

Queensland Drones Strategy

CONSULTATION PAPER



Queensland
Government

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Foreword

My government is focused on growing our economy and supporting the jobs of the future.

Our \$420 million investment in Advance Queensland is paying dividends—in just two years, we have supported over 4800 jobs, backed more than 1650 innovators to turn their ideas into reality and leveraged over \$100 million in co-investment from partners.

While our actions now are supporting Queensland's strong economic growth and job creation, we are continuing to look for new opportunities to strengthen and build on this growth. We need to ensure we are well positioned to take advantage of future opportunities.

An industry with significant potential globally, and for Queensland, is the drones industry. A 2016 report by Goldman Sachs highlights that potential drone market opportunities for consumer drones could reach US\$17 billion by 2020, and the commercial and civil drone market could reach US\$13 billion by 2020. Queensland has an opportunity to build on its existing technical expertise, our world-class research sector and status as an innovation leader to benefit from the growth in this market.

This Queensland Drones Strategy consultation paper has been developed as a way to start the discussion around how we can take advantage of this opportunity. We need to ensure industry can thrive, our research and development opportunities are maximised, investment flows into Queensland, our communities benefit, and Queenslanders' rights are protected. Importantly, we need to develop a strategy so that we have a shared vision, we know how to achieve that vision and what our responsibilities are in achieving our vision.

Success cannot be achieved by government alone. I encourage you to have your say on how we can make the most of this opportunity to support economic growth and the jobs of the future.

A stylized, handwritten signature in black ink.

Annastacia Palaszczuk MP
Premier and Minister for the Arts

Acronyms

Acronym	Definition
ACMA	Australian Communications and Media Authority
AMSA	Australian Maritime Safety Authority
AUV	Autonomous Underwater Vehicle
BVLOS	Beyond Visual Line of Sight
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulations
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAF	Department of Agriculture and Fisheries
DNRM	Department of Natural Resources and Mines
DTC Amendment Bill	Defence Trade Controls Amendment Bill 2015
DTMR	Department of Transport and Main Roads
DSD	Department of State Development
DSITI	Department of Science, Information Technology and Innovation
DTMR	Department of Transport and Main Roads
FAA	Federal Aviation Administration
GPS	Global Positioning System
IMO	International Maritime Organisation
IP Act	Information Privacy Act 2009 (Qld)
MSQ	Maritime Safety Queensland
QFES	Queensland Fire and Emergency Services
QPS	Queensland Police Service
ReOC	Remote Piloted Aircraft Operator's Certificate
RePL	Remote Pilot Licence
RPAS	Remotely Piloted Aerial Systems
SME	Small to Medium Enterprises
STEM	Science, Technology, Engineering, Mathematics
TIQ	Trade and Investment Queensland
UASSC	Unmanned Aircraft Systems Standard sub-committee
UAV	Unmanned Aerial Vehicle
UUV	Unmanned Underwater Vehicle
VET	Vocational Education and Training
WoDC	World of Drones Congress



Vision

Our vision is that Queensland is a world leader in drone technology and application. Our drone industry has strong investment and jobs growth, supported by our world-leading research and development capability and a highly skilled workforce. Queensland is a place where drones complement and enhance Queenslanders' lives and support our communities.

Insights

What is your vision for the drone industry in Queensland?

Defining 'drones'

Drone is the common term for Unmanned Aerial Vehicles (UAV), or Remotely Piloted Aircraft Systems (RPAS), Unmanned Underwater Vehicles (UUV) or Autonomous Underwater Vehicles (AUV). In the context of this strategy, drones refers to any remotely controlled or autonomous aircrafts or underwater crafts, with a primary focus on civilian uses.

Drones can be operated using sensors, global positioning system (GPS) data and video streaming, and may be autonomous or remotely piloted. Aerial drones are considered aircraft by Australia's Civil Aviation Safety Authority (CASA) and are covered by the *Commonwealth Civil Aviation Act 1988* and the *Civil Aviation Safety Regulations 1998* (CASR)ⁱ. Underwater drones are within the jurisdiction of the relevant water authority.

Drones range in size from nanoscale to those capable of transporting people. The types of drone platforms include multi-rotor systems, fixed-wing craft and single-rotor helicopters and hybrids. There are a wide range of existing and emerging applications for drones, including government service delivery, commercial, military, and scientific research. Drone technology is being increasingly embraced by hobbyists. The ways in which drones are used, operated and regulated, and the technology itself, is evolving rapidly.

Industry drivers and the global picture

Development of the drone industry is being driven by technological advances, consumer demand and rapid growth in commercial market opportunities, underpinned by an evolving policy landscape. Queensland's responsiveness to these industry drivers has positioned the state as a leader in drone use and development.

Technology

Drone technology is advancing rapidly. The first drones were developed for military purposes in the mid 20th century, with surveying and armed capabilities. The popularity of consumer and commercial drones has been relatively recent, with significant growth in production in the last 10 years. Technological advances have enabled civilian drones to be made at a lower cost and with capabilities such as GPS and waypoint navigation, smartphone based control systems, high definition video that can be adjusted during flight and thermal cameras.

Further advances in technology are expected to increase opportunities for the civilian drone market. A key area of development is autonomous navigation ability. This allows drones to identify and manoeuvre around obstacles, leading to a dramatic improvement in drone autopilot features. Increasing sophistication in drone systems, including Beyond Visual Line of Sight (BVLOS) long-range operations capabilities, payload capacity and advances in data collection abilities such as sound and images, will likely have a significant impact on the drone industryⁱⁱ.

Broader innovations in technology will also likely drive drone development. Existing platforms are the convergence of a range of technologies such as hydrodynamics, structural mechanics, robotics, signal and information processing, systems engineering, electrical components and sensor systems. Further developments in these areas, plus the continued emergence of new technologies, have the potential to lead to new drone capabilities.

Policy setting

Aerial drones

CASA regulates Australia's safety laws for aerial drones. *CASR Part 101 – Unmanned aircraft and rockets* governs the use of drones for commercial and recreational purposesⁱⁱⁱ. Recent amendments to CASR Part 101 have reduced the costs and legal requirements for low-risk drone operations by introducing new weight classifications. Prior to the amendments, a remote piloted aircraft operator's certificate (ReOC) and/or remote pilot licence (RePL) were required for all commercial drone use.

Licenses and certificates are no longer compulsory for all commercial operation of very small drones (0.1kg-2kg), and commercial use of small (2kg-25kg) drones over the operator's private property. Use of medium drones (25kg-150kg) over the operator's private property do not require a ReOC, though still require a RePL. These changes aim to reduce the red tape for commercial drone use while maintaining safety protocols in line with international standards^{iv}. However, licenses may still be required in specific circumstances, for example, for chemical application.

Commercial use of drones of any size are subject to restrictions under the *Radio Communication Act 1992 (Cth)*. The radio frequencies used to control drones must comply with those authorised under a licence issued by the Australian Communications and Media Authority (ACMA).

As part of CASA's review of Part 101, it has issued a discussion paper for public comment which closes on 22 September 2017. The paper considers issues that may need to be addressed by regulation in the



future, including developments in BVLOS capabilities, operation in Instrument Flight Rules, lift and carry issues and integration into the air traffic management system.

As technology advances and the market grows, the policy landscape will need to continue to evolve. The Unmanned Aircraft Systems Standards sub-committee (UASSC) is a joint CASA/aviation community forum for the development of regulations and standards of aerial platforms. A taskforce has recently been established to focus on the future development of Part 101. The principle aim of the taskforce is to develop a roadmap or strategic plan, setting out the objectives of future regulation in Australia. The roadmap will identify potential operations such as BVLOS, long-endurance, high-altitude or autonomous flight, and determine the regulatory, technological and procedural steps necessary to facilitate the safe introduction of these kinds of operations.

Underwater craft

Maritime Safety Queensland (MSQ) has jurisdiction over water space management up to three nautical miles off the Queensland coast. This includes the operation of drones. The Australian Maritime Safety Authority (AMSA) is responsible for the safety and protection of Australian waters. Drone use outside of three nautical miles will be under AMSA jurisdiction. At an international level, the International Maritime Organisation (IMO) is a specialised agency of the United Nations with responsibility for safety and security of shipping.

As yet, there are no regulations or guidelines specific to the operation of drones in Queensland at a state,

national or international level. Future developments in this area will have potential impacts on the drone industry.

Privacy

CASA does not deal with privacy complaints related to drone use and privacy issues are addressed through a complex suite of regulations. Collection of personal information by Queensland Government must be handled in accordance with the *Information Privacy Act 2009* (IP Act). Other considerations include:

- obligations in the *Invasion of Privacy Act 1971* concerning the audio recording of conversations
- common law relating to trespass against a person
- Section 227A of the *Criminal Code 1899* concerning observations or recordings in breach of privacy
- management of drone generated records under the *Public Records Act 2002*
- *Defence Trade Controls Amendment Bill 2015* (DTC Amendment Bill) which relates to 'Dual Use Goods' – Category 9: Aerospace and Propulsion Aero gas turbine engines, rocket propulsion systems, UAVs, sounding rockets, wind tunnels, turbine blade production equipment
- Section 131 of the *Survey and Mapping Infrastructure Act 2003*
- CASA requirements in relation to drones (though CASA does not explicitly cover privacy)
- MSQ and AMSA requirements for underwater vehicles
- *Major Events Act 2014*.

The Australian Privacy Commissioner and Queensland Privacy Commissioner have limited roles in this space.

For example, the *Commonwealth Privacy Act 1988* (the Commonwealth Privacy Act) and IP Act and their respective Privacy Commissioners, regulate only 'information privacy' and not surveillance more generally. The IP Act applies only to Queensland Government agencies. The Commonwealth Privacy Act applies to Commonwealth agencies and other entities, including corporations with annual turnover of more than \$3 million. However, many entities, including small businesses and individuals, fall outside the scope of both Acts.

The Australian Parliament's House of Representatives Standing Committee (the Committee) on Social Policy and Legal Affairs tabled the *Eyes in the Sky* report in July 2014, with the federal government response tabled in December 2016. The report recommended that the Australian Government consider introducing legislation that provides protection against privacy-invasive technologies, including drones, with particular emphasis on protecting against intrusions on a person's seclusion or private affairs. The Committee also recommended that the Australian Government coordinate with CASA and the Australian Privacy Commissioner to review the adequacy of the privacy and air safety regimes in relation to drones'.

The federal government is currently progressing public hearings for the Senate Standing Committee on Rural and Regional Affairs and Transport inquiry into regulatory requirements that impact on the safe use of RPAS, UAVs and associated systems. Amendments to privacy regulations have the potential to have a significant impact on the drones industry.

Screen Queensland

Drones are revolutionising the movie industry, making previously difficult shots much easier to accomplish and achieving shots that were previously impossible.

Queensland, as the prominent home of blockbuster movies in Australia, is at the forefront of this innovative work with films including *Pirates of the Caribbean: Dead Men Tell No Tales*, *Thor: Ragnarok*, *Aquaman* and *Pacific Rim 2* all utilising drones throughout filming.

On *Pirates of the Caribbean*, the filmmakers were able to work with the drone technicians to create shots that both saved costs to the production but also allowed for shots that have never been achievable before. This was key to refreshing the look, feel and ambition of the franchise.

The technicians used a large drone operated camera to achieve big sweeping aerial shots as well as manoeuvring the drone around a pirate ship, sweeping over the deck.

Consumer demand

Recreational drone use is a popular pursuit and is forecast to grow rapidly into the next decade. From its military origins, drone technology has diversified into the consumer market, with low-cost toy drones for recreational users readily available. Research by Grand View Research estimated the drone consumer market was valued at USD \$355.9 million in 2015 and forecast a 35 per cent increase in the Asia Pacific region by 2024^{vi}.

Insights

Are there any other drivers of industry growth? What will be the drivers into the future?

Commercial markets

Commercial and government markets are key areas of growth for the drone industry. Civilian markets are predicted to eventually outstrip the military market and present a significant opportunity for drone use, research and development^{vii}. A recent report by Goldman Sachs considered the opportunities for the whole drone market, including consumer markets, commercial markets, military applications and government operations. The research forecasts that potential drone market opportunities for consumer drones could reach US\$17 billion by 2020, and the commercial and civil drone market could reach \$13 billion by 2020^{viii}.

Drones have an extensive range of civilian applications. Queensland Government agencies are embracing this new technology to deliver services in a new, more efficient

and responsive manner. Examples include collecting intelligence during emergency or disaster events to allow real-time decision making, facilitating cost effective pesticide application in agriculture, invasive species management, aerial mapping and infrastructure assessment, and taking images/film for marketing and entertainment.

Growth in the drone market presents further opportunities for drone research and development. The Queensland Government actively supports research and development, providing funding grants through *Advance Queensland*, sponsoring the World of Drones Congress (WoDC) and supporting the UAV challenge.

Global trends

Globally, the drone industry is a sector of growth. There are variable estimates of the current and forecast drone markets from research bodies. This is due to differences in the classification of drones and what is incorporated into the estimates. For example, the estimates from Goldman Sachs aim to capture commercial, civil and consumer drones, while Grand View Research focuses on consumer drones. Business Insider Intelligence examines the sale of all drones, forecasting this will surpass \$12 billion in 2021^{ix}. What is clear from all of the research is that the market is growing rapidly, with commercial and consumer drones becoming more prevalent.

In the United States of America, recent amendments to federal regulations

for drones set by the Federal Aviation Administration (FAA) are opening the door to industry expansion, exempting companies from requiring a FAA issued certificate of airworthiness to operate drones for purposes such as insurance, construction and agriculture^x.

Europe accounted for over 30 per cent of the industry share in 2015 and is forecast to emerge as a predominant region for the industry^{xi}. By 2036, the sector is expected to directly employ more than 100,000 people and have an economic impact exceeding EUR \$10 billion per year, mainly in services^{xii}.

The European Commission released a communication, 'A new era for aviation', followed by the Riga Declaration in 2015, outlining a European level policy framework to enable industry development in a safe and secure manner^{xiii}.

The Asia Pacific region is also forecast to see substantial growth in the consumer drone market over the next decade. Much of this growth may be attributed to investors from the United States of America investing heavily in Chinese drone companies^{xiv}.

Queensland industry snapshot

CASE STUDY

Industry insights

Queensland boasts a significant depth of capability in drone design and manufacture. More than 30 per cent of Australia’s growing drone industry is located in Queensland^{xv}. According to CASA, the number of certified unmanned aerial systems operators in Queensland is 267. This is approximately 25 per cent of the total certified operators across Australia.

Underpinning the strength of Queensland’s drone capabilities is a strong base of international prime defence companies and small to medium enterprises (SMEs) providing world-class technological and manufactured goods and services across the sector. Emerging technologies, such as drones, can be applied across a broad array of traditional industries, for example automated crop and pest monitoring.

Queensland can capitalise on its existing technical expertise, along with our highly regarded research agencies and specialist capability in drones to develop systems that support the growth of industries such as mining and agriculture, and efficient service delivery such as disaster response,

Joint QPS-QFES exercise at WoDC

On 2 September 2017, as part of the inaugural World of Drones Congress, the Queensland Police Service (QPS) and Queensland Fire and Emergency Services (QFES) will conduct ‘Exercise Flight’, an interagency exercise on the South Bank stretch of the Brisbane River. An emergency drone will livestream the exercise to highlight both its search and rescue capability and the broader role that drones can play in responding to emergencies. This public demonstration reflects the commitment of QPS and QFES to embracing innovation and technology in service delivery and making our communities safer.

environmental monitoring, biosecurity and infrastructure assessment.

Drone technology has the capability to introduce greater efficiencies in a range of Queensland industries. The Queensland Government is working to facilitate the development and growth of the industry, through investment in a range of programs and initiatives. Companies across the state are leveraging our competitive advantages to create international opportunities.

Queensland Government actions

The Queensland Government recognises the potential of drones in supporting economic and jobs growth, the ability to deliver better services for Queenslanders and in supporting our communities. We are working hard to take advantage of these opportunities and our agencies have embraced the technology to deliver services in new, safer and more efficient ways. The table below presents a summary of the actions that agencies are currently undertaking.

Insights

Who are the key players in Queensland’s drone industry and what are they doing?

Agency	Action
Department of State Development (DSD)	Three government-funded trials aimed to determine aerial drone capacity to replace manned aircraft for government purposes, including surveillance of illegal fishing activities off the coast of Moreton Bay, North Stradbroke Island and the Great Barrier Reef Marine Park and biosecurity missions focused on the size and spread of Siam Weed
	Promotion of the Queensland aerospace industry, including drone capability, at targeted trade shows such as the Avalon Air Show
	Supporting the UAV Challenge as part of a joint sponsorship proposal with DSD, Department of Science, Information Technology and Innovation (DSITI) and Department of Natural Resources and Mines (DNRM)
	Commissioned the RPAS test, trial and evaluation site study
Department of Natural Resources and Mines	Developing the Queensland Aerospace 10 Year Roadmap and Action Plan (yet to be released)
	Working with the Business Corporate Partnership Procurement unit in Department of Environment and Heritage Protection to establish a new category in our Spatial Imagery preferred supplier panel for remotely sensed imagery captured by RPAS
	Piloting alternative technologies to deliver timely and reliable streamflow data

Agency	Action
Department of Science, Information Technology and Innovation	<p>Supporting the WoDC</p> <p>Advance Queensland funding to support:</p> <ul style="list-style-type: none"> Platform Technology Program Engaging Science Grants Hot DesQ Knowledge Transfer Partnerships Research Fellowships Ignite Ideas Fund <p>Provision of science delivery services and support of the legislative requirements of government, particularly in relation to the assessment of land use and pollution management</p>
Department of Education and Training	<p>Established a Remote Piloted Aircraft – Training Advisory Group to provide advice to support skills development for the commercial operation of unmanned systems technology in Queensland</p> <p>The AV130316 Certificate III in Aviation (Remote Pilot – Visual Line of Sight) qualification is subsidised under the Queensland Government’s Annual Vocational Education and Training (VET) Investment Plan, and is being trialled for VET in Schools delivery through Aviation High</p> <p><i>Schools of the future – A strategy for STEM in Queensland state schools</i> supports the implementation of the Australian Curriculum: Digital Technologies. The use of drone technologies will be an innovative resource to support this strategic activity. Schools will be supported to use drones as part of implementing this curriculum</p> <p>Development of a <i>Use of Drones in Schools Policy</i></p> <p>Developing risk assessments to guide the use of drones in schools</p>
Department of Environment and Heritage Protection	<p>Monitor compliance with environmental approvals including large scale rehabilitation</p>
Queensland Fire and Emergency Services	<p>Commenced a trial of RPAS and unmanned aircraft focused on understanding the future application of this technology in the field of fire and emergency services</p> <p>The Brisbane-based trial will run for 12 months and support operations through enhanced intelligence and situational awareness for firefighting, hazardous material management, fire investigation and search and rescue operations</p> <p>Obtained a department-wide ReOC from CASA in 2017, allowing drones to be introduced into day-to-day emergency operations, which is better informing the future needs of the department</p>
Queensland Police Service	<p>Developed the <i>Proposed strategy for the further implementation of Remotely Piloted Aircraft Systems within the Queensland Police Service (2016)</i></p> <p>Attained a CASA Operators Certificate in 2013. The QPS became the first Australian law enforcement and Queensland Government agency to be certified</p> <p>Utilising RPAS for aerial photography and mapping for forensic purposes, emergency and disaster events</p>
Department of Agriculture and Fisheries	<p>Amended legislation to enable the use of drones by licenced chemical applicators and issues licenses for the aerial distribution of agricultural chemicals</p> <p>In partnership with DNRM, Biosecurity Queensland has joined with the CSIRO to use drone technology to tackle pest weeds</p> <p>Using drones for fire detection, timber salvage assessments and other forestry managed activities</p> <p>The Crop and Food Science group operate UAVs for the collection of pest impact imagery on field crops as well as video imagery</p> <p>Agri-Science Queensland uses UAVs to undertake crop biomass sensing</p> <p>The Dairy Group uses a UAV to provide industry with options to improve farming practices</p>

Agency	Action
Department of National Parks, Sport and Racing	Monitoring conditions in marine and terrestrial protected areas
	Fire management
	Asset management
	Pest management
	Development of promotional material
	Operational policy: landing aircraft and recreational craft in Queensland Parks and Wildlife Services managed areas
Department of Transport and Main Roads	DTMR uses RPAS for the following activities: <ul style="list-style-type: none"> batter slope inspection (slope stability) landscaping assessments and training bridge & asset inspection (safety and asset management) volumetric survey construction progress photography fauna spotting feasibility studies emergency response data acquisition
	DTMR supports QPS in the use of RPAS to investigate fatal crashes
	The agency has a <i>Technical Note No. 156 – Use of Remote Piloted Aerial System (RPAS)</i> , ReOC and four RePL at South Coast Region
	DTMR, as representative of Queensland Government at National Airports Safeguarding Advisory Group, tabled the matter of drone use and safety implications upon transport corridors at the annual meeting held in March 2017
	Promote Queensland capabilities in drone research and development, and identify potential international opportunities for collaboration
	Attracted international drone companies, including Terra Drone, to establish operations in Queensland
Office of Small Business	Provided grants to six small businesses that either have drones as their core business or they were seeking to purchase drones to boost their business capability
Energy Queensland Limited	Using drones to identify existing and potential defects on the network
	UAVs were used to capture aerial views of the impacted network during the response to Tropical Cyclone Debbie
Powerlink	Continuing to explore the effective and efficient use of drones through research and development program
Stanwell	Collect video footage, visual assessments of infrastructure, and conduct stockpile surveys
CS Energy	Aerial photography
SEQWater	Monitor and maintain water supply assets, water catchments and recreational areas
SunWater	Visual inspection and surveillance of assets
	UUVs are used to inspect Paradise Dam
Gladstone Area Water Board	Inspection of water storage roof tops and surveys of managed land
	Photography and videography during times of emergency
	Submersible drones are used for the inspection of in-water infrastructure

Insights

How can government continue to develop its drone capability?

How can government support industry and the community to grow the drone sector?

Queensland's strengths

Home to global companies and industry stakeholders

Queensland is home to **leading industry stakeholders** in drone and platform technology research and development, systems design and manufacture including global companies, and SMEs. This existing network positions Queensland as an **attractive proposition** for future industry development.

World-class research capabilities

Our world-class universities and institutes including Queensland University of Technology, the University of Queensland, Griffith University, James Cook University, the University of Southern Queensland, University of the Sunshine Coast and the CSIRO's autonomous systems laboratory, are at the forefront of research on drone and associated technologies and are host to prominent researchers in the field of robotics. The strength of our universities also presents an **opportunity for training** university graduates and building research capacity in Queensland.

Regional leaders in investment and service delivery

The Queensland Government is **supporting drone industry development** through existing initiatives and is a leader in adopting the technology for **service delivery**. Government agencies have embraced new technology to deliver services, ranging from aerial mapping, emergency service management and agricultural practices. The QPS is the first Australian law enforcement agency to achieve a CASA Operators Certificate. DAF recently amended legislation to allow licenced

chemical applicators to employ drones for aerial distribution of agricultural chemicals. DAF, DNRM and Biosecurity Queensland joined with the CSIRO to use drones to tackle pest weeds.

Through *Advance Queensland*, the Queensland Government has funded drone initiatives including \$1 million to develop and test drone technologies in Queensland in collaboration with Boeing subsidiary Insitu Pacific, Shell's QCG project, Telstra and Queensland SMEs.

Our existing initiatives have positioned Queensland as regional leaders in drone technology, with existing industry networks and internal knowledge and expertise.

Proximity to growth markets

Queensland is ideally located to access and connect with the **high growth markets** in the Asia Pacific region. Asia's expertise in electronic manufacturing and technology development provide opportunities for **collaborations for industry and research and development**, as well as **exports**.

Queensland's **reliable and efficient infrastructure**, including five international airports and 56 certified airports, a modern and efficient road network, and access to reliable rail and port services, will facilitate these connections.

Land and coastline availability

Queensland's physical environment provides a **natural advantage** for drone facilities. Expanses of open land with uncongested airspace and favourable climate provide an opportunity for aerial drone use and testing. This advantage has already been recognised, with Dalby and Kingaroy selected as sites for the UAV Challenge.

Our state has extensive coastlines, boasting world-class beaches and the Great Barrier Reef. Queensland's coastal assets are an attractive proposition for underwater drone use and testing, with potential tourism and conservation benefits. The expanse of our marine areas may also support larger drone testing sites for military and commercial purposes.

Queensland's coastal assets are an attractive proposition for aerial and underwater drone use and testing, with potential tourism and conservation benefits. Drones have been deployed to monitor nesting grounds for green turtles as part of the Raine Island Recovery Project, a five-year \$7.95 million collaboration between the Queensland Government, BHP Billiton, the Great Barrier Reef Foundation, and the Wuthathi and Meriam Nations Traditional Owners. The Yuku Baja Muliku Rangers in Cape York are pioneering the use of aerial drones to survey offshore islands and coral reefs. Robotics researchers from QUT have developed COTSbot, an underwater drone capable of identifying and eliminating the destructive crown-of-thorns starfish.

Insights

What sets us apart and makes Queensland an attractive proposition for industry development?

Challenges

Complex regulatory environment

CASA's CASR Part 101 provides an overarching regulatory framework for the operation of aerial drones. This sets the safety guidelines and no fly zones for commercial and recreational use, and grants licences and permission for flight where required. The proposed Queensland strategy must operate within this regulatory framework. Regulations for underwater drones are under the jurisdiction of the water regulatory body. In Queensland, MSQ and AMSA are the agencies in charge of safety and management of our coastal waters. Recreation and commercial activities in inland catchments may be regulated by the catchment or water authorities.

Protecting individual's rights

Privacy issues are a potential concern in relation to drone use. Drones have the capacity to travel relatively unnoticed, enter private property and record live images and sounds. This poses a privacy risk as drones may be used to monitor, record or disclose individuals' private activities without their consent. The Commonwealth Privacy Commissioner has commented that *"the application of sophisticated drone technology raises some potential privacy issues that need to be addressed if the social and economic potential of drone technology is to be realised"*. The challenge for Queensland is to effectively address privacy and safety concerns while ensuring a policy environment that fosters investment and industry development.

Drones fitted with high-resolution cameras and sensors have the capacity to generate large volumes of imagery data and information. Once just the domain of commercial aerial surveying

companies, the ease of accessibility of data captured by drones brings with it a responsibility to maintain good information management practices within organisations. This includes ensuring data is collected officially, licenced and shared appropriately and that privacy and discoverability and access to information is actively managed.

Facilities restrictions

Queensland does not currently have commercial facilities capable of supporting certain types of drone testing, including testing for some military applications. To position Queensland as a hub for drone testing and development, upgrading existing facilities or developing greenfield sites will be required to accommodate large scale drones.

Insights

What are some other risks that we need to consider?

What ways can we mitigate these risks?

What are the appropriate insurance requirements for consumer and commercial use of drones?

Safety and security

Safety and security of the public is a foremost priority for the Queensland Government.

CASA guidelines set the restrictions for where and when aerial drones can be used. Drones may not be operated at night or out of visual sight, over 120 metres above ground level, within 30 metres of other people, within 5.5 kilometres from controlled aerodromes, over any populous areas

(including beaches, parks or sporting ovals), or near areas affecting public safety or where emergency operations are underway (without prior approval). These are enforced by CASA and fines apply to operators that breach these conditions.

The *Radio Communication Act 1992* (Cth) sets the radio frequencies that can be used to control drones. The Australian Radiofrequency Spectrum Plan delineates the Australian radiofrequency spectrum into a number of bands to be used for specific purposes: for example, anti-collision radar on commercial passenger aircraft. Drones must be operated in accordance with the appropriate frequency band to avoid interference with other activities.

Illegal use of drones presents a safety concern and a security risk. Operating outside of CASA guidelines or the allocated radio frequencies increases the potential for accidents, including collisions in the airspace, and poses a significant risk to members of the community. Drones' ability to carry objects may also lead to potential risks for national security.

Although CASA provides overarching guidelines for the safe use of aerial drones, there are specific circumstances that may need further consideration. For example, the use of drones above or near roads risks collision with vehicles and may cause driver distraction. Similarly, the use of underwater drones in busy water ways may present a collision risk.

Insights

What barriers are there to drone industry development in Queensland and how can they be overcome?

Opportunities for Queensland

Queensland is strongly positioned to take the lead in drone investment, research and development. Our existing technical expertise, highly regarded research and specialist capabilities in platform technologies have wide ranging benefits across industry, furthering the promotion of Queensland as a drone innovation and development hub.

Growth in the industry has the potential to support future employment opportunities through complimenting existing careers and creating new positions. According to CASA, three years ago in Australia there were 100 certified drone pilots. Today, nationwide, this has grown to over 900 certified drone pilots. To maximise the potential job opportunities, Queensland can build on our existing strengths to establish a strong drone industry within the state and increase the technical capabilities of our workforce through training and development.

For example, the Queensland Government recognises the importance of Science, Technology, Engineering and Mathematics (STEM) to our future industries and supports the use of drone technology in schools through a number of initiatives including grants, roadshows and competitions. There currently exists a range of programs to prepare Queensland school students for the jobs of the future, including the Queensland Coding Academy, the Advance Queensland Engaging Science Grants, the STEM.I.AM program and the introduction of the first STEM Champions in 2018.

These initiatives help urban and rural students and teachers reap the benefits of STEM education. Opportunities may exist for broader integration of drones in schools at a classroom level through teacher training, classroom resources and access to affordable technology. This work can be leveraged to target Queensland's drone industries, through existing STEM based initiatives in schools. There are a number of possible ways that drone technology can be further integrated into the school curriculum, including:

- making drones—developing skills in robotics, maths, electronics, programing and perseverance, as well as hands on experience

- operating drones—developing skills in coding and technical operation, as well as use for surveys, shooting videos and collecting data
- using drones for creative inspiration and debate—for younger school students this may include creative writing or art; older students may use drones to inspire ethical debates, media experience, film or photography.

To support training and education of the workforce, the Queensland Government has introduced a subsidy under the Annual VET Investment Plan for the AVI30316 Certificate III in Aviation (Remote Pilot – Visual Line of Sight) qualification. There is an opportunity for the course to be integrated into secondary schools and this is currently being trialled through Aviation High. The trial will be reviewed to determine the VET in Schools model to be supported in 2018.

Currently, AVI30316 is the only qualification specific to RPAS operation, however, additional qualifications may emerge as the industry develops. Supporting the provision of certified training courses to Queenslanders will help ensure our future workforce is able to take advantage of the job opportunities from drone technology.

A key opportunity for Queensland is in providing a coordinated policy landscape, balancing security and safety concerns, privacy issues, CASA regulations and regulations for water bodies, with an environment that fosters industry development and job growth. Queensland has the opportunity to be the first state in Australia to deliver an overarching strategy that addresses operational and privacy regulations and provides a cohesive framework to support industry investment.

There are multiple opportunities for use of drones by government operations,



with government agencies already adopting the technology. Opportunities for drones include:

- aerial mapping
- infrastructure assessment
- natural resource management
- disaster response and recovery
- mapping sea beds
- agriculture
- mining
- emergency services
- scientific research
- tourism
- marketing and entertainment
- screen industry.

Insights

What are the future opportunities for Queensland's drone industry? How can we capitalise on these opportunities?

Queensland has the opportunity to leverage existing relationships with key industry players to establish a hub for drone testing and development. This provides potential investment benefits and may enable Queensland small businesses, research organisations and startups to participate in broader global industry opportunities, including niche opportunities in national and international supply chains.

Global companies are seeking sites, both terrestrial and marine, to test drone technology, with particular interest in large drone craft.

Queensland has a strong industry base in agriculture, mining, marine industries and tourism where drone applications

can be developed and tested. From a disaster management perspective, Queensland is well placed to be a leader in drone development.

Queensland has identified existing facilities that may be appropriate to upgrade to support the delivery of RPAS test trial and evaluation services. The characteristics and topography of our natural landscape, coastline and a favourable climate are advantageous for potential upgrading and development of drone testing facilities.

New drone technology, coupled with CASA's responsive regulations, provides an opportunity for Queensland to be a preferred location for drone testing. For example, BLOS is an emerging capability that CASA is considering in an ongoing review of Part 101. The Queensland Government has a role in providing facilities capable of supporting the testing of this technology, and assisting international companies to understand the evolving

policy setting and ensure compliance with CASA guidelines.

Queensland is already considered a leader in the consolidation and accessibility of aerial and satellite imagery data and its supporting digital infrastructure through our enabling legislative frameworks giving rise to the State Remotely Sensed Image Library and online tools such as Queensland Globe and QImagery. Under the state's open data initiative, the most recent aerial photography from the state's imagery program is available through Queensland Globe. This includes very high resolution drone imagery captured over the remote Raine Island in the Great Barrier Reef. Together, Queensland Globe and QImagery provide public access to over half a petabyte of spatial imagery data, highlighting the importance of considered information management practices and enabling frameworks.

CASE STUDY

Mabel Park State High School— AVI30316 Certificate III in Aviation

Mabel Park State High School has commenced a trial program for students to attain AVI30316 Certificate III in Aviation (Remote Pilot – Visual Line of Sight). The trial provides an opportunity for students to gain valuable employment skills in an emerging industry with a nationally recognised qualification at no cost to the student or parents.

Following an application process, thirteen Year 11 students are participating in the program including eight from Mabel Park State High and five from Woodridge State High. The trial program will run from Term 3 2017 to Term 4 2018 and is being delivered one day a week incorporating theory in the morning and flight practice on the school oval in the afternoon. On completion, participating students will receive eight Queensland Certificate of Education points towards their senior school qualification and possibly obtain an ReOC and RePL issued by CASA.

The program aims to provide participating students with a pathway to a school-based traineeship and future employment, as well as potential opportunities for tertiary education.

Case studies

The UAV Challenge:

RFDesign

The UAV Challenge, a joint partnership between the Queensland University of Technology and the CSIRO, aims to raise awareness and grow the civilian drone industry. The Queensland Government was a founding partner of the UAV Challenge in 2007 and has continued to support the challenge as it has grown to an international event. Over the past ten years, the challenge has seen over 3000 people from more than 20 countries actively take part in a UAV Challenge team. Over 100 high school teams and 500 school students have participated, with the regional towns of Kingaroy and Dalby hosting these competitions.

Brisbane-based company RFDesign has developed a new data modem to facilitate long-range communication after discovering it was an issue for many UAV Challenge participants. RFDesign have now sold several thousand modems worldwide, with customers including Boeing and NASA.

Advance Queensland— Engaging Science Grant: SheFlies and James Cook University

In February 2017, the Queensland Government announced SheFlies was successful in attaining a \$9980 Advance Queensland Engaging Science grant to conduct drone lessons. The program aims to encourage females in STEM-related fields. SheFlies was founded by 2015 Queensland and National Corporate Telstra Business Woman of the Year and scientist Dr Catherine Ball and James Cook University Townsville science lecturer Dr Karen Joyce.

The grant supported the inaugural SheFlies Drone Day held in Cairns with the Tropical North Learning Academy Smithfield State High School, with students from Yorkeys Knob State School, Trinity Beach State School, and Caravonica State School. SheFlies will conduct drone days and drone camps across Queensland and nationally.

Advance Queensland— Platform Technology Program: Boeing

Queensland is home to global unmanned system companies such as Insitu Pacific, a wholly-owned subsidiary of Boeing, specialising in RPAS and UAVs. It is one of the few organisations in Australia permitted to conduct commercial RPAS operations beyond visual line of sight and is a recognised leader in the safe and effective operations of RPAS within commercial airspace. Boeing Defence Australia was awarded \$1 million through the Advance Queensland Platform Technology Program and will prototype, with support of Queensland SMEs, a world-first advanced airspace situational awareness system.

Through a number of trials throughout Queensland, Insitu Pacific has showcased the applicability of these unmanned systems to functions such as bushfire monitoring, mining infrastructure inspection, noxious weed detection, and cyclone damage surveys. Due to our significant agricultural sector, Boeing's developmental UAVs may have further application for remote sensing and analysis for precision agriculture.



Objectives, outcomes and future actions

Our vision is that Queensland is a world leader in drone technology and application. Our drone industry has strong investment and jobs growth, supported by our world-leading research and development capability and a highly skilled workforce. Queensland is a place where drones complement and enhance Queenslanders' lives and support our communities.

To support this vision there are potentially five key objectives to pursue:

- increasing capability
- improving government service delivery capability
- increasing research and development
- attracting new investment
- developing and supporting community-friendly drone policies.

Desired outcomes of these objectives and a number of actions to help achieve the objectives are proposed.

An overarching action will be to investigate establishing a system and/or guidelines of zoning within Queensland for different drone applications. These 'drone zones' would aim to ensure that business, industry, academia, government and the community are clear on where, when and for what drones can be tested, researched and used. This will help to facilitate all other actions and support all the objectives of the strategy.

Insights

Does this approach help us to achieve the vision for Queensland?

Will establishing 'drone zones' support all of the objectives?



Objective 1: Increasing capability

Outcome: Industry, research and workforce capabilities are increased and industry development is fostered

Potential actions	How will the action support the objective?
Investigate workforce transitioning and training and development opportunities	The workforce has the required skills, and industry has an appropriately skilled workforce
Investigate ways to build upon existing STEM programs in primary and secondary education	Using drones to facilitate existing STEM programs, building specific drone capabilities in addition to broader skills
Investigate options for linking in with universities and educational institutions	Education and research supports industry development
Identify and remove barriers and red tape for industry where appropriate	Industry can develop efficiently
Investigate options for increasing export opportunities	Industry has the ability to fill niche global market segments
Investigate opportunities to link with and commercialise research and development	Industry and research sectors benefit from each other's expertise and spillover effects arise

Objective 2: Improving government service delivery capability

Outcome: Drone technology is utilised for improved and more efficient government operations and service delivery

Potential actions	How will the action support the objective?
Develop a Queensland Government Drones Policy to articulate the government's preferred approach to the development of drone operational capability, including elements such as procurement, training and safety	Clearly outline the Queensland Government is committed to developing drone capability
Look for further opportunities to enhance services such as emergency management and primary industries for rural and remote communities	Service delivery is more efficient
Investigate ways to collaborate with industry, community and academia to share and develop new uses for drones	Service delivery is more efficient

Objective 3: Increasing research and development

Outcome: Queensland develops world-class research and development on drones and associated technology

Potential actions	How will the action support the objective?
Look at opportunities for leveraging existing research and development between academia, industry and government	Increased research commercialisation making investment in research more attractive
Investigate opportunities for new research and development opportunities, particularly in complementary industries and associated technologies	Provide more investment opportunities and generate spillover benefits

Objective 4: Attracting national and international new investment

Outcome: Queensland is a global hub for drones, associated technologies and applications

Potential actions	How will the action support the objective?
Investigate options for attracting international drone companies to set up operations in Queensland	Capitalise on the combined effect of associated companies, attracting international expertise and investment opportunities
Ensure Queensland start-ups and SMEs are able to participate in global drone supply chains	Ensuring access to market opportunities to grow a strong drone sector in Queensland
Continue engaging with regulators on safety and regulatory requirements to facilitate further safe and reliable drone testing in Queensland	Queensland is recognised as a centre for drone safety and reliability

Objective 5: Developing and supporting community-friendly drone policies

Outcome: Drones enhance people's lives, individual rights are protected, important amenity and environmental values are considered and people and communities are safer

Potential actions	How will the action support the objective?
Investigate how to inform businesses of opportunities to take advantage of commercial drones	People have better access to services and products
Review relevant Queensland legislation and regulations and assess whether these appropriately protect individuals' rights to privacy	Protect individuals' rights
Identify potential opportunities to utilise drones to achieve safer communities by, for example, improving detection and response to disaster events and emergency situations	Communities will be safer
Support safe recreational activities associated with drones	People understand the boundaries and appropriate use of drones

Insights

Are these objectives appropriate, is there potential for better objectives?

Do the outcomes support the objectives, are there outcomes that better support the objectives?

Do the actions support the outcomes and objectives?

What other actions would support the objectives?



Our progress to date

As outlined above, the Queensland Government is embracing drone technology. However, consistent with other states and territories in Australia, we do not currently have an overarching framework to align our activity. An overarching strategy aims to ensure that government is working with industry in the most efficient and effective way. Aligning our current activity under a common strategy helps government, industry and the community better understand where Queensland's ongoing opportunities are. This also helps us to see where our strengths are, and where we can improve.

Department	Action	Strategy alignment
Department of State Development	<ul style="list-style-type: none"> Promotion at targeted trade shows Support of the UAV Challenge RPAS test, trial and evaluation site study Queensland Aerospace 10-Year Roadmap and Action Plan 	<ul style="list-style-type: none"> ✓ Increasing capability ✓ Increasing research and development ✓ Developing and supporting drone friendly communities ✓ Improving government service delivery capability ✓ Attracting new investment
Department of Natural Resources and Mines	<ul style="list-style-type: none"> Collecting streamflow data Preferred Supplier Panel arrangement for Acquisition and Provision of Spatial Imagery data via Remotely Piloted Aircraft Systems Capture of spatial imagery and elevation data in remote locations such as Raine Island as part of the State Imagery program 	<ul style="list-style-type: none"> ✓ Improving government service delivery capability ✓ Increasing research and development ✓ Increasing capability
Department of Science, Information Technology and Innovation	<ul style="list-style-type: none"> Supporting the World of Drones Congress Advance Queensland funding 	<ul style="list-style-type: none"> ✓ Increasing capability ✓ Improving government service delivery capability ✓ Increasing research and development ✓ Developing and supporting drone friendly communities ✓ Attracting new investment
Department of Education and Training	<ul style="list-style-type: none"> Established a Remote Piloted Aircraft – Training Advisory Group Subsidised AV130316 Certificate III in Aviation (Remote Pilot – Visual Line of Sight) and Aviation High trial Development of a Use of Drones in Schools Policy 	<ul style="list-style-type: none"> ✓ Increasing capability ✓ Developing and supporting drone friendly communities ✓ Improving government service delivery capability
Department of Environment and Heritage Protections	<ul style="list-style-type: none"> Monitoring compliance with environmental approvals 	<ul style="list-style-type: none"> ✓ Improving government service delivery capability
Queensland Fire and Emergency Services	<ul style="list-style-type: none"> Trial of drones 	<ul style="list-style-type: none"> ✓ Improving government service delivery capability ✓ Increasing research and development ✓ Developing and supporting drone friendly communities

Department	Action	Strategy alignment
Queensland Police Service	<ul style="list-style-type: none"> Proposed strategy for the further implementation of Remotely Piloted Aircraft Systems within the Queensland Police Service (2016) Civil Aviation Safety Authority Operators Certificate Use for forensic, emergency and disaster events 	<ul style="list-style-type: none"> ✓ Improving government service delivery capability
Department of Agriculture and Fisheries	<ul style="list-style-type: none"> Facilitated aerial distribution of agricultural chemicals by amending legislation Weed control Fisheries management Forestry management Data on pest impact on field crops Crop biomass sensing Improved dairy farming practices 	<ul style="list-style-type: none"> ✓ Increasing capability ✓ Improving government service delivery capability
Department of National Parks, Sport and Racing	<ul style="list-style-type: none"> Monitoring condition of terrestrial and marine protected areas Pest management Fire management Asset management Operational policy: landing aircraft and recreational craft in QPWS managed areas 	<ul style="list-style-type: none"> ✓ Increasing capability ✓ Improving government service delivery capability ✓ Increasing research and development ✓ Developing and supporting drone friendly communities
Department of Transport and Main Roads	<ul style="list-style-type: none"> Technical Note No.156 Batter slope inspection (slope stability) Landscaping assessments and training Bridge and asset inspection (safety and asset management) Volumetric survey Construction progress photography Fauna spotting Feasibility studies Emergency response data acquisition 	<ul style="list-style-type: none"> ✓ Improving government service delivery capability
Trade and Investment Queensland	<ul style="list-style-type: none"> Promotion of Queensland's capabilities Attracted international companies 	<ul style="list-style-type: none"> ✓ Increasing capability ✓ Increasing research and development ✓ Attracting new investment
Energy Queensland Limited	<ul style="list-style-type: none"> Defect detection on the network Assess impacts of natural disasters on the network 	<ul style="list-style-type: none"> ✓ Improving government service delivery capability
Powerlink	<ul style="list-style-type: none"> Research and development program 	<ul style="list-style-type: none"> ✓ Improving government service delivery capability ✓ Increasing research and development
Stanwell	<ul style="list-style-type: none"> Infrastructure assessment and stockpile surveys 	<ul style="list-style-type: none"> ✓ Improving government service delivery capability
CS Energy	<ul style="list-style-type: none"> Aerial photography 	<ul style="list-style-type: none"> ✓ Improving government service delivery capability
SEQWater	<ul style="list-style-type: none"> Monitoring and maintenance 	<ul style="list-style-type: none"> ✓ Improving government service delivery capability
SunWater	<ul style="list-style-type: none"> Inspection and surveillance of assets 	<ul style="list-style-type: none"> ✓ Improving government service delivery capability
Gladstone Area Water Board	<ul style="list-style-type: none"> Inspection and surveys Emergency management and response 	<ul style="list-style-type: none"> ✓ Improving government service delivery capability



Next steps

This strategy presents an exciting opportunity for Queensland. Your input into the development of the Queensland Drones Strategy will ensure that we can take advantage of the opportunities that drones offer for our economy, jobs growth and for continuing to improve the lives of Queenslanders and their communities.

Industry, research and community views will build our understanding of the key issues, barriers and enablers to achieving the vision for Queensland in this space and will help inform our future direction.

You can have your say by:

Going to the Queensland Government's 'Get Involved' website:
www.getinvolved.qld.gov.au

Email: drones@premiers.qld.gov.au

Mail: Queensland Drones Strategy Consultation
Strategic Policy
Department of the Premier and Cabinet
PO Box 15185
CITY EAST Q 4002

Phone: (07) 3003 9332

Consultation closes 6 October 2017.

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