



POLICY REPORT



**North Sydney
Innovation Network**

DRONE REPORT

27 April 2018



WWW.NORTHSDNEYINNOVATION.ORG

Flying Robots in the Skies Above Our Neighbourhoods

Are North Shore Councils and Communities Ready for Drones?



Source: Envato (under licence)

Recommendations

1. That all North Shore Councils and urban planning bodies foster the development and adoption of technology and innovation policy that improves the inclusivity, sustainability and liveability in our communities.
2. That all organisations involved in the planning of our future cities and towns consider the opportunities from drone technology along with the broader requirements of data and information infrastructure.
3. That the Civil Aviation Safety Authority (CASA) review its guidelines to make them more easily understood and accessible and continue to support and improve the *Can I Fly There App*. The NSIN notes both of these can be achieved through CASA seeking more direct feedback from drone users. NSIN is happy to coordinate this on the North Shore.
4. That North Shore Councils lead a community awareness campaign concerning privacy and respect for others in the community, specifically directed at hobby and commercial drone photographers, supplementing CASA regulations with local protocols where appropriate.
5. That CASA support the above-mentioned public awareness campaign and promote its *Can I Fly There App*.
6. That North Shore Councils recognise drone use in their strategic and local planning, through a number of avenues, including the establishment of permanent educational signage (detailing the safe operation of drones) in open spaces and community education as described above. Councils can also actively support the deployment of drone services by provisioning for the local infrastructure required, including drone landing sites and hubs.
7. That North Shore Councils lead (the North Sydney Innovation Network is happy to coordinate) a meeting with drone developers, sellers, users and community members about the challenges and opportunities for drones on Sydney's North Shore as part of creating the 'smart cityscapes' of the future.

Executive Summary

- Drones (formally known as unmanned aerial vehicles (UAVs) or unmanned aircraft systems (UAS)) are an increasing presence in our day to day lives both in recreational, civil and commercial contexts.
- Globally the military market for drones is expected to continue to outpace all other sectors in spending but the fastest growth opportunity for drones is from businesses and civil governments. It is predicted that these entities will spend \$13 billion on drones between now and 2020, putting thousands of them in the sky. Goldman Sachs Research also suggests that the global commercial drone market alone will exceed \$20 billion by 2021 and that cumulatively the drones market will evolve into a \$100 billion market by 2020.
- In rural and less-populated areas, the use of drones in agricultural surveying and land management, offers significant advantages, without some of the safety and privacy concerns of metropolitan areas.
- Drones also offer some remarkable opportunities to enhance the lives of many and to save and preserve life, particularly in the context of their use in military combat situations and firefighting. Similarly, their use in urban planning and infrastructure underpinned by the power of open data, is an opportunity that councils should not overlook.

- Most north shore Sydney councils we surveyed currently do not have a specific policy on the operation of drones in their Local Government Area (LGA) and instead defer to the Civil Aviation Safety Authority (CASA) regulations.
- There is an opportunity for councils to take more of a leadership role in the safe and efficient operation of drones in their LGA, for example by educating residents on the relevant CASA regulations, holding information nights on safe operation and preparing for the inclusion of drones by planning for necessary drone infrastructure now.
- There are strict regulations governing the use of both commercial and recreational drones, including the requirement for commercial enterprises to obtain an operator licence. The sheer scale of the consumer drone market however, makes policing their operation increasingly difficult.
- There are some significant risks involved in the unregulated operation of drones, with collisions causing injuries and deaths around the world. At the LGA level, this could result in the injury of adults, children or pets in our community spaces and parks.
- In addition to safety concerns, there are also potential issues of noise and privacy to consider in the operation of drones by both private individuals, commercial and government enterprises.
- It is important for local governments to consider the implications of drone use in their LGAs now, both from the perspective of planning for their safe and efficient operation and to maximise the opportunity this innovative technology offers.

Introduction

In July of 2017, One Nation senator Pauline Hanson [posted a video](#) of herself flying a drone from a balcony over a street in Townsville. While flying the drone the senator remarked "Oh golly, as long as I keep it under 400 foot, I'm right". She wasn't right. The senator's fun diversion [drew the attention](#) of the Civil Aviation Safety Authority (CASA), who swiftly made contact with the senator as part of their assessment of whether any rules relating to the operation of the drone had been breached. CASA has the authority to issue fines of up to \$9000 for breaching safety regulations and if someone is injured by a drone, the authority can prosecute. In senator Hanson's case, the incident resulted in counselling on the regulations and how to be compliant with CASA regulations in the operation of a drone¹.

Senator Hanson was not alone in drawing the attention of CASA. In 2014 in Victoria, a real estate [agent in Mount Martha, Victoria](#) used a drone to take an aerial photograph of their vendor's property and unwittingly also captured a neighbour sunbaking topless (face-down) in the privacy of her own garden. The woman only realised she had been photographed when the real-estate board, including the aerial shot, was set up on her neighbour's front lawn. The offending board was quickly removed but the woman in question was understandably upset by the violation of her privacy and felt that the operator should have given fair warning to neighbours before sending a drone with a camera above their properties.

Similarly Australian aviation experts are warning that [Australian aircraft are at risk](#), after a drone was involved in a [near-collision with a passenger plane in the United States](#) as it descended on its approach to land at Las Vegas International airport in February of this year. The drone captured footage of its flight directly above the Frontier Airlines Airbus, coming dangerously close to the plane with 180 passengers on board. Drones have gotten even closer, a Boeing 737 was damaged in 2017 after hitting a drone while landing in Mozambique. In October 2107, a [Skyjet flight was struck by a drone](#) while inbound to Jean Lesage International Airport in Québec City, and in April 2016 a British Airways jet suffered minor damage when it collided with a drone on approach to London's Heathrow Airport. According to Ron Bartsch from the Asia Pacific RPAS Consortium, "It's not a matter of if a drone is going to bring down a commercial airliner – it's simply a matter of when"². Although Australian drone operators are required to stay at least 5.5km away from controlled airports, the rising number of drone owners is making this requirement increasingly difficult to monitor and enforce.

Drones are increasingly accessible to enterprises and amateur enthusiasts alike with refurbished drones equipped with high definition cameras available for sale on websites like Gumtree for as little as \$70 to \$100. Retailers like Harvey Norman and JB Hi Fi also stock drones ranging in price from \$68 to over \$10,000. In this climate of affordability and accessibility, it is worth asking- how are we preparing for the influx of both privately and commercially operated drones in our backyards?

¹ Source: Peter Gibson, Corporate Communications Manager, Civil Aviation Safety Authority via email.

² Payne, E. (2018). Droning on: Expert warns that it's only a matter of time before a drone brings down a plane, The Sun UK, published online 5 February 2018.

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Why are drones important to consider?

The NSW Government released its [Innovation Strategy, 'Bringing Big Ideas to Life'](#) on the 30th November 2016, with the objective of outlining a framework that would boost innovation in NSW. As outlined in the strategy, “the capacity for innovation-led growth is not just in the hands of the government, it also rests with businesses, non-government organisations (NGOs), education and research institutions, communities and individuals” (p.2). The report also states that “innovation has a place within every government department. The role of government is also to encourage and facilitate innovation in the broader economy” (p.4).

This NSW Innovation Strategy complements the [Australian Government's Smart Cities Plan](#), which sets out its three pillars: Smart Investment, Smart Policy and Smart Technology. In relation to the third pillar, the report states: “*We will embrace new technology with the potential to revolutionise how cities are planned, function, and how our economy grows. Disruptive new technology in transport, communications and energy efficiency are becoming a reality—we will position our cities to take full advantage. We will leverage real time open data driven solutions and support investment in sectors commercialising new innovations to grow Australia's economy.*”

The NSIN suggests that it is imperative for local governments to prepare for and wherever possible, harness, the opportunities offered by emerging innovations, including drones. Importantly, drone technology (along with other emerging technologies) necessitates that those involved in the planning of our future cities and towns examine the broader requirements necessary to underpin and unlock such technology. According to Dr Neil Temperley, Executive Product Manager of Future Cities Transport at CSIRO, there are fundamental factors that need to be considered.

As Dr. Temperley points out, most people don't recognise the massive opportunities drones offer in data collection and infrastructure analysis: “It's worth noting there may be secondary benefits to drones – delivery drones could at the same time collect valuable information about the urban environment, such as pollution, temperature, foliage health or traffic congestion. This data is of public interest. A good data infrastructure design ensures the right data is collected and made available to the public, and any privacy concerns are addressed.”

Dr Temperley further highlighted how data infrastructure is fundamental to many emerging technologies: “At the moment there are all sorts of technology solutions in cities, such as parking apps and various forms of travel assistance apps, but nothing is really integrated. When it comes to improved delivery services – whether via drones or humans – or improved mobility experiences – whether by driverless vehicles or not – the underlying data infrastructure to support service innovations in cities is the big puzzle piece missing,” he said. “The design for data infrastructure consists of the plan for the data capture, the data analytics and information flows between stakeholders, required to make seamless, integrated futures possible,” he said.

A recent report from Deloitte University Press, confirms Dr Temperley's sentiments. According to David Schatsky, “*New software is able to automate both drone navigation and the analysis of the data drones capture. This is making more practical a host of drone applications: monitoring construction, agricultural crops, goods and materials inventories, traffic, and crowds; infrastructure inspection; catastrophe response; search and rescue; and perimeter security*”³.

³ By Schatsky, D. and Ream, J. (2016). Drones mean business: Advanced software applications are driving commercial drone adoption retrieved at

Clearly, there are opportunities to use drones to address issues that are at the forefront of council concerns such as traffic congestion, community safety, environmental sustainability and servicing ageing resident populations. For example, drones could help elderly residents to age in place by facilitating the delivery of their groceries, small household items and medicines, potentially at a reduced cost and quicker than traditional transport modes. With their growing integration into the transport industry, [drones have the potential to reduce traffic congestion](#) and the environmental pollution it causes with fewer small scale delivery operators required if drones can make these deliveries. Similarly, some tasks like checking water meters and utility lines could be done [using drones](#) instead of sending out field workers. Thus, while Councils certainly wouldn't want to be an obstacle to the integration of drones, they do need to closely monitor their operation and play a pivotal role in planning the infrastructure required for the efficient and safe operation of drones.

According to [CASA statistics](#), as of December 2017, there were 5,780 remote pilot license holders and 1,106 drone operator certificate holders across Australia. While they acknowledge there are potential safety and privacy issues in operating drones, CASA's role is limited to aviation safety. This is also an issue that has been foreshadowed in the US, leading the US Congress to commission a research study, released in 2013, into the [integration of drones into domestic airspace](#). Similarly in 2014, the House Standing Committee on Social Policy and Legal Affairs reported that Australia's existing privacy laws were inadequate to prevent privacy violations by drones. The Committee's report, [Eyes in the sky: Inquiry into drones and the regulation of air safety and privacy](#) called on the Australian government to modernise and simplify Australia's privacy laws to protect against potentially invasive new technologies like drones.

The principal agency concerned with privacy in Australia is the [Office of the Australian Information Commissioner](#) (OAIC). At a recent Inquiry into Remotely Piloted Aircraft Systems (RPAS), Unmanned Aerial Systems (UAS) and associated systems the OAIC [made a submission](#) to the inquiry in which they outlined their support for the regulation of drones through principles-based and universally applicable law, as it was their view that this would accommodate changes to technology and provide consistency across industries and technologies. The OAIC recommended the application of the [Australian Privacy Principles \(APPs\)](#) in the Privacy Act, as the preferable principles-based law to utilise because it "is flexible, technology neutral, and promotes national consistency of regulation by providing a minimum set of standards that are applicable to both federal government agencies and the private sector"⁴.

The APPs regulate the collection, use, disclosure, security and handling of personal information, but the OAIC noted there were limitations to the application of the Privacy Act to drones as it "does not generally regulate the actions of individuals in their private capacity or certain small business operators"⁵. Similarly, the act affords different protections across States and Territories, making consistency an issue. The OAIC likewise supported the recent Australian Law Reform Commission's report, [Serious Invasions of Privacy in the Digital Era](#) whereby the creation of a statutory cause of action for serious invasion of privacy was recommended to be enacted by the Australian government through an Act. The OAIC also recommended [amending the existing privacy regulatory framework](#) in the Privacy Act to extend the complaint framework to cover serious invasions of privacy. It is possible that some

https://www2.deloitte.com/content/dam/insights/us/articles/3454_SfS_Drones-mean-business/DUP_Signals-for-Strategists_Drones-mean-business.pdf

⁴ Submission to the Senate Standing Committees on Rural and Regional Affairs and Transport by OAIC to the Inquiry into Remotely Piloted Aircraft Systems (RPAS), Unmanned Aerial Systems (UAS) and associated systems, submission by Timothy Pilgrim Australian Information Commissioner Australian Privacy Commissioner

⁵ *ibid.*

state and territory anti-stalking laws may also apply to the operation of surveillance drones in some circumstances⁶. Another valuable suggestion from the OAIC was for the aviation industry to embed operating practices that focus on privacy in all drone training and licensing. Although this would address most commercial and larger sized recreational drone operators, smaller commercial and recreational drone operators would not be subject to such training.

Overseas, the European Aviation Safety Agency (EASA) is currently [reviewing the European regulatory environment for drone operations](#) with the objective of developing a regulatory framework for all drones that includes minimum requirements for all drone operators to comply with relevant regulations, including those related to security, privacy and data protection⁷. In the United States, the National Telecommunications and Information Administration (NTIA) recently released [voluntary guidelines for drone use](#), that encourages operators to use the technology 'in a responsible, ethical and respectful way', a practice that includes 'a commitment to transparency, privacy and accountability'⁸.



Source: Envato (under licence)

So what exactly are the current rules for operating a drone in Australia? Are they consistent? Are our Local Government Areas (LGAs) ready for drone enthusiasts to launch drones from balconies and gardens? What planning and infrastructure issues should be considered, including the provision of drone landing pads and hubs?

Drones are already being used to change the paradigm of how small deliveries are made to households, how photographs are gathered for a range of uses (particularly in real estate marketing), [how fisherfolk fish](#), how natural landscapes are managed and how some of us spend our weekends. However, despite this seismic shift in the opportunities (and potential pitfalls), there has been little direct communication to residents or indication of a policy from most Councils regarding the operation of drones in their LGA. The NSIN urges Councils to

⁶ *ibid.*

⁷ EASA Commission Regulation on Unmanned Aircraft Operations (Prototype) and Explanatory Note (released August 2016), page 6, retrieved at <https://www.oaic.gov.au/engage-with-us/submissions/inquiry-into-remotely-piloted-aircraft-systems-rpas-unmanned-aerial-systems-uas-and-associated-systems#undefined>

⁸ NTIA, *Voluntary Best Practices for UAS Privacy, Transparency and Accountability*, page 2.

consider how drones will operate and their need for proximity to populous areas. This is a significant factor, given that most LGAs are host to an increasing number of high density developments, close to one another, providing little room for error if multiple drones are entering the same location at the same time.

Similarly, there are privacy issues to consider when more commercial drones equipped with cameras are being used by real estate agents, land surveyors and other commercial entities. In obtaining a licence to operate these commercial drones, should commercial operators also be required to submit details of their flight plans and any photography they plan to take, to allow Council to provide fair warning to affected residents? Or should the onus to provide fair warning rest with the operator, with penalties for failing to warn? These are just some of the issues that Councils should consider and preemptively respond to, in both their short and long term planning and policy decisions.

What exactly is a drone?

A drone is formally known as an unmanned aerial vehicles (UAV) or unmanned aircraft system (UAS) that may be remotely controlled by an operator or function autonomously. A typical UAV is composed of light composite materials to maximise its maneuverability. Most drones consist of:

- A central hub that houses the sensors and software used to operate the drone.
- Propellers with three to eight rotors, with quadcopters currently the most popular design, because the operation of the pair of clockwise and the pair of counterclockwise rotors provides stability to the UAV.
- Batteries that require recharging or replacement.
- Flight and motor controllers to manipulate the UAV.
- A transmitter and receiver to facilitate communication between the remote control and the UAV.



Source: Envato (under licence)

Why are drones important to consider at the LGA level?

As both a champion of innovation across all aspects of commercial and community functions and activities, the NSIN believes it vital for LGAs across Australia to be nimble and responsive to emerging technologies and the way in which they will impact public policy and decision making.

Drones represent a potentially significant change in the way goods will be delivered, locations and real estate will be photographed for marketing and surveying purposes and even how bushfires will be monitored. While commercial drone operators are required to obtain a licence, the recreational use of drones by unskilled operators is more difficult to monitor and control, with obvious risks to privacy and potentially catastrophic collisions as discussed above.

In this context then, Councils need to consider fundamental aspects such as the planning and approval required for drone landing pads, drone hubs and even the safe operation of drones within and across their LGA. While the operation of both commercial and recreational drones is primarily managed by CASA, some Councils have already decided to ban the use of drones in their local parks.

The NSIN informally investigated the local situation to determine if LGAs on Sydney's North Shore have established policies on the operation of drones in their municipalities. Our findings suggest that local councils generally defer to CASA rather than articulating their own local policy, which seems reasonable, given some drones would have the capacity to cross multiple municipalities in their flight paths. However, the absence of a formal council policy may also be interpreted by some recreational drone operators as unfettered permission to fly their drones anywhere.

Below are the results of our informal enquiry into the operation of a non-commercial drones in each municipality over a two month period.

LGA Drone Policy Results Table - August 2017 and November 2017

LGA (Local Government Area)	Policy Response - August 2017	Policy Response - November 2017
Mosman Council	Council has no jurisdiction on drones and CASA is the body who make and enforces drone regulations.	Referred to CASA, no flying over parks.
Willoughby Council	The Council prohibits the use of drones in ovals and reserves. Defers to CASA to regulate the use of drones.	Referred to CASA.
Lane Cove Council	Very small Remotely Powered Aircraft (RPA) can operate without certification, if it is being operated in standard RPA operating conditions.	In the process of creating council regulations, otherwise referred to CASA.
North Sydney Council	Council does not regulate - Defers to CASA to regulate.	Referred to CASA, can't film over the North Sydney CBD.

Ku-ring-gai Council	Awaiting response.	Referred to CASA.
Hornsby Shire	Referred to CASA.	Referred to CASA when asked if we could fly over backyards. Not allowed over parks.
Warringah Council	Referred to CASA.	Referred to CASA when asked if we could take photos of the park and lagoon.
Northern Beaches Council	Referred to CASA and provided a brochure from RPAS Training & Solutions .	Referred to CASA when asked if we could take photos of the park and lagoon.
Hills Shire	Looking into policy - will advise.	Referred to CASA when asked if we could photograph the National Park.
City of Ryde	Flying of drones is not permitted within any of City of Ryde's parks or sports grounds and 'No Flying of Model Aircraft' is stated on all park signs. Council advised flying a drone may be permissible on private land with the permission of the land owner but again drone operators must refer to CASA regulations. Council also recommended checking with remote controlled aircraft clubs, who may be better equipped for UAV operation.	Referred to police when asked if we could film down Victoria Road. No-fly zone over parks.

Findings from review of LGAs and Recommendations

Overall, most councils deferred to CASA and their regulations. Some councils such as the City of Ryde have taken a more proactive stance and banned the operation of drones in their parks and playgrounds. Referring individuals to CASA makes sense given the need for consistency, but it is questionable whether the average enthusiast will be motivated to access the information provided on the CASA website, particularly without guidance at their point of purchase.

One simple way to increase visibility of drone operation information would be to provide links to the [circulars and resources on the CASA website](#) on the home page of every local council and display CASA information material at libraries and other community locations. Unfortunately if Councils don't take more of a leadership role in preparing for, regulating and educating residents on the benefits of safely operated drone technology, they risk public resistance and fears around the use of drones in the LGA. There is an opportunity also for Councils to fulfill some of the imperatives for "innovation led growth" outlined in the NSW government's [Innovation Strategy, 'Bringing Big Ideas to Life'](#) by taking a more proactive stance in preparing for drones. Drones also represent a significant market opportunity and if local Councils want to capitalise on this opportunity while still remaining mindful of the concerns of local residents, it is vital for them to investigate this technology now.

Similarly, drone retailers should also play their part, and point of sale distribution of CASA safe drone operation circulars would also assist in providing enthusiasts with the information they

require to operate their drones safely. JB Hi-Fi [recently announced](#) their underlying first-half net profit has jumped by 21% to \$151.7 million, with total sales up 41% to \$3.7 billion. Among other categories, drones were highlighted as one of the key categories driving this growth. In this context, it seems reasonable to expect retailers to play a pivotal role in advising consumers where to find information about the safe operation of their purchased drones.



Source: Envato (under licence)

How Drones Are Used

Drones have traditionally been associated with the military but they are increasingly being used in commercial and recreational contexts, for example, search and rescue, surveillance, traffic and weather monitoring, firefighting, fishing and agriculture, [delivery services](#), commercial photography and videography and public recreation.

The consumer multirotor drones familiar today, emerged in [consumer markets around 2009 and 2010](#), at approximately the same time modern smartphones became widely available. In fact, both [iPhones and consumer drones](#) relied on advancements in embedded processors, tiny sensors, GPS receivers, and lightweight, powerful batteries. The increasing affordability and accessibility of these components allowed hobbyists to begin experimenting with their own drone creations and inevitably some of these evolved into commercial enterprises, such as [3D Robotics](#) and [DJI](#), who focus on consumer and civilian markets, producing cheaper and less powerful drones than required by the military. However, not all these enterprises have prospered, with [3D robotics struggling to remain viable](#).

In late 2013, [Amazon](#) was one of the first organizations to announce they would use commercial drones for delivery activities. Since then, Amazon has outlined its plan for drone delivery hubs, [comprising multilevel fulfillment centres](#) in every major city, to provide UAVs with the proximity to large populations they require to make them more efficient than regular road delivery. Other organisations have since followed suit. Google, through their Google X (now X Company) department's Project Wing, [conducted trials of package deliveries in outback Queensland in 2014](#). In September 2016, Virginia Tech also began testing of drone delivery services with Project Wing. Their initial testing involved the delivery of [burritos](#)

produced at a local restaurant, but the opportunity for drones to augment and potentially replace freight and delivery services are clear.

The decision to test at Virginia Polytechnic was not just about feeding hungry college students, the university is one of six Federal Aviation Administration (FAA) approved drone test sites, so it was the perfect location to gather data on drone services. [X Company also announced last year](#) that Canberra and its surrounds would be the major testing site of its autonomous drone delivery system. Capable of delivering up to 1.5 kilograms of goods, the Canberra location was chosen both because the large estates allowed the company to conduct test flights and do deliveries without flying over populated areas and because research indicated the local residents were receptive to new technology and innovation⁹.

Types of Drones



Source: Envato (under licence)

Consumer Drones

The consumer (as opposed to the commercial and military) drone market is split into different segments, each with their unique features and contribution to the total drone market¹⁰.

Aerial Photography (AP) Drones: these represent the largest segment of the market by revenue and based on its [recent study](#), Allied Market Research estimates that aerial imaging will be a \$2.8 billion industry worldwide by 2022¹¹. These drones are GPS stabilized and are designed to take high quality video and still pictures. AP drones often function as “crossovers” into light commercial uses such as roof inspections, public safety and related uses.

⁹ Williams, E. (2017). Google sister company Project Wing chooses Googong as autonomous drone delivery test site, Canberra Times retrieved at

<http://www.canberratimes.com.au/act-news/google-sister-company-project-wing-chooses-googong-as-autonomous-drone-delivery-test-site-20170715-qxbu0o.html>

¹⁰ The Drone report by Craigi, August 2015, retrieved at <https://www.droneflyers.com/the-drone-report-2016/>

¹¹ Aerial photography industry expected to grow despite drone regulations by <https://www.digitaltrends.com/photography/aerial-photography-industry-expected-to-grow/>

Toy Drones: These types of drones are used as pilot trainers and for recreational and indoor flying.

First Person View (FPV) and Racing Drones: These tend to be small machines with cameras designed to give the operator a drone viewing perspective. Many operators use head-gear ([goggles](#)) to enable them to experience the flight of the drone in real time. These are usually not equipped with GPS as they are flown within relatively close proximity to the operator. FPV drones are often sold in a form where they require some additional parts and labour before they are operational.

Hobbyist/Hacker/Developer Drones: This segment of drones caters to the hobbyist who enjoys building their drone as well as flying them. These drones are often better value for money than mass-produced machines, and operators can tailor their drones to their own specifications.

Government and Commercial Drones

According to [Goldman Sachs](#), the fastest growth opportunity for drones is from businesses and civil governments. It is predicted that these entities will spend \$13 billion on drones between now and 2020, putting thousands of them in the air. More recently Noah Poponak, Aerospace and Defense Equity Research Analyst at Goldman Sachs Research suggested that the global commercial drone market alone will exceed \$20 billion by 2021 and that cumulatively the drones market will evolve into a \$100 billion market by 2020¹².

Military drones: While recreational drones are more numerous than commercial drones, military drones, account for the vast majority (nearly 90%) of worldwide spending on drones. Drones have a long established role in protecting military personnel by allowing them to perform tasks like intelligence gathering or chemical detection from a distance. Military drones can vary from large drones with a wingspan larger than a commercial jet (40 metres) to tiny drones with a 16.5cm wingspan¹³. Drones are safer, cheaper and often more capable alternatives to manned military aircraft and accordingly, Defence spending on drones will remain the largest market for the foreseeable future as global competition intensifies and technology continues to improve¹⁴.

Some organisations are already reaping the benefits of the use of drones in the facilitation of urban planning¹⁵. Planners and engineers at the global consulting firm, [Arup](#)¹⁶, are utilizing drones to retrieve data from inaccessible or populous areas in an effort to address the limitation of traditional urban planning methods. Recently, the consulting firm teamed up with [DJI](#) to augment planning in an urban development project in Shenzhen, China. Customarily, Arup would send out 10 to 15 people to laboriously map a proposed building site. “Today, developers can enjoy access to [aerial survey data](#) at an unprecedented level. Arup’s developers can utilize the [mapping and surveying](#) capabilities of UAS to collect vast amounts of data much quicker and in three-dimensional form, adding a new level of spatial dynamics to the design process”¹⁷.

¹² Poponak, N. (2016). Drones: Flying into the Mainstream, retrieved at <http://www.goldmansachs.com/our-thinking/pages/drones-flying-into-the-mainstream.html>

¹³ Drones: Reporting for Work retrieved at <http://www.goldmansachs.com/our-thinking/technology-driving-innovation/drones/>

¹⁴ *ibid.*

¹⁵ Drones and the Future of Urban planning by Kevin Gallagher, 1 August 2017 retrieved at <https://www.simulyze.com/blog/drones-and-the-future-of-urban-planning>

¹⁶ Interestingly Ove Arup, the founder of Arup was involved in the original design of the Sydney Opera House and Arup continues to play a role in the building’s long-term development and preservation plan.

¹⁷ Drones and the Future of Urban planning by Kevin Gallagher, 1 August 2017 retrieved at <https://www.simulyze.com/blog/drones-and-the-future-of-urban-planning>

Local councils can similarly take advantage of the “birds eye view” that drones offer urban planners. For example, drones allow planners to map areas more efficiently than traditional methods and make decisions about infrastructure, taking into account a number of factors such as airflow and energy efficiency that are difficult to visualise from the ground.

A recent US report indicated there are now [one million drone registrations](#) with the Federal Aviation Administration, marking a new milestone for the two-year old registration program. Of these, hobbyists account for 878,000 of the registrations (although a single registration can be used to cover the ownership of multiple drones), and businesses (which must register each drone separately), account for 122,000 drone registrations.

The Business of Drones

A [2016 Business Insider \(BI\) Intelligence report](#) forecasted revenues from drones sales to top \$12 billion in 2021, with the growth of enterprise drone use to outpace the consumer drone sector in both shipments and revenues by 2021, reaching 29 million shipments worldwide.

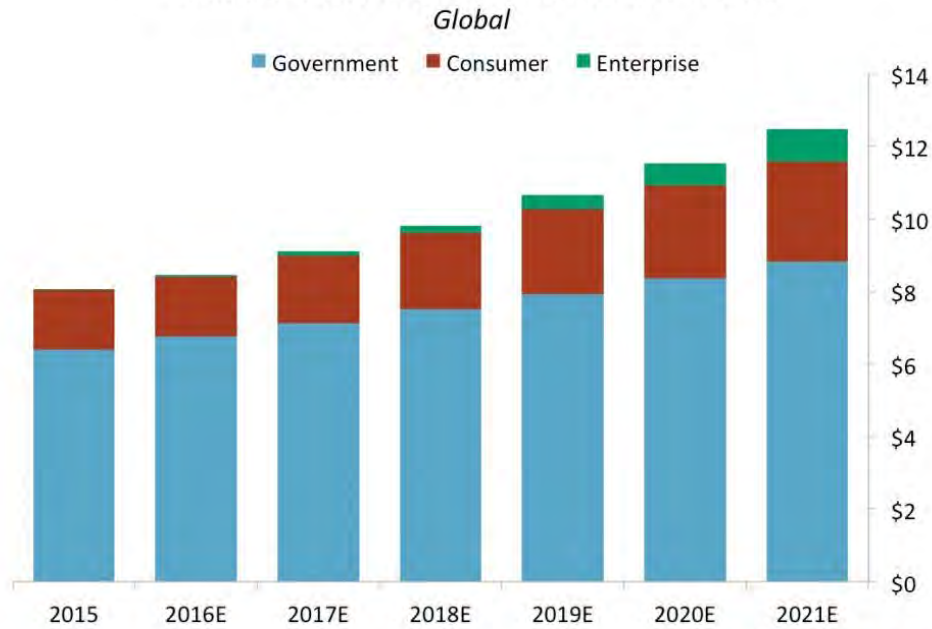
Relatedly, a [report published by the Association for Unmanned Vehicle Systems International \(AUVSI\)](#) in 2013 assessed the economic impact of UAVs in the US. The report by AUVSI concluded that the economic impact of the integration of Unmanned Aircraft Systems (UAS) into the National Airspace System (NAS) would total more than \$13.6 billion in the first three years of integration and would grow sustainably to more than \$82.1 billion between 2015 and 2025.

[AUVSI also estimates](#) that integration into the NAS will create more than 34,000 manufacturing jobs and more than 70,000 new jobs in the first three years of integration with total job creation to grow to an estimated 103,776 jobs by 2025.

Consumer drone shipments are also predicted to more than quadruple over the next five years, fuelled by increasing price competition and new technologies that make flying drones easier for amateur enthusiasts.

The BI report also predicts that technologies like geo-fencing and collision avoidance will make flying drones safer and make regulators feel more comfortable with larger numbers of drones taking to the skies. The military sector is expected to continue to lead all other sectors in drone spending due to the high cost of military drones and the growing number of countries seeking to acquire them.

Estimated Investment In Drone Hardware



Graphic reproduced from [2016 Business Insider BI Intelligence report](#)

Improvements in the technology and affordability of consumer drones are making them more reliable and easier to use for photography and video. In 2017, [DJI](#) has emerged as the clear industry leader in drone production for the consumer market. There is a clear growing ecosystem of drone software and hardware vendors, who are already addressing industries such as agriculture, land management, energy, and construction. Many of the vendors are smaller private companies and startups — although large defence-focused companies and industrial conglomerates are also investing in drone technology.

Commercial & Civil drones represent a significant business opportunity in the future. Between now and 2020, [Goldman Sachs Research has forecast a US\\$100 billion market](#) opportunity for drones, driven by growing demand from the commercial and civil government sectors. They also forecasted that Australia's drone spending will be an estimated US\$3.1 billion between 2017 and 2021. Overall, Goldman Sachs forecast that the ten largest opportunities for drones lie in construction (\$11.2M), agriculture (\$5.9M), insurance claims (\$1.4M), offshore oil/gas refining (\$1.1M), policing (\$885M), fire (\$881M), coast guard (\$511M), journalism (\$480M), customs and border protection (\$380MN) and real estate (\$265M)¹⁸.

However as Goldman Sachs points out, in order to maximise both their utility and market potential, many civil and commercial applications will require the use of drones beyond the pilot's visual line of sight (VLOS). This would require a loosening of regulations (both in the US and here) which usually require pilots operate their drones within a VLOS, to maintain orientation and achieve accurate flight navigation and tracking. Goldman Sachs believes that the biggest hurdle to faster adoption and utilisation of drones aside from safety and liability concerns is the regulatory environment, with the FAA yet to establish a complete framework and standard for use of drones in the US¹⁹.

Australia is in a similar position with no set of standards that are clear to all operators regardless of their location and across both commercial and recreational operators. Although CASA has set some rules for operation, this is very difficult to police, particularly in the

¹⁸ *ibid.*

¹⁹ Poponak, N. (2016). Drones: Flying into the Mainstream, retrieved at <http://www.goldmansachs.com/our-thinking/pages/drones-flying-into-the-mainstream.html>

recreational market segment where the average enthusiast either ignores or is unaware of the regulations and simply takes their drone to their local park or beach to fly, irrespective of nearby people or animals.

Where can you fly a consumer drone in Australia?



Source: Envato (under licence)

Recreational drone flying rules

As [provided by CASA](#), you must:

- only fly during the day and keep your drone within visual line-of sight (VLOS); close enough to see, maintain orientation and achieve accurate flight and tracking at all times (visualising via first-person-view (FPV) is not sufficient)²⁰.
- keep your drone at least 30 metres away from other people not involved with the safe operation of the drone
- keep your drone away from prohibited/restricted areas
- keep your drone at least 5.5km away from [controlled aerodromes](#); that is, facilities with an operating control tower
- only fly one drone at a time.

You must not:

- fly your drone over any area where, in the event of a loss of control or failure, you create an unreasonable hazard to the safety of people and property on the ground

²⁰ There are some complexities to this regulation. For example it has been noted that if a pilot joins the Model Aircraft Association of Australia and follows its rules, they can pilot using an FPV headset if there is a spotter beside them watching the drone at all times. See New Rules for drones on distance, weight, restricted zones by Chris Griffith, The Australian, September 29, 2016 retrieved at <https://www.theaustralian.com.au/life/personal-technology/new-rules-for-drones-on-distance-weight-restricted-zones/news-story/723cd3b4bdaa9dbf9b5c486ed889b005>

- fly your drone over or near an area affecting public safety or where emergency operations are underway (without prior approval)
- fly your drone higher than 120 metres (400ft) above ground level.

Are there no fly zones for drones?

To assist enterprises and enthusiasts alike in the safe operation of their drones, CASA has released a free safety app for Android, IOS devices and HTML5 called [“Can I fly there?”](#). CASA commissioned tech company, [Drone Complier](#) to produce the app following the creation of their own commercial drone operation and compliance app. The Can I fly there app provides sub-2kg commercial drone flyers with guidance as to where they can and cannot fly their drones. It clearly shows crucial drone no-fly zones and drone “fly with caution” zones and uses the drone operators’ location to identify no-fly zones around major airports, the flight paths of smaller airports and helicopter landing areas. App users can also see restricted and military airspace where drones must not be flown and these are clearly shaded in red on the map. Yellow shading is used to show “fly- with-caution” zones around areas where aircraft are known to operate at low altitudes.

The CASA app represents the first time an official app has been released in Australia to help drone flyers stay safe and abide by the safety regulations. It is certainly worth utilising, as the penalties for flying a drone in prohibited areas range from between \$900 to \$9,000. The display of CASA safe operation circulars wherever drones are sold, including information about the app, would assist to disseminate CASA’s information. Similarly, local community centres and libraries may also wish to prominently display the information or at the very least provide details of CASA’s website and the Can I fly there app. The installation of permanent signage outlining the safe operation of drones in parks, playgrounds and ovals across LGAs is another avenue for raising community awareness of CASA regulations.

CASA’s Rules for Commercial Drones

Generally, drones cannot be flown for economic reward without a specific licence. However, there are exceptions where certification is not required: for commercial-like operations over your own land, and for commercial flights with very small drones (under 2kg). Effective the 2nd of September 2016, a new category of excluded remotely piloted aircraft (RPA) came into effect, with reduced regulatory requirements to fly **very small** RPAs commercially. Thus, operators utilising a drone under 2kg do not need an RPA operator's certificate (ReOC), or a remote pilot licence (RePL).

Those operating in the excluded RPA category will however have to [notify](#) CASA at least five business days before their first commercial flight and agree to operate by the standard operating conditions and the guidance in CASA’s [advisory circular \(AC\) 101-10](#). It is interesting that although operators have to notify CASA, they do not have the same obligation to notify the council of the LGA where they will be flying. If there was a requirement by councils to provide such notification, they in turn could provide affected residents with fair warning and thus prevent potential breaches of privacy such as in the Mount Martha real estate agent case.

Collisions Between Manned Aircraft and Drones

In March 2017, the [Australian Transport Safety Bureau's \(ATSB\) report](#) into the growth of "remotely piloted aircraft systems (RPAS)" found 108 “occurrences” with manned aircraft between 2012 and 2016, with 69 of those happening in 2016.

There were however, no reported collisions between RPAS and manned aircraft in Australia. The ATSB noted that the consequences of any such collision between a drone and manned aircraft "are not yet fully understood" but were expected to cause "engine shutdown" in around 20% of collisions. The next most common type of occurrence involved collisions with terrain, almost half of which results from a loss of control of the RPAS.

According to our research, worldwide, there have been five known collisions. Three of these resulted in no damage beyond scratches. However, one collision with a [sport biplane in the United States in 2010](#) resulted in a crushed wing. Fortunately, the aircraft landed safely. Less fortunately, a Grob G 109B motorglider [collided with an RPAS in 1997 in Germany](#) resulting in the glider's wing breaking, the glider crashing and the two people on board being killed.

In Summary

Regardless of their application, it is clear that drones are here to stay and it is appropriate for all — consumers, government and regulatory authorities alike — to educate themselves and respond appropriately and swiftly to this rapidly emerging and evolving innovative technology.

Drones offer remarkable opportunities to improve our lives, but regulators will have to take account of a number of factors in their decision making which is why the NSIN urges LGAs to preemptively prepare for the increasing inclusion of drones in our society.

What is the North Sydney Innovation Network (NSIN)?

[The North Sydney Innovation Network \(NSIN\)](#) embodies an innovation culture. Its mandate is to promote and enhance the contribution of innovation-related businesses, particularly new startups and fast-growth businesses, to the economy and society of the North Sydney region.

The NSIN aims to be a network of both individuals and organisations from a diverse range of sectors but with a common purpose of fostering innovation and prosperity in Australian small to medium size enterprises and beyond. The NSIN supports events, an online community, policy and advocacy initiatives and the development of a major innovation precinct for the north and has a publicly available [Vision paper](#).

The NSIN advocates for technology and innovation policy that improves the inclusivity, sustainability and liveability of our local government areas (LGAs) and champions seven innovation policy priorities:

1. Free, accessible and good quality public WiFi
2. Smart cities: integrating the Internet of Things (IoT) into public infrastructure
3. Open data across community services and utilities
4. Promoting and creating flexible work "collaboration areas"
5. Preparing for drones in our communities
6. Preparing for autonomous vehicles in our communities
7. Actively boosting STEM involvement at all levels of education

Credits

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