

Queensland Drones Strategy



Queensland
Government

Image credits

Cover: International Drone/UAV Competition.

Photo © ben vos productions

Page 1: Water simulation.

Photo © StudioM1/Getty Images

Page 5: Academics at Queensland University of Technology.

Photo © ben vos productions

Page 7: Farmer using drones for agricultural application.

Photo © Budd Photography

Page 8: The largest purpose-built film water tank in Australia at Village Roadshow Studios.

Photo © Arts Queensland

Page 12: Emergency services flying drones.

Photo © Queensland Fire and Emergency Services, Queensland Police Service

Page 17: Fishing with the use of drones.

Photo © ben vos productions

Page 19: Students working on a drone.

Photo © Steve Debenport/Getty Images

Page 22: Queensland Government's Advance Queensland stand at World of Drones Congress 2017.

Photo © Queensland Government

Page 26: Science students learn about physics by studying a drone.

Photo © FatCamera/Getty Images

Page 29: Engineer working on drone.

Photo © zoranm/Getty Images

Page 30: Townsville State High School students.

Photo © Fullframe Photographics

Page 34: Noosa Heads Volunteer Surf Life Savers at Noosa Main Beach.

Photo © ben vos productions

Page 38: Testing drones.

Photo © ben vos productions

Page 41: Drone flying over wheat field.

Photo © valio84sl/Getty Images

Copyright

This publication is protected by the *Copyright Act 1968*.

© State of Queensland, June 2018.

Licence

This work is licensed by the Department of the Premier and Cabinet under a Creative Commons Attribution (CC BY) 4.0 International licence. To view a copy of this licence, visit: <https://creativecommons.org/licenses/by/4.0/>

You are free to copy, communicate and adapt this publication, as long as you attribute appropriately, including:

- The name of the publication “Queensland Drones Strategy”
- A link to the work if you have sourced it online
- The copyright licence statement above
- Indicate if you have made changes to the work.



Foreword

Queensland is leading the way nationally in drone technology and application. We are well positioned to build on industry capabilities in drone research, design and development to become a global leader in the sector—attracting investment and creating jobs for Queensland.

Queensland's existing strengths in drones gives us an edge in capitalising on the global potential of the industry, where Goldman Sachs has predicted a US\$100 billion market opportunity for drones by 2020.

The Queensland Drones Strategy has been developed to build on our strengths and leverage the state's innovation success to take advantage of new and emerging opportunities, and complement the government's Advance Queensland initiative.

Drones are part of a broader digital technology ecosystem that is characterised by significant and rapid transformation. At the national level, regulations and guidelines are continuing to evolve to meet the emerging opportunities and challenges presented by this new technology. To ensure Queensland continues to be at the forefront of this developing and dynamic industry, the government must be able to respond flexibly to these changes.

Since the launch of the Queensland Drones Strategy consultation paper in August 2017 at the inaugural World of Drones Congress, which attracted more than 630 delegates from around the globe, we have been collating input from local drones operators, industry stakeholders, peak industry associations, local governments and representative bodies, academia and research organisations, community representatives and national regulators to develop this strategy. This consultative approach will ensure our strategy is best able to support the industry now and into the future.

The Queensland Drones Strategy is the first of its kind in Australia and is leading the way internationally in terms of its whole-of-government strategic vision and broad focus across attracting investment, industry development, research and development, service delivery improvement, and enhancing the lives of Queenslanders.

The strategy aims to support not just our industry, but also unlock the potential use of drones for other industries, and provide recreational drone users with better clarity about where and how they can use drones. The strategy also aims to ensure that our communities' rights are protected and that the ultimate impact of this emerging technology is that Queensland is simply a better place to live, work and play.

Importantly, it is not a strategy attempting to provide long-term direction based on a fixed point in time. We know that the technology and how we use drones is just beginning to be explored. As we learn together, the Queensland Government will continue to engage with our stakeholders to ensure that our actions are working to support the industry and the community and unlock the potential that drones bring to our state.

Anastacia Palaszczuk MP
Premier and Minister for Trade

Acronyms

Acronym	Definition
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
DCRC TAS	Defence Cooperative Research Centre for Trusted Autonomous Systems
DESBT	Department of Employment, Small Business and Training
DTMR	Department of Transport and Main Roads
GPS	Global Positioning System
LGAQ	Local Government Association of Queensland
QCS	Queensland Corrective Services
QDS	Queensland Drones Strategy
QDS	Queensland Drones Strategy consultation paper consultation paper
QLRC	Queensland Law Reform Commission
QPS	Queensland Police Service
RPAS	Remotely Piloted Aircraft Systems
SMEs	Small and medium sized enterprises
STEM	Science, technology, engineering and maths
UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicles
WoDC	World of Drones Congress

Executive summary

The drone industry is growing and developing rapidly. With a number of existing competitive advantages such as being home to global companies, world-class research capabilities, proximity to growth markets and our unique geography and climate, Queensland is primed to become the world-leader in drones.

The ongoing success of the Advance Queensland Platform Technologies Program, which provides financial incentives to larger scale co-funded projects that accelerate the development and deployment of significant and highly collaborative industry based platform technology projects, has seen funding recipients such as the Boeing Company undertaking a major research project to develop and test Remotely Piloted Aircraft Systems technologies in Queensland.

Queensland's successful bid to host the Defence Cooperative Research Centre for Trusted Autonomous Systems will see Queensland become headquarters for a \$50 million centre to develop drone and robotics technology for the Australian Defence Force. This centre will draw together industry, researchers and local businesses to work with Defence to develop new technologies for drones and other unmanned vehicles. This will help build critical mass in key technologies like artificial intelligence, robotics, and autonomous vehicles and will position Queensland as a global leader in these areas.

The opportunity exists to use our foundation of current activity and to leverage this and other supporting initiatives to fully unleash our potential and strive for a bold vision for Queensland's future in this space.

Vision

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 peoples' lives and support our communities.

Key objectives and actions

The Queensland Drones Strategy (QDS) builds on Queensland's existing strengths and leverages our innovation success to take advantage of new and emerging opportunities. The QDS has been developed through consultation across government, with industry, academia and the general public.

The vision is supported by five objectives and a number of key actions summarised below.

Objective 1: Attracting national and international investment

Key actions include:

- Provide funding of up to \$350,000 over two years to sponsor the World of Drones Congress in Brisbane in 2018 and 2019.
- Commission the development of specific commercial drone zones for the testing of aerial drones and identify additional commercial drone zones with consideration of aerial, land and marine capabilities.

Objective 2: Increasing industry and workforce capability

Key actions include:

- Specific Queensland Aerospace and Defence Industry 10-year Roadmaps and Action Plans, supporting development in these industries and providing a broader supporting ecosystem for the drone industry.
- Develop an engagement strategy that identifies Queensland's drone businesses and strategies to connect with the knowledge and expertise offered by the research sector and other industries.
- Expand the Department of Education's STEM programs—such as Schools of the Future—to include drones specific elements under the curriculum.

Objective 3: Increasing research and development

Key actions include:

- Establish an independent body to facilitate the development of industry consensus standards to support the assessment and certification of autonomous and robotic technology. Up to \$3 million in funding will be available for the establishment of this accreditation body.
- Provide up to \$1 million over five years under the Advance Queensland fellowship program for drones targeted scholarships.

Objective 4: Supporting community-friendly drone policies

Key actions include:

- Refer the question of whether Queensland's legislation adequately protects individuals' privacy in the context of modern and emerging technologies to the Queensland Law Reform Commission.
- Develop and rollout a new education campaign targeted at recreational drone users to provide information on the safe and proper use of drones and respecting others' privacy.

Objective 5: Improving government service delivery

Key actions include:

- Develop an internal Queensland Government drones use policy that provides information to Queensland Government agencies regarding the use of drones.
- Develop a set of standards to ensure drone data and imagery captured by government agencies meets quality, completeness, privacy and licensing standards for inclusion in the State Remotely Sensed Image Library and online tools such as Queensland Globe and QImagery.

The full suite of supporting actions are outlined, in detail, from pages 19 to 37. A summary of the vision, objectives and actions can be found on page 40.

It is clear the technology and application of drones is just beginning to be explored. Throughout consultation, stakeholders highlighted the importance of a dynamic and agile strategy to ensure Queensland keeps up with the development and demand in the industry. The QDS has been designed as an agile strategy, able to evolve as the Queensland Government and industry learn together. Regular reviews of the QDS, with the first to be conducted in 2019, will ensure Queensland remains at the forefront of this industry now and into the future.



Development of this strategy

The Queensland Government recognises that drones and associated technologies present a wealth of opportunities and challenges for Queensland's businesses, industries, current and future workforce, and our communities.

The QDS has been developed to provide whole-of-government, strategic direction to ensure Queensland is best positioned to make the most of drone technology and application, and has the agility to address new opportunities and challenges as they emerge.

The QDS is the first of its kind in Australia and is leading the way internationally in terms of its broad focus across attracting investment, industry development, research and development, service delivery improvement, and enhancing the lives of Queenslanders.

The Queensland Drones Strategy consultation paper (QDS consultation paper) was released for public consultation on 31 August 2017 at the inaugural World of Drones Congress (WoDC) held in Brisbane. Throughout the consultation process, written submissions were received and meetings were held between the Queensland Government and stakeholders from industry, academia, regulatory bodies, government and the community.

This process helped to shape the final QDS. Queensland's strengths and opportunities were identified and the strategy was developed to ensure we capitalise on the growth in this sector.

The QDS also affords the opportunity to take measure of the existing drone-related activity occurring across the Queensland Government, see where it fits in the broader picture now, and provide a strategic direction for its alignment under the vision of the QDS moving forward.

Drones in agriculture have a number of applications, including facilitating cost-effective pesticide application, infrastructure assessment, noxious weed and pest detection, and monitoring stock movements.



Drones are revolutionising the movie industry, making previously difficult shots much easier to accomplish and achieving shots that were otherwise impossible. Queensland is at the forefront of this innovative work with blockbuster films including Pirates of the Caribbean: Dead Men Tell No Tales, Thor: Ragnarok, Aquaman and Pacific Rim 2 all utilising drones throughout filming.



Defining drones

Drone is the common term for Unmanned Aerial Vehicles (UAV), Remotely Piloted Aircraft Systems (RPAS), Unmanned Underwater Vehicles or Autonomous Underwater Vehicles.

While it is recognised that there is accepted industry terminology, for the purposes of the QDS, the common term drone is used to refer to any remotely controlled or autonomous aircraft or underwater craft.

Given the considerable difference in the regulatory and policy environment, unmanned and remotely or autonomously piloted land vehicles are considered out-of-scope for the QDS at this time.

The QDS aims to have a positive impact on the civilian unmanned systems industry and the broader ecosystem in which it operates, with the community as a fundamental part of the journey. Common terminology is used for the QDS, ensuring it is as accessible as possible for a broad and diverse audience.

Drones can be operated using sensors, global positioning system (GPS) data and video streaming, and may be autonomous or remotely piloted. Platforms range in size from nanoscale to those capable of transporting people. 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 use, military support, and scientific research. Drone technology is also being increasingly embraced by hobbyists. The ways in which drones are used, operated and regulated, and the technology itself, is evolving rapidly.

Global context

Drones are a part of a dynamic ecosystem of new opportunities and emerging challenges that will shape our economy and communities into the future.

The QDS focuses on Queensland's drone industry and the civilian use of drones. The QDS recognises that drones intersect with broader trends in technology innovation, workforce change and automation, and data collection, access and distribution to name a few. The dynamic nature of the drone industry and adjacent policy issues requires a strategy that is agile and responsive to new opportunities and challenges to ensure that Queensland continues to be globally competitive.

Drone industry

The drone industry is growing and developing rapidly. In 2016, Goldman Sachs predicted a US\$100 billion market opportunity for drones by 2020. Military is anticipated to remain the largest market contributor at US\$70 billion, however the consumer and civilian government sectors are anticipated to grow significantly. The consumer drone market, incorporating recreational users, is projected to increase by US\$17 billion in the four years between 2016 and 2020, and commercial and civil government markets will grow by US\$13 billion in the same time period.

The first drones were developed for military purposes in the mid-20th century, with surveying and armed capability. Consumer and commercial drones are increasing in popularity, with significant growth in production in the past 10 years. Advances in technology and manufacturing 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.

Technology

Technology advances are expected to increase opportunities for the drone market. The next decade will likely bring developments in artificial intelligence, robotics, automation, augmented and virtual reality, internet of things and big data to name a few. 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, and the continued emergence of new technologies, have the potential to lead to new drone capabilities.

'We view drones as part of a wider eco-system of advanced technologies.'

Industry comment—
written submission to the
QDS consultation paper.

A key area of development is autonomous navigation activity. 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) use, 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 industry.

Broader social and economic context

Drones will contribute to, and be affected by, broader social and economic changes. Digital transformation and automation are projected to be defining characteristics of future industry, with significant consequences for Australia's workforce. Automated technologies, including drones, have the potential to increase efficiency across a range of sectors. For example, automation of transport vehicles that carry freight has the potential to significantly reduce costs in the logistics chain. Such changes will impact the skills profile of the future workforce, with a potential shift away from manual skills to digital skills such as coding.

Currently, rapid technological change has shown that there are opportunities to strengthen our ability to protect the rights of individuals in terms of safety and privacy. Drones are just one example of the platforms capable of data and image collection. The proliferation of technology with advanced image and audio capabilities draws to attention issues of surveillance, image collection and distribution, and the impact this technology has on an individual's expectation of privacy. Similarly, the amount of data collected presents challenges for storage, protection and data integrity, as well as rights of access and use.

As a new and dynamic industry characterised by rapid developments in technology and influenced by broader social and economic trends, the policies and regulations that govern drone use will continue to evolve. The Civil Aviation Safety Authority (CASA)—the Commonwealth body responsible for air safety regulation in Australia—is tasked with regularly reviewing the aviation safety regulatory framework in light of new technology and recently released the findings from a review of drone safety regulations that addressed a range of issues including registration, education, geo-fencing and airspace data.

Similar ongoing reviews are occurring internationally, including in the United States, the outcomes of which may impact on the drone market and Queensland's strategic direction. As these changes continue, it is clear that the QDS should not reflect a point in time. Rather, it needs to reflect the dynamic nature of technological and regulatory change, and the opportunities and challenges this brings. Regular reviews of the QDS, with the first to be conducted in 2019, will ensure Queensland remains at the forefront of this industry.

'The regularity and increasing severity of disaster events such as fires, flooding and tropical cyclones provides opportunities for the ongoing development and broad application of drone technologies to provide effective, efficient and potentially life-saving operations.'

Fraser Coast Regional Council comment—written submission to the QDS consultation paper.

Queensland's emergency services are utilising drone technology in an operational capacity, with potential application for forensic purposes, disaster response, bushfire monitoring, and search and rescue.



Queensland strengths and opportunities

The drone industry encompasses a broad range of emerging technologies with varied applications.

In the face of emerging technology, government has an important role to play, providing clarity and assuring government's path forward for industry and the community.

This involves identifying Queensland's strengths and recognising the opportunities for our industries and ensuring the safety and security of all Queenslanders and our communities. Throughout consultation, a suite of strengths and opportunities for Queensland were identified, presenting key openings for Queensland to become a leader in the drone industry.

Defence capability

Defence has a wide spectrum of drone development underway over the coming decade. Major projects include Air 7000 (MQ-4C Triton) and Air 7003 (Armed Medium Altitude Long Endurance Unmanned Aerial System (UAS)) in Air Force, Sea 129-5 (Maritime Tactical UAS) in Navy and Land 125-4 (Nano UAS), Land 129-4B (Small UAS) and Land 129-3 (Tactical UAS) in Army.

These projects sum to billions of dollars of Defence investment over the decade and benefit Queensland directly with the Land 129-3 (Tactical UAS) being Brisbane-based and the Land 129-4B (Small UAS) including all Queensland combat troops, predominately in Brisbane and Townsville. The Army in particular is invested in Queensland with Brisbane being the home of the Army UAS Regiment, and half of Army's smaller UAS being operated by units in Brisbane and Townsville.

In support of these major capabilities, two development efforts are already running: the Defence Cooperative Research Centre for Trusted Autonomous Systems (DCRC TAS) and the Defence Innovation Hub Special Notice for Future Small UAS. The DCRC TAS will inject up to \$50 million over seven years to bring together industry, academia and research agencies to develop unmanned platform capabilities for Defence.

The Future Small UAS program is seeding Australian industry to complete the replacement of the current Small UAS in the early 2020s. The Defence drone sector is alive with potential and opportunities for Queensland industry.

Australian Defence Force comment

'Without a clear strategy, we will have fragmented, ad hoc development that will result in waste, duplication and sub-par outcomes when we really should be capable of shooting for the moon with the opportunities that these technologies afford.'

Industry comment—written submission to the QDS consultation paper.

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 small- and medium-sized enterprises (SMEs). This existing network positions Queensland as an attractive proposition for future industry development.
	Queensland's depth of capability in drone technology and application was recognised throughout consultation. More than 30 per cent of Australia's growing drone industry is located in Queensland. Approximately 25 per cent of the total certified operators across Australia are in Queensland.
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, the University of the Sunshine Coast and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) autonomous systems laboratory to name a few—are at the forefront of research on drone and associated technologies and are host to prominent researchers in fields such as robotics. The strength of our universities also presents an opportunity for training university graduates and building research capability 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 services and natural areas management as outlined in the QDS consultation paper. Local governments are also adopting drone technology for tasks such as infrastructure assessment.
	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 GCQ project, Telstra and Queensland SMEs.
	Our existing initiatives have positioned Queensland as a regional leader 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 continue to facilitate these connections into the future.
Geography and climate	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 a number of world heritage listed areas such as the Great Barrier Reef, Fraser Island and the Wet Tropics. 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.
	The environmental challenges that face Queensland present opportunities for drone technology and application to drive innovation to enhance our capabilities across a range of issues, from disaster management to pest and feral animal control.

Queensland's opportunities

Safety and security	<p>Safety and security of the public is a foremost priority for the Queensland Government. CASA guidelines set the restrictions for where and how aerial drones can be used. Throughout consultation, stakeholders raised concerns regarding recreational drone users flying with limited or no knowledge of CASA's regulations and guidelines. Though CASA's regulations are included in the packaging for many drones and educational campaigns have been run to improve public awareness, many recreational users remain unaware of the regulatory limits on drone use.</p>
	<p>The enforcement of CASA's regulation is a challenge due to the accelerating rates of drone ownership and use in Australia. CASA is working with state law enforcement, including the Queensland Police Service (QPS), to explore options to remedy enforcement issues.</p>
	<p>Illegal use of drones presents a safety concern and a security risk. Operating outside of CASA guidelines or the allocated radio frequencies as stipulated under the <i>Radio Communication Act 1992 (Cth)</i> increases the potential for accidents, including collisions in the airspace, posing a risk to the community. Drones' ability to carry objects may also lead to potential risks for national security.</p>
	<p>Although CASA provides overarching guidelines for the safe use of aerial drones, specific circumstances 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 waterways may present a collision risk.</p>
Protecting individuals' rights	<p>There are a range of concerns for the community with proliferating drone use, particularly relating to privacy. The QDS consultation paper outlined some of the potential issues; as drones may be used to monitor, record or disclose individuals' private activities without their consent. The results of consultation further demonstrate that privacy is a key concern. Stakeholders found the privacy landscape difficult to navigate and expressed uncertainty around the scope of current privacy laws in relation to drones.</p>
	<p>Drones can be used to capture images and video of private persons or private operations. The Commonwealth Privacy Commissioner has commented that <i>'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'</i>. The challenge for Queensland will continue to be addressing privacy and safety concerns while ensuring a regulatory environment that fosters investment and industry development.</p>
Imagery data and information	<p>Drones have the capability to collect large volumes of data. Drones fitted with high-resolution cameras and sensors have the capacity to generate large volumes of imagery data and information. During consultation, the security and protection of this data was identified as a challenge for the industry.</p>
	<p>Once just the domain of commercial aerial surveying companies, the ease of accessibility of data captured by drones bring with it a responsibility to maintain good information management practices within organisations. This includes ensuring data is collected officially, licenses are shared appropriately and that privacy and discoverability and access to information is actively managed.</p>
Facilities restrictions	<p>Key players in the drone industry are seeking facilities to test and trial drone capabilities such as BVLOS. Industry stakeholders highlighted that having testing facilities in Queensland would be a significant drawcard for international industry. 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.</p>

‘We also value the community’s right to safety and privacy and agree with the view expressed in the [Queensland Drones Strategy consultation paper] that the challenge is to effectively address these concerns while ensuring a policy environment that fosters investment and industry development.’

Industry comment—written submission to the QDS consultation paper.

CASA drones safety review

In 2017, CASA began a review into drones safety. As part of the review, a discussion paper was released for public consultation from 11 August to 29 September 2017. The findings of the CASA review, released in May 2018, are as follows:

- CASA supports mandatory RPAS registration in Australia for RPAS’s weighing more than 250 grams.
- CASA should develop a simple online course for recreational and excluded category RPAS operators on safe RPAS operations, followed by a quiz with a minimum pass mark.
- CASA’s education and training framework around the issue of a remote pilot licence should continue.
- CASA should continue to support RPAS manufacturers’ efforts to utilise geo-fencing technology to prevent RPAS operations in areas where operations are not permitted, including at or near major airports and certain classes of restricted airspace.
- CASA should participate, where appropriate, in international forums to stay abreast of global trends and participate in trials of the technology where feasible.
- CASA should work with Airservices Australia to ensure the development of standard data on airspace.
- CASA should deliver a RPAS roadmap to articulate how to safely integrate RPAS into the Australian airspace system, including content on unmanned traffic management systems.

These findings provide CASA with a firm basis on which to articulate and implement future aviation safety regulatory policy and the further development of regulations applying to drones.

Drone technology is being increasingly embraced by hobbyists. Drone fishing has surged, as anglers explore techniques and equipment to provide new opportunities for both land- and boat-based fishing.



‘A range of regulatory and security issues pertaining to the aerial space present challenges for the operation of drones in different environments. This includes public perception, acceptance, and issues associated with the capture of images with humans.’

Industry body comment—written submission to the QDS consultation paper.

‘Companies and pilots are unsure of future regulations.’

Industry comment—written submission to the QDS consultation paper.

Commonwealth Senate inquiry on the safe use of drones

The Commonwealth Senate referred an inquiry (the Senate Inquiry) into regulatory requirements that impact on the safe use of RPAS, UAV and associated systems to the Rural and Regional Affairs and Transport References Committee. The inquiry examined:

- current and future regulatory requirements that impact on safe commercial and recreational use, including consideration of:
 - ♦ CASR Part 101
 - ♦ local design and manufacture of RPAS and associated systems
 - ♦ importation of RPAS and associated systems
 - ♦ state and local government regulation
 - ♦ overseas developments, including work by the International Civil Aviation Organization and overseas aviation regulatory jurisdictions.
- the existing industry and likely future social and economic impact of the technology
- the international regulatory/governance environment and its comparison to Australian regulation
- current and future options for improving regulatory compliance, public safety and national security through education, professional standards, training, insurance and enforcement
- the relationship between aviation safety and other regulation of RPAS for example, regulation by state and local government agencies on public safety, security and privacy grounds
- the potential recreational and commercial uses of RPAS, including agriculture, mining, infrastructure assessment, search and rescue, fire and policing operations, aerial mapping and scientific research
- insurance requirements of both private and commercial users/operators, including consideration of the suitability of existing data protection, liability and insurance regimes, and whether these are sufficient to meet growing use of RPAS
- the use of current and emerging RPAS and other aviation technologies to enhance aviation safety
- any other related matters.

The findings from the Senate Inquiry will inform the continued progression of Queensland’s approach to supporting the drones industry and the community.

Our objectives and actions

The strategy's vision is for:

Queensland to be 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 peoples' lives and support our communities.

Five key objectives will be pursued to achieve this vision. These draw on our strengths and address the challenges identified throughout consultation. Working together to support the vision of the QDS, the five objectives are:

Objective 1:	Attracting national and international investment
Objective 2:	Increasing industry and workforce capability
Objective 3:	Increasing research and development
Objective 4:	Supporting community-friendly drone policies
Objective 5:	Improving government service delivery

A suite of actions have been developed to achieve these objectives.



‘With regard to opportunities for Queensland’s aviation industry, I see a demand for manufacturing, maintenance, R&D, testing and certification of autonomous aircraft including their avionics.’

Research sector comment — written submission to the QDS consultation paper.

Objective 1:

Attracting national and international investment

Queensland has the opportunity to build on its success in attracting key players in the drone industry to bring further national and international investment to the state.

National and international investment will help to deliver the economic and jobs growth potential that drones provide. The purpose of this objective is to establish Queensland as a global hub for drones, associated technologies and applications.

New technology that enhances drone capabilities, such as supporting BVLOS operation, provides an opportunity for Queensland to attract industry as the preferred location for drone tests, trials and evaluation. Global companies are seeking sites, both terrestrial and marine, to test new technology, with particular interest in large drone craft. Queensland’s climate and geography are favourable for the development of a drone testing facility and preliminary work has begun to identify potential locations.

Queensland has a strong industry base in sectors that provide opportunities for innovative drone application such as agriculture, mining, marine industries and tourism. This provides an attractive proposition for industry to choose Queensland as the location to test new applications. From a disaster management perspective, Queensland is well placed to be a leader in drone development.

During consultation, stakeholders supported the development of test facilities noting that the characteristics of Queensland’s climate and environment provide a great test-bed for drone capabilities. Opportunities such as events to promote Queensland to a national and international audience, providing a coordinated regulatory framework and outlining a clear vision for the industry are also identified as important for attracting national and international investment.

The following actions work to attract national and international investment with consideration given to the evolving regulatory environment, ongoing work around drone trial and testing facilities, and facilitating connections between the Queensland drone industry and international markets.

Actions

Provide funding from the Department of the Premier and Cabinet of up to \$350,000 over two years to sponsor the World of Drones Congress (WoDC) in Brisbane in 2018 and 2019. This action will help increase Queensland's profile, showcase Queensland's existing drone industry and attract new investment into the state. WoDC attracted over 630 delegates from across the world in 2017, providing the perfect vehicle to promote drone opportunities in Queensland.

Commission the development of a specific commercial drone zone, a common-user site for the commercial testing of aerial drones by 2020. The site, to be identified and developed by the Department of State Development, Manufacturing, Infrastructure and Planning, and the DCRC TAS will support industry by significantly reducing red tape for testing drones, speeding up development of new technologies and enhancing Queensland's reputation as an attractive place to invest in new drone technology development and testing.

Identify additional commercial drone zones as common-user sites for the commercial testing of drones, with consideration of aerial, land and marine capabilities. The Department of State Development, Manufacturing, Infrastructure and Planning will work with the DCRC TAS to identify the sites, supporting drone industry development in Queensland.

Promote Queensland's capabilities in drone research and development and its commitment to development of drone testing facilities by leveraging Trade and Investment Queensland's global presence and stakeholder engagement and marketing activities. This will promote Queensland's attractiveness as an international drones investment destination, help to attract international companies, and support the identification and facilitation of investment and collaboration opportunities.

Actively promote the Queensland drone industry at trade shows, like the Avalon Air Show, Singapore Air Show, New Zealand Defence, Industry and National Security Forum, Pacific International Maritime Exposition and Land Forces 2018, by providing information on Queensland's industry, support available, and opportunities for entrants into the Queensland market. This action will be led by the Department of State Development, Manufacturing, Infrastructure and Planning.

Monitor and evaluate other jurisdictions' use and testing of new drone applications and technology to inform Department of Transport and Main Roads' (DTMR) led trials and testing of emerging uses of drones. DTMR will engage with CASA to learn from these experiences and bring new-to-state opportunities for local industry, national and international investment.

Develop a feasibility report, specifically looking at opportunities, potential pilot projects or case studies, for drone technology to: support sustainable development across the tourism industry; attract investment in tourism industry development through the use and application of drones to create new or enhance existing tourism experiences; and develop and access new markets such as drone/technology-based tourism. The report, to be delivered before the end of 2018, will be facilitated by the Department of Innovation, Tourism Industry Development and the Commonwealth Games, in consultation with relevant industry stakeholders.

World of Drones Congress

Queensland hosted the inaugural WoDC in Brisbane from 31 August to 2 September 2017.

The Queensland Government proudly sponsored the event which attracted over 630 delegates from across the world. Key industry players and representatives from business and government, as well as investors and drone enthusiasts came together to discuss topics such as the new drone economy, safety, smart cities, emergency response and environment and conservation.

The congress provided an opportunity to promote Queensland as a hub for industry development and innovation. Following on from the success of the 2017 event, the WoDC is returning to Brisbane with the Queensland Government committing up to \$350,000 to support the event for the next two years.



Objective 2:

Increasing industry and workforce capability

The diversity of Queensland's existing drone industry, from cutting-edge technology development to specialised pilots in niche industries, underpins the strength of our drone capabilities. The Queensland Government is committed to continuing to support our businesses and workforce to be nationally and internationally competitive. Through pursuing this objective, Queensland will work towards delivering a thriving local industry and highly skilled workforce that is prepared for the future drone market.

Funding, partnerships and collaboration, and access to international markets are important drivers of local industry. To support local industry, the Queensland Government provides a number of opportunities through the Advance Queensland and Advancing Small Business Queensland initiatives. Programs such as the Platform Technology Program, Commercialisation Partnership Program, Small Business Innovation Research, Ignite Ideas Fund, Small Business Digital Grants, Small Business Entrepreneur Grants and Accelerate Small Business Grants support commercialisation, start-ups and industry development.

Queensland's related industry and workforce capability continues to strengthen. This is supported by Queensland Government activities such as the Queensland Aerospace 10-Year Roadmap and Action Plan, which aims to accelerate the pace of growth in both the civilian and defence sectors, and help them to create the high paid, sustainable jobs of the future.

The defence industry also plays a significant role in supporting the drone industry in Queensland. As drivers of development and innovation in drones and associated technology, the defence industry will continue to be inherently linked to the civilian industry, and provide an opportune market for Queensland businesses. The focus of the QDS on the civilian elements of developing the drone industry in Queensland ensures that Queensland will continue to leverage from the defence industry's investment in this space.

Digital technology will shape the industries and workforce of the future. Drones will be an important contributor, bringing increased efficiency and new opportunities, as well as some challenges. We must ensure that Queensland businesses and workforce have the skills and capability to make the most of the opportunities that come from the digital age.

Education will continue to provide significant support for the drone industry in Queensland. The industry requires a highly skilled workforce and today's students are learning the skills that will support the sector moving forward. Similarly, Queensland's future workforce need to be prepared for industries shaped by digital transformation and automation. Integrating technology including drones and digital skills such as coding into education is critical

'One particular and immediate opportunity is developing BVLOS test flight areas. Not only will this allow the industry to advance technologies and allow proof of concept to provide CASA with confidence to grant more BVLOS approvals, but it will bring in overseas participants.'

Industry comment—written submission to the QDS consultation paper.

‘Australia has an opportunity to tap what will be an enormous growing demand in Asia for qualified UAV pilots. Asian countries have always looked to Australia for best practice aviation pilot training and this is flowing into UAV pilot training.’

Industry comment—written submission to the QDS consultation paper.

to ensure Queensland students are highly competitive in this future jobs market.

The Queensland Government recognises the importance of science, technology, engineering and maths (STEM) to our future industries and supports the use of drone technology in schools through a number of initiatives including grants, roadshows and competitions.

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.

Through consultation, some key opportunities for training of operators and supporting workforce transition emerged. Concerns were raised about the potential for drone technology to displace some workers, highlighting the importance of supporting workforce transition. High quality training and jobs skills and work programs are important avenues to support workforce transitioning, with particular opportunity for rural areas and disadvantaged groups. As the industry continues to expand, it is important that a high professional standard be maintained for operator training.

To support training of the workforce, the Queensland Government has introduced a subsidy under the Annual Vocational Education and Training Investment Plan for the ACI30316 Certificate III in Aviation (Remote Pilot – Visual Line of Sight) qualification. 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.

The following actions will support local industry by increasing their awareness of drone related opportunities, support workforce transitioning and prepare our school students for the future.

Actions

Finalise, release and implement the Department of State Development, Manufacturing, Infrastructure and Planning's specific Queensland Aerospace and Defence Industry 10-Year Roadmaps and Action Plans, supporting development in these industries and providing a broader supporting ecosystem for the drone industry.

Develop an engagement strategy in 2018 that identifies the needs of Queensland's drone businesses and strategies to connect with the knowledge and expertise offered by the research sector and other industries. Through this work the Department of Environment and Science and the Department of Innovation, Tourism Industry Development and the Commonwealth Games will explore networking opportunities to encourage knowledge sharing and collaboration between industry and the research sector to improve the capability of the industry and its current and potential future workforce.

Expand the Department of Education's STEM programs within the next 12 months—such as Schools of the Future—to include drone-specific elements under the curriculum. Considering equity of access for all Queensland school children, this will increase focus on drones and related technologies in the classroom. This ensures that students are prepared for future opportunities in the drone industry and that industry has access to a pipeline of an appropriately prepared workforce.

Review the trials of the Certificate III in Aviation (Remote Pilot – Visual Line of Sight) in participating state schools across Queensland to identify the benefits for students and outcomes for the industry. The Department of Employment, Small Business and Training's Remote Piloted Aircraft – Training Advisory Group will work with relevant agencies in 2018 for the review and collaborate with the Department of Education to determine feasibility of further expansion of this initiative.

Publish a new information resource for Queensland businesses on the Business Queensland website in 2018. Coordinated by the Department of Employment, Small Business and Training with input from Queensland Government agencies, this resource will include information for existing businesses, those looking to establish a drones business in Queensland, and for industries that may benefit from the technology. Content will include information such as Queensland Government programs which could assist in building drone business capability or assist businesses to consider the potential uses of drones, information on starting a drones business in Queensland, and links to other relevant information.

Provide periodic advice to the Minister for Training and Skills Development and/or the Minister for Education on investment to support skills development for the commercial operation of remote piloted aircraft, and other unmanned systems technology in Queensland. Advice will be determined from regular meetings between the Department of Employment, Small Business and Training's Skills Investment and Market Strategy team and the Remotely Piloted Aircraft – Training Advisory Group which advises on the interests of industry, education and university sectors.

Provide support from the Department of State Development, Manufacturing, Infrastructure and Planning for the delivery of a 2018 UAV industry forum in Queensland. This forum will help to showcase the potential of drones to support Queensland's existing industries and attract new investment into the state. The previous UAV industry forum attracted over 300 participants from a number of industries and acted as a mechanism to share information and demonstrate new and existing uses of drones across various industries.

Engaging female students in STEM

In February 2017, the Queensland Government announced She Flies was successful in attaining a \$9980 Advance Queensland Engaging Science grant to conduct drone lessons across the state.

The program aims to encourage female students to explore career pathways in STEM-related fields, particularly coding and robotics. She Flies was co-founded by 2015 Queensland and National Corporate Telstra Business Woman of the Year and scientist Dr Catherine Ball and James Cook University academic Dr Karen Joyce.

The inaugural She Flies Drone Day was hosted by the Tropical North Learning Academy Smithfield State High School, with students from Yorkeys Knob State School, Trinity Beach State School, and Caravonica State School also attending. She Flies has since delivered 66 drone programs and camps across Queensland with 1673 students and teachers. These events have taken place in schools and communities in Cairns, Townsville, Brisbane, Longreach, Bundaberg, Mount Isa and Rockhampton.



Objective 3:

Increasing research and development

The aim of this objective is to further develop world-class research and development capabilities in respect to drones and associated technology in Queensland. Queensland boasts a strong research and development sector, led by the state's internationally recognised universities and research institutes. We have the opportunity to leverage this expertise, increase commercial output, build further capabilities and build Queensland's reputation for technology innovation.

A lack of industry standards for technical specifications is an identified gap in the current drones sector. Stakeholders expressed concern that the rapid expansion of drones without regulations for minimum technical specification poses a safety risk. As it stands, there is no accreditation body to test drone platforms and supporting technology that would help to develop industry standards. This poses a challenge for adopting a risk-based approach to regulating where and how drones can be used.

Queensland is well placed to fill this gap, with the research expertise and the potential to develop testing and evaluation sites. A Queensland-based accreditation organisation would allow the development of an industry standard, streamlining the commercialisation of new research and provide Queensland with a competitive advantage in drone-related technology.

Drone platforms and supporting technologies are evolving rapidly. Queensland needs to support our researchers to ensure they remain at the head of the field and are able to collaborate nationally and internationally. Further collaboration between industry and the research sector is important to ensure research aligns with industry needs, encourages the adoption of innovative technology across industries and to facilitate commercialisation. This can be achieved directly or indirectly through networking opportunities such as forums.

The following actions will help build collaboration between the research sector and industry, and ensure Queensland is internationally recognised for our research and development expertise.

‘Continued funding and support for research aligned with industry needs is critical to the continued growth of the commercial industry.’

Industry association comment—
written submission to the QDS
consultation paper.

Actions

Establish an independent body to facilitate the development of industry consensus standards to support the assessment and certification of autonomous and robotic technology through the Civil Aviation Safety Authority (CASA) and the Defence Aviation Safety Authority. The Department of Environment and Science and the Department of Innovation, Tourism Industry Development and the Commonwealth Games will work with the DCRC TAS to establish the accreditation organisation, with up to \$3 million in funding available for this purpose. The organisation will be established by December 2018, with the expectation that it will operate as a self-sustaining, fee-for-service organisation able to service defence and non-defence industries by 2021.

Provide up to \$1 million over five years under the Advance Queensland (AQ) fellowship program for drones-targeted scholarships. These research fellowships will support PhD qualified researchers in undertaking original research on autonomous systems projects to benefit Queensland. In addition, other opportunities to use AQ programs to support drones and related technologies will be explored.

Provide in-kind support to the 2018 Medical Express Challenge in Dalby through the Department of State Development, Manufacturing, Infrastructure and Planning. This event, to be held 24–28 September 2018, will bring together more than 50 teams from all over the world including Australia, Belgium, Canada, China, Egypt, India, France, Kenya, Poland, Spain, and the USA, to compete using their capabilities in drone technology to complete a medical retrieval task. This event provides an opportunity to trial new research, enables proof-of-concept testing, and helps drive the development of new technologies.

Identify project opportunities in 2018 that feed into the DCRC TAS, opportunities to leverage from the Advance Queensland Platform Technology Program funding and other opportunities to develop innovative applications of remotely piloted aircraft system technologies through collaboration between the Department of State Development, Manufacturing, Infrastructure and Planning, Queensland University of Technology's Aerospace Autonomy Group, other research institutions, industry and other relevant stakeholders.

Conduct a gap analysis into the drone industry's research and development needs to be completed by 2019. This study, led by the Department of Environment and Science with input from the Department of State Development, Manufacturing, Infrastructure and Planning and the Department of Innovation, Tourism Industry Development and the Commonwealth Games, will investigate and pursue new options to connect industry with the research sector to support research and development and its commercialisation.

Defence Cooperative Research Centre for Trusted Autonomous Systems

The Queensland Government has been successful in the bid to host the headquarters of a national defence research centre.

The Defence Cooperative Research Centre for Trusted Autonomous Systems (DCRC TAS) is the first of multiple Defence Cooperative Research Centres to be established from the Australian Government's \$730 million Next Generation Technologies Fund.

The DCRC TAS bid included a commitment from the Queensland Government to provide funding towards the establishment of a number of unmanned systems testing ranges in Queensland, which could include up to three aerial, two marine and a number of ground vehicle testing ranges.

The facility will investigate technology such as drones to transform the capacity and ability of Defence to acquire, deploy and sustain leading-edge autonomous and robotic technology.

For Queensland, the capability developed through the DCRC TAS will be readily applicable to non-defence applications such as agriculture, mining and environmental management.





Objective 4:

Supporting community-friendly drone policies

Drone technology provides new capabilities for recording images, videos and sounds. Drones are also increasingly accessible, with cheaper platforms becoming available that support these advanced capabilities. This provides a number of opportunities for industry and the community, however it also poses some challenges.

Queensland communities need to feel assured that drones can be used to benefit their lives, without compromising their individual rights, safety and amenity, or adversely impacting Queensland's environmental assets. This objective aims to balance industry growth with community-friendly outcomes such that drones enhance people's lives, individual rights are protected, important amenity and environmental values are considered and people and communities are safer.

Privacy has been recognised nationally and internationally as a key challenge posed by the proliferation of drones and other new and emerging technology with surveillance capability. A national inquiry into drones and the regulation of air safety and privacy in 2014 highlighted that Australia's current privacy regime was highly complex and suggested that some privacy laws were outdated by emerging technology. The results of consultation also indicated some concern that current legislation does not sufficiently address privacy in relation to drones. A review of Queensland's privacy laws in relation to technology with surveillance capability, including drones, will respond to these concerns and identify any gaps that may need to be addressed.

Throughout consultation, stakeholders emphasised the importance of ensuring that drones do not adversely impact the safety, security and amenity of the community. For industry, any incident that negatively affects community safety could have a significant impact on their business. For the community, Queenslanders want to feel confident that drones will not pose a threat to their physical safety or invade their privacy.

'Drones are giving rise to considerable privacy concerns. These in turn represent potentially substantial constraints on the achievability of Queensland's economic objectives in relation to drones.'

Research sector comment—
written submission to the QDS
consultation paper.

‘One of the most significant safety risks, as well as risk to the continued growth of the industry, is that posed by recreational/hobby UAS operators. This is a community-wide issue and not just an issue for the aviation industry. This risk is best addressed through community education and awareness.’

Industry association comment—
written submission to the
QDS consultation paper.

Community and industry stakeholders were concerned by potential risks that unfettered use of drones could pose, particularly from recreational users. Although CASA provides guidelines for recreational use, stakeholders suggested that, although well intended, some recreational users remain unaware of the CASA restrictions and are operating outside of these conditions.

Ensuring recreational users are able to enjoy operating drones in a safe manner is a fundamental part of ensuring the QDS supports the community-friendly use of drones. It is further recognised that most recreational users who may be operating drones in an unsafe manner are doing so simply due to being unaware of the regulatory requirements.

Given CASA regulates Australian airspace, the Queensland Government has limited jurisdiction over where and how drones are operated and their licensing or registration. Ensuring there is appropriate balance between increasing awareness of CASA guidelines and exploring potential options to assist in enforcement are further avenues that can support the safety and security of Queenslanders.

The following actions work to address community safety, security and privacy concerns within the scope of the Queensland Government’s jurisdiction. The Queensland Government will continue to work with all tiers of government to ensure the benefits of drones can be realised without adversely impacting our communities.

Actions

Refer the question of whether Queensland's legislation adequately protects individuals' privacy in the context of modern and emerging technologies to the Queensland Law Reform Commission (QLRC). The QLRC is an independent statutory body of the Queensland Government which makes recommendations for law reform to the Queensland Parliament, via the Attorney-General and Minister for Justice.

Develop and roll out a new education campaign targeted at recreational drone users to provide information on the safe and proper use of drones and respecting others' privacy. This will be launched by mid-2018 by the Department of the Premier and Cabinet.

Consider options to meet policy objectives of regulating, prohibiting and deterring the use of drones in the vicinity of correctional facilities. The work will be undertaken during 2018 by Queensland Corrective Services (QCS) in collaboration with other agencies, considering the QCS' review and trial of drone detection and anti-drone technology, and will culminate in a suite of options and recommended future actions.

Develop policy regarding Government and non-Government drone use in State controlled transport corridors and maritime jurisdiction. This will be developed by the Department of Transport and Main Roads after the internal Queensland Government Drones Use Policy is established.

In 2018, the Queensland Police Service (QPS) will work with the Civil Aviation Safety Authority (CASA) and other law enforcement agencies to support CASA's enforcement activities and facilitate the exchange of investigative information. The QPS will also undertake a review of relevant policies and procedures to ensure the QPS can adequately respond to, and investigate, other offences committed using drones.

Establish a working group, led by the Department of Local Government, Racing and Multicultural Affairs, with the Local Government Association of Queensland, individual local governments and relevant government agencies, to explore the mechanisms available to local governments to regulate drone operation in specific locations such as council owned parks. The working group, to be established in 2018, will facilitate coordination and collaboration between local governments to help achieve consistency in the use of drones across the local government areas, including recreational and commercial use.



Objective 5:

Improving government service delivery

Drone technology presents a number of opportunities to enhance government service delivery, improving safety and efficiency. Queensland agencies and local governments are already using drones in an operational capacity and are leaders in adopting the technology.

The QPS is the first Australian law enforcement agency to achieve a CASA Operators Certificate. The Department of Agriculture and Fisheries (DAF) recently amended legislation to allow licensed chemical applicators to employ drones for aerial distribution of agricultural chemicals. DAF, the Department of Natural Resources, Mines and Energy and Biosecurity Queensland joined with the CSIRO to use drones to tackle pest weeds.

Technology innovations will continue to expand the potential of drones across government agencies. The purpose of this objective is to ensure that drone technology continues to be utilised for improved and more efficient government operations and service delivery.

There is an opportunity to coordinate agencies' current and future drone activities through an internal government policy. This will ensure agencies are able to utilise drone technology, with consistent guidelines for platform capabilities, data management, communication of purpose to the public, data accessibility, procurement, and training and safety. The state government may also be able to assist in supporting coordination of the already high adoption of drone use across the local government sector.

From the perspective of government agencies, the data collection ability of drones is particularly useful. For example, spatial imagery may be used to inform natural areas management, disaster recovery actions or infrastructure decisions. To maximise the benefits from data collection for all agencies, it is useful to have a central database to store spatial imagery. Data collected from drones may attract significant interest and have much broader application for both government agencies and industry, and it is important that this is managed in an open, responsible and reliable way.

Queensland is already considered a leader in the consolidation and accessibility of aerial and satellite imagery data and 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. 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 for agency use of drones.

'In the 2017 LGAQ Digital Productivity Report, 25 per cent of councils reported that they are using drones for the monitoring and maintenance of assets. In addition, 33 per cent of councils have advised that they regularly use drones in part of their operations.'

Local Government Association of Queensland (LGAQ) comment—written submission to the QDS consultation paper.

‘Drones enable Council to undertake business activities more cost effectively and safely, and to undertake activities that were not technically feasible previously.’

Brisbane City Council submission to QDS consultation paper.

Local industry stakeholders highlighted the important role the Queensland Government can play in leading the way for local businesses, demonstrating drones’ potential in a safe and secure manner, and setting standards through procurement guidelines.

It is imperative government is a model purchaser and user of drones, and communities are confident their safety and individual rights will be protected. The potential for government to procure the goods and services from local businesses may also act as an important driver of local industry development.

The following actions support this objective, presenting both overarching approaches to improving government service delivery and leading the way for local industry as well as specific use of drones by government agencies.

Drones for conservation

Drone technology is providing new and more efficient ways to assist the conservation of Queensland’s precious ecosystems:

- 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.

Although drones provide opportunities for conservation, it is important the use of the technology does not adversely impact the natural environment and that animals’ space is respected. For example, migrating whales may be caused undue stress by the close proximity of drones.

The Department of Environment and Science provide guidelines stipulating that helicopters are not permitted within 500 metres of a whale or a dolphin (and no hovering above a marine mammal), and other aircraft are not allowed within 300 metres of a whale or a dolphin. Drones are also required to adhere to these distances.

Actions

Develop an internal Queensland Government Drones Use Policy that provides information to all Queensland Government agencies regarding the use of drones including requirements such as the operation, safety, security, data collection, information management, and procurement of drones. This policy, led by the Department of Transport and Main Roads, will be delivered in 2018 and help to ensure the Queensland Government is providing a good example as a model drone user and provide Queensland Government agencies with greater confidence to uptake drones to make services better and more efficient.

Develop a set of standards in 2018 to ensure that drone data and imagery captured by government agencies meets quality, completeness, privacy and licensing standards for inclusion in the Department of Natural Resources, Mines and Energy's State Remotely Sensed Image Library and online tools such as Queensland Globe and QImagery. Supporting extended availability of data and images captured by government drones will give industry and researchers better access.

Conduct an evaluation of additional technologies in a prison environment to make our prisons safer, including the use of mobile drone detection technologies that are only made available to public safety agencies and civil aviation authorities. The evaluation will be led by the Queensland Corrective Services in partnership with the Institute for Intelligent Systems Research and Innovation.

Develop internal procedures, develop risk assessments and seek to utilise any standing offer arrangements for the utilisation of drones to conduct government owned asset inspections by the Department of Housing and Public Works where appropriate. To be completed in 2018, this will improve efficiency and safety when conducting building inspections for government-owned building assets, in particular, public housing and government employee housing.

Finalise the trial of drones for Queensland Fire and Emergency Services operations by end 2018 and, by end 2019, make a recommendation to the Commissioner on the applications for drones within emergency response and to help guide the department's future investment in this technology.

Deliver a 2018 action plan for the Department of Environment and Science to use drones to identify species and assess numbers of flying-foxes in roosts. This will allow the efficient and effective collection of critical environmental management information.

Inform local governments on the potential use of drones to enhance service delivery and reduce the risk of working at heights to employees through collaboration between the Department of Local Government, Racing and Multicultural Affairs, the Department of Housing and Public Works and the Local Government Association of Queensland. This will improve the ability to conduct more efficient and safe asset inspections.

Incorporate the use of drones when required (through commercial providers) into Fisheries Queensland's intelligence-based compliance plans to assist with fisheries compliance activities.

Continue to develop research and development partnerships through the Department of Agriculture and Fisheries to facilitate the use of drones to develop surveillance and treatment applications in the management of invasive species, for example Red Imported Fire Ants.

Developing a Queensland Government Drones Use Policy will provide information to all Queensland Government agencies regarding the use of drones including requirements such as the operation, safety, security, data collection, information management, and procurement of drones.



A dynamic approach

Throughout consultation, stakeholders highlighted the importance of a dynamic and agile strategy to ensure Queensland keeps up with the development and demand in the industry.

It is acknowledged that not all issues identified during consultation are being addressed in the QDS at this time. For example, industry identified that an easier process to attain exemptions for BVLOS operations would significantly expand the potential of the drone industry. There were also calls for greater regulation of recreational users to reduce public safety risk.

The QDS addresses recreational use and public safety through education actions. Further actions that the Queensland Government could take to address issues will be influenced by the way in which CASA progresses the findings of its drones safety review and the outcomes of the Senate Inquiry. The adoption of geo-fencing technology or an unmanned traffic management system may influence Queensland's approach to supporting the commercial opportunities from drones. Similarly, mandatory registration for aerial drones more than 250 grams, as proposed by the findings of the CASA drone safety review, would influence Queensland's approach to supporting community safety.

Given the potential impact of the way in which CASA progresses the findings of its safety review, the outcomes of the Senate Inquiry, the dynamic nature of the industry and the influence of broader social and economic considerations, it is imperative that Queensland remains abreast of the key issues and emerging opportunities through an agile and responsive QDS. The Queensland Government will continue to work with CASA as the findings from the drones safety review and the outcomes of the Senate Inquiry are advanced.

Vision

Our vision is for Queensland to be 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 peoples' lives and support our communities.

Objectives	Attracting national and international investment	Increasing industry and workforce capability	Increasing research and development	Supporting community-friendly drone policies	Improving government service delivery
Abbreviated actions <i>See pages 21 to 37 for detailed actions</i>	<ul style="list-style-type: none"> Provide \$350,000 in sponsorship for the World of Drones Congress over two years Identify and develop specific common-user sites for the commercial testing of aerial drones Promote Queensland as an attractive location for international drone companies to establish operations through Trade and Investment Queensland's global presence, stakeholder engagement and marketing activities Actively promote the Queensland drone industry at trade shows Monitor and evaluate other jurisdictions' use and testing of new drone applications and technology, learn from these experiences and bring new-to-state opportunities for local industry, national and international investment Develop a feasibility report, specifically looking at opportunities, potential pilot projects or case studies, for drone technology to support the tourism industry. 	<ul style="list-style-type: none"> Finalise, release and implement Queensland Aerospace and Defence Industry 10-Year Roadmaps and Action Plans Develop an engagement strategy identifying the needs of Queensland's drone industry businesses and strategies to connect with the research sector and other industries Expand science, technology, engineering and maths (STEM) programs—such as Schools of the Future—to include drone specific elements under the curriculum Review the delivery of the Certificate III in Aviation (Remote Pilot – Visual Line of Sight) in participating schools across Queensland to determine benefits and outcomes, and explore feasibility of further expansion of this initiative Publish an online resource to provide information for businesses and industry on drones Remote Piloted Aircraft – Training Advisory Group will provide advice on investment to support skills development in Queensland Provide support for the delivery of a 2018 UAV industry forum in Queensland. 	<ul style="list-style-type: none"> Establish an accreditation organisation, with up to \$3 million in funding, to facilitate the development of industry consensus standards to support the assessment and certification of autonomous and robotic technology through the Civil Aviation Safety Authority (CASA) and the Defence Aviation Safety Authority Provide up to \$1 million over five years for drones targeted scholarships under the Advance Queensland fellowship program Support the 2018 Medical Express Challenge in Dalby through in-kind support Pursue opportunities to develop innovative applications of RPAS through collaboration with industry and researchers Conduct a gap analysis into the drone industry's research and development needs. 	<ul style="list-style-type: none"> Refer the question of whether Queensland's legislation adequately protects individuals' privacy in the context of modern and emerging technologies to the Queensland Law Reform Commission Develop and roll out a new education campaign targeted at recreational drone users to provide information on the safe and proper use of drones and respecting others' privacy Identify and consider options and future actions to meet policy objectives of regulating, prohibiting and deterring the use of drones in the vicinity of correctional facilities Develop policy regarding Government and non-Government drone use in State controlled transport corridors and maritime jurisdiction Queensland Police Service will work with CASA and other law enforcement agencies to support CASA's enforcement activities and facilitate the exchange of investigative information Establish a working group with the Local Government Association of Queensland (LGAQ), individual local governments and relevant government agencies to facilitate coordination and collaboration between local governments to help achieve consistency in the use of drones across local government areas. 	<ul style="list-style-type: none"> Develop an internal Queensland Government Drones Use Policy that provides information to all agencies regarding the use of drones Develop a set of standards to ensure drone data and imagery captured by government agencies meets quality, completeness, and licensing standards for inclusion in the State Remotely Sensed Image Library and online tools such as Queensland Globe and QImagery Queensland Corrective Services will partner with the Institute for Intelligent Systems Research and Innovation to evaluate additional technologies in a prison environment, such as mobile drone detection technologies, to make our prisons safer Develop internal procedures, develop risk assessments and seek to utilise any standing offer arrangements for the utilisation of drones to conduct government owned asset inspections where appropriate Develop a 2018 action plan to use drones to identify species and assess numbers of flying-foxes in roosts Collaborate with LGAQ to inform local governments on the potential use of drones to enhance service delivery and reduce risk of working at heights to employees Incorporate the use of drones when required into Fisheries Queensland's intelligence-based compliance plans Continue to develop research and development partnerships to facilitate the use of drones in the management of invasive species.



Over the horizon

It is clear the technology and application of drones is just beginning to be explored.

Queensland's strategy has been designed to ensure we keep our door open to the opportunities of the future. This is just the start of an exciting journey and we must continue to check our direction, adjusting as required, and exploring the new opportunities that arise.

The Queensland Government will continue to engage with industry, academia and the community to ensure we keep abreast of emerging issues and remain at the forefront of the industry. Queensland is home to leaders in drone research, technology and operation and we will draw on their insights and expertise to inform our future actions.

Even at present, it is clear that there is significant potential for drones to impact on transport and freight, environmental protection, law enforcement and defence, with autonomous ground vehicles also presenting significant opportunities for industries including mining and agriculture.

How the technology emerges will impact the possibilities in these areas. Importantly, we now have a strategy that sets our initial direction and places an appropriate focus on unlocking the potential of this industry, ensuring economic and jobs growth for Queensland, now and into the future.

