

GO8 SUMMIT:
**SPACE COLLABORATION
AND COMMERCIALISATION**

PROGRAM

Tuesday 13 August 2019
08.00–17.30

The Great Hall University House
Australian National University
1 Balmain Crescent
Acton, Canberra



**GROUP
OF EIGHT**
AUSTRALIA





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CONTENTS

PROGRAM

02

BIOGRAPHIES

06

SUMMIT PAPER

18

GO8 SPACE
COLLABORATION
AND COMMERCIALISATION
SUMMIT

P

R

O

G

R

A

M

TUE
13

08.00

Registration

WELCOME

08.45–08.50

Opening: Go8 Space Collaboration and Commercialisation Summit and release of Go8 Space Capability Statement

- **Professor Dawn Freshwater** Chair Go8 and Vice-Chancellor University of Western Australia

08.50–09.00

- **The Hon Karen Andrews MP**
Federal Minister for Industry, Science and Technology

09.00–09.15

Opening keynote and context

- **Professor Brian Schmidt AC** Vice-Chancellor
The Australian National University

09.15–09.30

Ms Vicki Thomson Chief Executive Go8 – Go8 Summary

09.30–09.45

The day's key objectives

- Summit Facilitator – **Professor Duncan Ivison**
Deputy Vice-Chancellor Research, University of Sydney

09.45–10.15

Australian Space Industry – the national context

- **Mr Anthony Murfett** Deputy Head – Australian Space Agency

10.15–10.45

Morning Tea

SESSION 1**AUSTRALIA AS A RESPONSIBLE SPACE ACTOR:
REGULATORY, LEGAL AND ETHICAL ISSUES IN
A NATIONAL AND INTERNATIONAL CONTEXT**

Australia's renewed focus on space requires that its regulatory, legal and ethical standing be robust and current to support the nation's role as an effective international Space actor. Careful consideration must be given to Australia's capacity to manage the novel and complex issues that are involved in international engagement in Space.

10:45–11.45

Panel Chair – **Ms Helen Margaret Trinca** Managing Editor
Sydney, The Australian

- **His Excellency Dr Michael Pulch**
Ambassador of the European Union to Australia
- **Professor Steven Freeland** Australian Space Agency Advisory Group, Professor of International Law at Western Sydney University
- **Professor Melissa de Zwart** Dean of the Law School, University of Adelaide
- **Professor Erika Techera** Pro Vice Chancellor (International), University of Western Australia

For open discussion and panel Q&A

SESSION 2**RESEARCH AND WORKFORCE – BUILDING CAPACITY**

Capacity building will be needed to support the growth of the Australian (International) Space Workforce which the Australian Civil Space Strategy plans to grow by 20,000 new jobs by 2030. There is a requirement to train this research and innovation focused workforce of engineers, researchers, and scientists.

11.45–12.45

Panel Chair – **Professor Caroline McMillen**
Chief Scientist for South Australia

- **Mr Andy Keough CSC** Managing Director, Saab Australia
- **Mr Valentin Merino Villeneuve** Head, Airbus Defence and Space
- **Professor Russell Boyce** Chair for Intelligent Space Systems, and Director, UNSW Canberra Space
- **Dr Sarah Pearce** Deputy Director, CSIRO Astronomy and Space Science

For open discussion and with panel Q&A

12.45–13.30

Lunch

13.30–14.15

The International Space Race – Implications for Australia

- **Mr Peter Jennings PSM** Executive Director
Australian Strategic Policy Institute

Presentation and Q&A

SESSION 3**GO8 COLLABORATION WITH AUSTRALIAN
AND INTERNATIONAL SPACE INDUSTRY**

The Space sector is highly competitive. This international competition will only become more intense. In such a climate how can the Go8 best collaborate and provide expertise to assist Australian companies prosper in the international Space industry? What should this collaboration look like across the gamut of activity from consortium led launch vehicle and launch site development, to "downstream" applications of Space technologies?

14.15–15.30

Panel Chair – **Professor Anna Moore** Director,
Institute for Space, Australian National University

- **Professor Iver Cairns** Professor of Space Physics,
University of Sydney and Director ARC Training Centre
for CubeSats, UAVs and their Applications (CUAVA)
- **Professor Michael Smart** Chair of Hypersonic Propulsion,
School of Mechanical and Mining Engineering,
University of Queensland
- **Mr Adam Gilmour** Chief Executive Officer,
Gilmour Space Technologies Pty Ltd
- **Mr James Prior** Managing Director, Skykraft
- **Dr Brigid O'Brien** Managing Director, In-Q-Tel Australia

For open discussion and with panel Q&A

15.30–16.00

Success in Action: The University of Sydney Rocketry Team

Winners of the 2019 Spaceport America Cup intercollegiate
rocketry competition

- **Mr André Franck Bauer** Team President
- **Mr Mitchell Galletly** Chief Engineer
- **Ms Clara Morris** Treasurer

16.00–16.15

The final wrap – future actions, collaborations and discussions

Summit Facilitator – **Professor Duncan Ivison**
Deputy Vice-Chancellor Research, University of Sydney

16.15–17.30***Wrap up drinks***

WELCOME, INTRODUCTION AND SCENE SETTING

WELCOME
08.45–08.50



WELCOME
08.50–09.00



Professor Dawn Freshwater

Go8 Chair
Vice-Chancellor
The University of Western Australia

Professor Dawn Freshwater became Vice-Chancellor of The University of Western Australia (UWA) in January 2017 and is leading the implementation of UWA's 2030 Vision and Strategic Plan. Her contribution to the fields of Public Health (specifically Mental Health and Forensic Mental Health) and her research in Leadership practices won her the highest honour in her field. Professor Freshwater is a Director of the Perth US Asia Centre, Vice-Chair of the Worldwide Universities Network and member of the NHMRC Women in Health Science Committee.

The Hon Karen Andrews MP

Federal Minister for Industry,
Science and Technology
Member for McPherson,
Queensland

Minister Andrews was elected to Federal Parliament in 2010 after a career as an engineer and having run her own industrial relations business. Following the 2013 election, she became Chair of Parliament's Joint Standing Committee on Public Works – one of the oldest investigatory Committees of the Parliament, and a “watchdog” on Government building and works programs. She has also served as the Assistant Minister for Vocational Education and Skills and Assistant Minister for Science. In this role, Minister Andrews was one of the architects of the \$1.1 billion National Innovation and Science Agenda. It is this experience which saw her become Minister for Industry, Science and Technology in the Morrison Government in August 2018 and again after the May 2019 election. She is the first female cabinet minister from Queensland and has been guiding the Australian Space Agency through its highly successful first year, as it works to a goal of tripling the sector's size to \$12 billion and to create 20,000 new jobs by 2030.



Professor Brian Paul Schmidt AC FAA FRS

Vice-Chancellor
The Australian National University (ANU)

Professor Schmidt was appointed the 12th Vice-Chancellor of the Australian National University in January 2016. Professor Schmidt is the winner of the 2011 Nobel Prize in Physics. He was an astrophysicist at the ANU Mount Stromlo Observatory and Research School of Astronomy and Astrophysics before becoming ANU Vice-Chancellor. Professor Schmidt received undergraduate degrees in Astronomy and Physics, and has a Master's degree in Astronomy and a PhD from Harvard. In 1998, under his leadership the High-Z Supernova search team made the startling discovery that the expansion rate of the universe is accelerating. Fellow of the Australian Academy of Science, the United States Academy of Science, and the Royal Society, he was made a Companion of the Order of Australia in 2013.



Ms Vicki Thomson

Chief Executive
The Group of Eight

Ms Thomson is the Chief Executive of the Group of Eight (Go8) – Australia's eight leading research-intensive universities. She took up her role in January 2015. Prior to this, she was Executive Director of the Australian Technology Network of Universities (ATN). Ms Thomson's diverse background covers print and electronic journalism, politics, issues management and the higher education sector. She has an extensive media, political and policy background and was Chief of Staff to a South Australian Premier. She is a Board member of the European Australian Business Council and is a member of the Australian Government's New Colombo Plan Reference Group.



Professor Duncan Ivison

Go8 Chair, Deputy Vice-Chancellor (Research) Group
Deputy Vice-Chancellor (Research)
The University of Sydney

Professor Ivison is Deputy Vice-Chancellor (Research) and Professor of Political Philosophy at the University of Sydney. Prior to this he was Dean of the Faculty of Arts and Social Sciences (2010–2015) and Head of the School of Philosophical and Historical Inquiry (2007–2009). Professor Ivison is currently Chair of the University of Sydney Confucius Institute Board; Chair of the Go8 DVCR Committee and the NSW DVCR / PVC Committee and a member of the ARC Council.

**WELCOME,
INTRODUCTION
AND SCENE
SETTING**
continued



**SESSION 1:
AUSTRALIA AS
A RESPONSIBLE
SPACE ACTOR**

Mr Anthony Murfett

Deputy Head
Australian Space Agency

Anthony Murfett is Deputy Head of the Australian Space Agency. He has oversight of strategy, policy and day-to-day operations and supports the Agency Head in monitoring the Agency's performance. Anthony has worked as Minister Counsellor, Industry, Science and Education at the Australian Embassy in Washington DC and also as General Manager of the Growth Centres' Branch; Department of Industry, Innovation and Science. He ensures the Agency delivers on its purpose to transform and grow a globally respected Australian space industry that contributes to productivity and employment across the Australian economy.



Ms Helen Margaret Trinca
Managing Editor Sydney
The Australian

2014 – present Managing editor,
The Australian and editor, The Deal
2011–2015 Managing editor,
The Australian
2009–2011: Chief leader writer:
The Australian
2007–2009 Editor: The Weekend
Australian Magazine
1999–2007 Editor: The Australian
Financial Review BOSS magazine
1997–1999 Workplace reporter:
The Sydney Morning Herald
1995–1997 Deputy editor (opinion):
The Australian
1993–1995 European
correspondent: The Australian
1991–1993 Higher education editor/
Opinion page editor: The Australian
1989–1991 Producer: ABC Radio
1988–1989 Public relations officer:
The Australian Vice-Chancellors'
Committee
1983–1988 Higher education editor/
Opinion page editor/ Canberra
bureau chief: The Australian
1982: Editor: ANU Reporter
1980–1982 Reporter/sub-editor:
The Australian
1979–1980 Reporter: The Australian



**His Excellency
Dr Michael Pulch**
Ambassador
Head of Delegation of the
European Union to Australia

His Excellency Dr Pulch has been the European Union Ambassador to Australia since September 2017. The European Union Delegation in Australia has been active since 1981 and aims to strengthen the bilateral ties between the EU and Australia. Prior to his arrival in Australia, Dr Pulch was the EU Ambassador to Singapore from 2013 to 2017. Previously he headed the Russia Division in the European External Action Service (EEAS) in Brussels from 2011 to 2013, and he was Deputy Chief of Mission of the EU Delegation to China, in Beijing, from 2006 to 2011. During the course of his career, Dr Pulch was posted in Seoul, Washington, Brussels, and Tokyo. He holds degrees in law and political science from the universities of Bonn, Paris, and Cambridge.



Professor Steven Freeland
Australian Space Industry
Advisory Group
Professor of International Law
Western Sydney University

Professor Freeland is Professor of International Law at Western Sydney University. He has advised the Australian, New Zealand, Norwegian and several other Governments on issues related to the national and international regulation of space activities and the development of a space-industry strategy. For the United Nations Committee on the peaceful uses of outer space, he co-leads multilateral member state discussions on the exploration, exploitation and utilisation of space resources. He is a member of Australia's Space Agency Advisory Group, and a Director of the International Institute of Space Law, a member of the Space Law Committee of the International Law Association, and a member of both the Space Law Committee and War Crimes Committee of the International Bar Association.

SESSION 1: AUSTRALIA AS A RESPONSIBLE SPACE ACTOR *continued*

PANEL
10.45–11.45



Professor Melissa de Zwart

Dean of the Law School
The University of Adelaide

Professor de Zwart is Dean of Adelaide Law School and Deputy Director, Research Unit on Military Law and Ethics. She developed her keen interest in the regulation and commercialisation of cutting-edge technology as Manager, CSIRO Corporate Legal Service. She has published widely on internet law, intellectual property, online intermediaries, social media and online communities, surveillance, privacy, and the law of outer space. She is a Board Member, Space Industry Association of Australia, a Member of the International Institute of Space Law, and Editor of the Woomera Manual on the International Law of Military Space Operations.

PANEL
10.45–11.45



Professor Erika Techera

Pro Vice-Chancellor (International)
The University of Western Australia

Dr Techera is a Professor of Law and Pro Vice Chancellor (International) (Interim) at The University of Western Australia (UWA). She is an international and comparative environmental lawyer focusing on governance issues in the Indo-Pacific region. Her research interests include oceans governance, the regulation of international spaces (including the high seas and outer space) and the interface of science, technology and law. She is a former barrister, and a Fellow of the Australian Academy of Law.

SESSION 2: RESEARCH AND WORKFORCE – BUILDING CAPACITY

PANEL CHAIR
11.45–12.45



Professor Caroline McMillen

Chief Scientist for South Australia

Professor McMillen commenced as Chief Scientist for South Australia in October 2018 after serving as Vice-Chancellor of the University of Newcastle from 2011. She is a Fellow of the Australian Academy of Health and Medical Sciences, a Fellow of the Royal Society of New South Wales and a Bragg Member of the Royal Institution, Australia. She holds a BA(Honours) and Doctor of Philosophy from the University of Oxford, and completed her medical training graduating from the University of Cambridge. Professor McMillen's research on how the environment in early development determines adult health has attracted national and international recognition. She has served on a range of industry boards including the National Automotive Industry Innovation Council, CRC for Advanced Automotive Technology, CRC for Rail Innovation as well as a range of national and state research, industry and government leadership groups.

PANEL
11.45–12.45



Mr Andy Keough CSC

Managing Director
Saab Australia

Mr Keough retired from the Navy in 2007 following 22 years' service, including command of two Collins Class submarines. He has worked in the defence and technology sector for over 10 years. He commenced his current role as Managing Director, Saab Australia in November 2017. His other roles include Adjunct Professor of UniSA, Chair of Australian Industry Group (AiG) Defence Council, Co-Chair of the University of Adelaide Defence Advisory Board, Board member of SACE, South Australia and Training and Skills Commission. Member of Board of Governors, Saint Peters Girls School, Prime Minister's Veterans' Employment Program Industry Advisory Committee.

**SESSION 2:
RESEARCH AND
WORKFORCE
– BUILDING
CAPACITY**
continued



**Mr Valentin Merino
Villeneuve**

Head
Airbus Defence and Space,
Australasia

Mr Villeneuve is an Aerospace Engineer; a graduate of the Spanish University Politécnica de Madrid.

He is a passionate about astronomy and space technologies and before joining Airbus he worked for the European Space Agency and Astrium. Since 2014 he has led the interests of Airbus Defence and Space in Australasia. Assisting Australia to grow its space ecosystem has been his drive for the past three years by leveraging the Australian burgeoning Space sector (Industry – Startups and Academia) with Airbus Space expertise.

Professor Russell Boyce

Chair for Intelligent Space Systems
Director UNSW Canberra Space

Professor Boyce is Chair for Intelligent Space Systems and Director of UNSW Canberra Space, providing the overall leadership in its establishment and growth from 2014–2019. His technical expertise includes a breadth of scientific and technological knowledge, leveraging a previous 25 plus years in hypersonics research and development. Professor Boyce has played a significant role in the growth of the Australian space sector, including as part of the Government's Expert Review Group for the establishment of the Australian Space Agency, and chair of the COSPAR2020 local organising committee.



THE INTERNATIONAL SPACE RACE – IMPLICATIONS FOR AUSTRALIA



Dr Sarah Pearce

Deputy Director
CSIRO Astronomy and
Space Science (CASS)

Dr Pearce joined CASS as Deputy Director in February 2011. She was previously Project Manager for GridPP, the UK computing grid for particle physics. She has also been a science advisor in the UK Parliament. Dr Pearce has a PhD in x-ray astronomy and an undergraduate degree in physics from Oxford (Worcester College). At CASS she chairs the CASS Executive and has responsibility for CSIRO's role in the Square Kilometre Array project, managing the CSIRO SKA Centre that co-ordinates CSIRO SKA activities. She has been Australian Science Director on the SKA Board, and on the negotiating team for the SKA Convention. She also leads CASS's new space research program. This includes the CSIRO Centre for Earth Observation, which co-ordinates activity in EO across CSIRO and manages CSIRO's share of the new national facility, the NovaSAR satellite.

Mr Peter Jennings PSM

Executive Director
Australian Strategic Policy Institute

Mr Jennings has worked at senior levels in the Australian Public Service on defence and national security. Career highlights include being Deputy Secretary for Strategy in the Defence Department (2009–12); Chief of Staff to the Minister for Defence (1996–98) and Senior Adviser for Strategic Policy to the Prime Minister (2002–03). He was awarded the Public Service Medal in the Australia Day 2013 Honors list for outstanding public service through the development of Australia's strategic and defence policy, particularly in the areas of Australian Defence Force operations in East Timor, Iraq and Afghanistan. In February 2016 Peter was awarded the French decoration of Knight in the National Order of Legion d'Honneur.

SESSION 3: GO8 COLLABORATION WITH AUSTRALIAN AND INTERNA- TIONAL SPACE INDUSTRY

PANEL CHAIR
14.15–15.30



Professor Anna Moore

Director
Institute for Space
Australian Astronomical Optic
The Australian National University

Professor Moore is a major force driving Australia's research and development agenda to grow the nation's space capabilities and industry. She is a world expert in astronomical instrumentation, and she sets strategy for space-related activities at the Australian National University. Professor Moore influenced the creation of the Australian Space Agency. NASA and the US National Science Foundation have also valued her expertise.

PANEL
14.15–15.30



Professor Iver Cairns

Professor of Space Physics
The University of Sydney
Director ARC Training Centre
for Cubesats, UAVs and their
Applications (CUAVA)

Professor Cairns has over 30 years' experience in space physics and space weather research. He is a co-investigator on NASA's STEREO mission and, since June 2019 on NASA's two new SMEX missions, PUNCH and TRACERS. In Australia he led the 2010–2019 Decadal Plan for Australian Space Science. Since then he has worked to "put runs on the board" to convince Governments to invest in the space sector. He led the INSPIRE-2 CubeSat project, which launched in May 2017 and which re-entered still working in November 2018. He currently leads CUAVA, the ARC Training Centre for CubeSats, UAVs, and their applications which trains, solves research problems, and works on commercial outcomes for industry, academic, and government partners.



Professor Michael Smart

Chair of Hypersonic Propulsion
Center for Hypersonics
School of Mechanical
and Mining Engineering
The University of Queensland

Professor Smart has a Bachelor of Mechanical Engineering from UQ, and completed a PhD at NYU-Poly. He was a research scientist in the Hypersonic Airbreathing Propulsion Branch at NASA's Langley Research Center for 10 years and returned to UQ in 2005. In 2007 he was appointed Professor and Chair of Hypersonic Propulsion. As head of UQ's HyShot Group, Professor Smart conducts scramjet related research within the UQ Centre for Hypersonics, with particular emphasis on space launch. He is the inventor of the SPARTAN concept for reusable launch of small satellites, and founder of space start-up company Hypersonix.



Mr Adam Gilmour

Chief Executive Officer
and Founder
Gilmour Space Technologies

Mr Gilmour is CEO and Founder of Gilmour Space Technologies, a venture-funded rocket company in Queensland that is developing more affordable launch vehicles for small satellite/payload customers. A lifelong space fan, Adam believes that rockets can be made smaller, cheaper, faster, and that the new space industry would benefit greatly from having more dedicated access to space.



Mr James Prior

Managing Director
Skykraft
Business and Commercialisation
Manager, UNSW

Mr Prior is Managing Director of Skykraft, a UNSW Canberra spin out company that specialises in the conceptualisation, design and manufacture of small satellite constellations for the delivery of space-based global services. His previous experience includes a 19-year history with Airbus Defence and Space, where from 2013 to 2017, he was the Managing Director of Airbus DS Intelligence, which is Airbus' Australian geospatial intelligence subsidiary. His experience brings a sound understanding of the space and spatial industry from both the multinational and start-up perspectives.

SESSION 3: GO8
COLLABORATION
WITH AUSTRALIAN
AND INTERNA-
TIONAL SPACE
INDUSTRY
continued



SUCCESS IN
ACTION: THE
UNIVERSITY
OF SYDNEY
ROCKETRY
TEAM

Dr Brigid O'Brien

Managing Director
IQT International Australia
(IQT-AUS)

Dr Brigid O'Brien is the Managing Director of IQT International Australia (IQT-AUS). IQT-AUS is located in Sydney, Australia, and is the Australian subsidiary of the U.S. based In-Q-Tel. In-Q-Tel (IQT) is a not-for-profit strategic investor that accelerates the development and delivery of cutting-edge technologies to intelligence and national security agencies. As Managing Director, Dr O'Brien is responsible for identifying, investing, and guiding a portfolio of start-up technology investments designed to deliver on IQT stakeholder strategy.

Dr O'Brien earned her bachelor's degree from the University of Massachusetts and holds a doctorate from Johns Hopkins University.



André Franck Bauer
Team President

Mitchell Galletly
Chief Engineer

Clara Morris
Treasurer

As Australia's first university based rocketry organisation, USYD Rocketry Team is pioneering new experiential learning and research opportunities for undergraduate and postgraduate students. The team was founded in 2016 by a group of engineering students at The University of Sydney who envisioned a student-run organisation that would be capable of competing in the world's best rocketry competitions. In 2017, USYD Rocketry Team made history when it launched the first Australian university-led high power rocket. Since this milestone, the team has gone on to develop their multi-award winning Silvereye rocket.

Designed to compete in the 10,000 feet target altitude category at both the inaugural Australian Universities

Rocket Competition (AURC) and Spaceport America Cup, Silvereye is a reusable sounding rocket capable of carrying up to 4kg of payload including a standard 2U CubeSat. After a successful competition debut at AURC, USYD Rocketry Team travelled to New Mexico, USA to fly Silvereye as Australia's first entry into Spaceport America Cup. After successfully launching to 10,027 feet and receiving perfect scores for the project technical report and presentation, USYD Rocketry Team won first place in their category with the highest total mark since the competition has been run in its current form. This achievement is just the beginning for the team as they refocus for next year and double down on creating meaningful learning and research opportunities for all students.

CONTEXT AND RATIONALE

Space is an Australian Government priority, and the Australian Space Agency was established in 2018. Industry has been supportive with a number of statements of strategic intent signed since the agency's formation¹, and there has been international endorsement of the agency².

The sector is expected to grow significantly, at an annualised 7.1 per cent, with the goal of increasing Australia's market segment from 10,000 jobs and a market size of \$3.9 billion to another 20,000 jobs and market size of \$12 billion by 2030³.

A key mechanism to enable this growth is increasing Australia's STEM-educated population and creating a workforce pipeline to sustain and grow the national space sector.

The Go8 brings a STEM-specific space capability as well as broader world class expertise in humanities and social sciences relevant to Australia's space regulatory environment, such as international space law.

Development of space technologies ie smart satellites, or directly relevant techniques such as robotics, nano-fabrication, cyber security and artificial intelligence, are all Go8 strengths, while experience in spacecraft launches,

working in harsh environments, communication and data security, supplement the Go8's quality capability.

Additionally, the Go8 leads, or is strongly involved in, key research infrastructure – including the Advanced Instrumentation and Technology Centre (AITC) at Mount Stromlo in Canberra, the Pawsey Supercomputing Centre in Perth, and the Square Kilometre Array project. Its capability encompasses not only civil space, the purview of the Australian Space Agency, but also defence-related space⁴.

Go8 universities have historically engaged strongly in Australia's space aspirations. Now in this new era of Australian space exploration and ambition, the Go8 brings the collective expertise of its eight leading research-intensive universities to collaborate with government, industry and others on Australia's future readiness, performance and ultimate success.

1 Statements of strategic intent have been signed with Sitael, Airbus Defence, Space SAS and Boeing

2 MOUs have been signed with Canadian, French, UK and United Arab Emirates counterparts

3 Australian Space Agency 2019, Advancing Space – Australian Civil Space Strategy 2019–2028, p.3

4 Go8 capability to support defence-related space endeavour is noted in the Go8 Defence Capability Statement 2019 released at the Go8 Defence Collaboration and Commercialisation Summit in April 2019

OBJECTIVES

This Summit leverages the renewed national space focus to provide an opportunity for industry, government, investors, researchers and scientists to examine how the Go8 can contribute with new or extended space-related collaborations.

With space research and innovation having relevance across many sectors – examples being agriculture, communications, aviation, resource management, and positioning – a challenge for this Summit is to focus on how the Go8 can contribute to immediate or strategic impact while bolstering Australia’s potential to be a highly successful contributor to the international space sector in the longer-term.

Developed in discussion with the Australian Space Agency and numerous others including Go8 experts, the Summit will focus on three specific areas (outlined in the following pages).

It will also provide the opportunity for existing and future partners to have a consolidated understanding of the Go8’s space capability and commitment, including where it collaborates or wishes to collaborate, its science, research and innovative strengths, and who and where are its key experts.

PRIORITY AREAS FOR DISCUSSION

The Summit will focus on areas that strategically foster and build on the Go8's capacity to engage and partner with others on space, while recognising that space encompasses a very wide range of activity.

Go8 capability is not exclusive to civil space. Much Go8 expertise is relevant to defence space. The Summit content will therefore encompass both civilian and defence space activities.

TOPIC 1 A RESPONSIBLE AUSTRALIA

As Australia increases its space activity, its responsibilities also increase. Its historical role in space means it is not the first time Australia has managed this. However, a renewed focus means Australia's space regulatory, legal and political standing must always be current and robust. Beyond legality, the ethics of space activity are also paramount as new relevant space technologies are developed, and new ways emerge to explore and exploit the opportunities these create, including in outer space.

There is international credibility in having a robust regulatory, legal and ethical framework, as well as having Australian expertise participate and lead in key global space developments.

The Go8 role varies, from contributing to the development of key domestic

legislation and regulation such as the Australian Government consultation on the *Space (Launches and Returns) Act 2018*, to leading in key initiatives such as the Woomera Manual⁵ and objectively articulating and clarifying existing international law applicable to military space operations.

The Go8 also collaborates with a range of overseas partners such as NASA, the French Space Agency and the Japan Aerospace Exploration Agency. The diversity of Go8 involvement means it can assist influence key developments.

The Australian Space Agency sets out responsibility – noted below – as one of the four pillars of its Australian Civil Space Strategy (Advancing Space), consistent with one of its values being Australia as a responsible global citizen.

⁵ Both University of Adelaide and UNSW are founding leaders of the Woomera Manual project.

ADVANCING SPACE PILLAR = RESPONSIBLE⁶

Regulation, risk, and culture

Promote a space sector culture that is globally respected, ensures national safety and security under an appropriate regulatory framework, and meets international obligations and norms

Implementation includes

- *Reform Space Activities Act 1998*
- Implement risk management framework for space activities
- Implement supporting arrangements for the *Space (Launches and Returns) Act 2018*
- Consider regulatory support for future space activities including Access to space
- Develop regulatory support for future space activities for example human space flight
- UN Conventions, bilateral and multilateral obligations, UN Strategy 2030

There are many issues to consider – ie space contestability, space congestion, how our space launch capability is developed, the treatment and avoidance of space debris.

There is an opportunity for the Go8 to contribute to, and assist shape how, these are addressed.

AREAS FOR DISCUSSION

- What are the challenges for Australia's space sector from a legislative, regulatory or ethical standpoint that the Go8 can assist manage?
- Where should the Go8 focus its collective efforts with the Australian Space Agency and others, to ensure Australia is ready to address major issues related to its participation in space, including in relation to other nations?
- How is Australia – including the Go8 – responsive, cost-effective and responsible in the development, deployment and sustainment of space technologies?
- How can the Go8 further support and boost Australia's role in space?
- How can Go8 expertise, trust and reputation best serve Australia's ability to influence internationally?

⁶ Commonwealth of Australia and the States and Territories of Australia 2019, Australian Civil Space Strategy 2019–2028

PRIORITY AREAS FOR DISCUSSION

TOPIC 2 RESEARCH AND WORKFORCE – BUILDING CAPACITY

‘The space sector in Australia is worth about \$3.9 billion and employs about 10,000 people. And the space agency is tasked with growing that to an additional 20,000 jobs and \$12 billion by the year 2030. So they will be engaging with our universities, creating links between our researchers and industry, to maximise opportunities for that economic and employment growth.’

The Hon Karen Andrews, Minister for Industry, Science and Technology,
ABC News Breakfast interview: first anniversary of the Australian Space Agency 1 July 2019.

As noted in the Go8 Space Capability Statement, the Go8 has world class research and science expertise across the many disciplines that involve space – agriculture, aerospace engineering, astrophysics, atmospheric physics, cybersecurity, data analytics, ecology, earth observation, extreme physics, space law.

These lead to, or have a strong footprint in, key technological developments including advanced space-durable materials, artificial intelligence, autonomous systems, electronics, infrared telescopes, laser communications, monitoring from ground or space technologies, photonics, quantum technologies, satellites, sensors, spacecraft.

This high-quality expertise, and Australia’s capacity for world class R&D, are only partly capitalised if they do not transfer effectively to a space-ready workforce including in industry, government, and research organisations.

The Review of the Australian Space Industry Capability articulated this issue, noting that, while Australia has a strong education system with a good R&D base in space technologies...

‘The key challenge for the Australian space industry sector is to build a path from research to industrialising and commercialising the resulting products and services. Many Australian graduates and researchers with space capabilities leave to work overseas. It was reported that some had been attracted back, but the lack of employment opportunities in the space industry sector was a key challenge for those graduates who wish to pursue a career in the space or space related sectors.’

The Go8, working with others including industry, can play a key role in stemming this possible brain-drain trend, and in identifying specific motivations, mechanisms and incentives that can underpin efforts to attract back, or retain, talented individuals.

The Go8 can, in practical ways, help foster its graduates' awareness of opportunities in-country, use its networks to develop bespoke initiatives – including microcredentials – to help build skills in specific areas of demand, and to orient its researchers and PhDs to work with, and for, industry and government.

As a source of emerging space knowledge, expertise and technology, the Go8 can also help anticipate where new industries and opportunities exist, and work with government and industry to help create the optimal settings for these to thrive.

It is also important future students and graduates know of the vast value and community impacts from the space sector to create additional career interest. As an example, it is likely unknown in the community that space technologies can be used to monitor soil moisture. Similarly, little may be known about advances in space medicine, and how such understanding is being improved via Australian research on the impact of space travel on the human body, and the relevance of those discoveries to humans on earth.

The importance of fundamental science and research skills to space workforce and developments – and of resulting knowledge such as research into space re-entry, observation of neutrinos, atmospheric physics or space chemistry – can be more challenging to articulate as directly relevant and impactful to a future workforce.

Yet the science behind the science needs to be continually supported if space ambitions -including the growth of Australia's space workforce – is to be robust and sustainable.

Go8 efforts are in keeping with the aspirations of the Australian Civil Space Strategy's Inspire Pillar, which identifies a range of mechanisms through which workforce can be built for the future over the decade from 2018–19, including by:

- setting conditions by engaging the nation and amplifying communication on space activities
- finding and implementing partnerships such as STEM initiatives and internships, as well as identifying workforce skills and training requirements
- delivering moonshot missions, space sector training priorities and building on partnerships in supporting the future workforce

The issue of workforce to support space capability, and the necessary curriculum to build the skills required, echoes parallel challenges currently faced by many sectors reliant on advanced technology and capability.

This crucial issue was discussed at the recent Go8 Defence Collaboration and Commercialisation Summit, and it is equally relevant to this Summit. The Go8 is working with government on the broader systemic issues such as in responding to the review underway of the Australian Qualifications Framework, and is examining ways to incorporate microcredentials.

PRIORITY AREAS FOR DISCUSSION

AREAS FOR DISCUSSION

- What is the principal or overwhelming factor that needs to be addressed if Australia's space workforce is to be built effectively to support a long-term Australian space capacity?
- What space-characteristic workforce issues can be addressed by the Go8 working with its universities and others? What specific workforce challenges does the space sector have that may not exist in other sectors? How can these be alleviated through Go8 effort in the short and medium term?
- How thorough is our understanding of the gaps in workforce capability, and what can be done to improve it?
- How does the broad nature of space workforce work for or against graduates and potential industries understanding what opportunities exist?
- How established or otherwise are pathways for space workforce participants? How can expectations be better set and met?
- What specific initiatives can be built to retain and attract a quality workforce including to work in, or with, the space sector?

TOPIC 3 INTERSECTION WITH SPACE SECTOR

The Australian space sector was in 2017 estimated to comprise around 388 companies, 56 education and research institutes, and to directly involve 24 government agencies. It was estimated to generate total revenues of up to \$4 billion.

The space sector capability was noted to be in:

- manufacturing (communication satellites, micro and nano-satellites, and satellite sub-systems)
- space operations including telemetry, tracking and command, and astronomy
- space applications relevant to agriculture, mining, aviation and other industries
- satellite communications, and ancillary services including technical, legal, marketing and regulatory⁷.

The Go8 has always worked with and consistently contributed to this diverse space sector in Australia and globally.

It has been at the centre of involvement in major industry-focused initiatives such as the Cooperative Research Centre for Smart Satellite Technologies and Analytics (or SmartSat CRC); in spinning off companies such as Amaero⁸ which produced the first 3D printed aerospike rocket nozzle, and the globally recognised Hypersonix⁹; to partnering with start-ups and companies such as Airbus¹⁰ and Saber Astronautics¹¹, and in producing quality graduates such as Adam Gilmour, a founder with his brother James, of Gilmour Space Technologies.

The diversity of Australia's space sector¹² dovetails with the Go8's comprehensive portfolio of space research, science, innovation and entrepreneurship. It extends beyond technology and know-how such as the development of a flight-ready Rotating Detonation Engine¹³ or the co-development and launch of cubesats, or the creation of drones that can collect data to monitor entire farms¹⁴.

7 ACIL Allen 2017 Report to Department of Industry, Innovation and Science: Review of the Australian Space Industry Capability

8 Amaero is a Monash University spin-off

9 A spin-off from University of Queensland, Hypersonix, developed SPARTAN (Scramjet Powered Accelerator for Reusable Technology Advancement), a small satellite launch system

10 Airbus is working with both the UNSW and its spin-off company Skykraft

11 Delta-V was formed as an alliance of Saber Astronautics Ltd, Hybercubes Pty Ltd, the Australian Centre for Space Engineering Research and the SpaceNet project at University of Sydney to create a new industry ecosystem convening otherwise fragmented groups (<http://www.deltavspacehub.com/space21>)

12 The Review of Australian Space Industry Capability noted that Australia has capabilities along most of the space industry supply chain

13 Responsive Access to Space Cooperative Research Centre Projects (CRC-P) collaboration

14 <https://pursuit.unimelb.edu.au/features/digital-vineyards>

PRIORITY AREAS FOR DISCUSSION

It entails working with the sector to preserve the space environment¹⁵ and providing space flight testing facilities for business at ANU's Advanced Instrumentation and Technology Centre¹⁶. It is also training and creating a future workforce – such as at the ARC Training Centre for CubeSats, Unmanned Aerial Vehicles and their Applications (CUAVA)¹⁷.

However, challenges exist. The Review of the Australian Space Industry Capability found that a fragmented supply chain, lack of finance, and lack of baseload work resulted in many innovations not being matured, industrialised or commercialised.

This must be redressed if Australia is to reach the Australian Space Agency's goal of tripling the sector's contribution to GDP to \$12 billion and creating an additional 20,000 jobs by 2030.

AREAS FOR DISCUSSION

- Given the Go8's diverse involvement with space sector, how can it best prioritise its further engagement to assist ensure the Australian Space Agency's goals are achieved?
- What does Australian business need and expect from the Go8, collectively and as individual universities, to achieve growth and other ambitions consistent with the national agenda?
- Conversely, how can Go8 better access business, including SME capability, to help it translate and/or commercialise its research or innovation.
- How can Go8 collaborations with multinational and global companies be built and leveraged by the government and others in support of Australia's space sector?

¹⁵ The Space Environment Research Centre (SERC) brings together expertise and resources from leading universities, international space agencies and commercial research providers to mitigate and ultimately remove the risk of space debris collisions.

¹⁶ <https://rsaa.anu.edu.au/news-events/news/anu-offer-businesses-access-space-testing-facilities>

¹⁷ CUAVA is led by the University of Sydney

EXPECTED OR DESIRED OUTCOMES

By the end of the Summit, expected outcomes are:

- A greater or nuanced understanding by participants of each other's needs, capabilities, and issues in collaborating in space activity
- Go8 expertise is more evident and transparent to non-Go8 participants, and opportunities for capitalising on this have been identified
- How to improve collaboration or drive partnerships, fine-tune identifying capability, and building gaps in space capability to serve the national agenda
- Potential collaborations among Go8 universities that can address identified needs
- New connections and relationships among participants.

STAKEHOLDERS

- Government – including Industry & Science, the Australian Space Agency, Defence, Education portfolios (Ministers and bureaucracy)
- Industry – key companies and SMEs, with a focus on current space providers
- Key research/innovation initiatives – including Cooperative Research Centres (CRCs), Industry Growth Centres
- Innovation and Science Australia
- Australia's and state Chief Scientists
- Go8 executive, research and collaboration experts
- Investors – venture capitalists and others

APPENDIX – BACKGROUND

GO8 PARTICIPATION IN SPACE

The Go8 universities are not the sole leaders in space research in Australia but they consistently top the international ranking charts for physics and astronomy. All eight universities achieved the top rating (5 on scale of 1–5) of well above world standard in astronomical and space sciences in the latest Australian Government Excellence in Research for Australia (ERA) ratings¹⁸.

Some Go8 highlights in space research and industry include:

- ANU's Advanced Instrumentation and Technology Centre (AITC) at Mount Stromlo in Canberra, whose national infrastructure, including research infrastructure, is key to the development of advanced space instrumentation and small satellites.
- ANU's involvement in the Giant Magellan Telescope is also key to building such capability, including through attracting significant industry contracts to Australia.
- ANU is also a research participant in the Space Environment Research Centre (CRC for Space Environment Management), a collaboration between government agencies, universities and space industry professionals from Australia, USA and Japan
- Participation in SmartSat CRC a consortium of industry and research organisations that aims to create leapfrogging technologies in advanced telecommunications and smart satellite systems to build Australia's space infrastructure for advanced communications and connectivity, remote sensing and monitoring for its land, seas and oceans. Go8 partners include ANU, UNSW, the University of Queensland, the University of Adelaide, the University of Western Australia¹⁹.
- UNSW hosts the Australian National Concurrent Design Facility (ANCDF) which supports emerging capability in small satellite design, manufacture and test. The ANCDF is Australia's first space mission design facility, providing the capability to develop space missions from start to finish. Located on UNSW Canberra campus, it is jointly funded by UNSW and the ACT Government, and supported through a partnership with the French Space Agency CNES (Centre National d'Etudes Spatiales)²⁰.

¹⁸ Australian Research Council 2019, State of Australian University Research 2018–19: ERA National Report

¹⁹ Partners in SmartSat CRC include Australian-based global companies such as Airbus, BAE, MDA, Northrop Grumman, Saab, SciSys, Dassault Systems, and THALES; Australian companies – Nova Systems, Optus, SHOAL, and FrontierSI; Australian startups – including X-Lab, Myriota, Fluorosat, Fleet, Innovor, Lyrebird, Delta-V and x-lab; Australian universities and research organisations – UniSA, ANU, UNSW, RMIT, Swinburne, QUT, Curtin, CSIRO, DST, the Universities of Queensland, Adelaide, Western Australia and Western Sydney; and international collaborators, UCL, Catapult, NASA, the European Space Agency and the National University of Singapore

²⁰ <https://www.unsw.adfa.edu.au/space-research/australian-national-concurrent-design-facility-ancdf> and <https://www.minister.industry.gov.au/ministers/karenandrews/media-releases/australia-france-join-build-space-industry-capability>

- The University of Sydney led ARC Training Centre for Cubesats and Unmanned Aerial Vehicles (an Industrial Transformation Training Centre) aims to train workers in sustainable Australian, advanced manufacturing, space and UAV industries and progress key related devices to create major commercial value.
- UNSW's Australian Centre for Space Engineering Research (ACSER), whose aim is to provide national leadership in Australian space engineering research, supports and leads research in GNSS receiver design, Earth Observation satellite systems, cubesat development in radiation tolerant FPGAs, Novel satellite structures utilising rapid manufacture, GNSS remote observation research and is an emerging leader in research of Off Earth Mining technologies.
- The Responsive Access to Space Cooperative Research Centre Projects (CRC-P) collaboration led by DefendTex Pty Ltd, and involving the University of Sydney as well as other universities and Defence, Science and Technology Group will develop a flight ready Rotating Detonation Engine by applying new thermal management techniques and advanced control of inlet, injection and fuel mixing processes, to create the opportunity for sovereign space launch capability.
- The SkyHopper Space Telescope CubeSat project led by the University of Melbourne involves ANU, the University of Sydney, UNSW, and the University of Western Australia. SkyHopper is a pioneering new cubesat space telescope to observe the most distant explosions in the Universe and to find planets around other stars. Once funded, it will support Australian industries such as Saber Astronautics and skilled workforce at Australian universities to build the science payload and integrate and test the spacecraft.
- The Australian Optical Communications Ground Station network's mission is to establish Australia as the global data downlink hub for solar system high speed, secure communications of the future, with the first step being a national network of ground stations for laser communications. It involves ANU, UNSW, University of South Australia, CSIRO, Defence Science and Technology, University of Auckland, industry partners and international members.
- In 2017, three miniaturised 'cubesats' developed in Australia and the first Australian-built satellites launched in 15 years, were launched by NASA from Cape Canaveral in Florida – involving one built by UNSW, one by University of Adelaide with the University of South Australia, and one through a collaboration of UNSW, ANU and University of Sydney.

APPENDIX – BACKGROUND

AUSTRALIAN SPACE AGENCY

- In September 2017, the Australian Government announced it was committed to establishing a national space agency and established a Review of Australia's space industry capability. The expert reference group formed to conduct the review was chaired by Dr Megan Clark AC.
- In May 2018, in releasing the report of the Australian Space Industry Capability – A Review Report, the Australian Government committed to the establishment of the Australian Space Agency, to support the long-term development and application of space technologies, growing Australia's domestic space sector and securing its place in the global space economy. Dr Clark was appointed as its Interim Head.
- The Government committed \$41 million towards the establishment of the agency, including \$26 million for the agency itself over four years and \$15 million over three years for the International Space Investment Initiative.
- The Government noted an aspiration to triple the size of Australia's domestic space industry up to \$12 billion by 2030, with the potential to create 20,000 jobs.

AUSTRALIAN SPACE INDUSTRY CAPABILITY – A REVIEW²¹, RELEASED 2017

- The Review examined and made findings of Australia's capabilities in space industry, noting that our strengths are in integrating space sourced data into communications, Earth Observations from Space and Global Navigational Satellite Services (GNSS).
- The Review Report noted that the key challenge was to take advantage of Australian research towards the industrialisation and commercialisation end, and further advised notable workforce issues partly due to the loss of Australian graduates and researchers overseas. The Report noted Australia was unlikely to be competitive in the manufacture of large high-altitude satellites or of receivers for applications in vehicles or in positioning. However, opportunities existed in new areas of:
 - » low orbit satellites and related service
 - » design of instrumentation and sensors, design testing and manufacture of small satellites
 - » optical communications, tracking space debris, robotics
 - » integration of space sourced data into ground based applications, big data analysis
 - » on board processing and launch services

²¹ A copy of the Report of the Australian Space Industry Capability – A Review can be found at <https://www.industry.gov.au/data-and-publications/review-of-australias-space-industry-capability>

AUSTRALIAN CIVIL SPACE STRATEGY 2019–2028²²

■ The Australian Civil Space Strategy 2019–2028, announced by the Australian Government on 2 April 2019, sets the landscape for the space sector into and beyond the next decade.

■ It is based on four Strategic Space Pillars:

- » International – open the door internationally
- » National – develop national capability in areas of competitive advantage
- » Responsible – ensure safety and national interest are addressed
- » Inspire – build a future workforce

■ Activities under the strategy will be guided by seven National Civil Space Priorities, with the first three as immediate priorities, with the remaining four to be focused on in 2021–2028.

1. Position, navigation and timing
2. Earth Observation
3. Communication technologies and ground infrastructure
4. Leapfrog R&D
5. Space situational awareness
6. Robotics and automation
7. Access to space

The first two National Civil Space Priorities received \$224.9m and \$36.9m respectively to Geoscience Australia in the 2018 Federal Budget, as well as funding to space activities through the CSIRO. The third Civil Space Priority, Communication technologies and services will be a focus in 2019–2021. The remaining four priorities will be foci in 2021–2028.

²² The Australian Civil Space Strategy can be downloaded from <https://www.industry.gov.au/data-and-publications/australian-civil-space-strategy-2019-2028>



**GROUP
OF EIGHT
AUSTRALIA**

MEMBERS

go8.edu.au



THE UNIVERSITY OF
**WESTERN
AUSTRALIA**



MONASH
University



Australian
National
University



THE UNIVERSITY
of **ADELAIDE**



THE UNIVERSITY OF
MELBOURNE



UNSW



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA



THE UNIVERSITY OF
SYDNEY