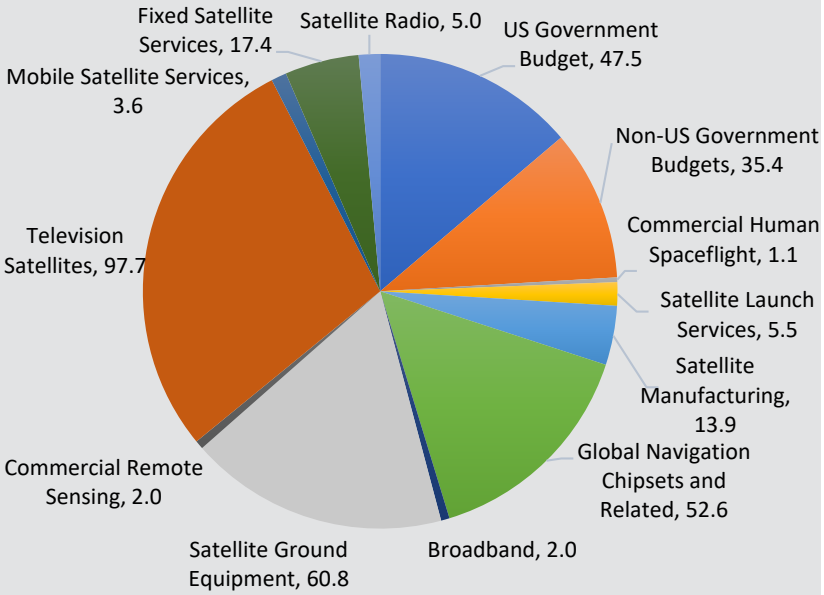
The global space sector is rapidly developing and diversifying, attracting significant private investment and giving rise to a moment of significant opportunity for industry and research.

'Space 2.0' is the evolution of the space sector from dependence on large national space programs to being driven by the private sector as a result of commercial opportunities and lower barriers to entry. Space 2.0 will bring technological disruption and give rise to the jobs of the future.

Space 2.0 industry trends:

- Falling launch costs due to miniaturisation
- Shorter and cheaper innovation cycles for componentry
- Data-dependent global economy
- Growth in private investment to 75% of space market
- Growing strategic and military importance of space
- Tripling of global space economy to US$1.1 trillion by 2040

The Global Space Economy was worth US$345 billion in 2016



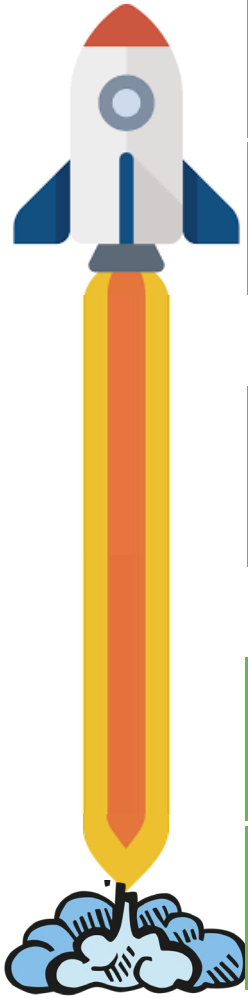
Space 2.0's broad applications are underpinned by key capabilities outlined below:

	Space Systems	Ground Systems	Applications and services	Users
Communications	Launch, satellites and instruments	Ground and reference stations	Data, telecoms, broadcasting, internet	Data/internet, broadcasting
Earth observation from space	Launch, satellites and instruments	Ground stations, data storage and publishing	Mapping, monitoring and data analytics	Mapping, emergency management, planning and environment
Position, navigation and timing	Launch of global navigation system satellites	Reference stations, communications receivers	Control systems, monitoring, mapping analytics	Agriculture, logistics, finance, navigation
Space mission and support services	Launch activities, space situational awareness, deep space operations, astronomy	Laser ranging facilities, tracking facilities, mission control, super computing	Remote operations, robotics, analytics	National space agencies, private space operators, defence, research institutions

Space technologies serve as an economic enabler, facilitating transformation across sectors underpinned by improved communications, sensing and data.

Global | National | Victoria | Next Steps

The Commonwealth and other state and territory governments are moving to capitalise on the opportunity presented by the space sector's growth.



$12 billion

The Australian Space Agency has set the goal of tripling the sector's **contribution to GDP**.

20,000

Jobs created in the space sector by 2030. For Victoria, this could mean over 3,000 high-value jobs.

$1 billion

Pipeline of **inbound capital investment** in Australia's civil space sector required between 2019 and 2028.

$165 million

Commonwealth **commitment to support supply chains** to participate in collaborative international space projects

$10 billion

Department of Defence **investment in the next 20 years** in space-related projects.

The Commonwealth Government is moving to capitalise on the space opportunity.

$150 million over five years from 2020-21to support Australian business and research to contribute to NASA's new program to return to the moon.

$225 million for **a Satellite Based Augmentation System**, ground stations and support for more accurate positioning.

$15 million for an International Space Investment grant program.

$19.5 million for a Space Infrastructure Fund, now fully committed.

$55 million for the **SmartSat CRC**, which has attracted another $190 million in co-contributions

Memoranda of Understanding with New South Wales, South Australia, Tasmania, Western Australia, the Australian Capital Territory and the Northern Territory.

Victoria's space capabilities are centred around our globally competitive advanced manufacturing and materials sector, and spatial infrastructure which is supported by world-class R&D organisations.

Victoria's space-related organisations offer a diverse set of space capabilities.

Earth observation from space

- La Trobe University contributed to the design of an advanced hyperspectral camera with the German Aerospace Centre (DLR) now integrated onto the International Space Station (ISS)
- The Bureau of Meteorology, Australia's largest user of space data, undertakes research and development at its Melbourne headquarters.
- RMIT University was named *Geospatial Research Institute of the Year* for 2019 by the Geospatial World Forum.

Communications

- The SmartSat Cooperative Research Centre, a $245 million initiative over seven years, has a research stream focused on Advanced Communication, Connectivity and IoT Technologies. Swinburne, La Trobe and Deakin Universities and BAE Systems are core partners of the CRC and Victorian-based DMTC and RMIT University are supporting partners, alongside Thales and Leonardo.
- Viasat is a global satellite company that provides services to the National Broadband Network and has made significant investments in establishing presences in Victoria and creating jobs.

Position, navigation and timing

- FrontierSI, a leading not-for-profit providing spatial research and advisory services, will lead the Satellite-Based Augmentation System Demonstrator Trial for Global Navigation Satellite Systems observations for the Commonwealth.
- The University of Melbourne is taking a leading role in the Australian Interconnected Multimodal EcoSystem (AIMES), deploying and testing Connected Intelligent Transport Systems on the streets of Melbourne.

2,300 Victorians are currently employed in space-related businesses.

Space-related industries in Victoria are estimated to generate **$400 million per annum in revenue**.

Victoria is home to around **250 established space and space-related businesses**.

Space mission and support services

- Monash University is a world leader in human and robotic interactions.
- Deakin University's Institute for Intelligent Systems Research and Innovation has developed training and simulation systems while its Institute for Frontier Materials works to foster innovation in materials science and engineering research.
- Victoria's leading medical research using microgravity experiments are an emerging strength for Victoria attracting international interest.
- Opaque Media Group is working with NASA and Boeing to provide virtual reality simulation for space mission training.
- Swinburne University has the only international agreement to operate the world's largest optical telescope, the W.M. Keck Observatory in Hawaii.

Victoria has a key role to play in delivery of the National Civil Space Priorities

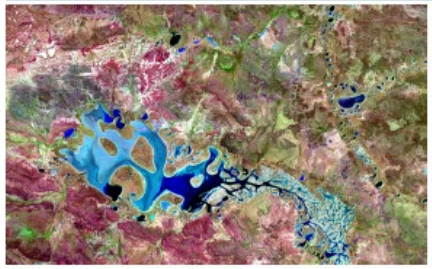
National Civil Space Priority Areas

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

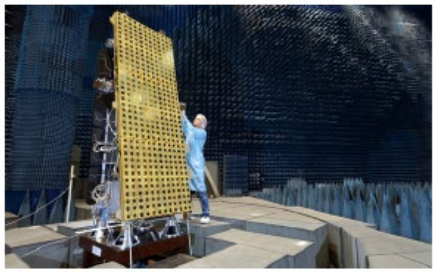
Space is crucial for communications on land, our marine jurisdiction, and airspace. Australia can play a lead role in emerging technologies such as lasers for data communication, quantum technologies for secure communication, and hybrid radio and optical communications.

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



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

Australian Civil Space Strategy 2019 – 2028