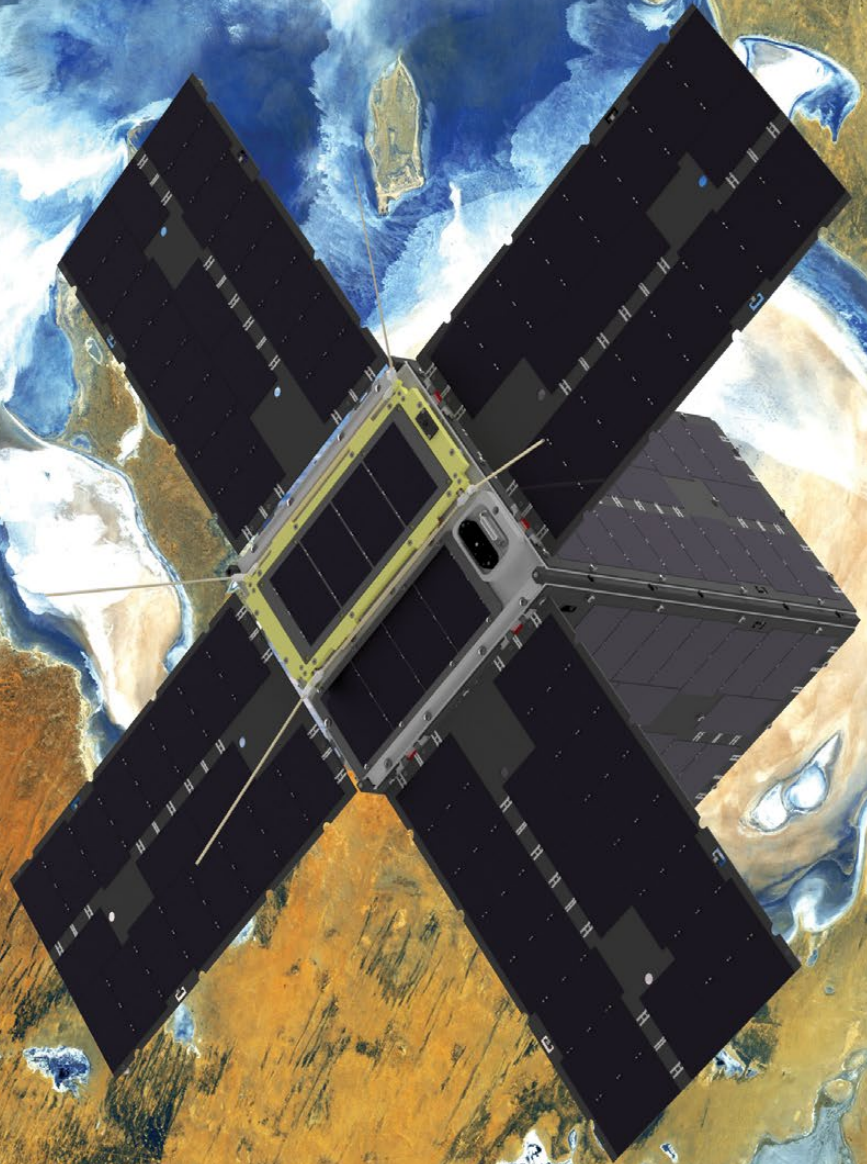


SOUTH AUSTRALIA

SPACE SECTOR STRATEGY



Government of
South Australia



SOUTH AUSTRALIAN
SPACE INDUSTRY
CENTRE

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Cover: The Hyperion (SDA) Small Satellite developed by Inovor Technologies circling above South Australia's Lake Eyre. Image: Inovor Technologies

FOREWORD

SOUTH AUSTRALIAN SPACE COUNCIL

The key objective of the South Australian Space Council (the Council) is to support the growth and development of the space industry in South Australia, and to encourage and enhance innovation within the sector.

Taking advantage of the unique concentration and diversity of space related expertise based in South Australia, the Council has representation from space research organisations, universities, private enterprise, defence, government, and space specialists. It provides a valuable platform to consider the contribution of the space industry to the broader social ecosystem and maximise cross-sector benefits.

Bringing together a diversity of experience and industry contexts, the Council is well-placed to assess the strategic environment and provide input for government decision making to support the space sector through innovation, investment, education and training, manufacturing, and employment. It also connects the South Australian space sector to key national and international networks.

SPACE INDUSTRY ASSOCIATION OF AUSTRALIA – STATEMENT

The Space Industry Association of Australia (SIAA) recognises the importance of this strategy for South Australia, and consequently for the Australian space sector as a whole.

The strategy identifies numerous opportunities where the South Australian Government can assist the local space sector to grow and thrive, including support for the full breadth of space organisations based in South Australia from manufacturing right through to launch.

The strategy also aims to increase awareness of space-enabled services and support users of these services by connecting upstream and downstream components of the sector.

Through supporting the Australian Space Agency's ambitious national space sector growth goals, the strategy ensures the South Australian Government is in turn enabling local industry to develop and mature. SIAA views this partnership between industry and government as a critical ingredient of South Australia's future space industry.

EXECUTIVE SUMMARY

This strategy outlines growth plans for nine key sectors and is aimed at ensuring the state's space industry journey continues its upward trajectory. The detailed strategic approach will be implemented through a series of focused action plans developed in partnership with industry.

In recent estimates, the value of the global space economy was USD\$350 billion with expectations that it will triple to US\$1.1 trillion by 2040.¹ Concurrently, Australia's share of the global market is less than 1%, which is low in comparison to Australia's overall global economic contribution.²

To capitalise on the potential for greater market share, the Australian Space Agency has a clear objective to grow Australia's space industry; tripling the space sector's contribution to GDP to AUD\$12 billion per year and creating an additional 20,000 jobs by 2030. South Australia, with its vibrant space ecosystem, is already playing an important role in achieving this goal and fuelling a thriving and enduring South Australian space sector, supporting Australia's national space strategy, while capitalising on the opportunities of NewSpace+.

Traditional space-related services fundamentally underpin our way of life on Earth and deliver a large proportion of the current revenue attributed to the space sector. These services comprise Position Navigation and Timing (PNT), communications, and Earth observation; and are largely delivered by large traditional space companies.

However, a new market has emerged offering phenomenal opportunities to new entrants who are unencumbered by legacy practice.

These NewSpace enabled products and services have strong potential to improve the productivity and competitiveness of virtually every sector of the broader economy, as well as making a direct contribution to growth.

This evolution of *South Australian Space Sector Strategy* has been developed through close consultation with industry and academia.

Whilst the impact of the COVID-19 pandemic has affected the sector in its initial phase, South Australia's space sector growth target projects above average growth of 5.8% for the next ten years. With a concerted effort from all states and territories, industry, academia, and federal government, Australia is on track to achieve the ambitious targets set by the Australian Space Agency.

Three pillars for growth will shape efforts to build a thriving and enduring South Australian space sector:

Contribute
to Australia's
national
space strategy

Capitalise
on the
opportunities
presented by
NewSpace+

Cultivate
South Australia
as a centre-of-
gravity for space
activities

¹ Space, Investing in the Final Frontier, Morgan Stanley, 2019, <https://www.morganstanley.com/ideas/investing-in-space/>

² Despite Australia comprising just 0.3 per cent of the world's population, Australia's nominal GDP is estimated at US\$1.5 trillion (almost A\$2 trillion) and accounts for 1.7 per cent of the global economy. Why Australia, Benchmark Report 2019, Australian Trade & Investment Commission

+ NewSpace is typified by commercial developments (vice government with a traditional national security focus), access to venture capital (previously unavailable for space ventures) and disruption.

SOUTH AUSTRALIA'S SPACE STRATEGY

VISION FOR GROWTH

A thriving and enduring South Australian space ecosystem, supporting Australia's national space strategy, building on the opportunities of NewSpace.

The vision for 2030 is simple – South Australia will be designing, manufacturing, launching, and operating small satellites;³ to deliver actionable, space derived intelligence for sovereign Australian missions.

³ Definitions of small satellites or 'SmallSats' vary, with 500kg wet mass generally accepted as the current, upper bound for a small satellite.

MISSION

Our shared mission with industry is to grow a thriving and enduring South Australian space sector.

The South Australian Space Industry Centre (SASIC) will be primarily responsible for coordinating the state's space industry development efforts and will work in partnership with universities, industry, research organisations, private enterprise, industrial associations, and government agencies to deliver the vision.



19 September 2020 marked the day of Australia's first ever commercial space-capable rocket launch from Southern Launch's Koonibba Test Range. Image: Sean Jorgensen-Day, DEWC Systems, Southern Launch

STRATEGIC PRIORITIES

We are focused on three pillars for growth to build a thriving and enduring South Australian space sector, developed in consultation with industry:

- Contribute to Australia’s national space strategy
- Capitalise on the opportunities presented by NewSpace
- Cultivate South Australia as a centre-of-gravity for space activities.

Contribute	Capitalise	Cultivate
Contribute to National Space Strategy	Capitalise on opportunities of NewSpace	Cultivate a centre-of-gravity for space activities
<p>Contribute to a whole-of-government National Strategy for space:</p> <ul style="list-style-type: none"> • launch into accessible lower Earth orbits • support positive norms for space actors • Moon to Mars – food production in space 	<p>Capitalise on the phenomenal opportunities presented by NewSpace:</p> <ul style="list-style-type: none"> • many, small, connected satellites • machine learning and AI to exploit space derived data 	<p>Cultivate South Australia as a centre-of-gravity for Australia’s expanding space activities:</p> <ul style="list-style-type: none"> • an expanding workforce (skills) • an innovation ecosystem (innovation) • supportive infrastructure (infrastructure) • globally competitive (trade) • attractive to investors (investment)

GROWTH TARGET

In the most recent analysis of the Australian space sector conducted by IBISWorld in January 2020, the Australian Space sector economy was projected to grow to AUD\$5.6 billion in 2020, representing a historical annual growth rate of 8.0% over the period 2015-2020.

Over the next five years, the sector is projected to grow at an annualised 7.4%, to reach \$8.0 billion by 2025.⁴ It must be noted that as these, and other global assessments were made prior to the emergence of COVID-19, it can be expected that actual growth will be more conservative.

The Australian Space Agency has been tracking a strong civil space capital funding pipeline, observing an AUD\$2 billion pipeline of capital projects in all states and territories over 2019-2028,⁵ of which South Australia has attracted a significant proportion of this.⁶

Recent surveys and economic analysis have shown that South Australia is home to over 100 space-related organisations, companies and education institutions. With limited official data available to measure the total space sector, a South Australian government analysis of the space sector contribution of businesses was derived from primes and start-ups to provide a macro view of the overall contribution, and a micro-view of the NewSpace sector was made to assess growth trends. This analysis excludes the significant positive contribution arising from academia, research and development, and significant Defence activity – providing a conservative space sector contribution in 2021 as:⁷

- Direct value-add of \$166m (see Figure 1)
- Employment of 1,584 FTE (see Figure 2)
- Average wage of \$98k
- 10-year growth (to 2020) of 4.1% with the last 5 years (2017-2021) experiencing growth of 6.2% despite the impact of COVID-19

4 IBISWorld Industry Report OD5545 Satellite Communications and Astronauts in Australia, January 2020

5 Australian Space Agency (2020), State of Space Report, Canberra: Commonwealth of Australia, April; available at: <https://www.space.gov.au>

6 Economics Legislation Committee, Answers to Questions on Notice, Department of Industry, Science, Energy and Resources, 2019 - 2020 Additional Estimates, <https://www.aph.gov.au/api/qon/downloadattachment?attachmentId=7caf830f-8ba5-4aed-b466-7f2ef66b7181>

7 Source: South Australian Department for Trade & Investment (DTI) analysis by the Office for Data Analytics (Department of the Premier & Cabinet) from linked State administrative records and the 2017/18 BDO RISE Model for South Australia and Regions.

Figure 1 – South Australian Space Economy (\$m)

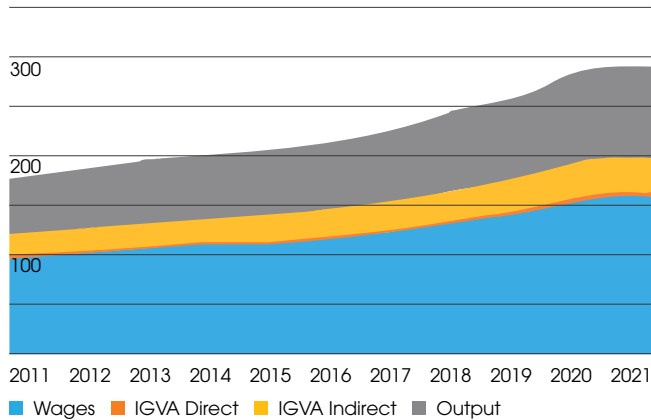
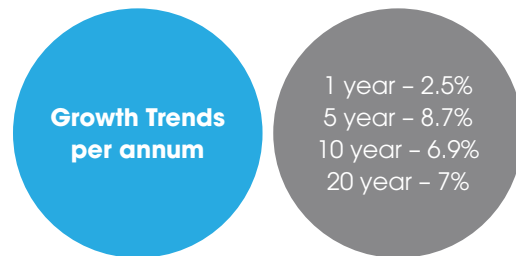
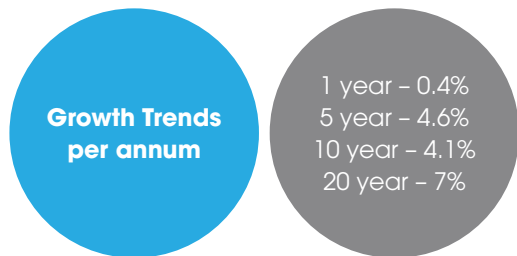
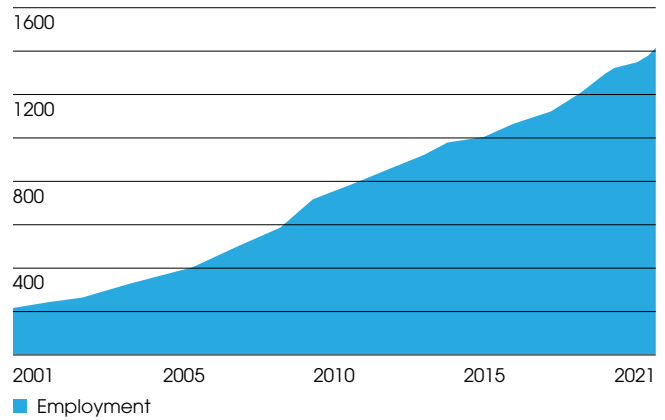


Figure 2 – South Australian Space Employees (Jobs)

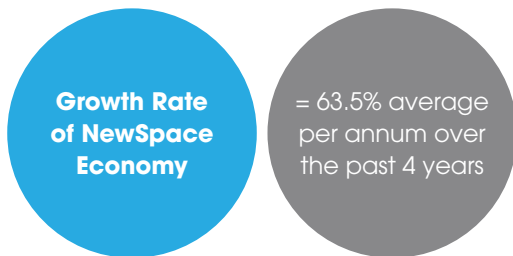
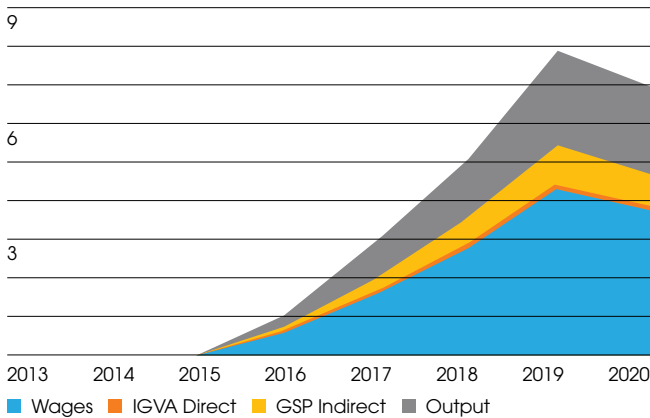


South Australia's micro NewSpace sector has grown an average of 64% per year from 2017-2020.

In the period from 2017-2021, the broader sector has grown at 6.2% per annum, despite the impact of COVID-19 (Figure 1). A micro-analysis of the vibrant and emerging NewSpace sector shows a rapid growth rate of 64% per annum from 2017-2020, with much of this growth derived from new entrants and start-ups (Figure 3). Data from these companies only exists for the short period they have been in operation, and provides an indication of strong future growth ahead.

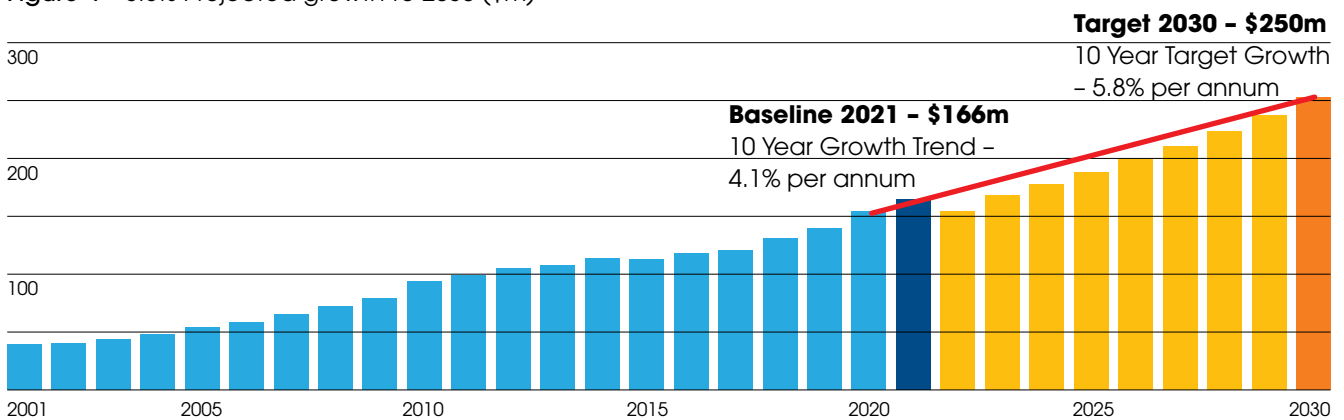


Figure 3 – South Australian NewSpace Economy (\$m)



Building on South Australia’s strong starting position in the NewSpace economy, the South Australian Government will continue contributing to the growth rate of the national space industry and aim to increase the nation’s share of the global space economy. Reflecting on the unique factors at play – the impact of COVID-19, a relatively small domestic base, large but down-track investments by the Australian Government, and an expectation of non-linear growth, the state will target an annual growth rate of the space sector of 5.8% over the next ten years, equating to a 2030 value-add contribution of \$250m (see Figure 4).

Figure 4 – 5.8% Projected growth to 2030 (\$m)



South Australia’s target for the annual growth rate of the space sector averaged over the next ten years is 5.8%.

A mature comprehensive measure of growth and development across the nation has not yet been developed or validated for the space sector, with current measures only providing a snapshot of activity in specific areas. A national database is under development by the Australian Space Agency to define and establish a sector baseline to quantitatively assess the space sector. The South Australian Government will build on these measures for the state to conduct comparative and ongoing quantitative assessment.

Notably for the NewSpace industry, the start-ups of today will become our future leading businesses.⁸ To capture this small yet critically important segment, additional target measures to monitor and track progress will include the number of start-ups with commercial products in markets, the number and quality of companies relocating or setting up in South Australia, total investment funding and funding type (e.g. venture capital, angel, Defence), and the number of jobs in the sector.

⁸ 30 Voices on 2030, The future of space, KPMG, <https://assets.kpmg/content/dam/kpmg/au/pdf/2020/30-voices-on-2030-future-of-space.pdf>

SECTOR OVERVIEW

SPACE SECTOR OVERVIEW – GLOBAL

The global space economy is worth between USD\$350 to \$360 billion (2019 estimates), with 2020 calculations likely to be adversely impacted by the COVID-19 global pandemic. Noting that the space economy encompasses more than the specialised space sector which we are focussed on, breaking down the 2019 space economy reveals where opportunity lies:⁹

- 48% (USD \$130B) for ground equipment including PNT and consumer equipment
- 45% (USD \$123B) for satellite services comprising television, radio, broadband, communications and remote sensing
- 5% (USD \$12.5B) for satellite manufacturing
- 2% (USD \$4.9B) for the launch industry.

Ground equipment constitutes almost half of revenue, followed closely by traditional satellite services. These critically important services are largely built on a legacy of larger incumbent space companies, utilising heavy lift rockets to launch large complex satellites into high Geostationary orbit (GEO) and Medium Earth orbits (MEO). However, it is the technological advances of electronic and mechanical miniaturisation, additive manufacturing, and commercial-off-the-shelf (COTS) componentry that is opening up new possibilities for NewSpace to ultimately deliver on the 2030 projection of USD \$1 trillion in projected revenue.

Reduced barriers to entry, advances in manufacturing technology, and private investment is revolutionising a 50-year approach to space that was largely dominated by great powers and legacy industries. At the dawn of an entrepreneurial space age, the NewSpace sector is rapidly growing globally, and largely underpins the potential for Australia's space sector growth. It is typified by commercial developments (compared to government with a traditional national security focus) and disruption; and fuelled by government grants, venture capital, and angel investment.¹⁰ As an indicator of activity, the number of new angel and investor-backed space companies globally has increased by a factor of eightfold, compared to a decade ago.¹¹

Much of the NewSpace capability will be delivered through small satellites (SmallSats), defined as having a mass less than 500kgs, and launched to Low or Medium Earth Orbit.

In 2019, 389 SmallSats were launched, corresponding to an eleven-fold increase in the up-mass of small satellites, demonstrating remarkable growth for this sub-sector.¹²

Projecting ahead, as the industry is radically transformed by the opportunity of disruptive services, we can expect the following global trends over the next decade:¹³

- the launch of four times as many satellites – some 10,000 satellites, compared to 2,300 in the last decade
- increased use of smaller satellites and the deployment of mega-constellations in Low Earth Orbit
- Geostationary Orbit (GEO) will still retain 40% of the value chain albeit with lower number of satellites
- a shift from broadcasting services to data-centric services
- growth of 30% in manufacturing and launch revenue.

IMPACT OF COVID-19

Despite projections of positive growth, the COVID-19 pandemic has significantly impacted many large global aerospace manufacturers, resulting in revenue loss, prime companies reducing their exposure through redundancies and curtailed production and greater fragility in the global supply chain. In the short term, traditional space activities—particularly launch to GEO and manufacturing—is likely to suffer more than NewSpace.

NewSpace is heavily reliant on venture capital, which is now focussed on the survival and success of existing investments, rather than new investment opportunity. Those who are funded are faced with longer runways, reduced cash flow, and delayed opportunities. This may mean that NewSpace companies with viable business offerings pre COVID-19 are unable to survive the market downturn.

These global impacts are likely to have a disproportionate impact on the growing Australian space ecosystem and its emerging new entrants because most of our industry in this area is early stage. Nevertheless, their relatively small size may translate to an agility that provides greater recovery options and opportunity to re-focus and adapt, the very essence of anti-fragility.¹⁴

9 2020 State of the Satellite Industry report, Bryce Space & Technology, https://brycetechnology.com/reports/report-documents/SIA_SSIR_2020.pdf

10 Investment in the Australian Space Sector: KPMG, Jan 2020

11 2020 Start-Up Space Update on Investment in Commercial Space Ventures, Bryce Space & Technology, https://brycetechnology.com/reports/report-documents/Bryce_Start_Up_Space_2020.pdf

12 SmallSats by the Numbers 2020, Bryce Space & Technology, https://brycetechnology.com/reports/report-documents/Bryce_SmallSats_2020.pdf

13 Satellites to be built & Launched by 2028 (2019 Edition), Euroconsult Research Report 22nd Edition

14 'Anti-fragility' as coined by Nicholas Taleb is an idealised condition whereby a system not only withstands shocks, but returns stronger. Antifragile: Things That Gain from Disorder.

SPACE SECTOR OVERVIEW – NATIONAL

The Australian Government's target for the sector is ambitious, adding 20,000 jobs (from current estimates of 13,200), with an annual contribution to Gross Domestic Product (GDP) of AUD\$12 billion (from AUD\$5.6 billion) by 2030.¹⁵ The Australian Space Agency target for year-on-year growth targets is 8.5% per annum.¹⁶

As a comparison, the United Kingdom's space sector was energised through a 2010 Space Innovation and Growth Strategy (IGS) to create a partnership between industry, government and academia to develop, grow and exploit NewSpace related opportunities.

In 2018 it grew at a rate of 3.3% per annum, and comprised 5% of the global space economy,¹⁷ with a goal of 10% global market share by 2030.¹⁸ This offers a good model to emulate and compare against the Australian space industry, but unlike Australia, it has the advantage of close connections to the European space industry and legacy partnerships.

The Australian Space Agency has been tracking a strong civil space capital pipeline, observing an AUD\$2 billion pipeline of capital projects including R&D in all states and territories over FY18/19-FY27/28, with over \$729 million of this in inbound investment from industry, private foundations and international space agencies. Overall, 88 projects are being tracked across all states and territories.¹⁹



THE AUSTRALIAN SPACE SECTOR DEFINED

According to the Organisation for Economic Co-operation and Development, the space economy is much broader than the space sector, and encompasses the full range of activities and the use of resources that creates value for the economy and society in any application of space (thus factoring in all space-derived products, services, and knowledge and the benefit to all industries).²⁰

The South Australian Government will employ the recently derived definition utilised by the Australian Space Agency as part of its framework to monitor and assess national benchmarks. It re-defines the value of the Australian space sector as only space related activity *contributing* to the broader space economy.

Definition of the Australian Space Sector²¹

The Australian space sector is defined as a set of space-related activities along the space value chain and is part of the broader space economy.

All actors (private, public and academic) participating in production, operation, supply and enablement activities that form the space value chain are part of the space sector. Space value chain segments broadly include: Manufacturing and core inputs (Ground and Space segment manufacturing and services); space operations; space applications; and enablers (such as regulation and essential service delivery, infrastructure and capabilities, research, development and engineering, and specialised support services).

While the space sector captures the provision of space related goods, services and applications to broader industries, it does not include subsequent non-space (value adding) activities that are enabled by space activities (such as food grown using precision agriculture techniques). These flow-on activities are captured by the broader space economy.

¹⁵ Advancing Space - Australian Civil Space Strategy 2019 – 2028

¹⁶ Australian Space Agency (2020), State of Space Report, Canberra: Commonwealth of Australia, April; available at: <https://www.space.gov.au>

¹⁷ UK Space Agency, Size & Health of the UK Space Industry 2018, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/774450/LE-SHUKSI_2018-SUMMARY_REPORT-FINAL-Issue4-S2C250119.pdf

¹⁸ UK Space Innovation and Growth Strategy: 2015 Update Report, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/444918/_SPACE-IGS_report-web-JJF-V2.0.pdf

¹⁹ Australian Space Agency (2020), State of Space Report, Canberra: Commonwealth of Australia, April; available at: <https://www.space.gov.au>

²⁰ OECD Space Forum, OECD Handbook on Measuring the Space Economy, Organisation for Economic Co-operation and Development, Paris, 2012, p. 20.

²¹ Definition of the Australian space sector, Australian Space Agency, June 2020, <https://www.industry.gov.au/data-and-publications/definition-of-the-australian-space-sector/defining-the-australian-space-sector>

SPACE SECTOR OVERVIEW – SOUTH AUSTRALIA

South Australia achieved the strategic objectives laid out in the state's inaugural 2016 *Space Innovation and Growth Strategy Action Plan*.

These objectives included winning the bid to host the prestigious International Astronautical Congress (IAC) in Adelaide in 2017; an event that put Australia on the world space stage and where the formation of the Australian Space Agency was announced.

Further, the Adelaide-based biannual Australian Space Forum has had remarkable growth, from just 50 attendees in 2016 to more 900 attendees in-person and virtually, along with a record 71 space organisations and companies in the forum's largest exhibition area at the March 2022 event.

Today, the capabilities of South Australia's space sector spans small satellite design and manufacture, including components and sensors; launch operations; mission control and ground stations; connectivity and bespoke applications; and data analysis and processing. Within the broader space sector as defined by the Australian Space Agency, there are numerous and diverse space focused companies located in South Australia comprising:

- large multinationals
- small to medium enterprises (SMEs)
- an ever-growing number of start-ups that are establishing themselves in South Australia to capitalise on the growing network of space professionals and industry initiatives
- more than 10 research organisations
- industry associations
- consultancies
- world-class educational institutions with a diverse array of departments engaged in the space sector.

Supporting this activity, the South Australian Space Industry Centre (SASIC) provides a whole of state government focal point for both local industry and international organisations. With a joint staff team derived from Defence SA, Department for Trade and Investment, and Department for Innovation and Skills, SASIC coordinates and implements industry and workforce development initiatives, events, scholarships, and an innovation fund.

SOUTH AUSTRALIA'S COMPETITIVE ADVANTAGES

A vibrant research and education capability in South Australia supports the growing space industry, including three public universities ranked within the top 2% of the world, two international universities and world-renowned

national research centres - all of which actively contribute to the state's innovation ecosystem.²²

Three major innovation precincts in South Australia facilitate dynamic collaboration and new ideas and are primed to include the space sector.

- **Technology Park Adelaide** is an established and thriving business hub, with a broad portfolio of technology, defence and training businesses that are growing every year.²³ The precinct is situated alongside University of South Australia's Mawson Lakes Campus, encompassing the Australian Institute of Telecommunications Research, and the International Space University's Southern Hemisphere Space Studies Program (in partnership with the University of South Australia).
- **Tonsley Innovation District** brings together leading-edge research and education institutions, businesses and start-ups, business incubators and accelerators, plus government and the wider community to connect and collaborate.²⁴
- The creation of an innovation precinct at **Lot Fourteen** is the most recent initiative.²⁵ Lot Fourteen is backed by the South Australian and Australian governments and is a key focus of the \$551 million Adelaide City Deal to provide a springboard for innovation, and bring together the state's leading abilities in space, defence, Hi-Tech and creative industries.

Lot Fourteen supports a strong emerging ecosystem with a blend of start-up and early stage companies, academia, space-orientated government and defence agencies. These include:

- Australian Space Agency headquarters
- SmartSat Cooperative Research Centre (CRC) headquarters, which is the most significant national space research collaboration in Australia, bringing together around 85 national and international organisations with a budget of \$245 million over the next seven years²⁶
- personnel from the Australian Defence Force Wide Area and Space Surveillance Systems Program Office
- industry-leading research with the Australian Institute of Machine Learning (The University of Adelaide)
- the national Mission Control Centre, which will provide a platform to control satellite missions and provide access to space-enabled data to use in agriculture, oil and gas, mining, emergency services and maritime surveillance.

²² <https://studyadelaide.com/study-options/institutions/universities-and-higher-education>

²³ <https://techpark.sa.gov.au/>

²⁴ <https://tonsley.com.au/>

²⁵ <https://lotfourteen.com.au/>

²⁶ <https://smartsatcrc.com/>



Reflection of Lot Fourteen innovation precinct.
Image: Department of Premier and Cabinet

Lot Fourteen Ecosystem

Lot Fourteen brings South Australia's leading abilities in space, defence, Hi-Tech, creative industries and entrepreneurship together in one place and provides a springboard for innovation, ideas and careers.

Backed by the State and Federal governments, it is a platform for opportunity. A precinct where future industries meet an innovation workforce in a vibrant ecosystem that supercharges collaboration and creativity – all in the centre of one of the world's safest and most liveable cities.

Already home to the Australian Space Agency, SmartSat Cooperative Research Centre, Australian Institute for Machine Learning, the Australian Cyber Collaboration Centre and key space organisations, Lot Fourteen is accelerating global interaction and

investment, creating high-value jobs and driving economic growth and future prosperity for South Australia.

"A space start-up ecosystem has been nurtured in Adelaide (Adelaide innovation neighbourhood), South Australia, through the Lot Fourteen development and a number of local space focussed companies are emerging as globally recognised brands."

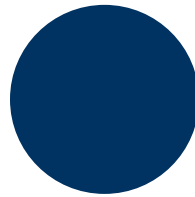
Investment in the Australian Space Sector, KPMG, January 2020

SOUTH AUSTRALIA'S SPACE SECTOR PRIORITIES

Until recently, the majority of historical growth in space could be attributed to government requirements, and traditional space services such as satellite TV, broadband, and communications; with smaller contributions accruing from NewSpace — the Hi-Tech equipment manufacturing, and start-up business sectors. Space is now attracting the attention of market-leading venture capital firms and start-up funds, signifying a fundamental shift in how space is funded. With the global space economy's present upward growth trend now being led by the private sector, increased visibility of the potential space market will unlock new clients for South Australian SMEs and start-ups and activate investment in these companies' unique capabilities.

As a complement to a national space strategy seeking aspirational growth, South Australia's priorities will be selective and niche, maximising the opportunities presented by disruption and NewSpace opportunities. This strategy shapes and guides future effort and investment and is not simply a technology roadmap.

As such, three space sector pillars have been carefully chosen to focus future effort.



CONTRIBUTE TO AUSTRALIA'S SPACE STRATEGY

The first priority is to contribute to a whole-of-government national strategy for space security and industry growth, focusing on:

- launch to accessible lower Earth orbits,
- supporting positive norms for space actors, and
- Moon to Mars – food production in space.

The Australian Space Agency is tasked with the responsibility to engage with international partners and define a national strategy for civil space.²⁷ Building on four strategic space pillars: international engagement; developing national capability in areas of competitive advantage; addressing safety and national interest; and inspiring and improving the lives of all Australians, this state strategy complements national goals where there is natural alignment or within its mandate.

The South Australian Government acknowledges that Australia's interests in space requires a whole-of-government approach, and this encompasses both the growth of the civil space industrial base and national security concerns pertaining to space. As space activities are bounded by a relatively fragile international legal framework, the advent of new-entrants and disruptive technologies in a shared global 'commons' requires civil and defence matters be addressed together.

The advent of new-entrants and disruptive technologies in a global commons requires that civil and defence matters are addressed concurrently.

²⁷ The Australian Civil Space Strategy 2019-2028. <https://publications.industry.gov.au/publications/advancing-space-australian-civil-space-strategy-2019-2028.pdf>

Activities under the four national strategic space pillars will be guided by seven *national civil space priorities* to grow and transform Australia's space industry. For each of the seven national priorities, South Australia will **contribute** to the Australian Government priorities in the following areas:

- **Access to space:** Australia's unique geography and sparse population means there are emerging opportunities for Australia to leverage international space missions and commercial launch activities from Australian territory to support industry growth. For South Australia, the development of launch capability is seen as a critical enabler for the rest of the space industry.
- **Earth observation:** There is untapped potential to grow Australia's economy in this area, for example, by improving agricultural monitoring, water management, and monitoring shipping routes. For South Australia, the opportunity to process and add value to this rich data source will be exploited by world class departments such as the Australian Institute for Machine Learning (AIML) and execution of the GRAVITY Challenge series.
- **Communications technologies and services:** Space is crucial for communications on land, our maritime and aerospace jurisdictions. 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. The Institute for Telecommunications Research (ITR) within the University of South Australia is already a recognised leader in space communication, and the Institute of Photonics and Advanced Sensing (IPAS) within Adelaide University brings together interdisciplinary experts to create new sensing and measurement technologies.
- **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. This is also a critical area of interest for Defence, who consider space an operational domain and define more broadly their area of interest using the label Space Domain Awareness. The Australian Defence Force operates its only primary sensor unit from South Australia supporting this mission, and several South Australian companies are actively working in the area including Silentium Defence, a global leader in the design and deployment of passive surveillance systems.
- **Leapfrog R&D:** Building on a strong research base, areas of opportunity include new rocket technology, new Hi-Tech materials, space medicine, synthetic biology, quantum communications, in-orbit servicing, and optical wireless communication technologies. South Australia's three leading universities, and consortiums such as the SmartSat CRC all contribute to game changing technologies for the sector. In the area of space medicine, the South Australian company Human Aerospace is pioneering 'Spacesuits for Preserving Human Health and Mobility'.
- **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. Contributing to this area, the University of Adelaide will conduct an Australian Rover Challenge as an alternative to NASA's Rover Challenge, now rendered inaccessible to Australian students by pandemic related travel restrictions.
- **Position, navigation and timing (PNT):** This 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 position, navigation and timing infrastructure is on track to underpin the growth of the broader economy. A national project to improve the accuracy (to 10cm), reliability and availability of positioning data satellite navigation systems is underway and will open up new uses for this space service, particularly in the area of precision agriculture in regional South Australia and object de-confliction services within populated centres.

As Australia's space industry grows, it is incumbent upon each state and territory to optimise scarce resources for success and to harmonise activity. Without this, unfettered competition has the potential to destroy the industry in its infancy. South Australia will work closely with other jurisdictions and space stakeholders to collaborate, deliver on Defence's security challenges, enhance resilience, and provide sovereign capability for the future. In contributing to Australia's national strategy, there are two policy areas that draw on South Australia's expertise to maximise its contribution to the national strategy: launch to accessible lower Earth orbits, and supporting positive norms for space actors. In addition, South Australia's research capabilities offer a potential leapfrog technology of food production in space.

As Australia's space industry grows, it is incumbent upon each state and territory to optimise scarce resources for success and to harmonise activity. Without this, unfettered competition has the potential to destroy the industry in its infancy.

LAUNCH TO ACCESSIBLE LOWER EARTH ORBITS

The geography of South Australia is well suited to the significant increase in ground-based infrastructure, including launch sites, ground stations and mission control centres, needed to support the large constellations of satellites due for launch in the next few years.

Our Goal

- Enable industry to develop space qualified, or 'flight heritage' products.

Our Challenge

- The space environment provides extreme challenges for deployed systems (vacuum, thermal extremes, radiation – to name a few). An important consideration for purchasers (both civil and government) and investors in their risk assessments is the level of space flight heritage for a new product. This can be developed directly (deployment of space technology) or indirectly (demonstration of services using deployed space technology) to improve products and reduce risk.
- Securing the funding to achieve flight heritage is a major challenge for small companies.
- The Australian cost recovery model proposed for certification of launch, launch vehicles and satellites is less competitive in comparison to other nations. This may drive the up-stream space industry offshore and stifle international investment.

Our Success

- Southern Launch is developing a dedicated commercial rocket launch site at Whaler's Way on the Eyre Peninsula for polar launch of small satellites into Low Earth Orbit. Whaler's Way unique geographic conditions (close to the South Pole, low population, close to industry and research, low air and sea traffic conflicts) make it an ideal location.
- A state task force (typically only enacted for larger capital projects) is coordinating the state approvals necessary for a launch site from Whalers Way.
- DEWC Systems are in partnership with the Royal Australian Air Force (RAAF) and Southern Launch to launch and test miniaturised sensor technology from South Australia.

Our Opportunity

- Develop a polar and sun-synchronous Low Earth Orbit launch site for Australia.
- Develop and advocate a national strategy for launch sites capable of accessing NewSpace Low Earth Orbits; with Koonibba delivering sub-orbital test, and Whaler's Way providing a polar and sun-synchronous launch site; complemented by another launch site in northern Australia providing access to Equatorial Low Earth Orbits.
- Using modelling and simulation of a congested and contested space domain, demonstrate the utility of sovereign launch sites for Resilience and Operationally Responsive Space concepts to Defence.
- To open up volume NewSpace satellite manufacturing in Australia by minimising the cost and transportation risks through closer proximity to launch facilities.
- Work with Federal Government partners such as the Australian Space Agency and Austrade to develop Australian-relevant, internationally competitive, best practice regulations and international technology agreements to support industry growth.
- Provide support for launch opportunities in South Australia (infrastructure for launch, supply of launch sites, testing and R&D).



Southern Launch CEO Lloyd Damp and DEWC Systems' CEO Ian Spencer at the 9th National Space Forum in Adelaide. DEWC Systems are in partnership with RAAF and Southern Launch to launch and test miniaturised sensor technology from South Australia.

Southern Launch and Whalers Way and DEWC Systems (partnership)

Southern Launch

Following an assessment that there were no suitable multi-user sites around the world that could address the high cadence and flexibility of launches required to satisfy the rapidly growing smallsat sector looking for polar and sun-synchronous launches, the company identified a suitable site at Whalers Way near Port Lincoln. A 25-year lease was subsequently taken on a 1,200Ha parcel of land, with 6km of south-facing coastline, suitable for establishing the required multi-user orbital launch facility.

Southern Launch have also established a sub-orbital test range at Koonibba near Ceduna to facilitate the development and testing of new rocket and space technologies. The company has partnered with another local company, DEWC Systems, to launch their prototype electronic warfare unit capable of detecting radar signals. In a history-making event, the miniature payload was launched from Koonibba in September 2020 as the country's first space capable rocket launched to the edge of space.

"With a viable launch facility providing flexible, high cadence and safe access to space in South Australia, the space ecosystem will continue to grow. Rocket companies will assemble their rockets close to the launch site; components for rockets and payloads will be manufactured nearby; employment opportunities will increase."

Lloyd Damp, CEO Southern Launch

DEWC Systems

DEWC Systems, a wholly veteran-owned South Australian company established in 2018, developed a prototype miniaturised electronic warfare unit capable of detecting radar signals designed for Air Force. The DART rocket, carrying the DEWC Systems' 27cm long and 3cm diameter miniature payload, is only a fraction of the size of rockets launched by NASA and SpaceX.

"The tiny payload that was launched to the edge of space to perform a radio frequency sensing mission was designed to enhance Australia's capability and to progress to DEWC Systems' larger program of delivering sovereign space-based electronic warfare capability to Australia. The success of the rocket launch in Koonibba ushered Australia into NewSpace era led by the collaboration of two local SMEs. And this is only the beginning."

Ian Spencer, CEO DEWC Systems

SUPPORTING POSITIVE NORMS FOR SPACE ACTORS

'The rules, norms and institutions that help maintain peace and security and guide global cooperation are under strain. Pressures on governance in the global commons, and in domains such as space and cyberspace, will open up potential sources of friction.'²⁸

Our Goal

- Support the establishment and enforcement of rules that enable industry growth through responsible access to space.

Our Challenge

- The future potential of NewSpace is in large part due to the proliferation of satellites into Low Earth Orbit. This increased traffic, coupled with existing debris is increasing the potential for collisions in space, potentially leading to a debris cascade that would impact all users.

Our Success

- Australia already contributes to positive norm for space actors through the provision of positional data on space objects enabled through Adelaide-based Defence No.1 Remote Surveillance Unit (1RSU) and the Wide Area Surveillance System Program Office (WASSPO).
- The University of Adelaide Law School is a global thought leader on space security, as evidenced by their leadership to develop the Woomera Manual on the International Law of Military Space Operations.
- Silentium Defence develops passive radar sensors for space situational awareness (SSA) and to support space traffic management (STM).

Our Opportunity

- Coordinate the elements towards building a centre of excellence for space domain awareness, bringing an inter-disciplinary approach to the problem.
- Work with Defence to support Space Domain Awareness capabilities, already supported in part by the Defence Innovation Hub grants and the Next Gen Technologies Fund.
- Support Australian industry to win contracts for JP 9360 – Space Domain Awareness, using commercial space operations concepts and local industry bids.



MAVERICK S-series passive radar: Image Silentium Defence

SILENTIUM DEFENCE

After commencing fulltime operation in April 2017, Silentium Defence has grown from just two employees to more than 20 full and part-time employees and contractors.

Silentium Defence specialises in tailored solutions designed to meet the critical surveillance and traffic management demands of high-end customers and space users.

The company was founded in Adelaide as a spin-out from Defence Science and Technology Group. As it continues to grow, its expansion will support further growth and investment in the South Australian space sector.

Silentium Defence continues to advance Australia's capability in Space Domain Awareness through strong linkages with the RAAF and Australian Space Agency, both of which have a strong presence in South Australia. Close proximity to these partners helps shine a light on the innovation happening in the region and allows the business to tap into the talent and international partners it attracts.

The company is currently the only commercial entity that is commercialising Space Domain Awareness with passive radar. In October 2020 Silentium Defence was awarded a A\$3.2m contract from the Department of Defence to further advance, deploy and demonstrate its MAVERICK S-series passive radar system for Space Domain Awareness

"One of the exciting things about South Australia's space industry is that all aspects of the space ecosystem are represented, from the end customer to companies making satellites, companies developing launch facilities, propulsion systems, payloads and services to be hosted on the satellites, and companies (like ours) developing Space Domain Awareness solutions to support their operations."

Dr James Palmer, CEO Silentium Defence Pty Ltd

²⁸ 2020 Defence Strategic Update, https://www.defence.gov.au/StrategicUpdate-2020/docs/2020_Defence_Strategic_Update.pdf

MOON TO MARS - FOOD PRODUCTION IN SPACE

Venture capitalists, and space agencies with aspirations to explore the solar system are looking at biotechnology needed to sustain humans in space for extended durations. The Australian Space Agency 'Moon to Mars' initiative is seeking a trailblazer project to contribute flagship Australian space capability within an international space exploration program, and leverage Australia's competitive strengths in space while showcasing Australian capabilities to the world.

Our Goal

- South Australia leverages its expertise in food production for extreme environments to support international human spaceflight missions.

Our Challenge

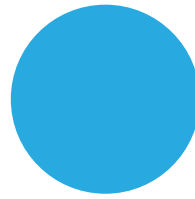
- Jurisdictions with more developed space sectors (US, Europe, Japan) are already conducting R&D for space farming and food production, so South Australia must identify a niche in which it can meaningfully contribute.

Our Success

- The University of Adelaide is conducting a mapping exercise across all disciplines to identify areas of expertise that contribute to a space farming and food production capability.
- The Adelaide Botanic Gardens will contribute their expertise through research and development.

Our Opportunity

- Develop a candidate closed-cycle agriculture project for the Australian Space Agency's flagship \$150 million Moon to Mars initiative.
- Leverage South Australia's long history of academic and industrial innovation in arid environment agriculture/horticulture, plant sciences and greenhouse technology to become the Australian centre of expertise in space-based farming and food production.
- Contribute South Australian space farming innovations to NASA's Artemis program.
- Spinoffs and applications of innovations for space farming and food production will benefit producers and consumers on Earth, as more tolerant crops and improved food production techniques will be required to mitigate the impacts of environmental degradation and climate change.



CAPITALISE ON NEWSPACE

The second priority is to capitalise on the phenomenal opportunities presented by NewSpace:

- many, small, connected satellites
- using machine learning and AI to exploit space derived data.

MANY, SMALL, CONNECTED SATELLITES

Small satellites describe a broad class of satellites that can be loosely defined as having a mass less than 500kg.²⁹ Their development has been enabled through technological advances for: semiconductors, electronics, batteries, propulsion, antennas, communications, and cheaper launch services. Constellations of thousands of satellites in Low Earth Orbits have now been approved, with more emerging. SpaceX has already launched over 800 satellites and is projected to launch thousands more for its Starlink constellation.

Our Goal

- Support the development of many, small, connected satellites with disruptive approaches to design and technology.

Our Challenge

- There are numerous small satellite competitors entering the global market.
- Traditional telecommunications remain expensive and consumer broadband services are limited, making it difficult for all Australians, especially those in remote and rural areas, to access global markets and services.

Our Success

- Myriota was founded to revolutionise the Internet of Things (IoT) and offers disruptively low-cost and long-battery-life global connectivity via space receivers.
- Fleet Space Technologies is supporting mineral discovery through space-based exploration for South Australia.
- Inovor Technologies provides turnkey small satellite solutions using their proprietary satellite bus and has several contracts to deliver small satellite systems.
- Neumann Space has designed a thruster for Low Earth Orbit mission profiles such as extending mission lifetimes, station keeping, orbit raising, constellation phasing, inclination changes, and de-orbiting.

²⁹ These include Femto, Pico, Nano, Micro, and Mini satellites.

Our Opportunity

- Support government-as-customer requirements for dedicated satellite systems to deliver space services to other terrestrial sectors such as health and water, and ultimately deliver improved services in capability or cost.
- Develop sovereign capability and reduce the impact of trade restrictions from established space economies.
- Design, build, launch and deliver a constellation of sovereign satellites for Australian needs, including Defence projects such as DEF 799 - Enhanced Satellite ISR Capability, and the Defence Science and Technology Group - Resilient Multi-Mission Space - STaR Shot.³⁰
- Establish a common use space engineering laboratory for development and test of space hardware and sensors thereby reducing barriers to entry for local design and manufacture.

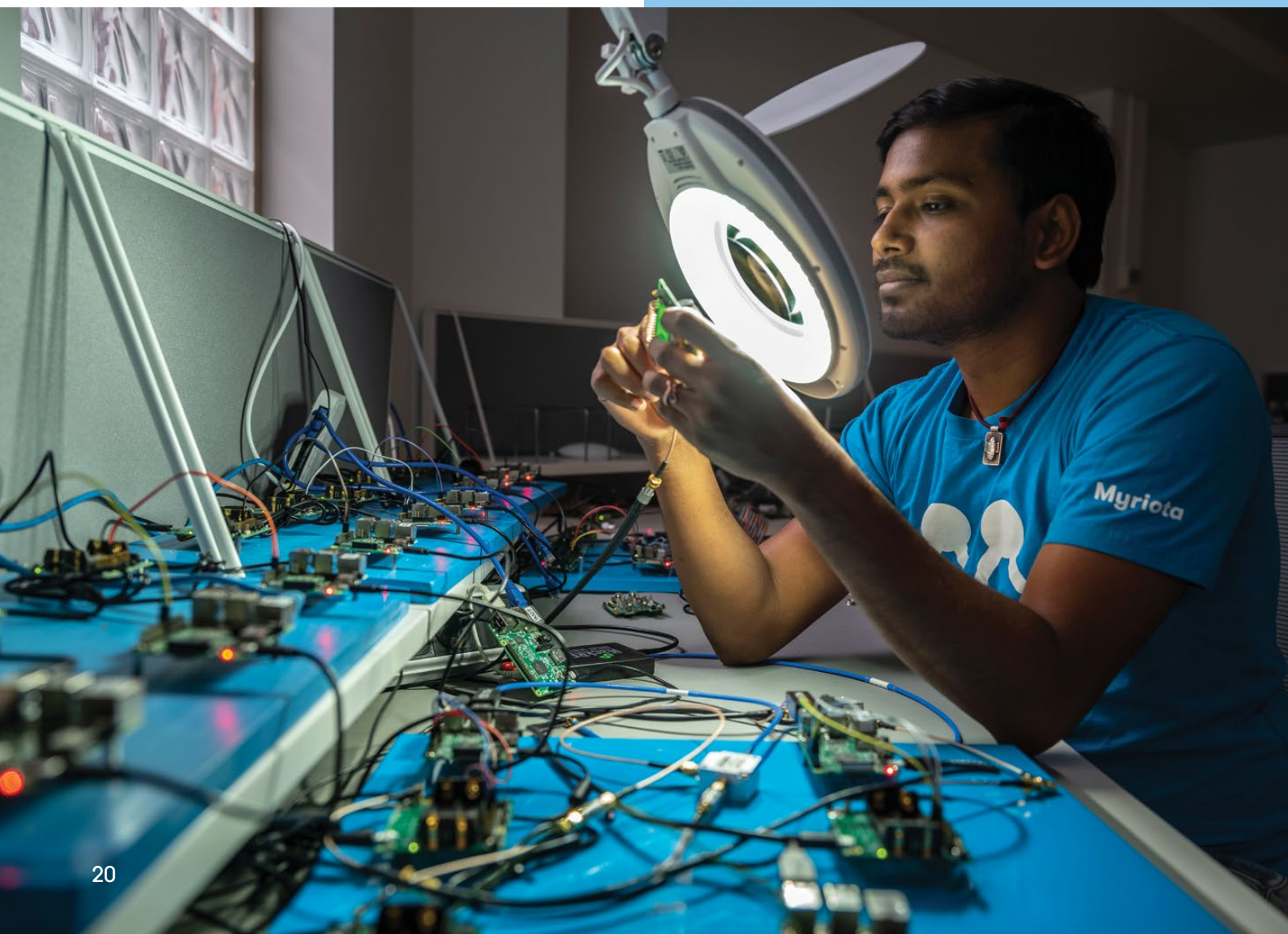
³⁰ Department of Defence, Defence Science & Technology Group, Resilient Multi-Mission Space, STaR shot. <https://www.dst.defence.gov.au/strategy/star-shots/resilient-multi-mission-space>

Myriota

Myriota was founded to revolutionise the Internet of Things (IoT) by offering disruptively low-cost and long-battery-life global connectivity.

Based in Adelaide, a focal point of the Australian space industry and home of the Australian Space Agency, Myriota has a growing portfolio of more than 60 granted patents, and support from major Australian and international investors. With deep heritage in telecommunications research, a world-first transmission of IoT data direct to a nanosatellite was achieved in 2013.

Myriota has made this ground-breaking technology commercially available for partners worldwide. The South Australian Government is an investor through the SA Venture Capital Fund.



MACHINE LEARNING AND AI TO EXPLOIT SPACE DERIVED DATA

Space Enabled Services serve the needs of business through the provision of timely and cost-effective data. Examples include data on crops, mining opportunities, water flow, bushfire detection and tracking, and as shown recently – the effect of a global pandemic. This not only services current business needs but opens opportunities for new business as the costs of obtaining detailed, persistent surveillance drops.

Our Goal

- Boost the productivity of the South Australian economy through accurate, timely and easily accessible space-derived data.

Our Challenge

- With so much data arriving through space services, new concepts and requirements will be required to unearth niche opportunities from the data sources.

Our Success

- The Australian Institute for Machine Learning (AIML) department for Machine Learning for Space will use a \$20 million investment to develop next generation space technologies.

Our Opportunity

- Deliver actionable, space derived intelligence to non-traditional users.
- Bring together the state's advanced data analytics capability with the NewSpace industry, whereby South Australia benefits from value adding along the entire value chain and benefiting multiple industries.
- Deliver a space education program to show potential customers the benefits of actionable intelligence from space derived data.
- Educate and develop new customers who might benefit from the use of space derived data.

GRAVITY Challenge (Deloitte, SASIC, SA Water and SA Health)

In 2019 South Australia secured world-first technology innovation hackathon, GRAVITY Challenge, which saw the space community and businesses across a variety of high-growth industries join forces to solve real-world problems using cutting-edge space technology and data.

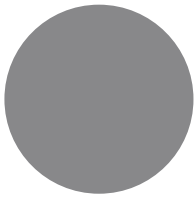
Driven by global giant Amazon and Deloitte, over a six-week period, 42 teams across Australia competed to solve 12 challenges across eight industry groups using space capabilities and data.

The event returned in 2020 and was again supported by the South Australian Government through the South Australian Space Industry Centre. The 2020 event was expanded to run across Australia and the UK, with the event headquarters at Lot Fourteen in the Adelaide CBD.

"The GRAVITY Challenge is a way to leverage the space ecosystem to create new ideas and potentially new jobs that will give a much-needed boost to the Australian and UK economies. In the current climate, programs like GRAVITY are important, as they emphasise a 'future focus' in times of crisis. Space is energising. It conjures dreams of going to the moon, of science and technology overcoming unsurmountable problems. Space acts as a catalyst to unleash innovative thinking and help create gravity-defying solutions."

Jason Bender, Head of Innovation, Deloitte





CULTIVATE SOUTH AUSTRALIA AS A CENTRE-OF-GRAVITY FOR SPACE ACTIVITIES

The third priority is to cultivate South Australia as a centre-of-gravity for Australia's expanding space activities, in five groups that align with state government focus areas:

- an expanding workforce (Skills)
- an innovation ecosystem (Innovation)
- supportive infrastructure (Infrastructure)
- globally competitive (Trade)
- attractive to investors (Investment).

The *South Australian Space Innovation and Growth Strategy 2016-2020* identified the key direction, mission, and actions needed to create a space-enabled economy in South Australia. Since its release, one update and a revision was released to recognise the impact of the formation of the Australian Space Agency. With many national and international organisations now recognising Adelaide and South Australia as a major hub for NewSpace activity, the intent is to build on the success of previous work and become an exemplar for the NewSpace ecosystem.

AN EXPANDING SPACE WORKFORCE (SKILLS)

Our Goal

- Develop a comprehensive space education program that leads to a sizeable interdisciplinary space workforce with depth that supports healthy exchange of professionals between industry and/or academia.

Our Challenge

- South Australia's space industry is vibrant, but the civil sector is dominated by start-up companies with the challenges this brings in achieving scale-up and critical mass.
- The current education offerings are all university based courses. To continue to develop the South Australian space workforce, the state will expand the education and training offerings to include the vocational sector.
- Building a highly skilled and diverse workforce is essential for innovation, business creation and growth.

Our Success

- The University of Adelaide's Centre for Sustainable Planetary and Space Resources brings together the University of Adelaide's collective exploration, mining, manufacturing and engineering research strengths to address the challenges faced by long term planetary exploration, while ensuring the near-term application here on Earth.
- The International Space University (ISU) and UniSA are partnered to deliver the annual Southern Hemisphere Space Studies Program (SHSSP).
- The South Australian Space Scholarship Program provides up to \$100,000 worth of scholarships to South Australian entrepreneurs and innovators annually to study, intern or attend world-leading conferences.
- The Space Industry Work-Experience Program provides students from years 10 to 12 the chance to undertake short-term placement at selected local space companies, managed through the Advanced Technology Program.
- Hamilton Secondary College Space School is one of only two schools in Australia with a designated facility and specialist curriculum to deliver space education. In collaboration with the Victorian Space Science Education Centre (VSSEC), these two institutions are inspiring and shaping our future workforce.
- Flinders University is developing a consortium dedicated to applied research on space politics and policy to understand and analyse space politics, space policy, and the importance of space assets for defence, economic development, international relations, and decision-making.

**Southern Hemisphere
Space Studies Program (SHSSP)**

**The International Space
University's SHSSP is an
intensive, five-week, live-in
experience conducted
each year at University
of South Australia's
Mawson Lakes campus.**

The annual program involves the international, intercultural, and interdisciplinary educational philosophy for which the International Space University is renowned.

Each year the South Australian Government awards five scholarships to local university students, providing an exciting opportunity for the students to gain valuable skills to use in their future careers in the Australian space industry.

Rocket launch exercise conducted by University of South Australia and Southern Hemisphere Space Studies Program participants.
Image: University of South Australia



Our Opportunity

- Develop a globally competitive space training curriculum in partnership with local and international partners, comprising:
 - + Vocational training
 - + Professional development programs (micro-credentialed courses)
 - + Post graduate programs
- Support the continued success of current programs:
 - + Southern Hemisphere Space Studies Program (SHSSP)
 - + Venture Catalyst Space
 - + The South Australian School Pathway Program, known as the Advanced Technology Program
 - + Space Scholarship Program
 - + Space Incubator Program

AN INNOVATION ECOSYSTEM (INNOVATION)

Our Goal

- A steady pipeline of start-up and scale-up space related companies with strong investment potential in South Australia.

Our Challenge

- The emergence and growth of start-ups and SME's requires capital investment, and tailored education catering to both business and space domain issues.

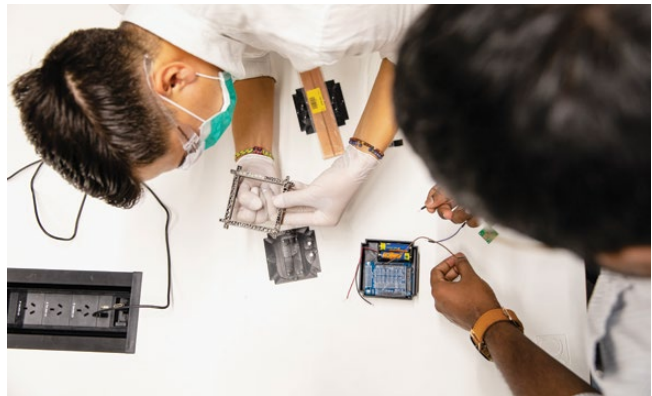
Our Success

A South Australian Government framework for providing assistance to industry through funds including:

- The \$100 million Economic and Business Growth Fund promotes growth of existing industries, development of new industries, building international connections, and attracting foreign and national direct investment.³¹
- The \$28 million Research, Commercialisation and Startup Fund (RCSF) supports researchers, entrepreneurs and businesses to accelerate their progress with funding from the South Australian Government.³²
- The Venture Catalyst Space incubator program supports founders of new startups to nurture and grow innovative ideas in the space sector. Delivered through the University of South Australia's Innovation and Collaboration Centre (ICC), the program includes a series of workshops, mentoring from expert advisors, and a stipend of up to \$10,000 per company.
- The University of South Australia's Innovation & Collaboration Centre is running the ActInSpace (AiS) contest. The contest engages teams to work over

31 <https://www.treasury.sa.gov.au/Growing-South-Australia/economic-and-business-growth-fund>

32 <https://innovationandskills.sa.gov.au/funds/research-commercialisation-and-startup-fund>



ResearchSat working in their lab on a satellite prototype in the Venture Catalyst Space tech room. Image: University of South Australia.

a 24-hour continuous period to find a solution to a challenge posed by the European and French Space Agencies.

- The Go2Gov program enables start-ups and early stage businesses to bid for and win government contracts where current policies would preclude their selection.³³
- To meet South Australia's skills needs, the Skilling South Australia fund supports an additional 20,800 apprentices and trainees over four years.
- The Stone & Chalk start-up hub at Lot Fourteen supports high growth potential start-ups in emerging technology.
- AUD\$4 million is invested in the South Australian Defence and Space Landing Pad, an initiative designed to lure scale up and start-up businesses to South Australia by offering global entrepreneurs up to AUD\$80,000 over 12 months to assist in costs associated with business accommodation and professional services.
- GRAVITY Challenge is a space technology innovation program exploring new uses for space data and space capability. Its goal is to activate the space ecosystem by bringing market challenges and global innovators together to create viable solutions, and ultimately accelerate their commercial uptake. Managed by Deloitte and headquartered at Lot Fourteen, SASIC is a key contributor to the program.³⁴

Our Opportunity

- Continue support for the GRAVITY Challenge to connect challengers (problems) to innovators (solutions) and accelerate ideas to market.
- Optimise Stone & Chalk's start-up hub to cater for NewSpace growth through delivery of dedicated programs and facilities.
- Utilise Government seed funding such as Go2Gov to solve terrestrial problems using space capabilities, delivering benefits to other growth sectors.

33 <https://www.fixe.org.au/go2gov>

34 <https://gravitychallenge.space/>

SUPPORTIVE INFRASTRUCTURE (INFRASTRUCTURE)

Our Goal

- The South Australian space sector has access to the infrastructure needed to promote the space industry, demonstrate investment potential, and unlock business opportunities.

Our Challenge

- The development of critical infrastructure for space products requires high-cost bespoke equipment that is beyond most small companies.
- Space services are not yet considered critical infrastructure in federal government policy.

Our Success

- The South Australian Defence and Space Landing Pad provides relocating companies with affordable, short-term office facilities and relationship building opportunities at Lot Fourteen.
- The start-up Hub at Lot Fourteen delivered by Stone & Chalk plays a critical role in supporting the rapid growth and commercialisation of start-ups and provides a graduation point for early stage ventures.
- The space industry and research hub at Lot Fourteen is home to the Australian Space Agency, SmartSat Cooperative Research Centre, Mission Control Centre, and Australian Space Discovery Centre.

- Australia's Mission Control Centre will be operated by Saber Astronautics. Also named the Responsive Space Operations Centre (RSOC), the facility will deliver next-generation mission control capabilities, concurrent design, pre-flight testing, launch support, as well as flight operations.
- The Australian Space Discovery Centre is a public place to inspire, educate and engage anyone who aspires to a career in space.

Our Opportunity

- To build or enable access to the infrastructure needed to reduce barriers to entry to design and test for space product qualification.
- Launch a globally competitive space hub at Lot Fourteen focused on supporting the rapid growth of space start-ups and SMEs in NewSpace.
- Assist the growth of the Responsive Space Operations Centre to support Space Domain Awareness capability.
- Ensure the long-term viability of the Australian Space Discovery Centre as a key element of the space ecosystem.
- A State task force (typically only enacted for larger capital projects) is coordinating the state approvals necessary for critical space infrastructure.



Artist's impression of the Mission Control Centre. Image: Saber Astronautics.

GLOBALLY COMPETITIVE INDUSTRY (TRADE)

Our Goal

- A globally competitive South Australian space industry exporting their products and services directly and through international partnerships.

Our Challenge

- Supporting South Australian companies to increase their technical readiness for international supply chains and develop international networks.

Our Success

- South Australian companies Fleet and Myriota are already operating in national and international markets, with other companies generating strong international interest in their products and services.

Our Opportunity

- Host international delegations looking for investment partnerships in Australia to foster new opportunities.
- Support South Australian companies during international missions and industry events.
- Leverage the South Australian Government's AUD\$12.8m investment in overseas offices to assist with international inbound investment leads and trade outcomes for South Australian companies: USA, Malaysia, UK, MENA, India, Singapore, Thailand, Indonesia, and Japan.
- Leverage Tradestart programs and export grants to assist South Australian space sector companies to export their products and services.

ATTRACTIVE TO INVESTORS (INVESTMENT)

Our Goal

- Significantly increase the level of external investment in the South Australian space sector.

Our Challenge

- Given limited funding available in the Australian market to entice NewSpace inbound investment, South Australia must leverage both existing competitive points of difference and leverage existing programs.
- Notwithstanding the emerging civil and commercial opportunities, the Australian Defence Force investment of approximately \$17 billion leading up to 2035 for space capabilities dominates Australian Government investment and will remain so for the foreseeable future. Defence projects typically acquire offshore capability, a legacy of the national security approach to space engendered by the cold war and reliance on legacy systems.

Inovor Technologies

The first employee joined space technology company, Inovor Technologies in 2015, with the company doubling in size in the last 10 months to now employ 53 people.

Inovor provides a turnkey solution for customers who want to fly space missions. They design, build, test and operate small satellites for a range of different applications. The key point of difference for the company is that the subsystems have been developed in-house enabling a sovereign space capability using a local supply chain. Inovor have signed a Memorandum of Understanding with Neumann Space to strengthen the collaboration on space technology development moving forward. Under the agreement, Neumann will provide Inovor with the thrust propulsion system needed in their nanosatellites.

In December 2019 Inovor was able to beat international competition to win a \$2.5m Defence contract to deliver a satellite bus that will be used to house equipment in space for the Buccaneer Main Mission.

"The single biggest game changer will be if Australian Defence and the wider government spend their money in country wherever possible."

Matthew Tetlow, CEO Inovor Technologies



Neumann Space's patented technology using solid conductive metal as fuel is unique, offering sovereign capability to Australia. Image: Neumann Space

Neumann Space

Neumann Space specialises in in-space electric propulsion systems for satellites.

The company moved their business from New South Wales to South Australia in December 2016, mainly due to lower costs associated with doing business in the state. In May 2019 the company made the move to Lot Fourteen to be co-located with other space technology start-ups but also the Australian Space Agency and SmartSat CRC.

Neumann Space's patented technology using solid conductive metal as fuel is unique, providing key competitive advantages and offering a sovereign capability to Australia in what is a globally competitive market.

"The key ingredients for success for South Australia's space industry are collaboration, locally and internationally to access the global markets but also, and very importantly, training a new generation of space qualified engineers and researchers."

Herve Astier, CEO, Neumann Space

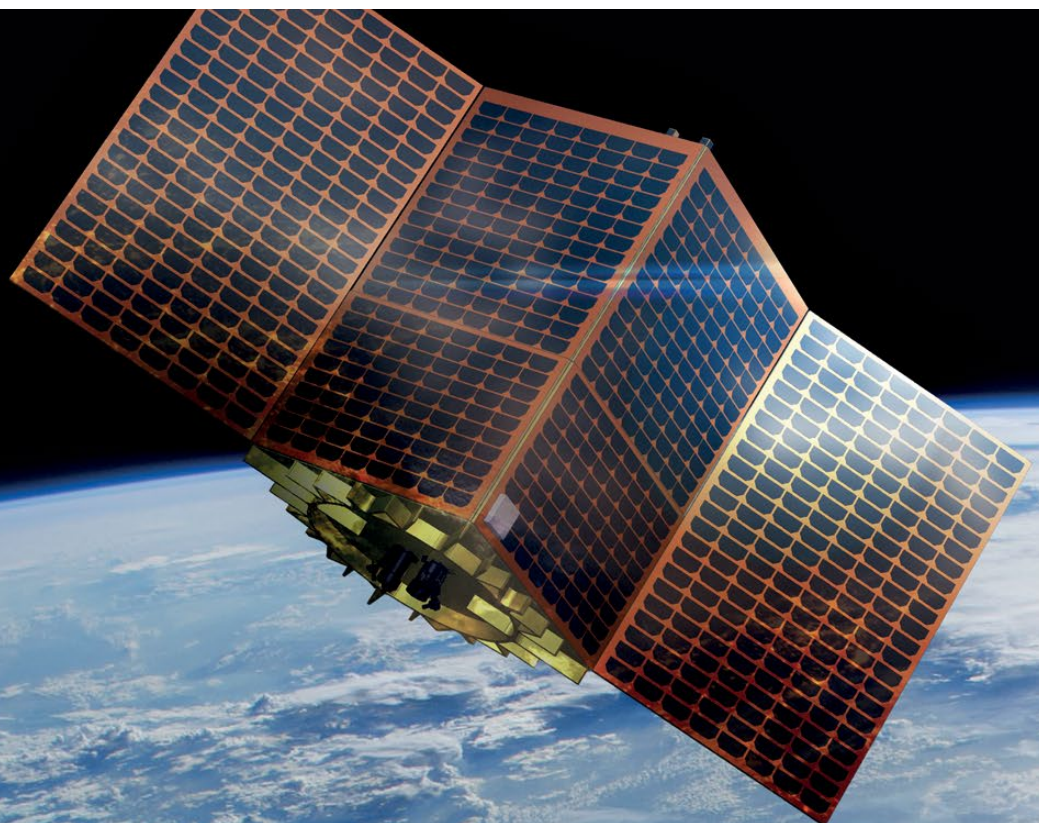
Our Success

- Tyvak Nano-Satellites is developing cube satellites for Fleet and Myriota, and have announced their intention to establish a satellite manufacturing facility in South Australia, with their first Australian ground station antenna delivered by Nova Systems in Peterborough, South Australia.
- SITAEL is a global leader in the development of next-generation small satellites and satellite electric propulsion technologies and is headquartered in Italy. SITAEL Australia established an office in Adelaide to help expand its Australian capability to design, build and manufacture 50-300kg class satellites locally.
- Southern Launch has agreements with multiple clients for the future use of launch and test services at both its Whalers Way Orbital Launch Complex and Koonibba Test Range (KTR).
- Attracting several emerging space companies into the South Australian Space Landing Pad in Lot Fourteen to kick-start their Australian operations.

SITAEL is a global leader in the development of next-generation small satellites and satellite electric propulsion technologies. Image: Sitael Australia.

Our Opportunity

- Work with industry, the Federal Government and other Australian State Governments to shape a national narrative for sovereign space capability and increased Australian industry content in key projects.
- Shape discussions about sovereignty and resilience noting the COVID-19 crisis has fundamentally altered the national economy and re-energised the debate.
- Work with the Australian Space Agency, ensuring a best practice, globally competitive regulatory environment to encourage international investment.
- Attract foreign direct investment, and NewSpace orientated companies (including start-ups, mid-tier companies and primes) to build out South Australia's space ecosystem.
- Create partnerships that will assist local companies to access international supply chains.
- Assist in creating partnerships between international and local companies that will allow Australian developed leapfrog technologies to emerge.
- Maximise Australian industry content for Australian Department of Defence capital projects in areas including satellite communications, surveillance, and Space Domain Awareness projects.
- Build partnerships with key emerging space economies, including the UK, Singapore, and Japan.
- Leverage the South Australian Government overseas trade and investment offices to assist with the identification of international inbound investment leads.



INDUSTRY AND GOVERNMENT AS PARTNERS

GOVERNMENT ROLE AND FOCUS

South Australian Space Industry Centre (SASIC)

In 2017 the South Australian Government created SASIC to drive space industry innovation, research and entrepreneurial development. SASIC has built on the work done by the previous Space Industry Office at Defence SA, which in 2016 developed South Australia's first state space strategy.

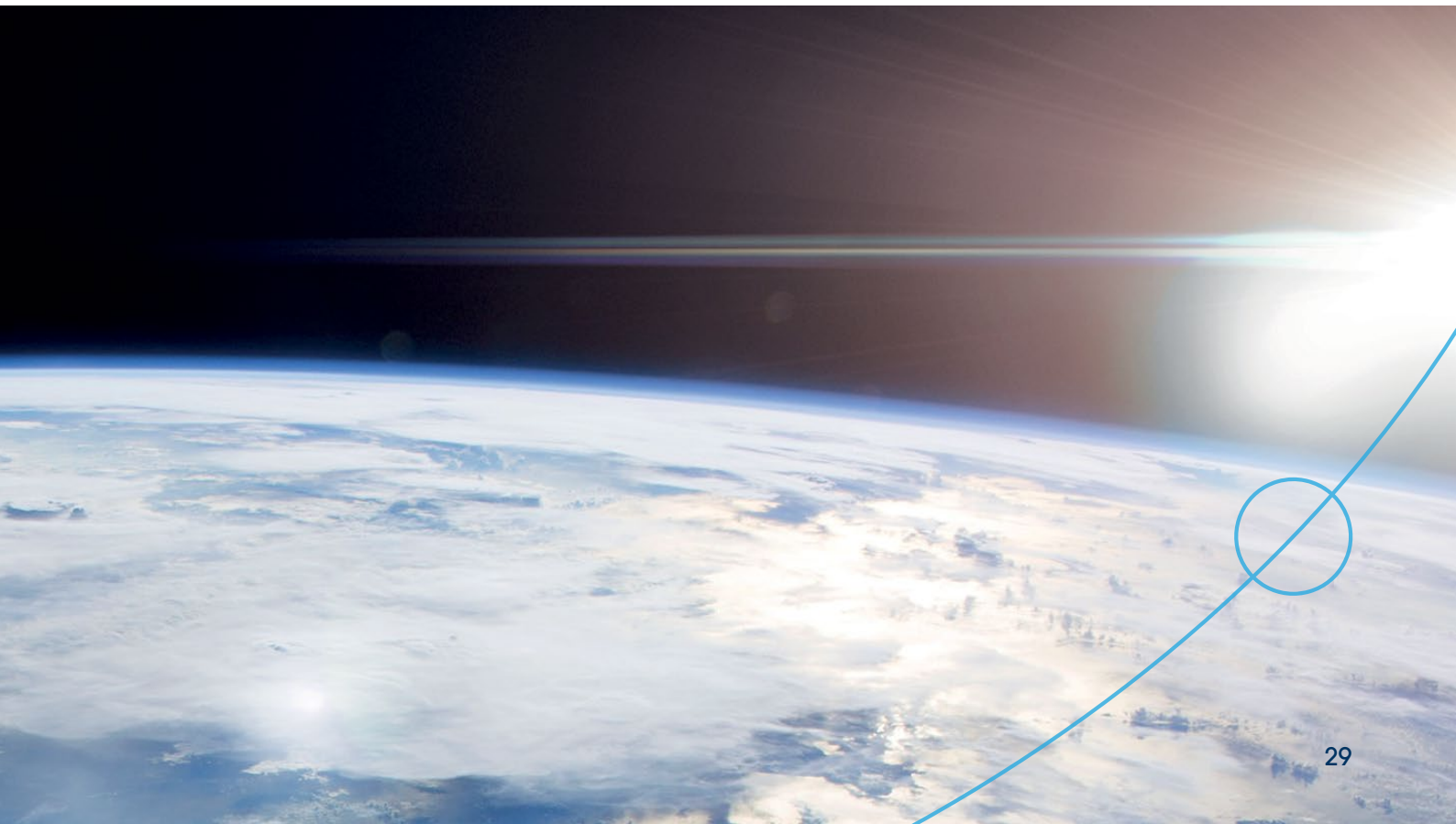
SASIC's mission is to lead the state's space industry development efforts and offer focused and responsive support to drive the growth of South Australia's space sector. It provides a prominent national platform for South Australia to promote and attract investment in the space industry in the state, works closely with the Australian Space Agency to align with the national space strategy, and implements the actions outlined in this strategy.

SASIC fosters space entrepreneurs and has established an environment where NewSpace technologies can be rapidly integrated into the community through the Defence and Space Landing Pad, located within Lot Fourteen. It also supports South Australia's emerging space industry by providing grant funding (the Space Innovation Fund) of up to \$1 million every year to young space entrepreneurs, along with new and existing space start-ups.

INDUSTRY ROLE AND FOCUS

South Australian Space Council

The key objective of the South Australian Space Council (the Council) is to support the growth and development of the space industry in South Australia, and to encourage and enhance innovation within the sector. The Council has representation from space research organisations, universities, private enterprise, government and stakeholders in the space sector.





SUMMARY: ACTION PLAN FOR GROWTH

It will take a concerted effort from all states and territories, industry, academia and government to achieve the ambitious targets set by the Australian Space Agency. South Australia is well-placed to play a key role in supporting the national strategy and contribute to the growth of this vital sector to build a thriving and enduring space ecosystem.

PRIORITY TARGET	GOAL
Launch to accessible lower Earth orbits	Enable industry to develop space qualified, or 'flight heritage' products.
Supporting positive norms for space actors	Support the establishment and enforcement of rules that enable industry growth through responsible access to space.
Moon to mars – food production in space	South Australia leverages its expertise in food production for extreme environments to support international human spaceflight missions.
Many, small, connected satellites	Support the development of many, small, connected satellites with disruptive approaches to design and technology.
Machine learning and AI to exploit space derived data	Boost the productivity of the South Australian economy through accurate, timely and easily accessible space-derived data.
An expanding space workforce (skills)	Develop a comprehensive space education program that leads to a sizeable interdisciplinary space workforce with depth that supports healthy exchange of professionals between industry and/or academia.
An innovation ecosystem (innovation)	A steady pipeline of start-up and scale-up space related companies with strong investment potential in South Australia.
Supportive infrastructure (infrastructure)	The South Australian space sector has access to the infrastructure needed to promote the space industry, demonstrate investment potential, and unlock business opportunities.
Globally competitive industry (trade)	A globally competitive South Australian space industry exporting their products and services directly and through international partnerships.
Attractive to investors (investment)	Significantly increase the level of external investment in the South Australian space sector.

SUMMARY TABLE OF OPPORTUNITIES (ACTIONS)

Contribute to a whole-of-government national strategy for space.

- + launch into accessible lower Earth orbits
- + Support positive norms for space actors
- + Moon to Mars – closed cycle agriculture

Develop a polar and sun-synchronous Low Earth Orbit launch site for Australia.

Develop and advocate a national strategy for launch sites capable of accessing NewSpace Low Earth Orbits; with Koonibba delivering sub-orbital test, and Whaler’s Way providing a polar and sun-synchronous launch site, complemented by another launch site in northern Australia providing access to Equatorial Low Earth Orbits.

Using modelling and simulation of a congested and contested space domain, demonstrate the utility of sovereign launch sites for Resilience and Operationally Responsive Space concepts to Defence.

To open up volume NewSpace satellite manufacturing in Australia by minimising the cost and transportation risks through closer proximity to launch facilities.

Work with Federal Government partners to develop Australian-relevant internationally competitive, best practice regulations and international technology agreements to support industry growth.

Provide support for launch opportunities in South Australia (infrastructure for launch, supply of launch sites, testing and R&D).

Coordinate the elements for a centre of excellence for space domain awareness, bringing an inter-disciplinary approach to the problem.

Work with Defence to support Space Domain Awareness capabilities.

Support Australian industry to win contracts for JP 9360 – Space Domain Awareness, using commercial space operations concepts and local industry bids.

Develop a candidate closed-cycle agriculture project for the Australian Space Agency’s flagship \$150 million Moon to Mars initiative.

Leverage South Australia’s long history of academic and industrial innovation in arid environment agriculture/horticulture, plant sciences and greenhouse technology to become the Australian centre of expertise in space-based farming and food production.

Contribute South Australian space farming innovations to NASA’s Artemis program.

Spinoffs and applications of innovations for space farming and food production will benefit producers and consumers on Earth, as more tolerant crops and improved food production techniques will be required to mitigate the impacts of environmental degradation and climate change.

Deliver actionable, space derived intelligence to non-traditional users.

Bring together the state’s advanced data analytics capability with the NewSpace industry, whereby South Australia benefits from value adding along the entire value chain and benefiting multiple industries.

Deliver a space education program to show potential customers the benefits of actionable intelligence from space derived data.

Educate and develop new customers who might benefit from the use of space derived data.

Capitalise on the phenomenal opportunities presented by 'NewSpace':

- + many, small, connected satellites
- + machine learning and AI to exploit space derived data

Support government-as-customer requirements for dedicated satellite systems to deliver space services to other terrestrial sectors such as health and water, and ultimately deliver improved services in capability or cost.

Develop sovereign capability and reduce the impact of trade restrictions from established space economies.

Design, build, launch and deliver a constellation of sovereign satellites for Australian needs, including Defence projects such as DEF 799 – Enhanced Satellite ISR Capability, and the Defence Science & Technology Group – Resilient Multi-Mission Space – STaR Shot.

Establish a common use Space Engineering Laboratory for development and test of space hardware and sensors thereby reducing barriers to entry for local design and manufacture.

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SUMMARY TABLE OF OPPORTUNITIES (ACTIONS)

Cultivate South Australia as a centre-of-gravity for Australia's expanding space activities:

- + an expanding workforce (SKILLS)
- + an innovation ecosystem (INNOVATION)
- + supportive infrastructure (INFRASTRUCTURE)
- + globally competitive (TRADE)
- + attractive to investors (INVESTMENT)

Develop a globally competitive Space Training curriculum in partnership with local and international partners.

Support the continued success of current programs, including:

- + Southern Hemisphere Space Studies Program (SHSSP)
- + The Advanced Technology Program
- + Space Scholarship Program.

Continue support for the GRAVITY Challenge to connect challengers (problems) to innovators (solutions) and accelerate ideas to market.

Continue support for startups through the Venture Catalyst Space Incubator program.

Optimise Stone & Chalk's start-up hub to cater for NewSpace growth through delivery of dedicated programs and facilities in 2021.

Utilise Government seed funding such as Go2Gov to solve terrestrial problems using space capabilities, delivering benefits to other growth sectors.

To build or enable access to the infrastructure needed to reduce barriers to entry to design and test for space product qualification.

Expand the globally competitive space industry and research hub at Lot Fourteen focused on supporting the rapid growth of space start-ups and small to medium-sized enterprises (SMEs) in NewSpace.

Assist the growth of the Responsive Space Operations Centre to support Space Domain Awareness capability.

Ensure the long term viability of the Australian Space Discovery Centre as a key element of the space ecosystem.

A State task force (typically only enacted for larger capital projects) is coordinating the state approvals necessary for critical space infrastructure.

Host international delegations looking for investment partnerships in Australia to foster new opportunities.

Support South Australian companies during international missions and industry events.

Leverage the South Australian Government's AUD\$12.8m investment in overseas trade and investment offices, covering the USA, Malaysia, UK, MENA, India, Singapore, Thailand, Indonesia, and Japan.

Leverage Tradestart programs and export grants to assist companies to export their products and services.

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