ADVANCE QUEENSLAND

Jobs now, jobs for the future

Queensland Aerospace 10-Year Roadmap

Discussion paper for consultation
May 2016

Queensland Government

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Abbreviations

ASEAN ..... Association of Southeast Asian Nations
BSMQ ..... Business and Skills Migration Queensland
CASA ..... Civil Aviation Safety Authority
DSTG ..... Defence, Science and Technology Group
EFIC ..... Export Finance and Insurance Corporation
HTA ..... Heat Treatment Australia
JSF ..... Joint Strike Fighter
MRO ..... maintenance, repair and overhaul
NAACEX ..... Northern Australia Aerospace Centre of Excellence
NAFTA ..... North American Free Trade Agreement
OEMs ..... original equipment manufacturers
QUT ..... Queensland University of Technology
RAAF ..... Royal Australian Air Force
R&D ..... research and development
RPA ..... remotely piloted aircraft
SMEs ..... Small and medium sized enterprises
UK ..... United Kingdom
UQ ..... University of Queensland
USA ..... United States of America
USQ ..... University of Southern Queensland

Draft vision

The following draft vision has been developed for consultation and stakeholder feedback:

By 2026, the Queensland aerospace industry will be recognised as the leading centre in Australasia and South-East Asia for aerospace innovation; manufacturing; maintenance, repair and overhaul (MRO); and training for military and civil markets.

Aerospace in Queensland – the 2026 vision

Purpose

The Queensland Government is investing $180 million in the Advance Queensland program—a comprehensive suite of reforms that will diversify the economy and create knowledge-based jobs now and into the future. A key element of this program is the $46 million Advance Queensland Future Jobs Strategy. This will build on the Queensland Government's previous investment in research, and focus on building a culture of collaboration between research bodies and business to translate ideas and research into products, processes, service outcomes and jobs.

To assist industry and research organisations achieve this outcome the Advance Queensland Supporting Priority Industries Program will invest in 10-year roadmaps where government will work with industry and academic and research partners to develop long-term plans for emerging industries. Aerospace is one of these industry sectors.

This discussion paper has been written to inform the development of the Queensland Aerospace 10-Year Roadmap and Action Plan that aims to grow the sector to create more jobs in the future. The discussion paper seeks to explore the current environment in relation to aerospace, the key attributes of aerospace businesses and the key opportunities and challenges in the sector. The discussion paper is seeking stakeholders' input on the key issues and actions for consideration in the development of the Queensland Aerospace 10-Year Roadmap and Action Plan.

What is aerospace?

Aerospace, both military and civil, encompasses all relevant technologies and key support systems necessary for the development, manufacture, modification, upgrade, testing, operation and maintenance of flight vehicles and related ground systems. These include component design and manufacture, platform design and manufacture including helicopters and remotely piloted aircraft (RPA), on-board and ground-based electronic systems, communication networks and decision support systems.

Aerospace's contribution to the Queensland economy

The July 2015 IBIS World *Aircraft Manufacturing and Repair Services in Australia* report states that Queensland is home to over 30% of establishments in the Australian aircraft manufacturing and repair services segment comprising an estimated 344 businesses[1].

In 2014–15 aerospace contributed around $600 million to the Queensland economy[2].

The sector currently provides over 4500 direct jobs in aircraft manufacturing and repair service and indirectly supports many more across the state. It generated approximately $1.3 billion of revenue in 2014–15[3]. Exports make up 44.5% of industry revenue and more than 47% goes to the United States of America (USA) closely followed by the Asia-Pacific region[4].

According to IBIS World July 2015, the sector has shown national annual growth of 0.9% from 2011 to 2016 with projected annual growth of 2% in the period 2016 to 2021.`

**Aircraft manufacturing and repair services*

Global demand

The global aerospace market is expected to grow to US$352.5 billion by 2023. The major drivers for growth in the global aerospace market are high replacement rates, changes in technologies, increased aircraft sizes, and high net-worth population increases[5].

Both Boeing and Airbus are forecasting nearly 27,000 new large civil airliners (with a market value of US$3.2 trillion) will be needed by 2030 and, as outlined in the United Kingdom's (UK) strategic vision of UK aerospace, by 2020 there will be a global market for approximately 9500 civil helicopters (worth around US$50 billion).

Defence budgets in North America, Europe and Asia are expected to grow or be refocused to meet national security threats and the geopolitical environment. The civil aerospace sector is also expected to continue its trend of above-average growth rates, driven by growth in passenger travel demand and an accelerated equipment replacement cycle[6].

This is particularly the case in Asia. By 2031, Asia-Pacific's fleet is expected to triple to about 13,500 aircraft. The global aerospace MRO market will grow to US$86.8 billion by 2024, according to forecasts from US aviation consultancy, Team SAI. In the Asia-Pacific, the market is expected to grow at a 5% rate between 2014 and 2024, with China's market expanding from US$4 billion to US$10.2 billion[7].

The helicopter market faces a number of challenges. Military helicopters are on the verge of a technological leap with next generation compound helicopters and tiltrotor crafts and there are opportunities to introduce these technologies for civil use. The helicopter worldwide business fleet is estimated to grow to 34,700 aircraft by 2025, with a 10-year MRO requirement of US$83 billion[8].

RPA continue as the most dynamic growth sector of the world aerospace industry this decade with the global RPA market valued at US$10.1 billion in 2015, and is expected to account for US$14.9 billion by 2020[9].

Global players

Many emerging aerospace nations, such as Brazil[10], have built aircraft manufacturing capabilities based on military acquisition and are now positioned to develop approximately 100-seat military and civil transport aircraft.

Aided by its proximity to the USA, the North America Free Trade Agreement (NAFTA)[11], and its lower cost base (approximately 16% less than USA), Mexico has implemented its National Flight Plan[12] for aerospace manufacturing, engineering and development to achieve US$5.463 billion of exports in 2013.

The UK has revitalised its aerospace industry through the Reach for the Skies and Lift Off[13] growth partnership with industry launched in 2012–13. The UK boasts the second largest civil aerospace industry in the world. Exporting 75% of what it produces, and generating almost £12 billion in revenues, the sector enjoys a 17% market share and is second only to the USA[14].

Queensland is in close proximity to the global aerospace centres of Singapore and Malaysia, which provides the opportunity for competitive differentiation and collaboration.

Singapore has invested heavily in its Aviation Development Fund to attract global original equipment manufacturers (OEMs) such as Rolls Royce and Pratt & Whitney. It undertakes approximately 25% of regional MRO business, supported by ST Aerospace. In 2013, the industry achieved a record output of over US$8.7 billion, with over 100 aerospace companies and employing over 19,800 workers[15].

The Malaysian Aerospace Industry Blueprint 2015–2030 includes MRO services as well as manufacturing high-tech components to generate total revenue of US$14.87 billion in the next 15 years[16]. Prominent foreign companies that have made substantial investments in Malaysia include GE Engine Services Malaysia, Honeywell Aerospace Services, Hamilton Sundstrand, Spirit AeroSystems, Airfoil Services, AAR Landing Gear Services and Messier-Bugatti-Dowty.

The Australian and Queensland aerospace industry is well-placed to maximise its presence in the Asia-Pacific region. Australian companies are playing a growing role in global supply chains in Europe, US, India, China and the Association of Southeast Asian Nations (ASEAN) countries. Education, design, safety, innovation and research and development (R&D) are key strengths.

Some of the advantages Australia offers are:

- the highest product quality levels within the Asia-Pacific region at competitive prices
- an advanced manufacturing environment with an excellent skills and transport infrastructure base
- high quality, cost effective aerospace design with excellent communications and IT infrastructure
- exceptional R&D resources, education and training facilities[17].

Global aerospace prime manufacturers are now largely integrators that bring together pre-manufactured components from global sources. 80 to 85% of the value of new aerospace program design is bought-in. The 'make-versus-buy' policy of these companies, and the implications for the development of core competencies in the supply base, will be crucial to companies in the supply chain. Because design and production of sub-systems, and components as well as some design services are outsourced, suppliers must be able to meet quality, price and delivery timelines.

Additionally, the rise of new middle and upper class societies with increased levels of disposable income throughout South-East Asia will continue to stimulate growth in the aerospace sector. The increased tax base arising from improved economic conditions will also allow South-East Asian nations to re-equip their military forces and civilian sectors with advanced aerospace platforms and systems.

What we are currently doing

Queensland companies have significant capability in military and civilian aerospace that includes RPA design and manufacture, major aircraft MRO, electronic systems integration and modelling and simulation.

Over the last 60 years, Queensland companies have built up a world-leading position in the manufacture, modification, design and support of dual-use aircraft, propulsion systems, helicopters, landing gear, wheels and brakes, and associated key aircraft systems. Innovations in advanced manufacturing processes and capability in key product areas have helped sustain Queensland's competitiveness in the global aerospace market.

The state is one of only a few sites in the world with the range of capabilities needed to build, test and maintain advanced military and civil helicopters. Further, more than 30% of Australia's growing RPA industry is located in Queensland[18].

Queensland's expertise in aerospace technology and manufacture is located throughout the state. Brisbane Airport is home to a state-of-the-art Qantas heavy maintenance precinct while the Wide Bay-Bundaberg area has a history of small aircraft manufacturing. Cairns is home to the largest recognised service facility in the Southern Hemisphere for Bombardier's Dash 8 Q-series aircraft and the largest avionics facility in Australia.

Townsville Airport has significant general aviation maintenance activities, supported by the establishment of the Northern Australia Aerospace Centre of Excellence (NAACEX), and a significant commercial airline paint shop—Flying Colours Aviation. NAACEX will accommodate the future growth of aerospace and aerospace support industries, both commercial and defence, for Australia and South-East Asia.

All these activities are supported by skilled Queensland manufacturing and services small and medium sized enterprises (SMEs) that form part of extensive domestic and global supply chains, and provide a strong foundation for aerospace growth in Queensland into the future.

The Queensland Government has recognised the requirement to address industry skills-needs more generally through the establishment of Jobs Queensland that will provide strategic advice on industry future skills and workforce planning needs.

It has also been active in supporting the current and future aerospace skills training needs of the civil market.

The Queensland Government worked with private stakeholders to establish the Brisbane-based Aviation State High School and

the Aerospace Gateway to Industry Schools program. They provide pathways for careers in aerospace for students who can continue their tertiary training at registered training organisations and/or university. Aviation Australia, with campuses in Brisbane and Cairns, offers a Bachelor of Business (Aircraft Maintenance Management) qualification where graduates emerge with two qualifications—a Diploma of Aircraft Maintenance Engineering (Avionics) or a Diploma of Aircraft Maintenance Engineering (Mechanical) issued by Aviation Australia, and a Bachelor of Business (Aircraft Maintenance Management) issued by the University of Southern Queensland[19]. University of Queensland, Queensland University of Technology and Griffith University provide tertiary qualifications in electrical and mechanical aerospace engineering.

Business and Skilled Migration Queensland (BSMQ) will also sponsor Skilled 190 and 489 (regional) visas for those applicants already working in Queensland in their chosen occupation (not offshore) in aircraft maintenance engineering (avionics), aircraft maintenance, and aircraft maintenance engineering (structural).

The state is home to subsidiaries of global prime aerospace contractors and significant Tier 2–5 companies demonstrating strong capabilities across the entire span of the global aerospace industry. Global prime contractors such as Boeing, Airbus, Raytheon, Sikorsky-Lockheed Martin, GE Aviation and Northrop Grumman have regional headquarters and substantial military and/or civil aerospace business in Queensland. They are complemented by aerospace macro SMEs such as Ferra Engineering, Micreo, TAE, Flying Colours Aviation and Heat Treatment Australia (HTA). The span of technologies and capabilities at the prime level includes major aircraft modification, helicopter build, life cycle support, avionics MRO, logistics analysis and management, electronic systems integration, modelling and simulation, and RPA design and manufacture.

At the Tier 2–5 level, there are also a wide array of Queensland companies involved in advanced manufacturing for global military supply chain components, military and civil jet engine MRO, large aircraft painting, helicopter overhaul, composite structures, electronic systems, medical evacuation systems and interior fit-out, heat treatment and vacuum brazing, precision machining, electro optics, and smaller aircraft/helicopter MRO. Each macro SME manages a multi-tier supply chain in its own right, relying on the extended aerospace community in Queensland to supply components, services and production materials.

Queensland aerospace companies continue to make new investments to create world-class facilities. These include the new vacuum brazing systems at HTA in Brisbane, F-135 military jet engine support by TAE, small jet turbine test cells at Asia Pacific Aerospace, and new tooling for advanced medical evacuation systems to enable joint military and civil humanitarian operations across air, land and sea.

Backing up the industry base, Queensland's highly regarded research agencies include Australia's only dedicated RPA aerospace automation research institute at Queensland University of Technology (QUT), advanced hypersonics research at University of Queensland (UQ) and University of Southern Queensland (USQ) to complement the Defence, Science and Technology Group (DSTG) Centre for Hypersonics implementation, nanotechnology and materials research at UQ, and the recently formed Aviation Innovation Network (QUT)[20].

Opportunities for Queensland

The global market outlook for aerospace presents major opportunities for Queensland companies in the short, medium and long term. These range from work to sustain, modify, upgrade and develop variants of existing aircraft, through to opportunities in emerging next generation platforms likely to enter service in the middle of the next decade in civil and military markets.

The greatest opportunities in aerospace lie in the new programs that will come on stream over the next 15 or more years. In the defence sector this includes the new USA bomber program and the Triton RPA, while in the civil sector it includes new variants of emerging aircraft and next generation platforms including RPA.

The highest priority opportunities are not created exclusively by an individual company. They are more typically created by macro SMEs underpinned by a local supply chain which can include up to 15 other smaller companies supplying specific components or services.

These opportunities are occurring in areas in which Queensland has a competitive advantage and they include:

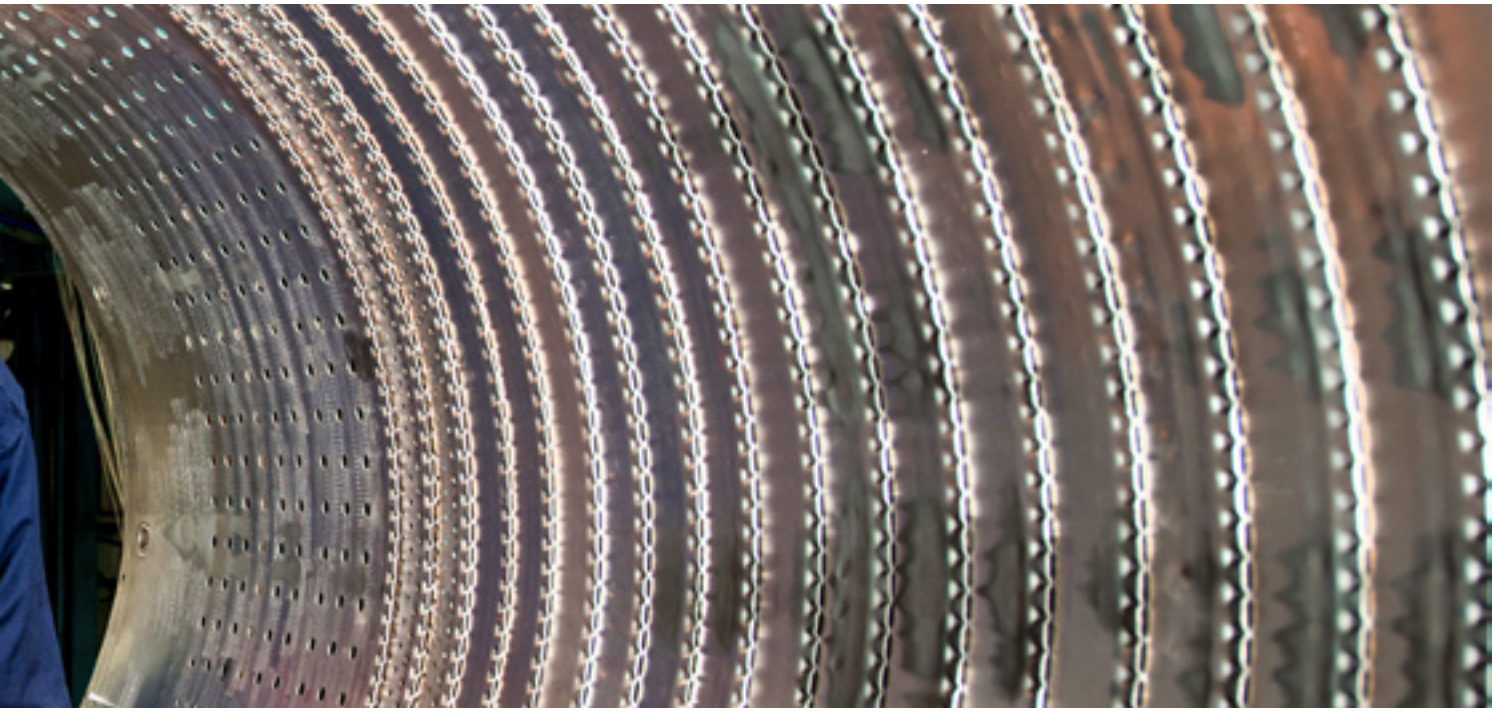
- RPA applications to precision agriculture, biosecurity and environmental monitoring projects, infrastructure monitoring, post-disaster surveys, search and rescue, and media for entertainment and advertising
- improved aeromedical evacuation systems interchangeable with local and global standards
- manufacturing opportunities associated with the new Joint Strike Fighter (JSF) global fleet supply
- expansion of the supply chain for the JSF F-135 engine
- large-scale super alloy casting for jet engine casings
- brazing and heat treatment for avionics and components

- leveraging past investments in hypersonics with US supply chains
- nanotechnology
- leverage aerospace precision manufacture into defence maritime and land applications.

Additionally, Queensland has long been home to the core of Australia's ageing aircraft technology and know-how. It is an area in which the state can excel and the presence of the Aircraft Airworthiness and Sustainment (Australia) in South East Queensland will underpin future activities in this area. Building regional aerospace businesses and capacity in MRO and training that capitalise on current expertise will also create opportunities for Queensland business in the growing South-East Asian markets.

There will also be opportunities created in the JSF project, in which Queensland companies are currently engaged, in both production of components and support systems, and life cycle repair and overhaul of subsystems and components.

Opportunities will also arise as the anticipated rate of future production of environmentally friendly, fuel-efficient, quiet aircraft drives structures, on-board systems, engines and materials generally. Step-change improvements in aerospace environmental performance will be delivered through future wing structure and power plant design, supported by



integrated systems such as advanced electronics and software. Queensland SMEs need to be working in overseas supply chains to engage early in next generation technology development in support of aerospace OEMs in these new areas.

The next generation of single-aisle aircraft will feature much greater use of composites or advanced materials not currently available in today's market. Queensland research agencies are undertaking world-class research in these areas.

Importantly, Queensland needs to position itself to secure maximum economic return on future new platforms which will incorporate new technologies and take a lead role in supporting development of new products such as:

- jet engine casings
- nanotechnology application to new materials
- additive manufacturing through leverage of the Centre for Advanced Materials Processing and Manufacturing (UQ) initiatives
- advanced hypersonics systems
- ageing aircraft fleet asset management for new complex materials and engines.

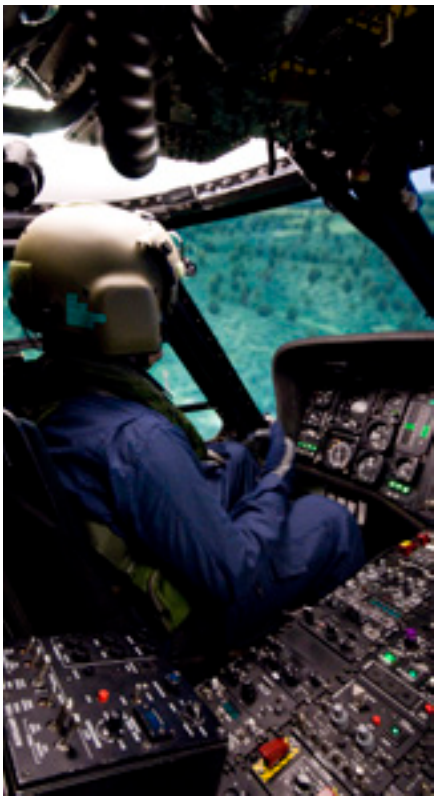
To compete in new and emerging aerospace markets, Queensland industry will need to overtake competing nations and seize selected niche opportunities in a sector based on radically different technologies, requiring new manufacturing processes.

TAE is a leading provider of military and commercial gas turbine engine maintenance, repair and overhaul services in Australasia. TAE delivers engineering, maintenance and logistics services for the Royal Australian Air Force's (RAAF's) F/A-18 aircraft engines for the Hornet and Super Hornet squadrons. TAE also provides aerospace aluminium vacuum brazing components for the F-35A Joint Strike Fighter Program and recently secured a repair and maintenance contract for the Honeywell AGT1500 Abrams M1A1 Main Battle Tank engine[21].

Challenges

Competition for Queensland aerospace companies and academia is global and intense. It is not necessarily within Australia, but with existing companies in well-established aerospace nations.

An increasing number of these companies are investing heavily in the area with strong subsidies and support from their governments in order to acquire market share. International competitors are gaining ground at an accelerating pace, and pose a real threat to the competitiveness of the Queensland aerospace industry.



Queensland aerospace is also facing a number of specific challenges. These include:

- a potential shortage of skilled engineers—particularly at senior technician, graduate and post-graduate level—in the aerospace manufacturing base
- the lack of emphasis on science, technology, engineering and mathematics education in schools and in the provision of tertiary courses relevant to industry requirements to address the ageing workforce
- ensuring the next generation of engineers and technicians understand the processes and techniques for dealing with older aircraft and the need to support the certificate level MRO training at Civil Aviation Safety Authority (CASA) approved registered training organisations; and ensuring the state does not struggle to meet the significant demand for these skills in five to six years' time
- some weaknesses in supply chain members' skills in management and operations
- the need to strengthen Queensland aerospace industry's ability to identify emerging opportunities to broaden its access to global supply chains, selling to a wider range of aircraft and equipment manufacturers across a broader front of defence and civil platforms
- continuing to ensure the government and industry support and nurture the capabilities required to grow the aerospace industry
- ensuring Queensland's aerospace supply chain develops the ability to engage early in, and influence, the product design cycle which in turn implies a trusted supplier position with global Tier 1, 2 or 3 suppliers for core subsystems of future aircraft such as undercarriages and engines
- ensuring Queensland's aerospace supply chain businesses are able to present attractive offerings to win internationally available work from Tier 1 and 2 suppliers
- the narrow base of suppliers adopting and maintaining continuous improvement plans for productivity, quality and delivery; taking opportunities to develop and incorporate product and manufacturing technology improvements; and demonstrating highly capable financial, project management and supply chain management skills
- the slow rate at which Queensland's supply chains are improving which increases their risk of losing business to competitors
- Difficulties for SMEs to manage their financial risk by analysing market trends and adjusting their business positioning accordingly
- ensuring the aerospace industry makes careful strategic decisions to stay ahead of the international competition and ensure continued economic success

for Queensland's high-value manufacturing

- the need to identify emerging manufacturing technologies and their alignment with future aircraft development requirements
- lack of industry assistance in the development of SMEs' strategic business plans to establish the quantum of investment and level of collaboration required to accelerate development and transition to market
- major risks in large volume 3-D printing of aerospace materials that arise because additive manufacturing and the process of integrating additive material properties and metallurgy into the design process to optimise structural integrity in design is in its early stages
- achieving a global standard in design and production standards, test and certification across the aerospace sector
- improving access to finance for SMEs in the aerospace industry. The heavy, up-front investment costs, and long time frames to make a return, make it hard for finance providers to understand risk and deters them from lending. In addition, SMEs are likely to struggle, particularly at the start of a period of potential growth, because they lack the cash to invest at that point
- SMEs' lack of understanding of the types and availability of finance available to support business such as the Export Finance and Insurance Corporation's (EFIC's) Export Contract Loan designed to help more SME exporters, and those in export-related supply chains, receive the finance they need to succeed in international markets, as against guarantees[22].

In summary, the main industry challenges appear to be the:

- looming skilled labour shortage
- narrow base of SMEs focused on continuous improvement and effectively engaged in supply chains
- low levels of awareness of emerging trends and technologies and the ability to respond to the trends quickly
- inadequate access to information and support to develop and grow businesses.

The way forward

The Queensland Government is committed to collaborating with industry and other key stakeholders to generate a Queensland Aerospace 10-Year Roadmap and Action Plan. A plan that will realise the vision for Queensland to be recognised as the leading centre in Australasia and South-East Asia for aerospace innovation, manufacturing, MRO and training for military and civil markets by 2026.

This discussion paper forms the basis of the government's consultation with key stakeholders and the development of the roadmap.

To participate in the process, you are invited to provide a submission on the questions listed below by: email to **diqld@dsd.qld.gov.au** or complete the online survey at www.statedevelopment.qld.gov.au/aerospace no later than **Friday 27 May 2016**.

1. Do you support the proposed vision? If not, what is your vision for the aerospace industry in Queensland?
2. Are the identified opportunities comprehensive? If not, what are the other new markets/opportunities for the state's aerospace industry?
3. Are the identified challenges comprehensive? If not, what are the other impediments to the development of a dynamic aerospace industry in Queensland?
4. What policy settings and actions can the government apply that:
   - capitalise on identified opportunities
   - address identified challenges
   - support the development of new innovative aerospace businesses
   - assist businesses identify and respond to market trends?
5. How can the government effectively market Queensland's aerospace industry capability and capacity?
6. How should the success of the roadmap be measured in the short, medium and long term?
7. Do you have any other comments?

Notes

1 IBIS World Aircraft Manufacturing and Repair Services in Australia, July 2015

2 IBIS World Aircraft Manufacturing and Repair Services in Australia, July 2015

3 This is estimated based on applying IBISWorld Queensland share of 33.4% of total national establishments in the aircraft manufacturing et al industry to the national level of employment (13,720 persons in 2014-15).

4 IBIS World Aircraft Manufacturing and Repair Services in Australia, July 2015

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