurt: *It's a complicated field. Even with the heavier multi-copters in this second category of drones, they usually have limited range of activity. The espionage matters are probably limited to specific cases, whereas classical, heavier fixed wing drones operate in high altitudes (as seen in military usage).*

Gareth: So, in terms of safety, there are a variety of factors to consider with using these second category of drones?

Kurt: *Absolutely. Take the size and weight of them. For example, a drone of 1m in physical size and weighing 10kg. If this machine falls into a mass of people from height (with its velocity taken into account), that can be potentially catastrophic.*

Some of these drones are sophisticated and they have safety mechanisms built into them. Some have a flight termination system built in, so that when the drone goes out of control, it launches the safety system which organises a controlled landing (e.g. a parachute to break its fall).

But there are some large drones in this category that don't have such a sophisticated mechanism.

Gareth: What impact on price do such features have? This is making me think about what our risk appetite for safety matters with these drones is, and our context (for example, are we operating them in populated areas, or in the middle of nowhere).

Kurt: Yes, this is true. Are you as an operator prepared to take the risk that an out of control drone could hurt somebody, or destroy something? For purposeful organisations, if we operate devices like this, we must have the right controls in place to manage all the risks that we can foresee.

It is good to have this discussion. How much safety is required, where is the balance?

There is a train of decisions to take…

Gareth: Perhaps we could use a decision tree to understand possible outcomes, and scenarios, and look at our risks and the impacts to them occurring (including safety)?

Kurt: Absolutely. For example, do we need our drones to have a parachute system on them? If we use them over cities and populated areas, yes. If we use them over a desert, maybe not?

Plus, a 100g drone doesn't need as much technology to "break its fall" as a heavier one does.

A dangerous part to the drone is the battery – similar to electric cars. The battery can catch fire.

Also, what payload is the drone carrying? Are you carrying delicate or dangerous materials? Heavy quad copters are starting to transport a variety of goods.

For example, drones can help to transport medical packages. In the USA, UPS has an agreement with hospitals to transfer medical tissue or blood samples.

In essence, these are the same safety considerations for lorries and trains that carry dangerous and delicate goods.

When it comes to the drones themselves, and the safety features they are equipped with, perhaps in future, regulation will force drone manufacturers into Supply Chain Management, where they need to demonstrate competence across the supply chain. This will add to the cost.

Gareth: Plus, we know about companies like Amazon experimenting with deliveries by drones.

Kurt: I don't see it being quick. It could take some time.

But what is happening now is that point to point grid for drone transport is being worked on. Drones stop at points akin to bus stops, that contain landing platforms with technology to change payloads, etc.

Gareth: is this a bit like the rail network?

Kurt: Yes, the advantage of this approach is that risks are easier to control. you have safe landing platforms for the drones, to keep them apart. Opportunities to change batteries to extend their reach. More control over it. and extend the reach of it.

Gareth: So for businesses like utilities it is a very enticing prospect?

Kurt: Indeed, this is a very attractive business case. Let's look at one example from the power industry in Switzerland. Their power grid extends over high mountains, in a harsh environment, which is difficult to inspect and maintain. A big issue at the moment to overcome is that for regulatory reasons, drones still have to be operated by visual line of sight. So, for a power line that crosses the Alps, this isn't viable – today. But things are starting to change. The first drone operator in Europe has received permits for autonomous operation. Pre-programmed autonomous flying. This is where the business case gets very interesting.

Gareth: What's the limitation?

Kurt: One of the main limitations I see is the battery range. Talking about limitations: an effective way to limit risks is to restrict the drone flight to a defined corridor. The drone has to be programmed to fly in these corridors.

A risk management task will be – what is the best corridor to fly down and use? For example, we do not want to fly over schools, airport, critical infrastructure, etc. so tightly managed geo-fencing technology is important. If the drone exceeds the defined range, or if it doesn't know where it is (e.g. GPS fails), it needs to be grounded - hopefully a controlled abnormal landing, i.e. by using a flight termination system.

Gareth: So, we need to look at scenarios and different perspectives, what would and should the drone's system do in certain situations?

Kurt: Yes. An important learning is that we are coming from an area that is closer to the high-tech environment rather than aviation. So why not marry experience from high-tech and aviation? An aviation specialist knows that emergency controls are required, or an alarm causes an emergency stop to be activated. Drone manufacturers and operators should understand that abnormal situations occur, as they do in maned aviation. Risk and controls are to be balanced especially for these situations

So a mind-shift is important. Risk Managers can help with this, to make people fully aware and to consciously manage risk appetite. We can largely benefit looking across borders – for example, adopt an aviation industry mindset. Adopt the aviation safety culture. A lot of things can be learnt.

Gareth: And a solution like RiskTalk can be used to help with this, I suspect?

Kurt: That's right. You need to ensure you have good risk management in place. We can take the aviation approach, as I mentioned just now. It's a cultural mindset. You need to accept that there will be incidents, and that drone incidents will fall "X number of times" and therefore, you will have to instigate a sound landing system at certain times – it's not a question of "if", but "when".

A system like RiskTalk can be a good tool to ensure full transparency on what is happening. In a new field like drone business, you want to tap into as many people's brains as possible, and their concerns and ideas.

I would say, as with any new, innovative projects and businesses, this is an extremely good case to have RiskTalk implemented at the drone manufacturer, and across the whole value chain (software, operators, suppliers, customers) – to establish and maintain transparency across it. This could be a great way to identify risks and avoid surprises. RiskTalk typically also helps to build a culture of openness as a result – which is key to effectively manage risks.

Thank you very much for your time, Kurt. This is a fascinating field, and I look forward to seeing how it develops.