

GO8 SUMMIT:
**DEFENCE COLLABORATION
AND COMMERCIALISATION**

PROGRAM

Tuesday, 9 April 2019
08.00 – 17.30

The University of Adelaide







go8.edu.au

CONTENTS

PROGRAM

02

BIOGRAPHIES

06

SUMMIT PAPER

16

GO8 DEFENCE
COLLABORATION
AND COMMERCIALISATION
SUMMIT

P

R

O

G

R

A

M

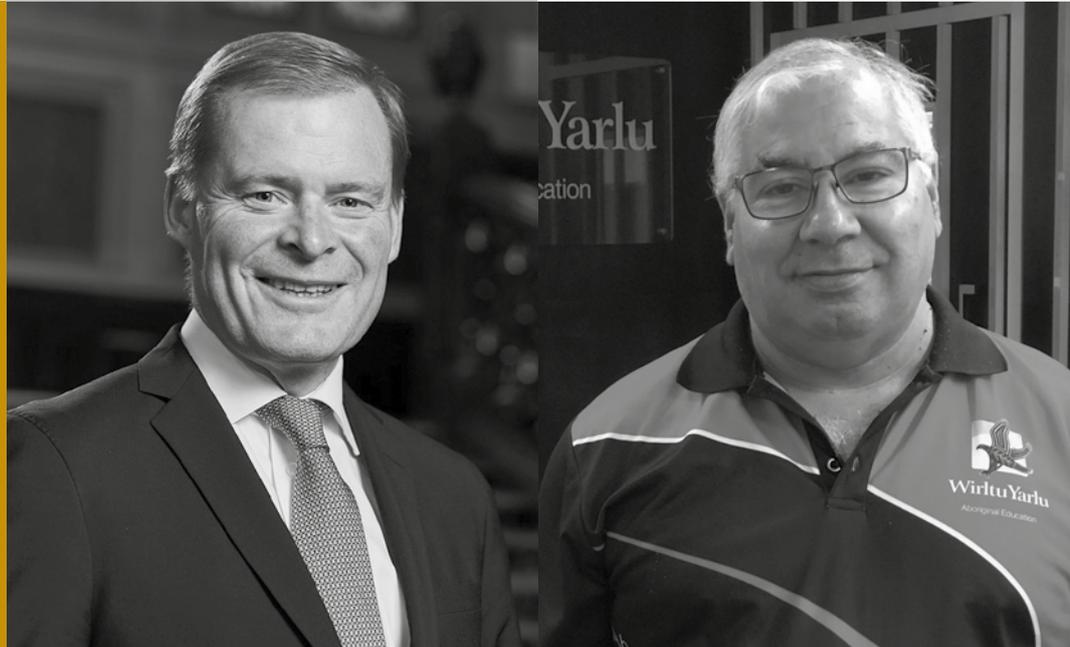
TUE
09

08.00	Registration
	WELCOME
08.30–08.35	Professor Peter Rathjen Vice Chancellor and President, University of Adelaide, Deputy Chair Go8
08.35–08.40	Welcome to Country – Uncle Rod O’Brien Cultural Advisor Wirrtu Yarlur, University of Adelaide
08.40–08.45	Opening the Go8 Defence Collaboration and Commercialisation Summit – Ms Vicki Thomson Go8 Chief Executive
08.45–08.50	Go8 context, rationale for the Summit and Go8 Defence Capability Statement ■ Professor Dawn Freshwater Vice-Chancellor University of Western Australia and Chair Go8
08.50–09.05	Keynote Address ■ Senator The Hon Linda Reynolds CSC Minister for Defence Industry
09.05–09.10	The day’s three key questions ■ Summit Facilitator – Professor Duncan Ivison Deputy Vice-Chancellor Research, University of Sydney
SESSION 1	WORKFORCE – CHALLENGES AND OPPORTUNITIES
9.10 –10.50	The problem to be resolved ■ Panel Chair – Professor Michael Webb Director Defence, Cyber & Space University of Adelaide
09.30–10.00	Key workforce issues ■ Mr François Romanet President and Delegate Naval Group Australasia ■ Dr John Best Vice President and Chief Technical Officer Thales Australia ■ Mr Vince Di Pietro Chief Executive Lockheed Martin Australia & New Zealand ■ Ms Lisa Phelps First Assistant Secretary People Services Department of Defence ■ Mr Jeff Connolly Chairman and CEO Siemens Ltd
10.00 – 10.20	Small group discussions 1. Ensuring Defence and Defence Industry have the workforce needed into the future: how the Go8 can address explicit areas of concern? 2. Retaining talent of our domestic graduate cohort 3. The Industry ‘pull’ for talent – opportunities external to Defence
10.20–10.50	Summaries of group discussions and Q&A

10.50–11.10	Morning Tea
SESSION 2	FILLING THE POLICY VACUUM – KEY ISSUES
11.10–12.45	Session Chair – Mr Doron Ben-Meir Vice-Principal Enterprise University of Melbourne
11.20–11.40	Presentations on Defence Trade Controls <ul style="list-style-type: none">■ Dr Sean O’Byrne Associate Professor School of Engineering and IT, UNSW Canberra■ Dr Ted Rohr Director Research Ethics and Compliance Support, UNSW Sydney
11.40–11.50	Presentation on Defence Industry Policy <ul style="list-style-type: none">■ Dr Sheridan Kearnan First Assistant Secretary Defence Industry Policy Department of Defence
11.50–12.20	Small group discussions <ol style="list-style-type: none">1. Sensitive technologies and Sensitive nationalities2. Defence Trade Controls – control versus collaboration3. Appropriate ICT and access control for Defence-funded research in universities4. Sovereign Industry Capabilities – Go8 role in supporting these critical areas identified by Defence
12.20–12.45	Summaries of group discussions and Q&A

12.45–13.30	Lunch
13.30–13.45	<p>Keynote Address: Geopolitical Context for Defence Collaborations</p> <ul style="list-style-type: none"> ■ Professor The Hon Stephen Smith Professor of Public International Law and Chair UWA Public Policy Institute’s Advisory Board University of Western Australia
SESSION 3	COLLABORATION AND COMMERCIALISATION – THE VALUE-ADD FROM RESEARCH
13.45–15.15	<p>Panel Chair – Professor Len Sciacca Enterprise Professor Defence Technologies Melbourne School of Engineering University of Melbourne</p> <ul style="list-style-type: none"> ■ Dr Jason Armstrong Brisbane Technology Centre Senior Manager, Boeing Research and Technology Australia ■ Dr Dong Yang Wu Chief of Division Aerospace, Defence Science and Technology ■ Dr Cathy Foley Chief Scientist CSIRO ■ Professor Andre Luiten Director, Institute for Photonics and Advanced Sensing ■ Professor Jason Scholz Chief Scientist and Engineer and Incoming CEO Trusted Autonomous Systems Defence CRC <p>For open discussion and with panel Q&A</p> <ol style="list-style-type: none"> 1. The value of research to Defence across the chain 2. Taking research further (collaboration and commercialisation) 3. Grappling with IP – expectations versus reality 4. How can the Go8 support Defence’s intent to innovate?
15.15–15.45	Afternoon tea
15.45–16.25	<p>Bringing it all together – Opportunities for action, basis for future collaboration and future discussions</p> <p>Summit Facilitator – Professor Duncan Ivison Deputy Vice-Chancellor Research University of Sydney</p>
16.25 –16.30	<p>Thank you and formal close of the Summit – Ms Vicki Thomson Go8 Chief Executive</p>
16.30–17.30	Wrap up drinks

WELCOME,
INTRODUCTION
AND SCENE
SETTING



Professor Peter Rathjen

Go8 Deputy Chair
Vice-Chancellor and President
The University of Adelaide

Professor Peter Rathjen is the University of Adelaide's 22nd Vice-Chancellor and President. He commenced his role in January 2018. He is an Australian scientist and medical researcher who is internationally recognised in stem cell science. Prior to his appointment, Professor Rathjen was Vice-Chancellor of the University of Tasmania, where he was instrumental in creating vibrant new university precincts within the CBDs of Hobart, Launceston and Burnie. Professor Rathjen is an alumnus of the University of Adelaide.

Uncle Rod O'Brien

Cultural Advisor Wirtu Yarl'u
The University of Adelaide

Rod identifies as a Kurna man and devotes much time to helping other Kurna people identify with the language and culture. He is an active member of the Adelaide Aboriginal community, volunteering his time as a Board member on a number of committees which include the Kurna Warra Karrpanthi Aboriginal Corporation, Kurna Yerta Aboriginal Corporation and Kura Yerlo Inc.

Rod has an Honors and Bachelor's Degree in Applied Science in Aboriginal Community Development and Management from Curtin University.

Prior to joining Wirtu Yarl'u in 2017 as a Cultural Advisor, he worked in the State Government for 23 years in the area of Child Protection



Ms Vicki Thomson

Chief Executive
The Group of Eight

Ms Vicki Thomson is the Chief Executive of the Group of Eight (Go8) – which is comprised of 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 (EABC) and is a member of the Australian Government’s New Colombo Plan Reference Group.



Professor Dawn Freshwater

Go8 Chair
Vice-Chancellor
The University of Western Australia

Professor Dawn Freshwater is Vice-Chancellor of the University of Western Australia (UWA). She commenced her role in January 2017. For the previous three years she had been UWA’s Senior Deputy Vice-Chancellor (SDVC) and Registrar, and as Acting Vice-Chancellor in late 2016. In the role of SDVC, she led UWA through its most significant transformation in over two decades, with the aim of optimising UWA’s world class research. Professor Freshwater, a health professional, has an internationally recognised reputation for her ongoing work in the area of mental health.



**The Hon Linda Reynolds
CSC**

Federal Minister for Defence
Senator for Western Australia

Senator Reynolds was elected to the Australian Senate in 2014. In March 2019 she was sworn in as Minister for Defence Industry, Emergency Management and North Queensland Recovery. She was previously Assistant Minister for Home Affairs. Senator Reynolds has more than 20 years’ experience in national politics working for Members of Parliament and the Liberal Party of Australia. She has a Master of Arts (Strategic Studies). Senator Reynolds served for 29 years in the Australian Army as a Reserve Officer, and was a Project Director with Raytheon Australia. Career appointments include: Deputy Federal Director of the Liberal Party of Australia, Commanding Officer of a Combat Service Support Battalion and Adjutant General of Army, the Chief of Army’s key governance advisor. Senator Reynolds was the first woman in the Australian Army Reserves to be promoted to the rank of Brigadier and was awarded the Conspicuous Service Cross.



FIRST SESSION: WORKFORCE – CHALLENGES AND OPPORTUNITIES



Professor Duncan Ivison

Chair, Go8 Deputy Vice-Chancellor
(Research) Group

Deputy Vice-Chancellor (Research),
University of Sydney

Professor Duncan Ivison is currently 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.

Professor Michael Webb

Director Defence, Cyber & Space
University of Adelaide

Professor Michael Webb joined the University of Adelaide in July 2008 where he is currently Director of the University's Defence, Cyber and Space.

Michael's career in Defence research spans more than 30 years, predominantly in the areas of surveillance, intelligence, communications, command and control. Michael received the Australian Operational Service Medal (Iraq and ICAT) for his leadership of an activity in the Middle-East and an award for his work in enhancing the safety of Australia's deployed troops in relation to improvised explosive devices.

Michael is passionate about bringing academic, industry and Defence capability together to enhance our collective ability to safeguard Australia.



Mr François Romanet

President and Delegate Australasia
Naval Group

François Romanet is the President Australasia of Naval Group (formerly DCNS). In this position he is the representative of Naval Group headquarters to Government authorities, military officials and industrial partners in the region. Mr Romanet is also the President of the French Australian Chamber of Commerce and Industry (FACCI). Prior to this, he was the Chief Executive Officer of SAFRAN Pacific, and the Managing Director of Sagem Australasia (Telecommunication, Defense & Security) and a Board Member of Sagem Communication. He is also a member of the French Foreign Trade Advisors (Australian Committee) for the French Government.



Dr John Best

Vice President
Chief Technical Officer
Thales Australia

Dr John Best is Vice President, Chief Technical Officer at Thales Australia. His responsibilities include technical strategy, research and development, innovation and engineering. Partnerships and collaboration are significant components of the Thales innovation system and within his portfolio of responsibilities. John is also a director of DMTC Limited, a Defence oriented research consortium, and Eurotorp Pty Limited.



Mr Vince Di Pietro

Chief Executive
Lockheed Martin Australia
and New Zealand

Vince has been the Chief Executive of Lockheed Martin Australia since December 2016. He is leading LMA to achieve its vision to be Australia's partner of choice for Defence, aerospace, sustainment and technology solutions.

He served in the Royal Australian Navy for 40 years. He holds a Master of Arts (Strategic Studies) from Deakin University.

He was awarded the Conspicuous Service Cross in 2007 for outstanding achievement as Director General Navy Certification, Safety & Acceptance in Navy Systems Command. On promotion to Commodore Vince was appointed Australia's Naval Attaché to the United States from 2007 to 2010.

On return to Australia he was Director-General Navy Capability Plans and Engagement in Navy Strategic Command and from January 2013 he was Commander Fleet Air Arm. Vince transferred from full time service to the Active Reserve in March 2016.

**FIRST SESSION:
WORKFORCE –
CHALLENGES
AND
OPPORTUNITIES**
continued



Ms Lisa Phelps

First Assistant Secretary
People Services
Department of Defence

As First Assistant Secretary People Service, Lisa leads and manages a large and dispersed workforce, budget and resources to deliver agreed activities regarding HR Services, Workforce Strategy, Pay & Administration, Honours & Awards, Work Health & Safety and Senior Officer Management.

Since joining the Department of Defence in 1999 as an APS1 Registry Clerk delivering mail, Lisa has worked in a range of roles spanning across many parts of Defence including People Reform, Indigenous Affairs, Workplace Relations, International Policy, Navy and Strategy Group.

Prior to joining Defence Lisa had a successful career in the Commonwealth Bank. Lisa is also the LGTBI Champion for Defence.

Mr Jeff Connolly

Chairman and Chief Executive Officer
Siemens Ltd

Jeff Connolly is Chairman and Chief Executive Officer of Siemens in the Pacific region. Siemens has been active in Australia since 1872, has a turnover of > A\$2.5 Billion, employing over 2500 people. Siemens' local financial commitment, via local equity, and in debt and equity participation in public infrastructure, is approx. A\$1 Billion.

Jeff is a graduate of Melbourne University and was Adjunct Professor at Swinburne University; Advisory Councillor AIG Industry 4.0 Advanced Manufacturing Forum; previous Chair of the Prime Minister's Industry 4.0 Task Force; President of Ai Group Victoria Council and Vice President of Ai Group National Executive; Member of Ai Group Defence Council; Chair of the German-Australian Chamber of Industry and Commerce; Director of EABC; National Trustee of CEDA; VIC/TAS Advisory Councillor; Member of the German-Australian Advisory Group; and Member of AIDC.

**SECOND
SESSION:
FILLING THE
POLICY VACUUM
– KEY ISSUES**



**Mr Doron Ben-Meir
B.Sc. B.E (Hons) GAICD**

Vice-Principal (Enterprise)
University of Melbourne

Mr Doron Ben-Meir B.Sc. B.E (Hons) GAICD, is the Vice-President Enterprise on the Chancellery Executive of the University of Melbourne. Building upon the operational base established within the Research, Innovation and Commercialisation portfolio, this new role is responsible for the overarching strategic development of the University's Enterprise Model which focuses on the appropriate utilisation of the University's human capital, physical assets & platforms, investment capital and its intellectual property portfolio to optimise the resources available to drive its research and teaching agenda.

Dr Sean O'Byrne

Associate Professor
School of Engineering and
Information Technology
UNSW Canberra

Associate Professor Sean O'Byrne has been working in the field of hypersonics since 1996, mostly in the application of advanced laser-based diagnostic techniques to hypersonic flows. He received Masters and PhD degrees in Physics at the ANU, and worked as a postdoctoral fellow at NASA Langley Research Centre and UNSW before taking a Lecturing position at UNSW Canberra, where he has been working since 2004. Much of his research and teaching involves development of Defence-relevant or dual-use technologies.

SECOND
SESSION:
FILLING THE
POLICY VACUUM
– KEY ISSUES
continued



Dr Ted Rohr

Director Research Ethics and
Compliance Support
UNSW Sydney

Convenor, Australasian Research
Management Society Ethics &
Integrity Special Interest Group;
Member, UNSW Sydney Evolution
& Ecology Research Centre

Dr Ted Rohr is the Director of Research Ethics & Compliance Support at UNSW. He is responsible for export controls and the University's operations of research involving humans, animals, gene technology, radiation, controlled goods and technology, drones and biosecurity. Dr Rohr is closely involved with regulators in the development of national Codes and guidelines. Dr Rohr still pursues his academic background and publishes in the fields of evolution and conservation, biology and is actively involved in public discussions on ethical issues.

Dr Sheridan Kearnan

First Assistant Secretary
Defence Industry Policy
Department of Defence

Dr Sheridan Kearnan commenced in the role as First Assistant Secretary Defence Industry Policy in January 2018. Dr Kearnan's responsibilities include the Defence Capability and Innovation Branch, which manages a consolidated innovation program and the associated portfolio of innovation investments; the Defence Export Controls Branch, responsible for managing Australia's export control of military and dual-use goods and technologies; and the Defence Industry Branch, which is accountable and responsible for Defence industry policy.



THIRD SESSION: COLLABORATION AND COMMERCIALISATION – THE VALUE-ADD FROM RESEARCH



Professor The Hon Stephen Smith

Professor of Public International
Law Chair UWA Public Policy
Institute's Advisory Board
University of Western Australia

Professor the Hon Stephen Smith is Professor of Public International Law at the University of Western Australia. He is also Chair of the UWA Public Policy Institute's Advisory Board and a member of the Perth USAsia Centre Board.

Professor Smith served as Australia's Minister for Defence, and prior to that, as Minister for Foreign Affairs. He was Federal Member for Perth 1993 to 2013.

Professor Smith was a member of the Resources 2030 Taskforce, is a member of the board of the LNG Marine Fuel Institute and is Chairman of archTIS.

Professor Len Sciacca FTSE

Enterprise Professor
Defence Technologies
University of Melbourne

Professor Sciacca has extensive experience in government, industry and research sectors forming collaborations and partnerships leading multidisciplinary teams in scientific and engineering environments with impact.

Professor Sciacca has over 30 years research and industrial experience in engineering real systems and senior executive roles in the government and industry sectors. A Fellow of the Academy of Technological Sciences and Engineering and Fellow of Engineers Australia. Professor Sciacca now leads the Defence research program and engagement at the University of Melbourne.

**THIRD SESSION:
COLLABORATION
AND COMMERCIALISATION –
THE VALUE-ADD
FROM RESEARCH**
continued



Dr Jason Armstrong

Brisbane Technology Centre
Senior Manager
Boeing Research and
Technology Australia

Jason received his PhD at a US NASA Research Centre. That work involved automation and experimental design of payloads for three space shuttle missions and included himself flying on NASA zero gravity aircraft missions. From the late 1990s to 2011 he worked in venture capital, had CEO and board roles, and in 2005 he led a company through an IPO on the ASX.

Currently, Jason leads Boeing Research in Brisbane with a portfolio across: human factors, materials/manufacturing, simulation & autonomy.

Dr Dong Yang Wu

Chief of Aerospace Division
Defence Science and
Technology Group

Dr Dong Yang Wu is the Chief of Aerospace Division leading 300 scientists, engineers and technicians who support Defence's fixed-wing aircraft and helicopters. She has PhD in physical chemistry, and a BA in chemistry

Prior to DST Dr Wu held positions at Boeing for eight years as Managing Director/Director in China and Australia, and at CSIRO for 17 years as the Leading Scientist and Leader of the Sustainable Polymeric Materials Research Program.



Dr Cathy Foley

Chief Scientist
CSIRO

Dr Cathy Foley, CSIRO Chief Scientist, has made distinguished contributions to the understanding of superconducting materials and to the development of devices using superconductors to detect magnetic fields and locate valuable deposits of minerals. As a CSIRO leader she is working to help Australia transform to be globally competitive by engaging with Australian researchers, and to build new companies and enterprises to assist with the translation of research for economic prosperity.

Dr Foley has contributed to the scientific community as president of several scientific societies and as a member of committees such as PMSEIC giving advice to Government on scientific and technological matters.



Professor Andre Luiten FAIP GAICD

Director Institute for Photonics
and Advanced Sensing
Chair of Experimental Physics
University of Adelaide

Prof Andre Luiten FAIP GAICD is Director of the Institute for Photonics and Advanced Sensing and Chair of Experimental Physics at the University of Adelaide. He has held three ARC Fellowships and raised over \$22.5M for research. His research has been recognised with the Barry Inglis Medal from the National Measurement Institute, the Australian Institute of Physics' Alan Walsh Medal for Service to Industry and the 2018 Eureka Prize for Outstanding Science in safeguarding Australia. Andre is also the co-founder and managing Director of Cryoclock Pty Ltd, a start-up recently named Avalon 2019 Defence SME of the Year.



Professor Jason Scholz BE(EE) PhDEE GAICD

Chief Scientist and Engineer
Trusted Autonomous Systems
Defence CRC

As Chief Scientist, Professor Jason Scholz ensures scientific and engineering excellence for the Trusted Autonomous Systems Defence Cooperative Research Centre, a not-for-profit company advancing industry-led, game-changing projects and activities for the Australian Department of Defence with over \$50m in funding.

A recent highlight of Professor Scholz's leadership has been the successful Autonomous Warrior 2018 (AW18) trial and industry-dynamic exhibition on behalf of the Department of Defence Science and Technology (DST), a culmination of four years' collaboration between the militaries, defence scientists and defence industries of five nations, Australia, UK, USA, Canada and New Zealand. Professor Scholz will take up the position of CEO for the Defence CRC in July 2019.

CONTEXT AND RATIONALE

The Go8 is comprised of Australia's leading research-intensive universities with seven of its members in the world's top 100 universities and with over 99 per cent of the Group's research rated at world class or above.

One of Australia's key research and development areas is Defence innovation. It attracted 5.3 per cent of the Australian Government's R&D investment in 2017–18¹. Government has also committed \$200 billion to Defence Industry to 2026 – a sector which employs some 25,000 and has over 3000 trading businesses². (In 2018, Australia's top 40 Defence Industry companies had a turnover of \$12.4 billion³, a growth of almost 34 per cent since 2014⁴.)

The 2016 Defence White Paper underscores Australia's need to have the critical industrial, scientific, technological and innovation capabilities to underpin

national security. Both the White Paper and the Defence Industry Policy Statement seek a more direct and earlier role for Defence Industry in capability development and sustainment, based on a collaborative innovation approach.

Small to medium enterprises are identified as 'incubators for advanced defence capability'⁵, while academic expertise is another target. There is \$730 million research funding to 2025–26 to assist Defence respond to strategic challenges and develop the next generation of game-changing capabilities⁶.

1 Measured by socio-economic objective – see Australian Government 2017–18 Science, Research and Innovation Budget Tables

2 <https://www.myskills.gov.au/industries/defence-industry> and 2016 Defence Industry Policy Statement. (<http://www.defence.gov.au/WhitePaper/Docs/2016-Defence-Industry-Policy-Statement.pdf>) \$730 million also referenced in Defence Industry and Innovation Programs update report 2017 (<https://www.business.gov.au/centre-for-defence-industry-capability/resources/dii-update-report-2017>)

3 Australian Defence Magazine, January 2019, Top 40 Defence Contractors 2018. Accessed 11 January 2019 from <http://www.australiandefence.com.au/industry/top-40/adm-s-top-40-defence-contractors-2018>

4 Based on figure of \$9.7 billion turnover for top 40 defence contractors cited in House of Representatives Inquiry into Government Support for Australian Defence Industry Exports. Accessed 11 January 2019 from https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Foreign_Affairs_Defence_and_Trade/Defence_Industry_Exports/Report

5 2016 Defence White Paper, p.35 and p.108

6 Ibid, p.112

OBJECTIVES

Complementing this is the Group of Eight (Go8) universities' expertise in a range of areas relevant to defence capability, with strong alignment to the Defence innovation priorities⁷.

Go8 universities have already built a comprehensive involvement with Defence and Defence Industry, whose collaborations with universities are numerous and growing.

Importantly, Defence has indicated to the Go8 that more can be done to drive the uptake of, and access, to Go8 expertise and skills.

The Go8 is keen to advance this; to encourage, accelerate and improve the ways that Defence and Defence Industry can work together with Go8 academics and our universities.

Workforce preparedness is a prominent issue to be addressed; as is how to successfully negotiate the often very different cultures of academia and Defence – and the rigours of national security – to ensure resources and knowledge are shared to the level Defence seeks.

The Go8 is positive this can be achieved.

Recognising the need for increased collaboration between Defence, Defence Industry and the Go8 to support scientific, technological and innovation capability, a primary aim of this Summit is to provide the opportunity to successfully consolidate and extend our existing collaborative connections.

The Summit seeks to explore how Defence and the Go8 can be better aligned with a focus on three key themes:

- Workforce capability – ensuring that university talent and expertise can be better tapped into by Defence
- Policy objectives – making collaboration happen while recognising the key driver for Defence is national security and that some research may demand a closed rather than open approach to sharing
- The value of research – aligning the breadth of Defence innovation interests with how universities can adapt and tailor their research approaches

The Summit will provide the additional benefit of a comprehensive snapshot of the Go8's collective capability.

⁷ <https://www.business.gov.au/centre-for-defence-industry-capability/defence-innovation/defence-innovation-hub/defence-innovation-hub-priorities>

PRIORITY AREAS FOR DISCUSSION

Go8 universities generate exceptional capability that can be even further utilised to assist drive defence innovation.

A prime example is the University of Adelaide Sapphire Clock team's role in the Jindalee Over-The-Horizon Radar Network (JORN).

JORN speaks to how university expertise can achieve technological breakthroughs, while, just as significantly, embedding Go8 people and skills into the Defence workforce.

1. WORKFORCE – CHALLENGES AND OPPORTUNITIES

Future workforce is a major concern for Australian Defence.

Identifying for both the Go8 and Defence what core skills an innovative Australian Defence Force (ADF) and Defence Industry requires immediately and into the future; what trends are expected, is one component. Another is how does a Go8 university degree fit with those needs, and what might be expected of a graduate beyond the skills and knowledge of a Go8 education such as, to use one example, acquiring technical skills?

Conversely, higher certainty of relevant employment for graduates and other skilled people who are attracted to

working with Defence and Defence Industry is critical. For example, the Australian Government's 2015 decision to announce a continuous build of naval surface ships is said to have provided long-term certainty to secure critical skills for the naval shipbuilding industry⁸.

Defence will depend on an abundant pool of STEM qualified candidates, (while also needing HASS skills for a range of defence related areas).

As recognised by the Australian Defence Industry Skilling and STEM Strategy⁹, Defence is not the only sector facing workforce and STEM challenges, and the Go8 has a determination to assist where possible.

⁸ Commonwealth Government 2016, Defence Industry Policy Statement, p. 20

⁹ Commonwealth of Australia 2019

AREAS FOR DISCUSSION

1: Ensuring Defence and Defence Industry have the workforce needed into the future: how the Go8 can address explicit areas of concern

- a. Top areas of concern specific to Defence
(i.e. not just applicable to workforce in general) – issues, and capability areas
- b. Degree to which Go8 capability can currently address this
- c. Future workforce – how the Go8 can boost development of Defence-capable or Defence-ready graduates in the short, medium and long term

2: Retaining the talent of our domestic graduate cohort

- a. Nature of the problem – competing employment options, lack of awareness, overseas pull, comparative attractiveness of Australian Defence and Defence Industry, the need for an employee pool that can access security clearance
- b. Go8 efforts and initiatives to steer future graduates towards Defence
- c. Tailoring Defence and Defence Industry 'attractiveness' to domestic graduates – initially, mid-career, and career pathway options
- d. Building initiatives to attract domestic graduates – connecting early and during study-life of student, internships, scholarships and other

3: The Industry 'pull' for talent

- a. The Defence Industry landscape – the 'fit' for Go8 skills and capability
- b. Pathways to pursue a career with Defence Industry
- c. Options to have dual academic/industry roles in the workforce (simultaneous or linear)
- d. What Defence Industry offers that no other employer might

PRIORITY AREAS FOR DISCUSSION

2. FILLING THE POLICY VACUUM

The 2016 Defence White Paper and its implementation present significant opportunities for defence innovation, and for the associated intellectual capacity – including Go8 research, knowledge and applications.

As Australian academic capacity expands to meet the challenge, pre-existing considerations around national security are heightened. New concerns may also emerge if previously unlinked research becomes relevant to new areas of defence activity.

Global research collaboration, a strong and successful feature of Australian research, may be regarded by Defence with added caution.

Further policy and implementation certainty regarding where and how such concerns may impact on burgeoning collaborations between the Go8 and Defence is needed. It can include how to protect Australia's sensitive technology and intellectual property from cyber and other security threats, a focus under the Australian Government's Defence Export Strategy¹⁰.

The *Defence Trade Controls Act 2012 Act* regulates dealings in items listed in the Defence and Strategic Goods List (DSGL) and in items covered by the Defence Trade Cooperation Treaty between Australia and the US.

The Department of Defence submission response to the 2018 Review of the *Defence Trade Controls Act 2012 Act* stated that the current Act and regulatory regime were insufficient to cater for the changing national security environment. The Department of Defence sought to expand controls under the Act.

While the Act Review concluded it did not support the broad approach in the Department's recommendations, it did note gaps in the Act; including limits due to locational criteria, lack of control over technology transfer not covered by the Act, and inadequate control of emerging and sensitive technology.

The Go8 and industry have indicated their concerns about the strengthening of Defence Trade Control powers as a potential deterrent to further collaboration between research, industry and others, both within Australia and internationally¹¹.

A potentially more complex regulatory requirement is that introduced by the *Foreign Influence Transparency Scheme Act 2018* that introduces new obligations for individuals and entities undertaking certain activities on behalf of foreign principals.

The nature of such activities, and the implications for those conducting research and innovation – which are

¹⁰ The 2018 Defence Export Strategy (p.65) notes that Defence will also consider strategies, including strengthening Government-to-Government agreements, to ensure indigenously developed sensitive technologies and intellectual property remain under Australian control, including where they are related to Sovereign Industrial Capability Priorities.

¹¹ Submissions to the Defence Trade Controls Review at <http://www.defence.gov.au/publications/reviews/tradecontrols/Submissions.asp>

not exempt from registration – including when receiving funding from a foreign government, is yet to be completely understood.

Given the myriad registrable circumstances that *may* exist for those conducting research or innovation activities while collaborating internationally, let alone the possible permutations of relationships with foreign principals, this new regulatory requirement warrants discussion during the Summit.

Within the wide breadth of Defence needs, the Sovereign Industrial Capability Priorities are those that are critical to Defence – i.e. those ‘so important to

Australian Defence missions that they must be developed or supported by Australian industry because overseas sources do not provide the required security or assurances we need’¹².

An initial 10 were announced by the Australian Government in 2018 (shown below)¹³. Alignment of relevant existing and future Go8 strengths with these priorities – or components of these priorities – should be considered.

For example, this could include how the Go8 can assist in providing relevant technology and skills to ensure *Collins Class* submarines are effectively maintained over their lengthy lifetimes.

<i>Collins Class</i> submarine maintenance and technology upgrade.	Continuous shipbuilding program (including rolling submarine acquisition).	Land combat vehicle and technology upgrade.	Enhanced active and passive phased array radar capability.	Combat clothing survivability and signature reduction technologies.
Advanced signal processing capability in electronic warfare, cyber and information security, and signature management technologies and operations.	Surveillance and intelligence data collection, analysis, dissemination and complex systems integration.	Test, evaluation, certification and systems assurance.	Munitions and small arms research, design, development and manufacture.	Aerospace platform deep maintenance.

Go8 researchers must be ready to operate effectively within the existing and changing regulatory regime, and be informed and consulted in a

timely way regarding changes in the national security environment – and the implications of those changes – that may impact their work.

12 Commonwealth of Australia, 2016 Defence Industry Policy Statement, p.23

13 Commonwealth of Australia 2018, 2018 Defence Industrial Capability Plan

PRIORITY AREAS FOR DISCUSSION

AREAS FOR DISCUSSION

1: Sensitive technologies and Sensitive nationalities

- a. Discuss how the regulatory environment assists in advancing research knowledge of interest to Defence, and in achieving greater collaboration, while addressing concerns around sensitive technologies and nationalities
- b. Are there any specific aspects of the environment that are immediate concerns or which may become medium to longer term hurdles to collaboration?
- c. Discuss optimal approaches for sensitive technologies and collaborating with sensitive nationalities, recognising the regulatory environment and national security concerns that exist or may be heightened

2: Defence Trade Controls – control versus collaboration

- a. Drawing on examples, discuss what complex (rather than straightforward) scenarios may arise for researchers in defence collaborations that are impacted by the Defence Trade Controls Act, (DTC) and how these are best addressed. (note: complexity is also created by change e.g. the release of ASPI's 'Picking Flowers, Making Honey' report prompted action by Defence and universities, but responses weren't necessarily coordinated. Communication is key to ensuring universities understand and can respond quickly to Defence's views and requirements
- b. Discuss how the implementation of the recommendations of the DTC Act Review may lead to further clarity for the research sector, Defence and Defence Industry of how collaborations should be conducted

3: Appropriate ICT and access control for Defence funded research in academia

- a. Discuss appropriate ICT and access control and accreditation for Defence and others where Go8 research is funded by Defence

4: Sovereign Industry Capabilities

- a. Go8 capability match with Sovereign Industry Capabilities and related Technology Readiness Levels
- b. Future Go8 focus – where that should be and how does the Go8 maintain the awareness of Defence's emerging requirements that would enable timely response?

3. COLLABORATION AND COMMERCIALISATION – THE VALUE-ADD FROM RESEARCH

The Go8, government, business, investors and others have reiterated that collaboration is challenging*. Separate to the need for time and resources to discover what capability and opportunities exist, different parties have different expectations, for instance of speed of reaching formal agreements and how to best leverage capability. (**in a range of contexts – including Go8 – RAAF discussions, a Go8-BHERT Summit, and the inaugural Go8 Collaboration and Commercialisation Summit, on Genomics*)

The value of research for Defence extends across the entire research spectrum. While the Government largely invests in defence science and technology through the Defence portfolio, research that may be relevant to defence – whether initially or subsequently – is funded through a range of mechanisms including the National Competitive Grants Program, administered by the Australian Research Council, (ARC) and through the National Health and Medical Research Council (NHMRC).

In addition, Government funding programs to assist business connect with researchers, such as Innovation Connections, the Cooperative Research Centres and the Industry Growth Centres, may also be relevant to defence innovation.

For Defence and others, reliance simply on the outputs of the Defence-funded programs would be limiting. However, the landscape complexity may mean it is difficult for those who seek to collaborate to navigate the various schemes. A key issue, whether in defence or elsewhere, is understanding what expertise and capability exists that can be acquired or tapped into.

Determining what and where that expertise is, and what potential exists in so far unexamined capability, takes time and effort. This can be compounded if the intent is to meet a yet-to-be articulated need, or if there is an abrupt and urgent need for a specific innovative capability, especially if transient advantage is to be 'the new normal'¹⁴.

¹⁴ Plan Jericho Group Captain Jerome Reid presentation to Go8 Deputy Vice Chancellors Research, 8 November 2018, Canberra

PRIORITY AREAS FOR DISCUSSION

Defence aims to create a seamless link between capability needs, smart ideas and innovation in Australian industry and to streamline its engagement with industry and academia¹⁵, and enacts this intent in its streamlining of Defence Industry and innovation programs under two broad initiatives funded at around \$1.6 billion over ten years to 2025–26.

In addition to the \$230 million Centre for Defence Industry Capability focused on Defence collaboration with industry, the Next Generation Technologies Fund and the Defence Innovation Hub seek to foster game-changing innovation and commercialisation opportunities.

This is complemented by Go8 university efforts to drive an uptake of its research by Defence and Defence Industry and to meet known and future priorities.

There are many key Defence partnerships and networks that have Go8 universities

as core partners, including state-based initiatives. One example is the Defence Science Institute (DSI) established by the Victorian Government in partnership with The University of Melbourne and DST to support engagement between universities, industry and government¹⁶. Further examples are listed in the Appendix.

In Industry, the 2018 R&D of the top 40 Defence contractors represents 0.88 per cent of their total turnover¹⁷, while R&D for the top 20 Small to medium enterprises (SMEs) in defence represents 1.71% of their turnover indicating a potentially readier propensity to undertake innovation.

This is significant given that SMEs represent over 99.5 per cent of Australian businesses across all sectors¹⁸.

15 Commonwealth of Australia 2016, Defence Industry Policy Statement, p. 11

16 <http://www.defencescienceinstitute.com/> and 2018 Victorian Defence Research University Capability Map

17 Australian Defence Magazine, January 2019, Top 40 Defence Contractors 2018. Accessed 11 January 2019 from <http://www.australiandefence.com.au/industry/top-40/adm-s-top-40-defence-contractors-2018>

18 This takes the view that SMEs are businesses of 0-200 employees. Based on ABS 2018, *Counts of Australian Businesses, including Entries and Exits*.

AREAS FOR DISCUSSION

1: The research value to Defence from basic to applied

- a. How can Defence and Defence Industry take more advantage of the Go8's expertise to establish, advance or grow R&D capabilities, while recognising that the value of such expertise may lie not only in resolving immediate problems, but in helping prepare for future contingencies?
- b. What steps can Go8 universities take, beyond their current efforts, to make the relevant research and resources more visible, accessible and translatable, including as a collective?

2: Taking the research further (collaboration and commercialisation)

- a. What are the optimal processes or structures to make it easier for Defence and Defence Industry to collaborate with Go8 universities?
- b. How can Go8 universities remain agile enough to respond at speed to Defence needs?
- c. How can relevant small to medium enterprises (SMEs) build connections within the Go8 to break further into the Defence Industry market?
- d. What must Defence, Defence Industry and Go8 universities do to achieve optimal understanding of each other's needs, capabilities and opportunities?
- e. Discuss specific collaborative projects or solutions Defence, Defence Industry and/or Go8 universities may be interested in establishing or developing; and what Go8 capability and resources are available in relation to those.

3: Grappling with intellectual property – expectations versus reality

- a. What specific challenges around intellectual property are encountered with research relevant to Defence?
- b. How can these be addressed?
- c. What exemplars exist of effective and appropriate IP exchange?
- d. How do researchers grapple with providing IP or knowledge uniquely to Defence and for its purposes, while at the same time seeking to commercialise and translate?

4: How can Defence's intent to innovate be better supported by the Go8?

EXPECTED OR DESIRED OUTCOMES

By the end of the Summit, expected outcomes are:

- A far greater or nuanced understanding by participants of each other's needs, capabilities, and issues in collaborating with Defence
- Go8 expertise is more evident and transparent to non-Go8 participants, and opportunities for capitalising on this have been identified
- A shared / agreed view of the pressing, or immediate to medium term topics or projects that must be addressed, including identifying where further discussion with Go8 universities would assist
- How to improve collaboration or drive partnerships, fine-tune identifying capability, and what specific Defence capability is needed
- Potential collaborations among Go8 universities that address identified needs
- New connections and relationships among participants.

STAKEHOLDERS

- Government – including Defence (ADF and Department), Industry & Science, Education portfolios (Ministers and bureaucracy)
- Industry – key companies and SMEs, with a focus on current defence providers
- Key research/innovation initiatives – including Defence Centre for Defence Industry Capability (CDIC), Defence Innovation Hub, Next Generation Technologies Fund initiatives, Cooperative Research Centres (CRCs), Industry Growth Centres, Australian Space Agency
- Innovation and Science Australia
- Australia's and state Chief Scientists
- Defence Chief Scientists
- Go8 executive, research and collaboration experts
- Investors – venture capitalists and others

APPENDIX – BACKGROUND

GENERAL

In the Defence White Paper 2016, Government committed to increase defence spending to two per cent of Gross Domestic Product (GDP) by 2023–24 with the paper noting it would reach this target in 2020–21¹⁹. An additional \$29.9 billion would be provided to Defence over a 10-year period to 2025–26²⁰.

In research and development, in 2017–18, Government was expected to invest \$540.48 million on Defence R&D or 5.3 per cent of its total 2017–18 R&D investment²¹. This compares to around 7.9 per cent of R&D investment on energy, 12.8 per cent on health, 0.4 per cent on education and 21.4 per cent on industrial production and technology²².

The 2016 Defence White Paper outlines the Government's major capability priorities around six capability streams as follows:

- Intelligence, Surveillance, Reconnaissance, Electronic Warfare, Space and Cyber stream
- Key Enablers stream
- Land Combat, Amphibious Warfare and Special Operations stream
- Strike and Air Combat stream
- Maritime and Anti-Submarine Warfare stream

■ Air and Sea Lift stream

For each of these streams, the Defence White Paper articulates the goals.

R&D investment programs introduced as a result of the Defence White Paper, such as the \$730 million Next Generation Technologies Fund and the Defence Innovation Hub, further define the Government's specific areas of focus²³. These parameters additionally guide researchers and other eligible participants in determining targets for inquiry and collaboration.

The Next Generation Technologies Fund is focussed on nine priority areas²⁴:

- Integrated intelligence, surveillance and reconnaissance
- Space capabilities
- Enhanced human performance
- Medical countermeasure products
- Multi-disciplinary material sciences
- Quantum technologies
- Trusted autonomous systems
- Cyber
- Advanced sensors, hypersonics and directed energy capabilities

19 Defence White Paper 2016, p 30

20 Defence White Paper 2016, p. 24

21 In 2016–17, The Commonwealth Government spent \$557.2 million on defence R&D or 26 per cent of its total own government research expenditure of \$2.1 billion. From ABS Research and Experimental Development, Government and Private Non-Profit Organisations, Australia 2016–17

22 Australian Government science, research and innovation budget tables 2017–18, SEO tab

23 For example, the Next Generation Technologies Fund focusses on nine priority areas. More details are in the Appendix A.

24 <https://www.dst.defence.gov.au/nextgtechfund>

APPENDIX – BACKGROUND

A range of strategic statements guide Defence and Defence Industry direction, investments and advances, in addition to the 2016 Defence White Paper and the 2016 Defence Industry Policy Statement. These include²⁵:

- The 2016 Integrated Investment Program to guide the implementation of the bulk of investment over the decade to FY 2025–26 to build the future force and Defence capability goals of the Defence White Paper²⁶.
- The 2018 Defence Industrial Capability Plan outlines the Government’s long-term vision to build and develop a robust, resilient and internationally competitive Australian defence industry base that is better able to help meet defence capability requirements²⁷. It introduces the initial Sovereign Industry Capability Priorities.
- The Defence Export Strategy builds upon the Government’s defence industry policy by setting out a comprehensive system to plan, guide, and measure defence export outcomes²⁸.
- The Defence Industry Skilling and Science, Technology, Engineering and Mathematics (STEM) Strategy, released on 28 February 2019, details how the Government will help

Australian defence industry to meet their workforce skills requirements over the coming decades. It focusses on four areas – Engage, Attract, Train and Retrain, and Collaborate²⁹.

- The 2017 Naval Shipbuilding Plan outlines the Government’s vision for the Australian naval shipbuilding enterprise and the significant investment required in coming decades. It seeks to create a long-term, sustainable naval shipbuilding and ship sustainment capability over many decades. The Government aims to establish foundations for an Australia-wide, continuous National Naval Shipbuilding Enterprise to end the previous start-stop/ boom-bust approach to shipbuilding in Australia³⁰.

GROUP OF EIGHT CAPABILITY

In 2016³¹ Go8 universities collectively spent \$46.5 million or 0.73 per cent of their total R&D investment on defence. This equated to 52.5 per cent of the total R&D expenditure on defence by the higher education sector.

Group of Eight institutions rank highly in a range of related fields, as assessed by the 2018–19 Excellence in Research for Australia (ERA) round conducted by the Australian Research Council.

25 More specific statements include the Defence Industry Participation Policy, the 2017 naval shipbuilding plan

26 Commonwealth of Australia 2016, 2016 Integrated Investment Program, p. 7

27 <http://www.defence.gov.au/SPI/Industry/CapabilityPlan/>

28 <http://www.defence.gov.au/Export/Strategy/Default.asp>

29 <http://www.defence.gov.au/SPI/Industry/IndustrySkillingSupport.asp>

30 <http://www.defence.gov.au/NavalShipBuilding/Plan/>

31 Latest data available from ABS Research and Experimental Development, Higher Education Organisations, Australia, 2016

A sample of Go8 institutional performance against ERA 2018–19 against relevant fields of research are below, noting 5 is the highest rating that can be achieved³²:

0201 Astronomical and Space Science

ANU	Monash	Adelaide	Melbourne	UNSW	UQ	USyd	UWA
5	5	5	5	5	5	5	5

0206 Quantum Physics

ANU	Monash	Adelaide	Melbourne	UNSW	UQ	USyd	UWA
5	n/a	n/a	5	5	5	5	5

0306 Physical Chemistry

ANU	Monash	Adelaide	Melbourne	UNSW	UQ	USyd	UWA
5	5	5	5	5	4	4	5

0404 Geophysics

ANU	Monash	Adelaide	Melbourne	UNSW	UQ	USyd	UWA
5	n/a	4	n/a	n/a	n/a	5	4

0801 Artificial Intelligence and Image Processing

ANU	Monash	Adelaide	Melbourne	UNSW	UQ	USyd	UWA
5	5	5	5	5	4	5	4

0805 Distributed computing

ANU	Monash	Adelaide	Melbourne	UNSW	UQ	USyd	UWA
4	4	4	5	4	n/a	5	n/a

0901 Aerospace engineering

ANU	Monash	Adelaide	Melbourne	UNSW	UQ	USyd	UWA
n/a	5	n/a	n/a	n/a	n/a	5	n/a

0912 Materials engineering

ANU	Monash	Adelaide	Melbourne	UNSW	UQ	USyd	UWA
5	5	5	5	4	5	5	3

1007 Nanotechnology

ANU	Monash	Adelaide	Melbourne	UNSW	UQ	USyd	UWA
5	5	5	n/a	n/a	4	4	n/a

16 Studies in Human Society

ANU	Monash	Adelaide	Melbourne	UNSW	UQ	USyd	UWA
5	4	3	4	4	5	4	4

32 Commonwealth of Australia 2019, State of the Service University Research 2018–19 ERA National Report

APPENDIX – BACKGROUND

GO8 INITIATIVES AND COLLABORATIONS

A sample of key initiatives that Go8 members lead or are involved in is below. More detail is in the Go8 Defence Capability statement.

Go8 Member	Initiative
University of Sydney University of Melbourne University of Adelaide University of Queensland UNSW Sydney University of Western Australia Monash University	DMTC – Established in 2008, DMTC works collaboratively with many successful and innovative Australian industry, research and government agencies to advance technologies in priority areas. The focus is on delivering enhanced defence and national security capabilities and strengthening Australian industrial capacity.
University of Queensland	DST and UQ partnership in advanced research in flight science and enabling technologies ³³ DST Applied Hypersonics Group founded by absorbing many UQ staff involved in the HyShot program. More details in Go8 Defence Capability Statement.
UNSW Sydney	UNSW Defence Research Institute – established to stimulate, unify, and support all defence-related research within the UNSW community while striving to build and maintain a network across both Australian and International defence industries ³⁴ NSW Defence Innovation Network: university-led initiative of the NSW Government and the Defence Science and Technology Group to enhance NSW Defence industry capability through collaboration with government and academic research institutions ³⁵ Defence CRC for Trusted Autonomous Systems

33 <https://www.dst.defence.gov.au/news/2018/11/15/partnership-research-high-speed-flight>

34 <https://dri.unsw.edu.au/> and <https://newsroom.unsw.edu.au/news/science-tech/defence-research-institute-launched-unsw-canberra>

35 <https://defenceinnovationnetwork.com/>

Go8 Member	Initiative
University of Adelaide	<p>Defence Innovation Partnership – The Defence Innovation Partnership helps deliver innovative technologies and research and development solutions to Defence. A ‘catalyst’ for defence-relevant research and development in South Australia, fostering collaboration and engagement between Defence SA, Defence Science and Technology, the University of Adelaide, Flinders University, the University of South Australia and other research organisations and industry.</p> <p>https://www.defenceinnovationpartnership.com/</p>
University of Melbourne	<p>Defence Science Institute – Established in 2010, a collaborative research initiative of DSTO and the University of Melbourne that creates defence science research networks for Australia.</p> <p>https://www.dst.defence.gov.au/partnership/defence-science-institute</p>
Australian National University	<p>Strategic and Defence Studies Centre – Centre dedicated to the analysis of the use of armed force in its political context. Primary expertise consists of three related research clusters: Australian defence, military studies, and Asia-Pacific security</p> <p>http://sdsc.bellschool.anu.edu.au/</p>
Monash University	<p>Defence Science Institute</p> <p>https://www.monash.edu/engineering/defence-research</p>
University of Sydney	<p>The Centre for Intelligent Mobile Systems: established in partnership with BAE Systems with the aim to undertake research and representative experimentation in the area of intelligent systems, to mature technology relevant to BAE Systems in the current and future defence and security sector.</p> <p>http://www.acfr.usyd.edu.au/research/defence/TheCentreforIntelligentMobileSystems.shtml</p> <p>NSW Defence Innovation Network</p>
University of Western Australia	<p>Defence Science Centre – The Defence Science Centre (WA) will facilitate science and innovation connections across universities, industry and Defence to support security and technology development and capability requirements. The Centre will also support the commercialisation of defence-related research and cultivate a competitive, local defence industry³⁶.</p>

36 <https://www.jtsi.wa.gov.au/economic-development/defence-west/defence-science-centre>

APPENDIX – BACKGROUND

CURRENT ACTIVITY / RECENT RESEARCH DISCOVERIES (SAMPLE)

1. In July 2018, the **Go8** signed a letter of intent to establish a two-way pilot research mobility program with French company Airbus. The intent is to develop a pilot program, based on the Nicolas Baudin internship in France initiative launched in 2017, that will target the Defence sector. It will ideally allow Go8 research students the opportunity to work within French universities in close collaboration with Airbus. The program would offer similar opportunities for French students in Australia.
2. Professor Xinhua Wu, Director of the **Monash** Centre for Additive Manufacturing, is an internationally recognised leader in her field who also heads the ARC Centre of Excellence for Design in Light Metals. The work of her team has resulted in 3D printing of complex jet engine components cutting down significantly on time needed to manufacture from 6–24 months to 1–2 weeks. In 2014 she 3D printed the world's first full size jet engine and in 2016 achieved international aerospace qualification
3. 20 years of leading-edge fundamental research, combined with cutting-edge engineering, has led to a disruptive technology that is now revolutionising a vital Australian defence asset. The cryogenic sapphire clock, a University of Adelaide technology, offers a 1000-fold improvement in timing precision, which delivers an improved ability for Australian Defence to identify threats to Australia. The Sapphire Clock team – including Professor Andre Luiten³⁷, Director of the Institute for Photonics

for 3D printed Titanium components for civil aircrafts C919. In 2016, Amaero Engineering — **a spin-out company from Monash University's** innovation cluster – signed an agreement with Safran Power Units to print turbojet components for Safran, the French-based global aerospace and defence company, establishing a new manufacturing facility on the Safran Power Units site in Toulouse, France. Once Safran has tested and validated the components produced by the Amaero team, the factory will enter serial production, producing components that will eventually be assembled into auxiliary power units and turbojet engines for commercial and defence use.

³⁷ In May 2017, Professor Luiten and team were awarded the Barry Inglis Medal by the National Measurement Institute in recognition of their research into developing techniques for extremely precise and accurate measurement of time. In October 2018, the team was also awarded the Defence Science and Technology Eureka Prize for Outstanding Science in Safeguarding Australia.

and Advanced Sensing (IPAS) and Chair of Experimental Physics at the **University of Adelaide**, A/Professor John Hartnett, Adjunct Associate Lecturer at IPAS, and A/Professor Martin O'Connor – has developed a high-precision technology that generates signals of the ultimate purity. The Sapphire Clock is a cryogenic sapphire oscillator that allows time to be measured to the femtosecond scale (one quadrillionth of a second), with only a single second gained or lost every 40 million years. This accuracy is required for ultra-high precision measurements. The team is collaborating with the **Jindalee Over-The-Horizon Radar Network (JORN)**, a vital component of Australia's security that provides long-range, broad-scale and continuous surveillance. When applied to the JORN radar application it delivers a signal that is more than 1000 times purer than its existing approach, significantly enhancing its capability. Other potential applications include assisting astronomers to observe the most distant points in the universe and enabling the first quantum computers.

4. Engineering students David Mann, Elena Vella and Rowan Skewes from

The University of Melbourne have developed a drone able to recharge its batteries from powerlines via an induction loop, backed by Lockheed Martin's new STELaRLab advanced research centre. This has applications in the use of drones to survey powerlines, which currently costs some \$1 billion each year to carry out by helicopter. With drones able to grab a powerline and recharge whenever needed, surveying lines for faults and weak spots will be a fraction of the current cost. The new STELaRLab facilities, an outpost of Lockheed Martin's broader US research network was launched in 2016 with an investment of \$13 million.

5. The **University of Adelaide's** School of Computer Science, together with the Defence Systems Innovation Centre, has developed a complete System Execution Modelling (SEM) laboratory environment for the analysis of submarine combat systems. This collaboration will lead to major improvements in mission-critical system performance and design, which in turn will keep the Australian defence forces at the forefront of technological advances³⁸.

³⁸ <http://sainnovation.com.au/casestudy/mission-critical-systems/>

APPENDIX – BACKGROUND

6. **UNSW** has partnered with DST Group and the Royal Australian Air Force to rapidly develop Australia's space research and engineering capabilities. Buccaneer, a cubesat designed, built, launched and controlled in collaboration with DST Group, remains in orbit since its 2018 launch from Vandenberg Air Force Base in California. Buccaneer is helping to calibrate the Jindalee Over-The-Horizon Radar Network (JORN) and providing data and predictions on space object orbits. M1 was launched on a Falcon 9 rocket in Q4 2018 and was the first of four cubesats to be designed, built, launched and controlled in collaboration with RAAF. M2 is due for launch on a PSLV rocket in Q3 2019.
7. The **University of Western Australia (UWA)** has a digital twin of a submarine control room known as CRUSE which undertakes human factors studies. The UWA MicroElectronic Group have been awarded a Counter Improvised Threat Grand Challenge project under the Next Generation Technologies Fund that is integrating hyperspectral infrared sensors on a drone for detection scenarios.
8. The **University of Queensland** collaborates with DST on the Hypersonic International Flights Research Experimentation (HIFiRE) program to investigate the fundamental science of hypersonic technology and its potential for next generation aeronautical systems³⁹.

³⁹ <http://hypersonics.mechmining.uq.edu.au/hifire>



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
SYDNEY



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA



THE UNIVERSITY OF
SYDNEY