

AIDA DRONE PRESENTATION:
DRONES: NEW RULES, NEW CHALLENGES
(GAME OF DRONES)

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WHY TALK ABOUT DRONES?

- Drones preview the problems that will face insurers and operators of motor vehicles and other transportation modes, and they are fun. Technology is now to the point where drones are within reach of just about everyone, and soon will be able to operate autonomously.
- Drones pose both traditional risks – property damage and personal injury, as well as new ones including trespass and invasion of privacy.
- The question of responsibility and liability for safe operation will become diffuse – when there is a pilot or a driver they are responsible for safety; but who is responsible when the pilot or driver is a piece of software?
- Security from outside interference – hacking – is now a real threat. There have already been instance of automobiles being hacked, and serious concerns about passenger aircraft. When drones are allowed to be fully autonomous security will be critical.

DRONES LEAD THE WAY

We should focus on drones because they are leading the way. While self-driving cars are coming – they are still a work in progress and are likely to be hindered more by regulatory concerns than technological ones; drones already have the capability and are likely to jump the regulatory hurdles first. While passenger aircraft autopilots are now theoretically capable of operating without pilots, the public is not yet close to trusting a pilotless aircraft.

WHAT IS A DRONE?

They have several official names, and, in the long tradition of aviation, they are shortened to initials:

- RPV - Remotely Piloted Vehicles
- RPAS - Remotely Piloted Aircraft Systems [official designation by ICAO]
- UAS - Unmanned Aircraft Systems [FAA]
- UAV - Unmanned Aircraft Vehicles [CASA, EASA and others]

All of these names describe a device with the following characteristics:

- It can fly
- It operates under its own power
- It is controlled (or directed) from the ground; and
- There is no one on board (at least not yet).

Beyond that there is a wide disparity in size, mission, power plant and sophistication. The first drones I became aware of (other than the radio controlled models of my youth) were relatively large aircraft, flown remotely and used by the US military first for reconnaissance and then armed with missiles.

A parallel development on the civilian side, at first for hobbyists and then for commercial users, came small, multi-rotor devices powered by batteries with increasing cost, size and sophistication. These drones are readily available at hobby shops or on line and range from a tiny 20 gram device that can fly for 5 minutes, 700 gram aircraft with a little iPhone like camera that can talk to your iPhone or iPad by Wifi, to far larger devices with longer range, GPS navigation ability and advanced sensor capability. Cost can range from under \$100 to over \$60,000.

Some examples:

- Blade Inductrix about AUD \$80 , 20 grams
- Blade 350 QX3 about AUD \$400, 680 grams
- DJI Inspire 1 V2.0 about AUD \$5300
- Xact Sense Max 8 about AUD \$65,000, span 1.2 m, weight 2.2 kg, payload 9 kg

USES:

Drones can be used as toys - just flown in the park or paddock for amusement.

The most common recreational use now seems to be video photography - getting a new perspective on your own property, that of your neighbour, your neighbour's wife sun bathing; or recording events from football matches to bush fires. Commercially, the uses are endless: drones are being used for power line patrol, agriculture, movie production, real estate sales promotion and in many other industries.

Additional uses, presumably for larger drones, is delivery of goods: Amazon's fantasy of delivering packages to your door, Domino's goal of delivery pizzas to couch potatoes at home, and first responders delivering medical supplies to remote or difficult to reach locations. There are also more dubious uses: there have been cases of helpful friends delivering drugs or mobile phones to prison inmates.

One enterprising American (of course) in the State of Connecticut was exercising his 2nd Amendment rights and fitted a drone with a handgun, causing a certain amount of concern.

WHO CAN OWN ONE?

Basically anybody with the money to buy one can own one. With the recent exception of the UAE¹, I know of no country that restricts drone ownership. There are no present restrictions on age², mental stability or affiliation with a terrorist organisation.

WHO CAN FLY ONE?

¹ Sale of drones was apparently banned in UAE from March 2015, and existing owners were required to register them with the government. This arose from concerns about drones operating near the airport in Dubai.

² FAA requires pilot of UAS to be at least 16 years old for commercial use. 14 CFR 107.61(a)

Now we come to the answer lawyers love and clients hate. It depends. It depends on the country, the size, the location, the purpose and the route of the mission. By way of background let me frame the basic issues.

Because drones are aircraft³ they will potentially be sharing the sky with manned aircraft. When what we now call drones were called model aircraft and flown by enthusiasts in an empty paddock far from anyone and at very low altitude there was little chance of conflict. But as model aircraft mutated to drones and increased in size, range and endurance the chance of conflict became significant.

Drones can also be of sufficient size to cause injury to persons or property on the ground while operating well below the realm of regular aircraft. It is beyond the scope of this presentation to detail the precise regulations pertaining to drones, first it is too boring, but also likely to be obsolete by the time we have dinner this evening. That said, a brief synopsis may be helpful.

A Brief Country by Country Review

Australia:

Normally Australia responds to any potential safety problem as a good nanny state should-with over regulation. Those of you familiar with the Australian rules involving bicycle helmets, child car seats, work place health and safety and pool fences will understand. Australia has only about 10,000 registered regular aircraft as compared to nearly 300,000 in the US, but about three times the volume of aviation regulations. However, to its credit, in this instance it has responded more reasonably and more quickly than its northern rival, the American Federal Aviation Administration (FAA).

Current Australian rules:

Hobby:

Model aircraft⁴ flown below 400 feet Above Ground Level (AGL) and more than 3 nautical miles (about 1.8 kms) from airports are exempt from most regulations.

Commercial:

Because model aircraft by definition excludes commercial use, drones used commercially (for money or any economic reward) are subject to the regulations found in Part 101 of the *Civil Aviation Safety Regulations 1998*. Previously the regulations required that all commercial operators hold a license issued by the Civil Aviation Safety Authority (CASA)⁵. CASA, being CASA, did nothing by half measures and therefore had two separate licenses with different requirements but so far as I can tell exactly the same privileges. I won't bore you with the difference between a UAV Controller Certificate and a Remote Pilot License Level 1. Since September 2016 the rules have changed and now require a remote operator's certificate only for certain commercial operations.

³ Section 3 of the Civil Aviation Act 1988 defines an aircraft as: "any machine or craft that can derive support in the atmosphere from the reactions of the air, other than the reactions of the air against the earth's surface."

⁴ The *Civil Aviation Safety Regulations 1998* [CASR] (dictionary) define model aircraft as "an aircraft that is used for sport or recreation, and cannot carry a person."

⁵ CASR 1998 section 101.270

This rule change is controversial and presently the Australian parliament is being urged to overturn the relaxed regulations.⁶

In brief summary, absent special permission, drones in Australia, both recreational and commercial must be operated in the day time, in good weather, within sight of the operator, more than 30 metres from persons, less than 400 feet above the ground and away from airports or other controlled airspace.

At this time autonomous operation is strictly prohibited absent special permission from CASA.⁷

Neither CASA, nor the American FAA (to be discussed below), have articulated a sensible reason why commercial use should be more strictly regulated than recreational use. A building owner using a drone to photograph his or her own building for private use creates no different risks than a real estate broker photographing the same building to use in a sales brochure.

One explanation may be, and this is pure speculation, that it is a reflex left over from manned aircraft. Different licenses are required to operate manned aircraft privately and commercially, and even within commercial operations a higher grade of license is needed to be an airline captain than a charter pilot. The reasoning there makes sense. The paying public expects, and should receive, a higher level of safety than the passengers of a private aircraft. Passengers of private pilots presumably know the pilot they will be flying with and have some capability to assess his or her qualifications and experience. The commercial passenger must accept whoever the pilot is and trust that the airline and the regulator has made sure the pilot is properly qualified.

A drone, however, doesn't know or care who the operator is, nor if money is changing hands.

United States:

Remarkably, the otherwise generally reactive US Congress has been forward-looking on this issue, directing the FAA in 2012 to begin developing institutional reforms for safely integrating drones into U.S. airspace through the FAA Modernization and Reform Act (FMRA)⁸. Drones weighing less than 55 pounds (25 kg) were to be integrated by August 2014, while larger commercial drones would be covered by no later than September 30, 2015.

Congress, however, had not counted on the bureaucratic inertia of the Federal Aviation Administration. The FAA utterly failed to meet the timetable enacted by Congress. As a result, unfortunately, the FAA instead became a problem.

A June 2014 report by the FAA's Inspector General⁹ found that the FAA had not even started to develop the necessary data analysis or safety reporting processes several years into the project. Meanwhile, American drone operators had little guidance about how to proceed.

⁶ <http://www.abc.net.au/news/2016-09-28/new-drone-laws-could-lead-to-mid-air-collisions-pilots-say/7884574>

⁷ CASR 1998 101.097(2)

⁸ US Public Law 112-95

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A brief digression into US rule making. Congress often delegates the power to make rules implementing legislation to the administrative agencies. This process is governed by the Administrative Procedure Act.¹⁰

Briefly, before an agency can make an enforceable rule it must publish a draft called a Notice of Proposed Rule Making (NPRM). The public and stakeholders then comment on the proposed rules, the FAA responds and perhaps revises proposed rules that have received adverse comments or added sections based on suggestions (this may take several rounds) and eventually publish the final rule.

Long before any NPRM was published, the FAA acted as if commercial drone flights were already illegal. This ban had a tenuous legal basis and resulted in litigation before the National Transportation Safety Board, which acts like a court of appeals from FAA actions.

While this was going on, and under substantial pressure from industry and the public, the FAA used its exemption authority to bridge the gap. Section 333 of the FMRA outlined a process for drone operators to petition to fly registered drones in U.S. airspace before the final rules were issued. Over 2,000 Section 333 exemptions have been issued since the FAA began extending them in late 2014, with recipients using them to perform activities such as university research, video journalism, filming movies and testing delivery of goods.

Allowing commercial drone testing was a long-overdue step in the right direction, but the ad hoc exemption application process was inefficient. On 15 February 2015, the FAA finally released its 195 page NPRM for small drone regulations for public comment. The new Part 107 finally became law in June 2016 and effective on 29 August 2016.

Here is a summary of the FAA's new rules:

Summary of Major Provisions of Part 107¹¹:

Operational Limitations

- Unmanned aircraft must weigh less than 55 lbs. (25 kg).
- Visual line-of-sight (VLOS) only; the unmanned aircraft must remain within VLOS of the operator or visual observer, thus no reliance on First Person View (FPV) which is pilots using the streaming video from the on-board camera.
- At all times the small unmanned aircraft must remain close enough to the operator for the operator to be capable of seeing the aircraft with vision unaided by any device other than corrective lenses.
- Small unmanned aircraft may not operate over any persons not directly involved in the operation.
- Daylight-only operations (official sunrise to official sunset, local time).
- Must yield right-of-way to other aircraft, manned or unmanned.
- May use visual observer (VO) but not required.
- First-person view camera cannot satisfy "see-and-avoid" requirement but can be used as long as requirement is satisfied in other ways.

¹⁰ 5 USC Sections 500-596

¹¹ 14 CFR Part 107

- Maximum airspeed of 100 mph (87 knots, 160 km/hr).
- Maximum altitude of 500 feet above ground level.
- Minimum weather visibility of 3 miles from control station.
- No operations are allowed in Class A (18,000 feet & above) airspace.
- Operations in Class B, C, D and E airspace are allowed with the required ATC permission.
- Operations in Class G (uncontrolled) airspace are allowed without ATC permission
- No person may act as an operator or VO for more than one unmanned aircraft operation at one time.
- No operations from a moving vehicle or aircraft, except from a watercraft on the water.
- No careless or reckless operations.
- Requires preflight inspection by the operator.
- A person may not operate a small unmanned aircraft if he or she knows or has reason to know of any physical or mental condition that would interfere with the safe operation of a small UAS¹².
- Proposes a microUAS category that would allow operations in Class G airspace, over people not involved in the operation, and would require airman to self-certify that they are familiar with the aeronautical knowledge testing areas.

Operator Certification and Responsibilities

- Pilots of a small UAS would be considered “operators”.
- Operators would be required to:
 - Pass an initial aeronautical knowledge test at an FAA-approved knowledge testing center.
 - Be vetted by the Transportation Security Administration.
 - Obtain an unmanned aircraft operator certificate with a small UAS rating (like existing pilot airman certificates, never expires).
 - Pass a recurrent aeronautical knowledge test every 24 months.
 - Be at least 16 years old.
 - Make available to the FAA, upon request, the small UAS for inspection or testing, and any associated documents/records required to be kept under the proposed rule.
 - Report an accident to the FAA within 10 days of any operation that results in injury or property damage.
 - Conduct a pre-flight inspection, to include specific aircraft and control station systems checks, to ensure the small UAS is safe for operation.

¹² A small UAS is one that weighs less than 55 pounds (23.6 kg)

Aircraft Requirements

- FAA airworthiness certification not required. However, operator must maintain a small drone in condition for safe operation and prior to flight must inspect the drone to ensure that it is in a condition for safe operation. Aircraft Registration required (same requirements that apply to all other aircraft - more about this below).
- Aircraft markings required (same requirements that apply to all other aircraft - also more about this below). If aircraft is too small to display markings in standard size, then the aircraft simply needs to display markings in the largest practicable manner.

Model Aircraft

- Proposed rule would not apply to model aircraft that satisfy all of the criteria specified in section 336 of Public Law 112-95.
- The proposed rule would codify the FAA's enforcement authority in part 101 by prohibiting model aircraft operators from endangering the safety of the national airspace system.

These rules are quite restrictive, and prohibit many of the uses of which the drones are capable. For one, operators would be limited to flying one drone at a time during certain hours, even over areas without any people below. Additionally, autonomous (or FPV) drones may be out of the question if the FAA holds fast to its insistence that operators maintain "line of sight" procedures during the entire flight.

Breach Of Airspace Rules

The FAA, even before the new rules became law were fully prepared to punish operators who violated existing airspace rules (remember, drones are "aircraft"). On 6 October 2015 the FAA filed a Notice of Proposed Civil Penalty Action against a Chicago based drone operator¹³, which the FAA alleges violated the Class B (highly restricted) airspace around New York City's three main airports. The proposed civil penalty is USD \$1.9 million (about AUD \$2.6 million). That case has a long way to go with layers of hearings and appeals, but is a good indication that violations will be treated seriously.

Registration Of Drones

As part of the new rules the FAA has implemented a registration scheme for drones between 0.55 pounds (250 grams) and 55 pounds (25 kg). Essentially for recreational use just the owner must be registered but for commercial use each drone must be registered. The process is done on line. For drones over 55 pounds the owner must register the aircraft under 14 CFR Part 47 and obtain an N number exactly as one would for a regular aircraft.

Close Calls

FAA officials are quick to publicize any reported incident involving a drone misdeed, and the FAA's website even maintains a running count of "close calls" between commercial airliners and private drones. But an independent analysis of this dataset by the Academy of Model

¹³ http://www.faa.gov/news/press_releases/news_story.cfm?newsId=19555

Aeronautics¹⁴ finds that only around 3.5 percent of the 764 FAA records are true "close calls" of concern. However birds are actually a greater problem. The agency's own report finds that the number of snowy owls that crashed into civilian aircraft last winter alone far exceeds the number of near misses with drones.

Other legal problems

Another American legal issue, as reported in the most recent issue of ISASI Forum, the journal of the International Society of Air Safety Investigators, is that despite the enormous usefulness of drones in assisting first responders and aircraft accident investigators in assessing the safety of the scene of an aircraft accident, the locating and determining the condition of victims, identifying the status and location of wreckage and many other uses, use of drones by the NTSB (National Transport Safety Board) is impossible as it cannot obtain an operator certificate. The reason is that other legislation requires that federal agencies seeking to operate aircraft (recall that drones are aircraft) must have a congressionally mandated aviation program. While this makes sense for manned aircraft, it is silly for drones, but is nonetheless the law.

United Kingdom:

The UK has adopted reasonable regulations for operations of drones under 20 kg¹⁵:

1. A person shall not cause or permit any article or animal (whether or not attached to a parachute) to be dropped from a small aircraft so as to endanger persons or property.
2. The person in charge of a small unmanned aircraft may only fly the aircraft if reasonably satisfied that the flight can safely be made.
3. The person in charge of a small unmanned aircraft must maintain direct, unaided visual contact with the aircraft sufficient to monitor its flight path in relation to other aircraft, persons, vehicles, vessels and structures for the purpose of avoiding collisions.
4. The person in charge of a small unmanned aircraft which has a mass of more than 7 kg excluding its fuel but including any articles installed in or attached to the aircraft at the commencement of its flight, must not fly such an aircraft:
 - a. in Class A, C, D or E airspace unless the permission of the appropriate air traffic control unit has been obtained;
 - b. within an aerodrome traffic zone during the notified hours of watch of the air traffic unit (if any) at that aerodrome unless the permission of any such air traffic control unit has been obtained; or
 - c. at a height of more than 400 feet above the surface unless it is flying in airspace described in sub-paragraph (a) or (b) above and in accordance with the requirements for that airspace.
5. The person in charge of a small unmanned aircraft must not fly such an aircraft for the purposes of aerial work except in accordance with a permission granted by the CAA.¹⁶

¹⁴ <http://www.modelaircraft.org/gov/docs/AMAAnalysis-PressRelease09-11-2015.pdf>

¹⁵ Sect 253 Air Navigation Order 2009

¹⁶ Article 166, Air Navigation Order

European Union:

The EU's current rules are a work in progress¹⁷ but I expect they will ultimately track the UK.

ISSUES PRESENTED BY DRONES

SAFETY ISSUES

Persons and property on the ground:

Despite their relatively small size, drones can present hazards to persons and property on the ground, including the operator¹⁸. Apart from direct physical injury drones can cause injury indirectly such as by distracting a driver or spooking a horse. Property damage might arise, for example, by contact with a power line or breaking a window.

Other aircraft

This is the serious risk. A one kilogram drone could, under the right circumstances, damage or destroy a 100,000 kg airliner. Ingestion into an engine could cause an uncontained failure of the engine and loss of control or a serious fire. While aircraft windscreens are meant to be strong enough to withstand bird strikes, they are not designed to resist the larger drones. A drone crashing into the cockpit could injure or kill a crew member and then cause a crash.

The liability issues created by these safety risks will be discussed below.

PRIVACY ISSUES

Unlike the model aircraft of my childhood, all but the very smallest drones can carry high resolution video cameras and potentially other sensors including microphones and night-vision (IR) capability. This creates the potential for serious invasions of privacy.

- Australia's privacy laws are known as a "fractured landscape".¹⁹ The Privacy Act 1998 (Cth) applies only to the government. The states have various rules, but Queensland, for example, covers audio privacy but not images. You can't listen but you can look.²⁰
- In the UK images captured by drones are likely covered by the Data Protection Act 1998.

¹⁷ <https://www.easa.europa.eu/easa-and-you/civil-drones-rpas>

¹⁸ <http://blogs.wsj.com/metropolis/2013/09/05/remote-control-helicopter-kills-man-in-brooklyn/>

¹⁹ *Eyes in the sky – Inquiry into drones and the regulation of air safety and privacy*, House of Representatives Standing Committee on Social Policy and Legal Affairs, July 2014, 33.

²⁰ The Invasion of Privacy Act 1971 (Qld) mainly includes prohibitions on the use of listening devices to record private conversations. Surveillance Devices Act 2004 (WA) prohibits the use of listening and optical surveillance devices by a person to monitor or record someone engaged in private activity. The antiquated legislation in Queensland, Tasmania and the ACT, makes no reference to cameras at all, let alone cameras hovering overhead. There are also a range of State and Territory stalking and harassment statutes that may be used to protect against privacy breaches caused by drone users, though again these are not consistent across jurisdictions. In addition to surveillance laws, some States and Territories have laws which make photography for indecent purposes a criminal offence, or which prohibit observing or filming a person in a private place or when that person is engaging in a private act. These laws, though they were introduced with the intention of protecting against child abuse or voyeurism, may nonetheless provide limited privacy protection against invasive drone use. Australian Law Reform Commission, *Serious Invasions of Privacy in the Digital Era: Discussion paper*, March 2014, 41-42.

- The EU's Data Protection Act does not appear to cover drones, and privacy acts vary among the member states.
- Drones have the capacity "to enter private property, to travel unnoticed, and to record images and sounds which can be streamed live."²¹ This creates significant opportunities for privacy breaches.

So how is the use of drones going to be regulated so that we can achieve the benefits of new technology while making sure people have a remedy if their privacy is breached through misuse of technology?

There have been a number of suggestions on solving the problem. For example, the Recommendations from Australian Government 's Inquiry into drones and the regulation of air safety and privacy' July 2014:

1. CASA working to educate drone users that it is their responsibility not to monitor, record or disclose individual's private activities without consent.
2. Introduce legislation by July 2015 to provide protection against privacy-invasive technology (particular emphasis on protecting individual's private affairs). Proposal for the creation of a tort of "serious invasion of privacy", a remedy that is well established in New Zealand and the United Kingdom and in a number of US states.
3. Harmonise surveillance laws that cover the use of listening devices, tracking devices, surveillance devices etc.
4. Measures / legislation regulating the use of drones by Commonwealth law enforcement agencies.
5. CASA and Government to review adequacy of privacy and air safety regarding drones in June 2016.

The EU has also been looking into the issue. A comprehensive review can be found in "Privacy and Data Protection Implications of the Civil Use of Drones"²²

Common law torts

- There are a number of common law torts which may also be relevant to drone use. These include trespass, nuisance or breach of confidence may be available to people whose privacy has been invaded by drones, depending on the circumstances.
- Even if a drone operates smoothly and causes no injury or damage, other issues to be aware of include the possibility of trespass or nuisance. Governmental regulatory approval does not grant an operator any rights against owners or occupiers of land over which drone operations are conducted; nor does it grant immunity from claims in respect of injury to persons or damage to property.
- Landowners' rights have been hyperbolically described as extending "from the heavens above to the centre of the earth below". While not literally true, a trespass can arise from intentionally invading the 'lower stratum' of a landowner's airspace where its control is

²¹ Eyes in the Sky (supra at 34).

²² [http://www.europarl.europa.eu/RegData/etudes/IDAN/2015/519221/IPOL_IDA\(2015\)519221_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/IDAN/2015/519221/IPOL_IDA(2015)519221_EN.pdf)

reasonably necessary for the landowner's enjoyment and ordinary use of his or her land and the structures upon it at ground level. In New South Wales and other Australian jurisdictions, statutes restrict the applicability of trespass or nuisance to overflight by aircraft. However, this legislation in NSW, has been considered unlikely to apply to drones.²³

Use of images of individuals or private property

- Whether a drone has trespassed will be fact-dependent, turning on whether the potential use and enjoyment of the land and the airspace by the occupier has been interfered with from within the limits of that occupier's use of the land. There is currently a substantial lack of authority on this point, although the possibility of trespass-by-drone has been noted by the Law Reform Commission and other bodies. What is clear from the case law is that a flight at 500 feet over a property in an airplane for aerial photography has been considered not to amount to a trespass²⁴.
- The lower a drone descends over a person's property (including in order to comply with CASA, FAA or CAA regulations), the greater the risk of trespass.
- Drone operation over a property that substantially and unreasonably interferes with its use and enjoyment could also ground a nuisance action – and this might be more likely if surveillance is involved. There has been judicial suggestion that if a plaintiff was “subjected to the harassment of constant surveillance of his house from the air, accompanied by the photographing of his every activity” an action in nuisance might be available.²⁵ Depending on the facts, other operational characteristics of drones might increase the likelihood of nuisance, including: loud buzzing, lower speeds during flight, and operations involving sustained hovering.

LIABILITY ISSUES

In Australia, the *Damage by Aircraft Act 1999* (Cth) provides protection to those who suffer injury or damage to person or property as a result of an impact with an aircraft or something which falls from an aircraft.

For example, under section 10(1) of the Act, if a plane crashes into a person's house and the homeowner is showered with debris, the person will be able to claim compensation in respect of the damage to the house and any physical injuries they suffered.²⁶

Section 11 the Act imposes strict liability without proof of intention, negligence or other cause of action.

²³ See Australian Law Reform Commission, *Serious Invasions of Privacy in the Digital Era* (DP 80) at [3.38]

²⁴ *Bernstein of Leigh v Skyviews and General Ltd* [1978] 1 QB 479

²⁵ *Ibid* at 489

²⁶ Aviation Legislation Amendment (Liability and Insurance) Bill 2012

Because of the limitations of Section 51 of the Constitution, the Commonwealth Act only applies to owners and operators which are financial corporations or operating in interstate commerce. The private operator operating within a single state is not covered by the Act. However, all of the states have filled the gap with legislation imposing similar strict liability on individuals and non-financial corporations operating within the state.²⁷

The definition of aircraft under this Act is taken from the *Civil Aviation Act 1988* but excludes model aircraft. It is yet to be seen whether damage caused by drones would be covered, but because commercially used drones are not, by definition, model aircraft, my belief is that all but hobby use drones would be captured by the State acts.

In other countries it appears drone operation is covered by ordinary laws pertaining to negligence and product liability.

INSURANCE

As drone use moved away from the model aircraft paddock, insurance became both necessary and desirable. Drone operation is not covered by most general or homeowner liability policies, so special insurance is required.

I know of at least two aviation insurers in Australia who provide policies for drones, and there may be others. Insurance is also available in the United States, the EU and the UK. As with auto policies there is a first party and third party component to the policies. Some companies are apparently starting to write bespoke drone policies while others have simply modified their general aviation aircraft policies.

Hull insurance

This is first party coverage for loss or damage to the drone itself. The policies I've seen follow the regular aircraft wording and have an agreed value in case of total loss. In my limited experience when temporarily acting as a claims manager for one of the drone insurers, I found that any serious damage resulted in a total loss, as replacement parts were often impossible to obtain or labour costs would exceed the value. This may change over time.

The other issue with hull insurance is the agreed value. Prices are falling as drone competition heats up, thus it is often the case that by the time of the loss a drone is over insured. Thus the owner of a crashed drone can replace it and still have cash left over from his claim. A suggestion to underwriters - change the agreed value language to read the agreed value or replacement cost, whichever is less. It will cut down on fraudulent claims and save money.

Liability insurance

This covers claims by those injured or killed by a drone, or whose property is damaged or destroyed. What most policies may not cover are the kinds of claims that drones can create the regular aircraft usually do not, such as trespass, nuisance and claims arising from invasion of privacy, surveillance, improper use of images and the like. Likewise most policies do not cover the cost of defending prosecutions by CASA, the FAA or other regulatory agencies for rule violations.

²⁷ Sec 73, Civil Liability Act 2002 (NSW); Sec 16 Air Navigation Act 1937 (QLD); Sec 61 Civil Liability Act 1936 (SA), Damage by Aircraft Act 1963 (TAS); Sec 31, Wrongs Act 1958 (VIC); Damage by Aircraft Act 1964 (WA)

In Australia, the requirement for licensing if re-instated will inevitably generate issues under section 54 of the *Insurance Contracts Act*, when the operator lacks the proper license or certificate and the insurer seeks to deny cover on that basis. Section 54 could be a seminar subject all its own, but insurers should be aware of the two leading cases - Triple C²⁸ and Highway Hauliers²⁹.

Insurance law in the United States varies state by state, with some requiring that a policy violation have a causal connection to the loss, while others allow coverage denial for any violation related or not.

The serious issue for insurers is what limits will be available. While key components of damages are reasonably capped in Australia for personal injury under such legislation as the Civil Liability Act 2003 (Qld) and its fellows in the other states, the exposure for colliding with an airliner is well beyond the limits of most normal aircraft policies.

Claims in the United States can reach significant amounts, well beyond those of most other countries.

Products liability

Drone makers may require products liability insurance. Because many drones are made in China, it is also important for the vendors to obtain the insurance since the chances of recovering from a Chinese manufacturer are close to zero.

Importers in Australia are deemed to be manufactures if the actual manufacturer does not have a place of business in Australia.³⁰ Thus anyone importing drones should seriously consider products liability insurance. Such insurance is becoming available but I have no information on cost.

Likewise, in the U.S., anyone in the chain of commerce, from manufacturer, to wholesaler to retail vendor can be liable for a defective product and thus should consider product liability insurance.

CONVERGENT TECHNOLOGIES

Integration with existing vehicles

As Google and others working on autonomous automobiles (putting the auto back into automobile) have discovered, while their cars strictly obey all road rules and traffic signals, the human operated ones do not necessarily do so and extra programming is needed to deal with unexpected human behaviour.

As autonomous drones overcome the regulatory hurdles they now generally face they too will have to integrate not only with other drones (both piloted and autonomous) but with all of the other things that happen close to the surface: pedestrians, motor vehicles, birds and other animals, fixed structures like bridges, powerlines, towers and cranes; trees and other natural hazards. Not all of that integration will be successful. When accidents occur the issues of liability will have to be met by insurers, these include:

- The owner
- The operator (or person directing the route of an autonomous drone)

²⁸ Johnson v Triple C Furniture & Electrical P/L [2010] QCA 282

²⁹ Matthew Maxwell v Highway Hauliers Pty Ltd [2013] WASCA 115

³⁰ Sec 7, Australian Consumer Law (Schedule 2 to Competition and Consumer Act 2010 (Cth))

- The manufacturer
- The seller/distributor
- The regulator

For the moment most jurisdictions prohibit, or severely limit, autonomous drone operation, but because the technology is just about there, the pressure on regulators from giant companies like Amazon to allow such operations will soon force the regulator to confront the issues and that will also force insurers to be prepared to confront a new world of risks.

FORECASTS

There is an old Danish proverb, most famously quoted by physicist Neils Bohr, that "prediction is difficult, particularly about the future". That said, I will venture the following:

First, drones will become smarter and more capable. Just like iPhones they will have more features, more autonomy and more performance.

Second, drones will become increasingly popular, as cost declines and ease of operation increases more people will get one. That gives rise to a good news / bad news prediction. The bad news is that a certain percentage of the new owners will be idiots who will use their drones to cause accidents either deliberately or accidentally. I have seen the same trend with powerful laser pointers - some demented people use them to try to blind pilots of approaching aircraft, sometimes successfully. The good news is that those accidents will make more work for lawyers and keep insurance claims officers gainfully employed.

Third, because drones operate digitally, both internally and in their communication with the operator, they will be hacked. No good will come of that I'm sure; and

Finally, that uses will develop that no one has thought of yet. Some of these will be of great benefit and make our lives easier and richer and some of which will be dangerous or annoying and make us long for simpler times.