



Australian Government



Australian
Space Agency

Advancing Space

Australian Civil Space Strategy 2019 – 2028

space.gov.au

Australian Civil Space Strategy 2019 – 2028 is an Australian Government strategy to deliver a globally responsible and respected space sector that lifts the broader economy, and inspires and improves the lives of Australians.

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Minister's Foreword



We are witnessing a real transformation of the global space economy. Space technology is getting smaller, access to space is becoming cheaper and innovation cycles are becoming shorter.

This has meant companies big, medium and small can make significant contributions to the space economy, which has resulted in a rapidly growing space industry, worth around US\$350 billion in 2018 globally.

Importantly, for Australians every day, space-based technology provides essential data for what we've come to expect – everything from weather forecasting and emergency management to internet access, online banking, and simply knowing where we are.

More and more, we are dependent on digital data and space-enabled services in our work and everyday lives.

They are now driving our productivity and economic growth, our engagement in STEM disciplines and the next generation of high-value jobs.

Our remote regions not only benefit from space technology, they play an important role in hosting ground stations that enable communications between space and Earth.

With these opportunities in front of us, the Coalition Government invested \$300 million in space-related activities in last year's Budget, this included \$41 million over four years to establish the Australian Space Agency, and a further \$260 million to develop world-leading satellite capabilities through Geoscience Australia. In the 2019-20 Budget we are investing further in the space sector through the \$19.5 million Space Infrastructure Fund. The Coalition Government has also announced an additional \$6 million to support a Space Discovery Centre.

Collectively, this is part of our overall investment of around \$2.4 billion to grow Australia's research, science and technology capabilities. The Coalition has invested in space activities, not only because it is a growing market with the ability to be a big part of our structural transition to a high tech future, but because space impacts on the broader economy.

The Australian Space Agency commenced operations in July 2018 with a goal to triple the size of the space sector to \$12 billion and create up to another 20,000 jobs by 2030. The Australian Civil Space Strategy 2019-2028 sets a clear path to take the space sector into the next decade and beyond.

The Hon Karen Andrews MP

Minister for Industry, Science and Technology

Head of Agency – Executive Summary



In our first year of operation, we thank Australia and the international community for their overwhelming support as we establish the Australian Space Agency. Our team will do our very best to serve our nation and its vision.

Nothing inspires quite like space and with the momentum of a nation behind us, the Agency is on the right trajectory to transform and grow a globally respected space industry, and to reach and inspire all Australians. We have listened to what the sector has told us through consultations across all states and territories and we have sought to reflect the view of the nation in this Strategy. Threaded through the Strategy are our values - Australia as a responsible global citizen; being safe and secure in space and on Earth; achieving shared ambition through partnership; doing what we say we will do; embracing entrepreneurship and inclusion; and being curious to learn more.

Opportunity

Australia's space sector touches virtually every sector of the Australian economy and includes sending satellites and spacecraft into space as well as using space to help us communicate, locate, and see the Earth in new ways. With the rapid transformation of the sector the time is right for Australia to leverage its competitive advantages; with our unique location to connect with space; robotics, sensors and automation; and our capability in advanced communication, quantum technology, rocket propulsion, space medicine and astronomy, to take its place in the global space sector.

Challenge

Australia's space sector must also address the challenges of a fiercely competitive and rapidly growing space sector while building scale and addressing market barriers. The Agency has a vital role to help open the door internationally for our research and industry sectors, and set a relevant legal and regulatory framework that meets our international obligations and facilitates growth in our industry while maintaining safe and secure operation in space and on Earth.

Australian Civil Space Strategy

To realise these opportunities and address our challenges, the Australian Civil Space Strategy outlines a staged plan to meet the Government goal to diversify the economy, triple the size of Australia's space sector and grow an additional 20,000 jobs by 2030.

The Strategy is built on four Strategic Space Pillars - open the door internationally; develop national capability in areas of competitive advantage; ensure safety and national interest are addressed; and inspire and improve the lives of all Australians. It also makes clear that meeting Australia's international obligations and supporting a rules-based order are central to achieving this vision.

Activities under the pillars will be guided by the seven National Civil Space Priorities that build on Australia's areas of strength and address our challenges. The first two National Civil Space Priorities - Position, navigation and timing; and Earth observation received \$224.9m and \$36.9m respectively to Geoscience Australia in the 2018 Federal Budget, as well as funding to space activities through the CSIRO. Communication technologies and ground infrastructure will be a focus in 2019-2021, for example funding a mission control facility in Adelaide. 2021-2028 focusses on the remaining four priorities of Leapfrog R&D, Space situational awareness, Robotics and automation, and Access to space.

The Strategy lays the foundation for Australia to participate in joint missions with international partners and multilateral fora. It lays out a phased investment in our National Civil Space Priorities for Australia and sets a timetable for regulatory reform to enable launch to space from Australia and the foundations for human space flight from Australia. The Strategy seeks to engage and inspire the nation and set a framework for training and future jobs in the space sector.

Measuring success

We will report every two years on our progress towards our goal of tripling the sector's contribution to GDP to \$12 billion and creating an additional 20,000 jobs by 2030. We also aim to stimulate at least a \$1 billion pipeline of inbound capital investment in Australia's civil space industry sector between 2019 and 2028; achieve year-on-year growth of the Australian space sector that exceeds 8.5 per cent; create a regulatory framework that ensures effective, efficient and safe space activities; and reach at least 10 million Australians a year with our work and the impact of space to the nation.

In the short term we also aim to form cooperative agreements with international space agencies and states and territories, along with effective industry partnerships.

Australia has a strong and dynamic space sector, with high ambitions, great potential characterised by creativity, entrepreneurship, and a sense of discovery. This Strategy provides the certainty of a long-term framework around which the sector can plan its activities towards the long-term transformation and growth of the industry. We want to build on Australia's strong heritage in space. Our 65,000 years of Indigenous connection with space reminds us all that we are here to serve our nation, honour our past and build a future to benefit all Australians.

Dr Megan Clark AC
Head, Australian Space Agency

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AUSTRALIAN CIVIL SPACE STRATEGY 2019-2028: IMPLEMENTATION

1 SET CONDITIONS
2018-2019

2 ENGAGE WITH OPPORTUNITY
2019-2020

3 DELIVER SUCCESS
2021-2028



INTERNATIONAL

Open doors

CNES, UK, Canada, UAE

NASA, ESA, DLR, JAXA, NZ, Indo Pacific region

Joint international missions

Partnerships for a globally competitive space sector

International Space Investment

Multilateral presence



NATIONAL

Increase capability

Access to space

Robotics and automation

Leapfrog R&D

Space situational awareness and debris monitoring

Communication technologies and services

Earth observation

Position, navigation and timing

State and territory engagement and industry partnerships

Export ready space industry

Coordinated civil space activities

Space Infrastructure Fund



RESPONSIBLE

Regulation, risk, and culture

Reform Space Activities Act 1998

Implement risk management framework for space activities

Implement supporting arrangements for the Space (Launches and Returns) Act 2018

Consider regulatory support for future space activities including Access to space

Develop regulatory support for future space activities for example human space flight

UN Conventions, bilateral and multilateral obligations, UN Strategy 2030



INSPIRE

Build future workforce

Engage the nation
Amplify communication on space activities through leveraging partnerships across the nation

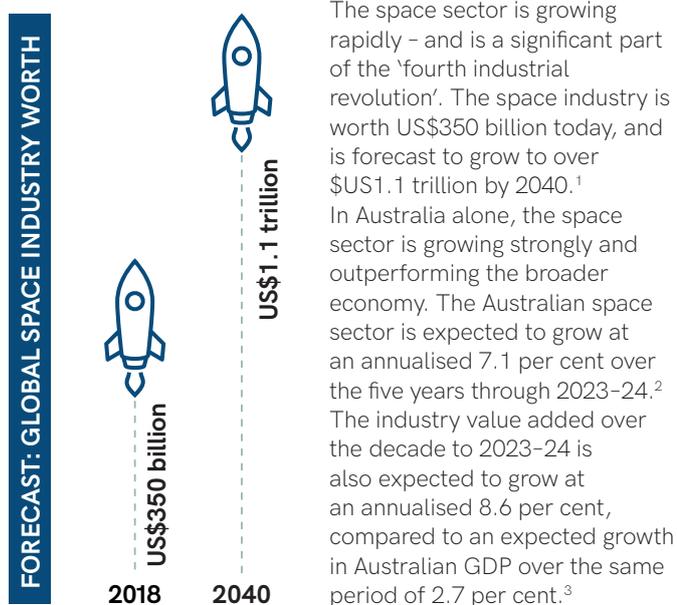
Identify and implement partnerships to build the future workforce, for example through STEM initiatives, internships
Identify workforce skills and training requirements

Moonshot missions
Space sector training priorities
Build on partnerships to support the future workforce

Strategic vision

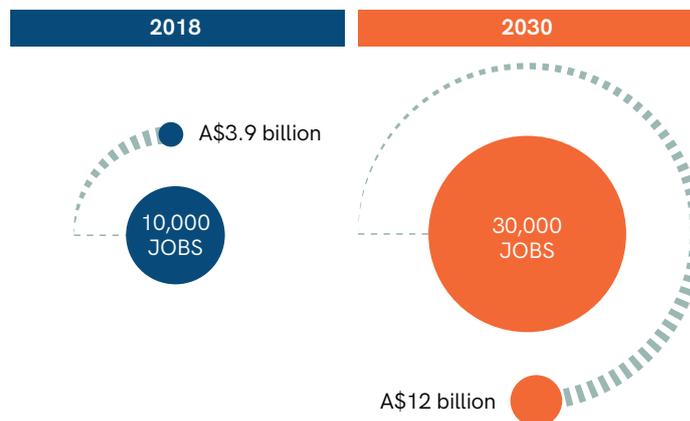
A globally responsible and respected space sector that lifts the broader economy, and inspires and improves the lives of Australians.

Future of the Australian space sector



To realise this potential growth in Australia, focus and a sustained nationally coordinated effort is required. The Australian Space Agency (the Agency) was established to provide this national focus, and to create and sustain the conditions necessary to grow Australia’s space sector.

By leveraging our competitive strengths, addressing our challenges, and engaging with risks, Australia aims to significantly grow its market segment from around 10,000 jobs and a market size of \$3.9 billion to up to another 20,000 jobs and \$12 billion by 2030, with further jobs and economy growth from spillover effects. To drive this growth, effort will be directed towards National Civil Space Priority Areas in which Australia has a competitive advantage or opportunity.



The Australian Civil Space Strategy 2019–2028 (the Strategy) sets out a plan to diversify the economy, connect internationally, develop national capability in areas of competitive advantage, ensure the safety and security of our sovereign space infrastructure and activities, and inspire and improve the lives of all Australians. It also makes it clear that meeting Australia’s international obligations, and supporting rules-based order, are central to achieving the vision.

Space, space technologies and space data are becoming increasingly important to the functioning of the modern economy. They support future economic growth, and assist business with cost savings and advancements. For example, they assist in agriculture with targeted crop spraying and precision planting, through to improving the products and services Australians enjoy every day including phone coverage, precision mapping, food availability, and health. By inspiring the next generation through the prism of space, Australia will increase its STEM educated population and create a workforce pipeline to sustain and grow a national space industry. This includes exploring new ways to engage with young people, working with successful entities locally, and drawing on global best practice.

The Strategy will be reviewed regularly to keep in step with the rapid pace of change in the space sector, and be updated as necessary to reflect changes in market, industry and research sectors.

¹ <https://www.morganstanley.com/ideas/investing-in-space>

² IBISWorld Industry Report OD5545 Satellite Communications and Astronauts in Australia November 2018 at page 7

³ IBISWorld Industry Report OD5545 Satellite Communications and Astronauts in Australia November 2018 at page 11

A strategy for growth – strategic space pillars

Based on the opportunity and challenge for Australia in the global space sector, four Strategic Space Pillars have been identified to transform and grow Australia's space industry.

These pillars focus on transforming, inspiring and creating a competitive environment for the space sector to grow, and advancing Australia's competitiveness and role as a responsible actor in civil space.

STRATEGIC SPACE PILLARS



Opportunity

Australia's space sector has broad-ranging impacts, touching virtually every sector of the Australian economy.

International

- Opportunities for global partnerships in the space sector for Australia are growing, for example the UK's International Partnership Program.
 - Australia has a good reputation internationally as a country that punches above its weight in technology fields. With 0.3 per cent of the world's population, Australia produces more than 4 per cent of the world's scientific publications,¹ and is a trusted supplier in international markets.
 - Australia can attract international investment through a whole-of-government approach, leveraging others' activity in a coordinated approach across government to the benefit of the space sector.
- Collaboration between our R&D sector and industry is growing.³ With lower costs and clear benefits to participation in space activities, the number of new start-ups is increasing.

All Australian market sectors get direct or spillover benefits from space-enabled services and practical applications of space capabilities, including finance, agriculture, mining, health and tourism.

National

- The space sector is no longer restricted to governments, becoming a fast-growing and fiercely commercial sector, driven by falling costs of launch and rapid technology development.
 - Australia has a geographical advantage with a unique view into the galaxy, which supports areas such as space communications, space situational awareness, and remote asset management.
 - The Australian space sector is growing – in the last five years at 10.1 per cent, and forecast for 7.1 per cent over the next five years, outpacing GDP – and has a common vision for success.²
- There are many ancillary services to the space sector such as legal, marketing, finance, and technical and regulatory activities.
 - The Australian space economy demonstrates strong performance in downstream activities, and there is opportunity to build upstream capabilities.*
 - Australia can grow capability in integrating space data and leverage data analysis for innovative space services and technology.
 - Australia's civil space businesses can provide capability to support our national defence capability.



¹ Office of the Chief Economist Australian Innovation System Report 2017

² IBISWorld Industry Report OD5545 Satellite Communications and Astronauts in Australia November 2018 at page 10

³ OECD The Space Economy at a Glance 2014 pages 86-87

* Upstream activities focus on sending objects into space and space exploration, while downstream uses the data and technology from upstream in a range of different applications.

Challenge

To realise these opportunities, Australia's space sector must also address a number of challenges.

International

- Australia is entering a rapidly growing and competitive market. There are a growing number of global participants vying for market share of the space sector.¹
- Australia needs to open doors internationally to access opportunities. Opening doors internationally for industry and researchers requires national coordination.
- Australian space businesses will need to build capability and capacity to enter international supply chains. This will include internationally recognised certifications and qualifications, for example quality or technical certification of hardware or processes to meet the stresses of launch or the space environment.
- It will be necessary to create industry scale and focus to demonstrate Australia can play a significant role in the growing space economy, for example by focussing on areas of competitive advantage.
- Strong space economies like the US and Europe are underpinned by large aerospace industries, while Australia will need to grow capabilities through its start-up and growing space businesses, and attract international partnerships.

National

- Start-ups and growing space businesses face challenges accessing investment and venture capital markets. As an emerging market, limited information is available to support investors to evaluate investment decisions in the growing space economy.
- Australian space businesses face a range of market barriers that limit growth, for example physical distance from markets, and limited or incomplete local value chains.

Responsible

- Australia will need to address national security, meet international obligations, have a clear understanding of our national interests, and manage safety while fostering the growth of the space industry.
- The rapid advance of space technology, including cyber security, artificial intelligence, optical communications, and other emerging technologies creates opportunities, but also risks for Australia's growing space industry and government regulation.

Inspire

- To support Australia's future space industry it will be important that the workforce is equipped with the necessary skills and children are engaged in STEM education.

¹ Bryce Space and Technology, LLC, Global Space Strategies and Best Practices - Research Paper for Australian Government 2018

Role of Government

The Australian Government established the Agency to transform and grow a globally respected space industry. To be sustainable, the space industry itself needs to lead investment; however the Government has an important role as a partner, facilitator, and regulator. The Government's roles and responsibilities, through the Agency, include to:

International

- Identify and enable international opportunities, for example through international bilateral and multilateral partnerships.
- Identify and address barriers or impediments to space market participation, both domestically and abroad.

Responsible

- Engage in development and implementation of international obligations and norms, as well as providing a regulatory framework that enables entrepreneurship while ensuring safety, managing risk, and considering Australia's national security interests.
- Advise on the intersection between civil space matters, military space matters, national interest, and the broader security environment (including cyber security), as it applies to civil space.

National

- Focus on market gaps, inefficient or ineffective markets, as well as emerging areas of interest.
- Stimulate commercial investment, giving Australia the 'first mover' advantage in new technology areas.

Inspire

- Encourage STEM education and skills development through the prism of space.
- Create conditions to grow the future workforce.

Investment principles

To guide the Australian Government's investments in the space sector, the following principles will maximise the benefit to industry and minimise market distortions. Investments should:

- Align, and be consistent with the Strategy, the Australian Space Agency's purpose, government policy priorities, and Australia's economic and national interest.
- Align with Australia's National Civil Space Priorities.
- Target a gap in the market, market failures and inefficiencies, including enabling infrastructure that will bring industry to scale.
- Leverage contributions from other sources, for example from academia or research organisations, industry, state and territory governments, and international counterparts.
- Have the potential for significant impact in Australia's space sector or the use of space in the broader economy.

These principles will be applied consistent with existing government policy, for example the Foreign Influence Transparency Scheme.



Growing Australia's space industry – actions under the strategic space pillars

Australia has a strong and dynamic space sector, with high ambitions and great potential. This Strategy provides the space sector with the certainty of a long-term framework around which to plan its activities towards the transformation and growth of the industry.

Actions of government under the pillars

Initial strategic actions, initiatives and programs for government to enable the space sector under the Strategic Space Pillars include:

International

- Provide an international 'front door' for civil space activities and partnerships through the Agency.
- Leverage Australia's competitive advantages to build new partnerships for industry, for example through the International Space Investment initiative and Austrade's strong national and international commercial networks.
- Work with counterpart space agencies, relevant multilateral forums and other international organisations to create an enabling environment for Australia's space industry.

National

- Support the National Civil Space Priorities, commencing with investing in national enabling infrastructure to support the growth of Australia's space industry. For example, through the Space Infrastructure Fund, and Geoscience Australia's initiatives, Digital Earth Australia (DEA), National Positioning Infrastructure Capability (NPIC), and Satellite-Based Augmentation System (SBAS).
- Assist in developing national capability in critical space data gathering, analysis and services, particularly in areas in which Australia has critical dependencies and in consideration of international partnerships.
- Identify future national and international opportunities and barriers through technology road mapping aligned to the National Civil Space Priority Areas and Agency partnerships.
- Coordinate civil space activities across the nation through the Agency.

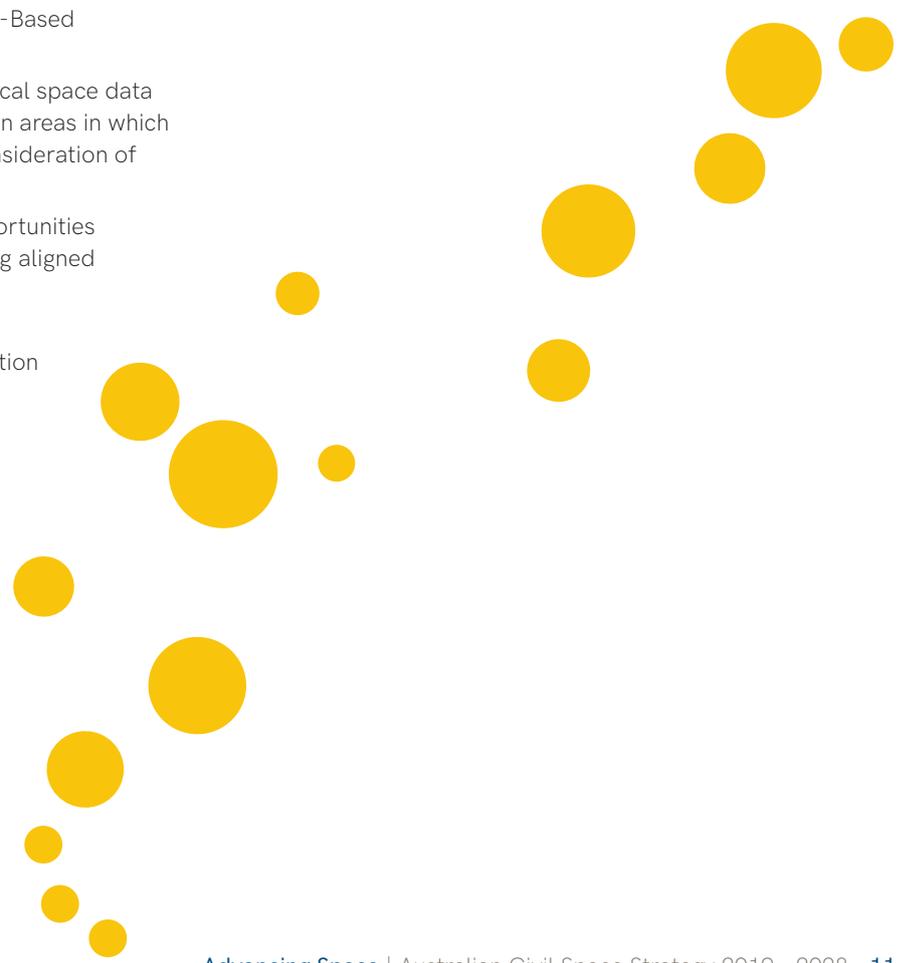
Responsible

- Develop a world-class regulatory system that enables entrepreneurship while ensuring national safety and security, including cyber security, and meeting international and national obligations.
- Investigate the risks and opportunities related to domestic launch capability.

Inspire

- Showcase Australia's achievements in space activities to inspire young people to take up STEM careers, and support the growth of the future workforce.
- Identify options for 'moonshot' missions that inspire the nation and provide stretch, increase capability and build collaboration in the space sector.

The Agency will also leverage other complementary government policies and programs that would support growth and transformation of the National Civil Space Priorities.



National Civil Space Priority Areas

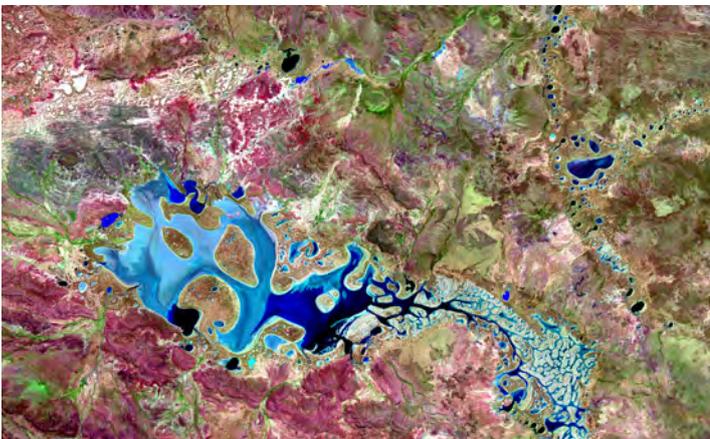
Activities under the Strategic Space Pillars will be guided by National Civil Space Priority Areas.



Position, navigation and timing

Position, navigation and timing (PNT) is critical for many areas of the Australian economy, including agriculture and mining. While Australia does not have its own global navigation satellite system, Australia's PNT infrastructure needs to be world-class to underpin the growth of the broader economy.

Photo: Thinkstock



Earth observation

Earth observation (EO) has untapped potential to grow Australia's economy, for example, by improving agricultural monitoring, water management, and monitoring shipping routes. Through Geoscience Australia's Digital Earth Australia (DEA) initiative, Australia is world-leading in this field. Australia will continue to focus on and develop this priority area to grow Australia's broader economy.

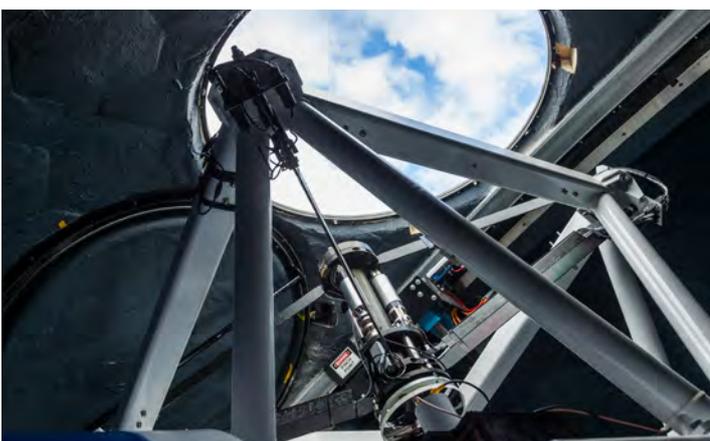
Photo: Geoscience Australia



Communications technologies and services

Space is crucial for communications on land, our marine jurisdiction, and airspace. Australia can play a lead role in emerging technologies such as lasers for data communication, quantum technologies for secure communication, and hybrid radio and optical communications.

Photo: Geoscience Australia

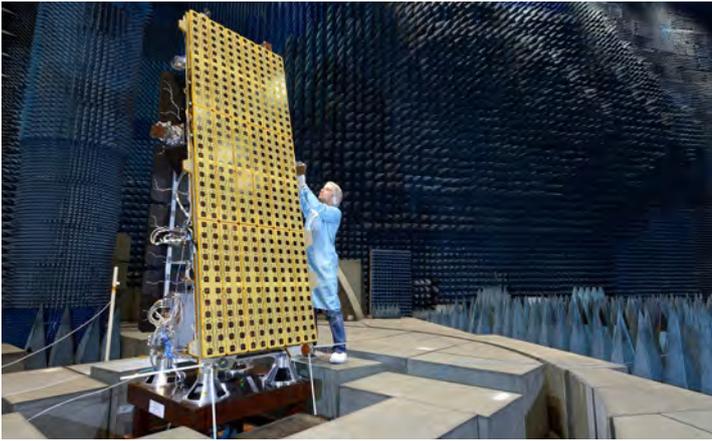


Space situational awareness and debris monitoring

Collisions in space with debris pose a risk to assets and life. Australia's geographical position makes it an ideal location for space debris tracking and space traffic management activities.

Photo: SERC

National Civil Space Priority Areas



Leapfrog R&D

Australia has a strong research base in space-related R&D, contributing 6.8 per cent of the world's publications in this sector between 2012 and 2016. To transform our space sector and leapfrog into new areas consistent with our broader economic and security interests, Australia can encourage and support research that inspires, identify areas to develop, and commercialise R&D that would grow and transform our space sector. Areas of opportunity include new rocket technology, new high-tech materials, space medicine, synthetic biology, quantum communications, in-orbit servicing, and optical wireless communication technologies.

*NovaSAR-1 during development.
Credit: Airbus Defence and Space.*



Robotics and automation on Earth and in space

Australia is a world leader in remote asset management in industries including mining, oil and gas, transport, agriculture, and fisheries. Australia can leverage its expertise in robotics technology and systems for remote operation and exploration in space. Such systems are becoming more accessible with the lowering cost to access space.

Photo: Thinkstock



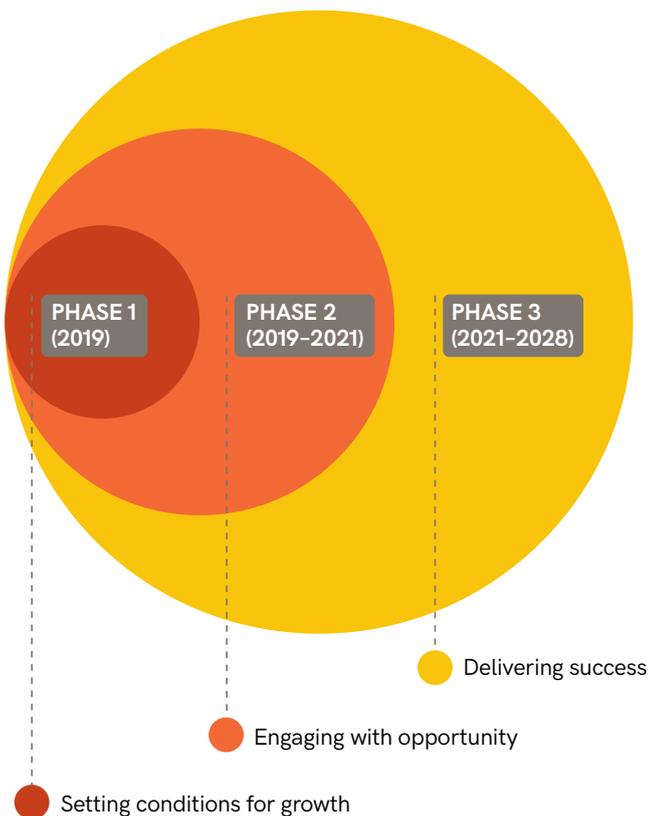
Access to space

There are emerging opportunities for Australia to leverage international space missions and commercial launch activities from Australian territory to support industry growth. Protecting national safety and meeting our international and national obligations will be critical before domestic launch can occur.

Photo: Arianespace launch, NBN Co

Implementing the strategy

The Strategy will be implemented in three phases over the next decade, and builds on work undertaken by the Agency since it was established in July 2018.



National Civil Space Priorities: investment pipeline

Phase 1 (2018-2019) – Setting conditions for growth

Delivered by the Australian Space Agency and Geoscience Australia through the \$300 million space package announced in the 2018-19 Budget.

International

- Development of international partnerships, for example with France, Canada, UK, UAE and discussions commenced with the US and the European Space Agency (ESA).
- Leverage the strengths of Austrade's international and national networks with the space sector.

National

- Develop statements of strategic intent with national and international industry partners.
- Invest in two of the seven national civil space priorities – Position, navigation and timing (SBAS and NPIC) and Earth observation (DEA) through Geoscience Australia.
- Fund space activities through the CSIRO.
- Data and research collaborations realised through this Strategy will be supported by Australia's world-class national research infrastructure facilities, including Australia's higher performance computing capabilities at the Pawsey Supercomputing Centre in Perth and the National Computational Infrastructure in Canberra. Proximity of the global Square Kilometre Array (SKA) and the Pawsey facility to New Norcia allows deepening of international partnerships in science research and deep space mission data. These collaborations will continue across Phase 2 and 3.

Responsible

- Amend the Space Activities Act 1998.
- Engage as whole-of-government on space.
- Support engagement with the United Nations through the Committee on the Peaceful Uses of Outer Space (COPUOS).

Inspire

- Engage with the Australian community.



Position, navigation and timing



Earth observation

Phase 2 (2019–2021) – Engaging with opportunity

Building on setting conditions for growth.

International

- Deliver the \$15 million International Space Investment (ISI) initiative terminating 2020–22.
- Continue development of international partnerships including with the US and ESA.
- Explore opportunities with other international partners, including multilateral opportunities.

National

- Deliver the \$19.5 million Space Infrastructure Fund to support the transformation and growth of industry, complementing and amplifying outcomes for industry from the ISI.
- Develop roadmaps for each priority area in consultation with industry and government agencies to build on activities to date, identify areas of opportunity for industry including investment, and identify areas where government could provide effective investment to deliver on the Strategy.

Responsible

- Finalise subordinate legislation to support the Space (Launches and Returns) Act 2018.
- Establish a regulatory framework for safe operations that meets our international obligations, including for launching from Australia.

Inspire

- Implement STEM initiatives and partnerships with industry to develop the future diverse and inclusive workforce, including Indigenous engagement and internships.
- Examine options for ‘moonshot’ missions that inspire the nation and provide stretch, increase capability and build collaboration in the space sector.

Phase 3 (2021–2028) – Delivering success

Focussing on priorities across each of the Strategic Space Pillars.

International

- Focus on continuing international engagement through a proposed second stage of the ISI.
- Establish joint international missions.
- Further engage in our region where consistent with our national interests.

National

- Focus on investment in the remaining four civil space priorities – Leapfrog R&D, Robotics and automation on Earth and in space, Access to space, and Australia’s role in civil space situational awareness.
- Investments will be guided by the Investment Principles and sector roadmaps, which would identify which areas are being industry led and where the Government could provide effective investment.
- Progress in all civil space priority areas will be monitored, and horizon scans will identify changes to areas of competitive advantage and opportunities.

Responsible

- Regulatory reform will continue to ensure safe operations in space and on the ground.
- Areas of opportunity include considering conditions and the foundations needed for space launch and human space flight from Australia.

Inspire

- Investigate training priorities for the space sector, and develop a future workforce plan.
- Continue to explore and develop opportunities through industry or international partnerships, including potential ‘moonshot’ missions.
- Partner with organisations such as Questacon and the CSIRO to leverage and add support to other government STEM initiatives.



Communications technologies and services



Leapfrog R&D



Space situational awareness and debris monitoring



Robotics & automation



Access to space

NovaSAR-1 during development.
Credit: Airbus Defence and Space.

Measures of success

Activities under the four Strategic Space Pillars will grow and transform Australia's space industry and position Australia to triple the space sector's contribution to GDP to over \$12 billion per annum and create up to an additional 20,000 jobs by 2030.

In working towards this broader objective, the activities would aim to:

- stimulate at least \$1 billion pipeline in inward capital investment in Australia's space industry between 2019 and 2025, including R&D investment and infrastructure investment
- achieve year-on-year growth of the Australian space industry that exceeds 8.5 per cent per annum
- achieve year-on-year growth of direct and indirect jobs that would meet a target of 20,000 additional jobs by 2030
- create a regulatory framework that ensures effective, efficient, and safe space activities
- increase awareness of space activities and the impact on the Australian economy, cumulatively reaching at least 10 million Australians per year.