



Australian Government



DEFENCE INDUSTRY & INNOVATION



2017–18 Defence Industry and Innovation Programs Annual Report

DEFENCE INNOVATION HUB

CENTRE FOR DEFENCE INDUSTRY CAPABILITY

NEXT GENERATION TECHNOLOGIES FUND

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Department of Defence
Russell Offices, ACT 2600
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Australian Government

2017–18 Defence Industry and Innovation Programs Annual Report



Foreword



The Australian Government is transforming Defence industry and innovation and we intend to make the future vibrant and sustainable to ensure Australia's prosperity and security. As the Ministers for Defence and Defence Industry, we are committed to ensuring Australia is well-equipped to meet emerging regional and global threats, while maximising economic benefits through local industry and innovation.

Almost two years on since the launch of the Government's \$1.6 billion investment in programs to drive growth in the defence industry and innovation sector, the Centre for Defence Industry Capability, the Next Generation Technologies Fund and the Defence Innovation Hub are delivering results.

The support and opportunities available through these Defence industry and innovation programs are helping to enhance our Australian industrial base, and provide the confidence and certainty that businesses need in an environment of rapid technological transformation.

The Centre for Defence Industry Capability has expanded its services to help Australian

industry and has seen increasing demand for its innovation facilitation services. More than 1000 industry representatives attended seminars as an introduction to the defence market and more than \$1.1 million in Capability Improvement Grants were awarded. This year the Government further expanded the Global Supply Chain program with additional funding of \$3.2 million to help Australian small and medium enterprises access the supply chains of prime contractors. An additional \$4.1 million a year has been set aside for grants to build the capability of small and medium enterprises to compete internationally.

The Next Generation Technologies Fund has continued to build on its solid foundations. This year the Government announced the launch of the first Defence Cooperative Research Centre – a major investment of \$50 million over seven years to research, develop and deliver world-leading trusted autonomous technology for Defence.

The investments made by the Defence Innovation Hub in Australia's defence industry, primarily with small to medium enterprises, have helped these companies not only retain their existing workforce but also create new jobs. Australian innovators are putting in a tremendous effort to deliver innovation in Defence capability. The Hub has created a portfolio of investment directly linked to Defence's capability needs, which now includes projects under all six priority capability streams. Since launch, the Defence Innovation Hub has signed 63 contracts, with a total investment value of \$81.2 million.

We are confident that in the coming years we will see some of those innovations go into service with our Australian Defence Force and achieve success in the export market.

The Government is unlocking more jobs and investment in Australia's Defence sector, with the release of the Defence Export Strategy, Defence Industrial Capability Plan and identified priority sovereign industrial capabilities. All of these initiatives are working together to deliver defence capability and defence industry outcomes.

The Hon Christopher Pyne, MP
Minister for Defence

The National Innovation and Science Agenda is built on key pillars, including government as an exemplar. We are pleased to report on the Department of Defence's progress in driving innovation with these initiatives and congratulate Defence on all the work to date to undertake this transformation. We welcome this report on the progress of the Defence Industry and Innovation initiatives for the 2017-18 year and look forward to the continued success of the programs in enhancing Defence capability and building and sustaining the Australian defence industry.

The Hon Steven Ciobo, MP
Minister for Defence Industry

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Overview

This report follows the 2017 Defence Industry and Innovation Programs Update Report and is the first report delivered to Government by financial year.

The 2017–18 Defence Industry and Innovation Programs Annual Report covers the period 1 July 2017 to 30 June 2018. It reports on the performance of the Government’s defence industry and innovation initiatives:

- Next Generation Technologies Fund
- Defence Innovation Hub, and
- Centre for Defence Industry Capability.

Next Generation Technologies Fund

The Next Generation Technologies Fund is a forward-looking program focusing on research and development in emerging and future technologies. Launched in March 2017, it is designed to develop game-changing capabilities for Defence.

The initiative is funded at around \$730 million to 2025–26. It engages the Australian innovation sector—universities, research agencies and industry—to shape research programs that will turn ideas into science and technology with the potential to deliver game-changing capabilities for the ‘future force after next’.

Outcomes resulting from research conducted under the Next Generation Technologies Fund can be further explored and realised into capability through multiple avenues, including the Defence Innovation Hub.


Defence Innovation Hub

The Defence Innovation Hub was launched in December 2016 and is funded at \$640 million to 2025–26. It accepts proposals that are ready to enter the engineering and development stages of the innovation process, from concept exploration and technology demonstration to prototyping and integrated capability demonstration and evaluation.

The Defence Innovation Hub enables Defence, industry and research institutions to collaborate on innovative technologies that can be delivered as advanced capability for Defence.

Centre for Defence Industry Capability

The Centre for Defence Industry Capability (CDIC) is a cornerstone of the Government’s strategy for resetting the Defence-industry partnership, and supporting Australian industry to meet Defence’s current and future capability needs. The program is helping build a world-class, globally competitive and sustainable Australian industry as a fundamental input to capability.



The CDIC plays an important two-way enabling role between Defence and Australian industry, including through:

- tailored advisory services
- export and sector development initiatives
- funding for defence business development and skilling
- facilitating innovation proposals, and
- a national advisory network.

It combines the program delivery and industry expertise of the Department of Industry, Innovation and Science with strategic guidance from the Department of Defence, and the passion, skills and expertise of industry participants.

Facts and figures



1,200+ PROPOSALS RECEIVED FOR
DEFENCE INNOVATION PROGRAMS



650+ ADVISORY SERVICES
PROVIDED BY CDIC



\$154M + DEFENCE INNOVATION
CONTRACTS SIGNED



730+ ATTENDEES AT NEXT GENERATION
TECHNOLOGIES FUND EVENTS



\$1.1M + CAPABILITY IMPROVEMENT
GRANTS AWARDED



1,000 + ATTENDEES AT INTRODUCTION TO
DEFENCE INDUSTRY SEMINARS



\$1B + GLOBAL SUPPLY CHAIN
CONTRACTS AWARDED

Progress in 2017–18 – achieving the Government’s objectives

ENHANCING DEFENCE CAPABILITY THROUGH INNOVATION

The Next Generation Technologies Fund, Defence Innovation Hub and the Centre for Defence Industry Capability have transformed the way Defence approaches innovation. There are now better linkages between the innovative ideas in Australia’s industry and research sector with Australia’s defence capability needs.

Programs under the Next Generation Technologies Fund have matured with extensive engagement from Australia’s innovation community. Across the whole portfolio, more than 900 proposals have been received from Australia’s universities, publicly-funded research agencies and industrial entities, ranging from new start-ups to long-established defence primes.

Research projects have been established across each of the technology priority areas identified in the *2016 Defence Industry Policy Statement*. Defence partners under the Next Generation Technologies Fund now include organisations from every state and the Australian Capital Territory.

The Defence Cooperative Research Centre (CRC) for Trusted Autonomous Systems is a key highlight. Announced in December 2017 by the Minister for Defence Industry, the centre was registered as a company in February 2018. Defence is investing \$50 million in a seven year research program through this initiative.

Building on the solid foundation established to date, the Next Generation Technologies Fund will significantly expand in 2018–19 with greater partnering and more research projects. This includes establishing a major national research network to address Defence’s needs in quantum technologies, creating specific research projects within the Defence CRC for Trusted Autonomous Systems, and the next round of the Small Business Innovation Research for Defence program.

In 2017–18 the Defence Innovation Hub awarded 50 contracts with a combined investment value of around \$70.3 million. The Defence Innovation Hub supports Australian industry and research organisations, backs good ideas and provides the capital needed to further develop these into defence capability. More than 330 proposals were received from Australian innovators across all states and territories. Industry continues to respond well to Defence’s published innovation investment priorities (see pages 61–62), with more than 84% of proposals aligning to the top three priority streams.

The Defence Innovation Hub’s portfolio of investment is directly linked to Defence’s capability priorities. Investments made by the Hub now include projects under each of the six priority capability streams. During this period, the first Air and Sea Lift project commenced with an investment of around \$714,000 and an industry partner to design lightweight armour solutions for the Australian Defence Force (ADF) C-130J aircraft. The Defence Innovation Hub also concluded its trial of the Special Notice service offering. Three Special Notices were launched as pilots throughout the year and seven Special Notice contracts were signed.

Innovators working with Defence through the Defence Innovation Hub are developing cutting-edge and world-first technologies that will equip our warfighters with some of the most advanced capabilities. In 2018–19 the Defence Innovation Hub will continue to grow its investment portfolio to enhance defence capability in partnership with Australian industry and research organisations. The program will continue to mature with more projects advancing to the mature stages of technology development.

BUILDING THE CAPABILITY AND CAPACITY OF THE AUSTRALIAN DEFENCE INDUSTRY

The CDIC continued to undertake broad industry engagement activities throughout 2018, underscoring its reputation as ‘the front door’ for industry access to Defence and in response to the significant demand business.

A series of 16 ‘Introduction to the Defence Industry’ seminars were conducted for small to medium enterprises in all state and territory capitals and key regional centres between March and May 2018. More than 1000 businesses took part.

The CDIC supports eligible small and medium enterprises to improve their business capabilities, extend networks and take advantage of growth and collaboration opportunities within the sector. In 2017–18 the CDIC received 267 online applications for advisory services, of which 244 were approved and progressed to engagement planning with CDIC advisers.

Work has also continued to develop business skills in defence industry through Capability Improvement Grants. These grants have helped train engineers, purchase software-skilling systems, and develop management and marketing skills. The CDIC received 36 applications in 2017–18 for Capability Improvement Grants of which 34 were approved with a combined value of \$1.175 million.

Throughout 2017–18 the CDIC continued to support defence exports. Work continued with Defence primes and the Global Supply Chain (GSC) program to identify opportunities for Australian businesses within their international supply chains. GSC program outcomes reached \$1 billion during the year.

DRIVING COMPETITIVENESS AND EXPORT POTENTIAL

The Government aims to maximise opportunities for competitive Australian businesses, building export potential, depth of skills and diversification for the Australian defence industry.

In 2017–18 Defence launched a number of initiatives outlined in the *2016 Defence Industry Policy Statement* and policy initiatives to recognise defence industry as a fundamental input to capability. This included the release of the Defence Export Strategy and Defence Industrial Capability Plan, as well as the announcement of the Sovereign Industrial Capability Priorities.

The Government’s goal through the Defence Export Strategy is to:

- achieve greater export success, and
- build a stronger, more sustainable and more globally competitive Australian defence industry to support Australia’s Defence capability needs.

The strategy identifies key initiatives to achieve this goal and establish an export system that strikes the right balance between:

- Australia's foreign and strategic policy interests
- Defence's capability needs, and
- industry growth.

Progress has been made in implementing the strategy, including appointing Australia's first Defence Export Advocate, former Defence Minister and Senator the Honourable David Johnston, and the official opening of the Australian Defence Export Office on 23 April 2018.

The Defence Industrial Capability Plan was released in April 2018 and outlines the Government's vision for Australia's defence industry over the next decade: to build an innovative domestic defence industry that is better placed to help meet Defence's capability needs.

The plan identifies 10 initial Sovereign Industrial Capability Priorities—and details a Sovereign Industrial Capability Assessment Framework—to provide a top-down, strategy-led structure with a repeatable methodology to identify Sovereign Industrial Capability Priorities.

Major highlights

6 JULY 2017

The first Defence Cooperative Research Centre in Trusted Autonomous Systems is launched.



31 JULY 2017

Submissions close for the first Defence Innovation Hub Special Notice pilot, which challenges industry to develop a next generation deployable wireless environment.

7 AUGUST 2017

Submissions close for the second Defence Innovation Hub Special Notice pilot, which challenges industry to develop a portable small unmanned aerial system for the future.

14–18 AUGUST 2017

More than 500 visitors from industry, academia, government, the education sector and the scientific community attend Partnerships Week at Defence Science and Technology Group's Edinburgh site in Adelaide.



21 AUGUST 2017

Submissions open for the Defence Innovation Hub's Special Notice challenge for Army Innovation Day 2017.

4–8 SEPTEMBER 2017

Formation roadshows for the Defence Cooperative Research Centre in Trusted Autonomous Systems. Information sessions are held in every state capital, attracting 386 individuals from 164 organisations including industry, academia, research organisations and government.

30 OCTOBER 2017

The Australia–Israel Defence Industry Cooperation Memorandum of Understanding is signed, providing the framework to establish mutually beneficial cooperation on defence industry, including defence industry innovation.

6 NOVEMBER 2017

Army and the Defence Innovation Hub partner to deliver Army Innovation Day 2017. This enables industry to present capability options that could shape Army's approach to novel weapons and effects.

15 NOVEMBER 2017

The Defence Innovation Hub enters its largest contract to date with Daronmont Technologies. This \$8.6 million investment will build a prototype radar capability to replace existing technology approaching the end of its life.

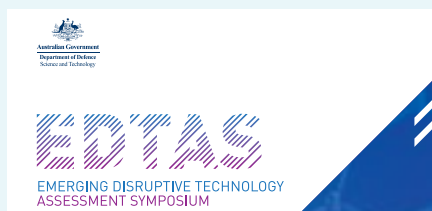
21 NOVEMBER 2017

A \$10 million investment in the Small Business Innovation Research for Defence program is announced under the Next Generation Technologies Fund. The initiative is designed to attract innovative research proposals from small companies.



28–29 NOVEMBER 2017

Defence joins with Noetic Group and Melbourne University to hold an Emerging and Disruptive Technology Assessment Symposium. Eighty delegates from Defence, industry and academia attended to consider advanced materials, manufacturing and industry in the year 2040.



6 DECEMBER 2017

The University of Tasmania is awarded \$3 million through the Next Generation Technologies Fund to collaborate with seven US universities on hydrodynamics under the US Multidisciplinary University Research Initiative.

14 DECEMBER 2017

The Formation Plan for the Defence Cooperative Research Centre for Trusted Autonomous Systems is approved.

20 DECEMBER 2017

The winners of the Grand Challenge to counter improvised threats are announced. A total of \$19 million was awarded for 13 collaborative proposals involving 20 universities and companies, and CSIRO.

25 JANUARY 2018

A \$6 million investment is announced through the Next Generation Technologies Fund to help develop quantum technologies for Defence.

28 FEBRUARY 2018

The Defence Cooperative Research Centre for Trusted Autonomous Systems is registered as a company.

20 MARCH 2018

The Annual Defence Materials Technology Centre conference is held. The Defence Innovation Hub funds DMTC at \$3 million per year until 2018–19.

6 MARCH – 15 MAY 2018

CDIC delivers the national seminar series, Introduction to the Defence Market.

11 APRIL 2018

The inaugural meeting of all participants in the Grand Challenge to counter improvised threats is held, marking the formal start of research activities.

17–19 APRIL

'Introduction to Defence Industry' seminars are held in Adelaide and Darwin for Indigenous businesses.

26 APRIL 2018

Minister for Defence Industry announces the achievement of over \$1 billion in Global Supply Chain Program contracts.

3 MAY 2018

Australian company Aerospace and Mechanical Consulting Engineers secures the Defence Innovation Hub's first contract under the Air and Sea Lift capability stream. It will design a lightweight armour solution for the ADF C-130J aircraft.

3–4 MAY 2018

Defence and the University of Adelaide partner to deliver the Emerging and Disruptive Technology Assessment Symposium. A total of 105 delegates attend to learn about human biotechnologies.

23 MAY 2018

Minister for Defence Industry launches the Defence Cooperative Research Centre for Trusted Autonomous Systems in Brisbane at the International Conference on Robotics and Automation.

**24 MAY 2018**

Two teams from four Australian universities are awarded \$6 million from the Next Generation Technologies Fund. Their joint research with US universities will cover priority Defence projects under the Australia–US Multidisciplinary University Research Initiative.

MAY 2018

The Defence Innovation Hub Special Notice service officially opens following successful pilots in 2017.

JUN 2018

Minister for Defence Industry announces that Defence Innovation Hub partner, Kord Defence, achieves export success with the US Marine Corps.

Next Generation Technologies Fund

The Next Generation Technologies Fund will create a research portfolio aligned with Defence priorities to deliver world-class science and technology capabilities.



Program performance for the Next Generation Technologies Fund is reported over the following pages. Strategic measures are reported qualitatively and supported by quantitative performance information. Since the 2017–18 financial year report overlaps with the already published 2017 calendar year report, there is an emphasis on reporting progress in the first half of 2018.

COLLABORATION

Expanded collaborations across industry, academia and publicly funded research organisations.

14

CASE STUDIES

How Australia's innovation system is being activated and engaged on Defence challenges.

18 21 22 25 32

BUILDING ENGAGEMENT WITH THE RESEARCH COMMUNITY

Exchanging information and building professional networks.

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PARTNER PROFILES

Investment with industry, academia and government.

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INVESTMENT PORTFOLIO VERSUS PRIORITY NEEDS

Portfolio investment profile and alignment to Defence priorities.

35

RESEARCH QUALITY PERFORMANCE ASSESSMENT

Quality assurance processes being developed.

50

Partnering with purpose – Driving change in delivering Defence strategic research

PROGRAM IMPACT

The Next Generation Technologies Fund is creating a research portfolio aligned with Defence priorities to deliver world-class science and technology capabilities.

Defence has implemented a unique operating framework for the Next Generation Technologies Fund. This framework has been used to establish major programs in 2017–18, demonstrating that it is capable of addressing a wide range of Defence’s science and technology challenges. Defence is poised to build on this foundation and expand the Next Generation Technologies Fund research portfolio at scale.

“The US Department of Defense Multidisciplinary University Research Initiative is enabling the University of Tasmania to deepen its engagement with world-leading US research institutions. Collaborations formed and research insights gained through this program will inform new technologies and approaches for design of the next generation naval platforms.”

PROFESSOR PAUL BRANDNER
CAVITATION RESEARCH LABORATORY,
AUSTRALIAN MARITIME COLLEGE

Through the Next Generation Technologies Fund, Defence is enabling new ways to bring together industry and academia to focus on major challenges. For example, in addressing the Grand Challenge to counter improvised threats, five teams featured university–industry partnerships involving four universities, seven small companies and one defence prime, all collaborating with Defence experts and scientists.

“It is a great way to harness the knowledge and experience that exists in industry and academia, and a great example of the collaboration between Defence organisations such as the Joint Counter Improvised Threats Taskforce and Defence Science and Technology.”

BRIGADIER JONATHON BEESLEY,
JOINT COUNTER IMPROVISED THREAT TASK FORCE

The Next Generation Technologies Fund is attracting partners that are new to each other and new to Defence. More than 70 of 215 proposals received to address the Grand Challenge to counter improvised threats were from applicants new to working with Defence.

ImeasureU is one of the new partners which is now leveraging its expertise from other areas to target Defence needs.

“We typically work with elite athletes with lower limb injuries. The war fighter is a form of elite athlete, just with a different type of application. It is a really good opportunity for us to expand our user base which is very exciting for us.”

MARK FINCH, IMEASUREU

The national research community is demonstrating a heightened awareness of Defence's research needs and the potential to engage as a longer-term, strategic Defence partner. For example some universities are tailoring research programs to align with Defence needs. Research partners are committing to innovative, high-risk programs which have strong potential to deliver very high capability pay-offs.

"I think it offers an opportunity to innovate: go for some of those high-risk, high reward concepts that might not be explored under traditional capability acquisition programs. This gives us the opportunity to think outside the box and see if it works. If it does, it will really change the way things are done."

DAMIEN CAHILL, DEFENDTEX

Through programs such as the Grand Challenge to counter improvised threats and the Defence CRC for Trusted Autonomous Systems, the Next Generation Technologies Fund is delivering on its promise to invest at scale, and maximising the potential of ambitious research programs to deliver on their potential.

"Defence has always leveraged the Australian science and technology community and our international partners to collaborate on smaller programs. But the newness here is in embracing the entire Australian science and technology community and focusing on solving a dedicated problem through the Grand Challenge."

OLAF REINHOLD,
PROGRAM LEADER COUNTER IMPROVISED THREATS

Collaborations under the Next Generation Technologies Fund

The Next Generation Technologies Fund expanded its collaborations significantly in 2017–18, building on foundational first-year partnerships and bringing together industry, academia and publicly-funded research organisations to work with Defence’s scientists.

Through an ongoing outreach program including national roadshows, Partnerships Week (now called SCIndicate) and visits to individual institutions, Defence continues to raise awareness of the Next Generation Technologies Fund and strengthen connections with the research community.

To address the full range of its science and technology challenges, Defence has developed an operating framework including:

- large-scale collaboration vehicles such as Grand Challenges
- medium-scale partnering arrangements such as university research networks, and
- lightweight technology acceleration mechanisms such as Small Business Innovation Research for Defence.

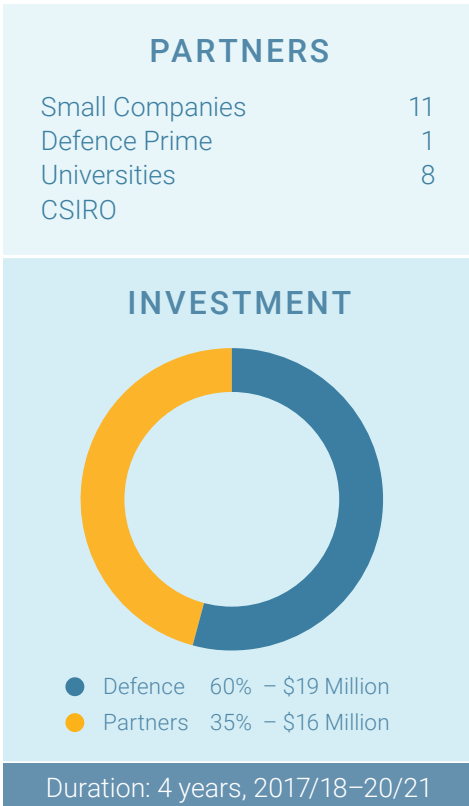
In the reporting period, the Next Generation Technologies Fund announced new partnerships with 14 Australian universities, 15 companies and CSIRO, in four primary streams of collaborative research:

- the Grand Challenge to counter improvised threats, in which Defence is partnering with 12 companies, eight universities and CSIRO
- the Defence Cooperative Research Centre for Trusted Autonomous Systems, with three foundation participants
- Australia–United States university research networks, under the Multidisciplinary University Research Initiative and the Australia–United States Multidisciplinary University Research Initiative, through which five Australian universities are partnering with 15 US academic institutions, and
- the Small Business Innovation Research for Defence pilot, where two small companies are collaborating with Defence to deliver a fight recorder prototype.

These new collaborations are in addition to those established in the first year of operation:

- the strategic cyber research partnership between Defence, Data61 (CSIRO) and 11 Australian universities
- the medical countermeasure products initiative under the Defence Materials Technology Centre, bringing Defence together with 17 industrial, academic and government organisations, including five new partners established this year, and
- exploratory research with 22 Australian universities to investigate Defence priority topics.

The Grand Challenge to counter improvised threats



Defence established the Grand Challenge to counter improvised threats to address this high-priority defence and national security problem.

The defeat of improvised threats is an internationally evolving challenge of critical importance to partner nations, driven by the complexity of threats and their rapid evolution. The approach has been to engage Australian innovation enterprises—including small companies, primes and universities—to develop technologies with the promise to provide significant advances beyond the current state of the art. A wide cross section of enterprises has been selected to participate, with expertise spanning a number of disciplines and research streams including novel sensor concepts for detecting improvised threats, innovative effectors to deal with detected threats, and cognitive algorithm development to match responses with targets.

Research topic	Partners
The application of biologically inspired acoustic sensor and algorithms to enable very long detection ranges, using electro-optical sensors, to detect and classify unmanned aerial vehicles (UAVs).	University of South Australia, Midspar Systems, Textron Systems and Lockheed Martin
Development of a lightweight fluorescence sensor to enable identification of trace-vapour-elements to detect explosives.	University of Queensland
Development of an algorithm using ground based radar and electro-optic sensor suite input for long range detection UAVs.	Teledyne Defence Australia
A deep learning neural network for automatic target recognition of person borne improvised explosive devices.	Teledyne Defence Australia
Using directed microwave energy to detect and defeat buried improvised explosive devices.	Tectonica Australia Pty Ltd and the University of Melbourne
Development of adaptive threat jammer technology for applications in radio-controlled IED defeat.	RFteq Pty Ltd and Consunet
Development of a mission system algorithm capable of pre-deployment intelligence preparation, asset planning and generation of weapon-target assignments using given sensors and effectors.	Lockheed Martin Australia, Consilium Technology and the University of Melbourne
An array of high energy lasers to defeat single or multiply IED threats.	L3 Micreo
Development of a portable sensing platform for rapid stand-off detection of chemical hazards and concealed explosives.	University of Queensland of Technology and Flinders University
Development of light weight payload imaging and infrared spectrometer for use on a UAV to detect and classify IEDs.	University of Western Australia, Scientific Aerospace and Panorama Synergy

Research topic**Partners**

Application of an up-conversion fluorescence sensor for real-time stand-off detection and classification of explosives.

University of Adelaide

Application of terahertz hyperspectral imaging sensor to detect explosives and concealed threats.

CSIRO and Wollongong University

The integration and development of a UAS to intercept and engage a threat UAS, using biological algorithms to detect, track and apply electro-magnetic pulse systems to counter the threat.

DefendTex Pty Ltd and University of Adelaide

Defence scientists and military operators are collaborating with these partners to assess emerging technologies against meaningful threats and environments, ensuring that research is innovative and will provide benefit to the warfighter.

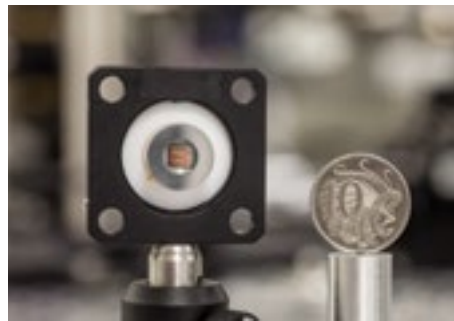
Research partners have commenced their activities, established performance measures and target milestones, undertaken literature

and knowledge surveys, and commenced testing and data collection for analysis to establish research foundations. A technical working group has been established with national and international subject matter experts. The group will guide the research program to achieve the Grand Challenge goals and advise Defence on the best transition paths as the science and technology matures.

CASE STUDY

Grand Challenge: WA partnership to counter improvised threats

The first Grand Challenge to counter improvised threats brought more than 20 partners together to work with Defence. Three of these joined forces in Western Australia after meeting at an information session in 2017. Led by the University of Western Australia (UWA), the team includes Scientific Aerospace and Panorama Synergy, two Perth-based tech companies working on precision sensing and long range UAVs.



Scientific Aerospace's quadcopter and camera system (left) and the University of Western Australia's infrared spectrometer sensor (right) will evolve into a drone-mounted spectrometer

The Grand Challenge program supports mission-directed collaborative research, tackling specific Defence problems which are ambitious, complex and of high priority. The first Grand Challenge is a problem of critical importance, with its scope and scale rapidly evolving.

Western Australia has a wealth of talented engineers and scientists who are invested in working in the defence industry. This was reflected in the turnout at an information session in Perth and the enthusiasm of participants involved in the challenge.

The challenge is an Improvised Explosive Device Detection System. Researchers are working to develop a novel hybrid UAV-mounted spectrometer which can detect long range threats, enhancing the safety of partner defence forces.

UWA is employing its Australian Nano Fabrication Facility to lead research into micro-engineering of the spectrometer's filter. Scientific Aerospace is contributing its

expertise by integrating the sensor, camera and rangefinder systems onto the UAV. Meanwhile Panorama Synergy is developing a control system and a calibration method for the tuneable filter.

UWA's Professor Lorenzo Faraone, who is the team lead, says this is the first time they have received a large amount of funding to develop new technology and capability for the ADF.

"What I find very exciting about the Next Generation Technologies Fund is that the level of funding is such that you can actually develop real technologies. In Australia in the past there hasn't been this level of funding to develop capability and technology that will be of strategic importance to Australia."

**PROFESSOR LORENZO FARAONE,
UNIVERSITY OF WESTERN AUSTRALIA**

The Defence Cooperative Research Centre for Trusted Autonomous Systems

FOUNDATION PARTICIPANTS

RMIT University
BAE Systems
Department of Defence

INVESTMENT

Defence: \$50 million
Partners: TBD

Duration: 7–10 years, 2017/18–26/27

The first Defence Cooperative Research Centre for Trusted Autonomous Systems (TAS-DCRC) has commenced operation. Headquartered in Brisbane, it will research, develop and deliver world-leading trusted autonomous technology for Defence.

It was registered as a company in February 2018 with foundation participants BAE Systems, RMIT University and the Department of Defence. The Commonwealth grant agreement committing \$50 million over a seven-year period was signed in March. The TAS-DCRC board has been formed, and all members appointed.

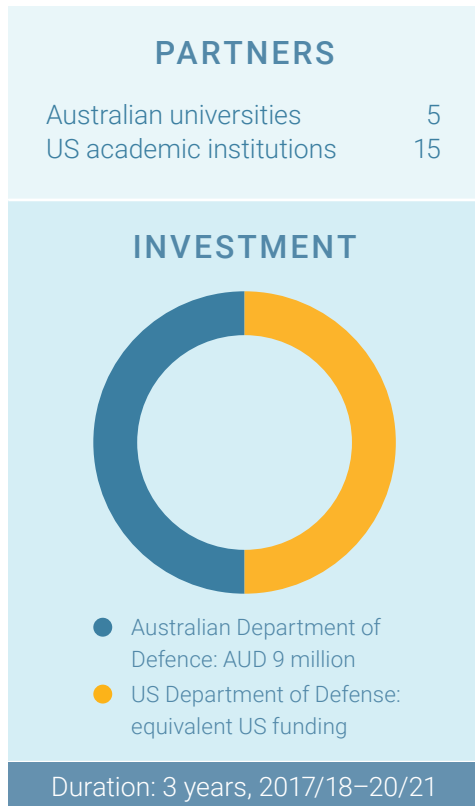
Through a series of workshops TAS-DCRC is engaging nationally and internationally to inform the research program and to share essential knowledge with the research community. The research program

workshops—which are addressing topics including maritime, land and aerospace domain autonomy—are attended by stakeholders from industry, academia and Defence, particularly capability managers or their representatives, as well as Defence’s own autonomous systems experts.

The knowledge-sharing workshops were held in June and had national and international academic engagement. Topics included ethical and legal aspects of trusted autonomous systems.

In parallel with the workshop series, some aspects of the technical program are initiating. TAS-DCRC is helping two small companies to prepare their first project proposals for presentation to the board. Preparation is also under way for Australian participation in major international interoperability trials. Known as ‘Autonomous Warrior’, this is an initiative of the five-nation Technical Cooperation Program (TTCP). Interoperability testing of autonomous technologies was completed with industry and TTCP partners in the lead-up to the Autonomous Warrior trials, which were to be held in Jervis Bay in November 2018.

Australia–United States university research networks



The 2016 Defence Industry Policy Statement confirms that, where appropriate, research should be undertaken in collaboration with Australia’s allies. In line with this guidance Defence has now invested \$9 million in three Australia–US strategic research collaborations under the Multidisciplinary University Research Initiative and the Australia–United States Multidisciplinary University Research Initiative, through the Next Generation Technologies Fund. As a consequence, five Australian universities are now partnering with a total of

15 US academic institutions in priority areas of research for Defence.

The Next Generation Technologies Fund has made a \$3 million, three-year investment to enable the University of Tasmania to partner with seven leading American universities on hydrodynamics research to improve the performance of Australia’s naval capability. Funding for the US universities was provided under the US Department of Defense’s Multidisciplinary University Research Initiative.

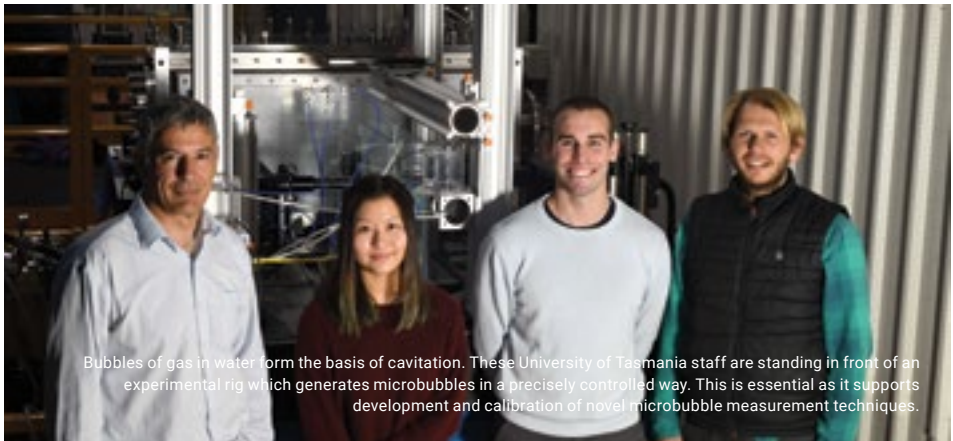
In May 2018 the Minister for Defence Industry announced a \$6 million investment in two projects under the Australia–United States Multidisciplinary University Research Initiative program. Griffith University, the University of New South Wales and the University of Technology Sydney, are now working with US partners including Duke University, the University of Oregon and the Massachusetts Institute of Technology on integrated quantum sensing and control. Sydney University and the University of New South Wales will partner with the University of Tennessee, and Ohio State University and Virginia Polytechnic Institute will work on a project in material sciences.

The selection process for the second round of the Australia–United States Multidisciplinary University Research Initiative is underway. The focal topic is ‘active perception and knowledge exploitation in navigation and spatial awareness’. This aligns with Next Generation Technologies Fund priority themes, including trusted autonomous systems, cyber and integrated intelligence, surveillance and reconnaissance (ISR).

CASE STUDY

Strategic research into naval hydrodynamics

Over the past decade, the University of Tasmania has been partnering with Defence's scientists to build a world-class capability for hydrodynamics research. Based in Launceston, this facility is now attracting partners from other leading international research institutions in the field. A centrepiece is a cavitation research laboratory which is unique in Australia and one of only a handful of such laboratories in the world.



Bubbles of gas in water form the basis of cavitation. These University of Tasmania staff are standing in front of an experimental rig which generates microbubbles in a precisely controlled way. This is essential as it supports development and calibration of novel microbubble measurement techniques.

Modern naval platforms rely on signature control, both to avoid detection by adversaries and to ensure their on-board sensors perform at optimal levels. Turbulent, bubbly and cavitating flows control signatures. These flows are scientifically challenging due to complex physics involving physical and temporal scales ranging from molecular through to ship or submarine sizes.

The Next Generation Technologies Fund has made a \$3 million, three year investment to enable the university to partner with American universities, whose funding was provided under the US Department of Defense's Multidisciplinary University Research Initiative. The project is called 'Predicting turbulent multi-phase flows with high fidelity: a physics-based approach' and partners include the University of Minnesota, University of California, California Institute of Technology, University of Iowa, University of Michigan, Johns Hopkins University and the Massachusetts Institute of Technology.

The project will engage a diverse range of disciplines to gain new insights into these flow phenomena. Computer based tools will be developed, underpinned by state of the art experiments carried out in the US and Australia. This work will lead the way for new technologies and approaches to design the next generation of naval platforms.

This project showcases a number of the positive attributes of Defence's innovation strategy. The Defence Industry Policy Statement states that, where appropriate, research should be undertaken in collaboration with Australia's allies. This is an excellent example of an instance where the aligned research capabilities of Australia and the United States can support a collaborative partnership to benefit both countries. It also shows that—with resourcing from an innovation fund such as the Next Generation Technologies Fund—Australian regional centres can very effectively support world-class research.

CASE STUDY

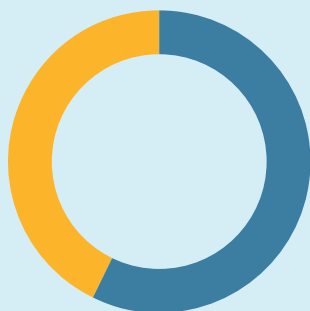
Defence brings together small businesses to improve warfighter protection

PARTNERS

2 small companies:

- IMeasureU
- Myriota

INVESTMENT



● Defence	\$750,000
● Partners	\$520,000

Duration: 2 years, 2017/18–18/19

Enhancing human performance is vital to maintain Defence's capability edge. Research questions critical to this field are being explored through the Small Business Innovation Research for Defence pilot under the Next Generation Technologies Fund.

Defence Science and Technology is famous for inventing the Black Box Flight Recorder. Given advances in technology, it is now viable to adapt the Black Box concept to support soldiers, much as the recorders support aircraft. The aim is to develop a wearable miniaturised data acquisition, analysis and recording device that can act as an emergency beacon if necessary. Defence recognises that there are small to medium enterprises with the bright ideas and skills necessary to bring this concept together into a practical system to benefit the war fighter. For this reason, Defence has two partners to explore the concept of a Fight Recorder.

A small firm in South Australia, Myriota, provides world-leading expertise in the field of low earth orbit satellite connection and the Internet of Things. The company is an ideal partner to develop the beacon element of the Fight Recorder.



"We were thrilled to be awarded the contract as a relatively new start up. Myriota will be hiring new people over the next one to two years. I think the fight recorder project is certainly helping with that. I think the more significant affect the project has had, has been supporting our case for private investment which is where the real jobs growth comes from."

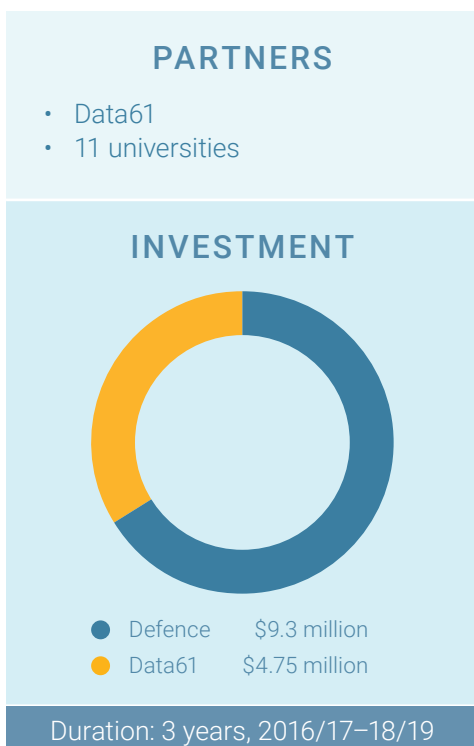
ALEX GRANT,
CHIEF EXECUTIVE OFFICER, MYRIOTA

Another small firm—iMeasureU from New Zealand—is a world leader in understanding which human performance measures will be required to implement the concept, and how to acquire the required data to achieve those measures. IMeasureU is developing the software that will deliver Fight Recorder's event reconstruction capability.

Field trials with military users are scheduled for late 2018 which will guide further refinement of Fight Recorder's design, and ensure the final research outcomes are the best possible fit to Defence's future capability needs.

These companies and their technologies illustrate that valuable innovation is happening around the country. Defence is capitalising on these opportunities from emerging technologies and combining them to address particular needs of Defence capability.

Data61 strategic partnership



Defence is investing in a strategic cyber partnership with Data61. Through this alliance Defence, Data61 and 11 Australian university partners are collaborating in a research program with four themes, and are leveraging university capabilities for greatest impact. The strategic partnership is strongly guided by the Defence White Paper and National Security strategies, and is well aligned with the overlapping priorities articulated in the Australian Government’s national Cyber Security Strategy. Defence’s research program extends from supporting strategic capabilities to supporting information warfare operations, including military platform cyber defence.

The cyber program has yielded substantial progress against aims in each of the foundational research themes. Nearly two dozen refereed publications have been submitted to scientific journals and conferences on a variety of cyber security applications of artificial intelligence, including machine learning, autonomy and knowledge representation. Defence awareness of the cyber security benefits achievable through emerging network technologies such as software defined networking (SDN) has been rapidly advanced by developing the experimental network architecture and analytics. A concept for a military communications system that exhibits enhanced robustness in a contested environment has been demonstrated, and is transitioning towards a prototype. Machine learning algorithms have also been demonstrated in high speed on field programmable gate array (FPGA) technology.

Complementing this scientific progress, the cyber program has also demonstrated success in growing national cyber capability. The program has sponsored a number of advanced cyber security ‘summer schools’ where leading international academics join Australian researchers in short, focused educational opportunities attended by Australian students. A developing community in cyber security science and technology received a boost through a Defence cyber research networking forum in November 2017.

Foundational research theme**University partners**

System design for resilience

Development of trustworthy systems from components that have mixed levels of trust; vulnerability discovery and mitigation; and technologies to assure mission continuity under cyber duress.

University of New South Wales
Australian National University
University of South Australia

Influence and analytics

Understanding the interaction between human and machine to achieve effective, resilient cyberspace operations; developing and applying new data science to analyse and reason about data in cyberspace.

University of South Australia
University of Sydney
University of Technology Sydney
University of Melbourne

Sensing to effects

Technologies for sensing cyberspace and for planning and achieving effects.

Macquarie University
University of Sydney
Australian National University

Autonomous cyber

Application of autonomous and automated approaches to augment human analytical and decision processes in cyber operations.

Swinburne University
University of Queensland

CASE STUDY

Revealing threats hidden in encrypted traffic

Whether messaging with friends, searching for a local restaurant or binge-watching Orange is the New Black, modern life has become heavily reliant on the internet. Encryption protects the privacy of our online activities from eavesdropping and—according to the Electronic Frontier Foundation—more than half of all web traffic is now encrypted. And this is expected to grow. The downside of encryption is that it is also capable of hiding the online activities of hackers and criminals intent on exploiting Defence networks and disrupting operations. The use of encryption in this way has accelerated sharply. Given this, how does Defence identify and protect itself from encrypted threats across a range of high-tech operational systems?



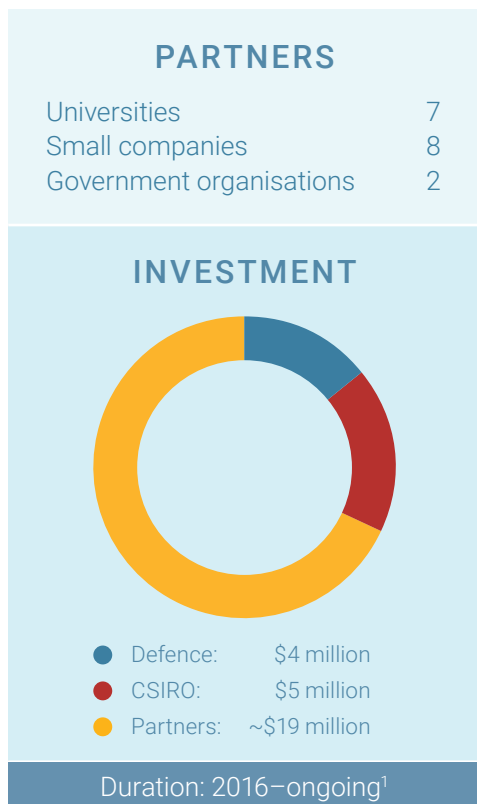
The broadly adopted practice of decrypting and re-encrypting traffic for inspection is not always practical and impacts the integrity of the encryption. However it isn't always necessary to have access to the content to know the purpose of a communication. There is substantial research demonstrating the success of various statistical and machine learning techniques which infer the likely intent of communications without examining content. Despite some laboratory-scale successes, many of these techniques make assumptions that limit their value in the real world.

Under the Defence and Data61 strategic partnership in cyber science and technology, the Deep Bypass project seeks to develop technologies to help Defence identify encrypted threats that overcome these flawed assumptions. The Deep Bypass project partners the complementary technical expertise of Defence's Data61's Networks Group, with world-renowned machine learning expertise in the University of Technology

Sydney and the University of Sydney, while providing a catalyst to engage postgraduate students. The project draws on the team's collective capabilities to develop an advanced sensor to classify communications which will apply to real-world communications networks.

In its first months the Deep Bypass project has already produced a prototype traffic classifier able to reveal when a device is streaming one of a known collection of YouTube videos over Wi-Fi. Streaming video produces very distinctive traffic patterns that are unaffected by encryption. The prototype exploits these patterns to identify known videos with an accuracy of 97%. While designed principally to stimulate collaboration, the prototype is a useful surrogate for identifying—through behavioural classification—the different communications types of interest to Defence, and accordingly will guide requirements for future project stages. Most significantly, the work illustrates the value of a collaborative and multi-disciplinary partnership.

Medical countermeasure products



Defence is working with 17 industrial, academic and government organisations in the medical countermeasure products collaboration. This was formed under the umbrella of the Defence Materials Technology Centre.

Five new partners have joined this year. The stakeholder group has a strong emphasis on defence and national health security outcomes, and includes senior representation from the departments of Defence, Health, and Industry, Innovation

¹ Funding for the two-year period 2016–17 to 2017–18.

and Science. In 2018 the head of the Indo–Pacific Health Security Initiative within the Department of Foreign Affairs and Trade joined the group.

The three priority research themes—antimicrobial resistance, point of care diagnostics, and security sensitive biological agents—remain the same. However additional areas of interest have grown to include malaria, dengue, orthopox and arboviruses. This year an additional \$2 million was contributed by Defence through the Next Generation Technologies Fund to grow the program. Each partner is also co-investing where they are project participants.

The investment from the Next Generation Technologies Fund is already contributing to promising early results in a range of key areas including diagnostic technology, vaccine and therapeutic research. For example:

- a new class of chemical compounds for treatment against biological threats has been developed in a project led by the University of Western Australia
- a multiplex diagnostic device has been developed for viral and bacterial pathogens in a project led by Lumos Diagnostics—a wholly owned subsidiary of Planet Innovation. The next stage of this project will commence in 2018–19, and
- new chemical coatings have been developed to adhere antibodies to sensors. The coatings have potential applications in a range of diagnostic technologies.

Leadership from the Surgeon General and Defence’s scientists—as well as productive collaboration with industry and academic partners—are key features of this program. As a

consequence, partners are now well-placed to explore the industrial potential of technologies already developed, and deliver benefit to both military and civilian populations.

The partners are collaborating around particular themes as shown below. Defence's scientists participate in all three of the research themes.

Research theme	Academic partners	Industrial and government partners
Antimicrobial resistance		
Developing broad spectrum vaccines and therapeutics for force protection and operational continuity.	University of Western Australia Peter Doherty Institute University of Melbourne University of Würzburg University of Queensland University of Adelaide	Dstl (UK) BioSparQ Neoculi Defence
Point of care diagnostics		
Compact, low-cost, robust, technologies to expedite clinical decision making, to reduce patient loss to follow-up while waiting for test results, and to facilitate the delivery of care in the field.	Deakin University Monash University	CSIRO MiniFab Planet Innovation Anteo Diagnostics Hydrix Trajan Scientific Australian Rickettsial Reference Laboratory Defence, BioSparQ
Security sensitive biological agents (SSBA)		
Developing therapeutics and SSBA vaccines to reduce mortality rates and adverse health impacts to the military and first responder (civilian) communities.	University of Western Australia University of Würzburg Peter Doherty Institute – University of Melbourne Deakin University	Planet Innovation Anteo Diagnostics CSIRO Dstl (UK) Defence

Building engagement with the research community

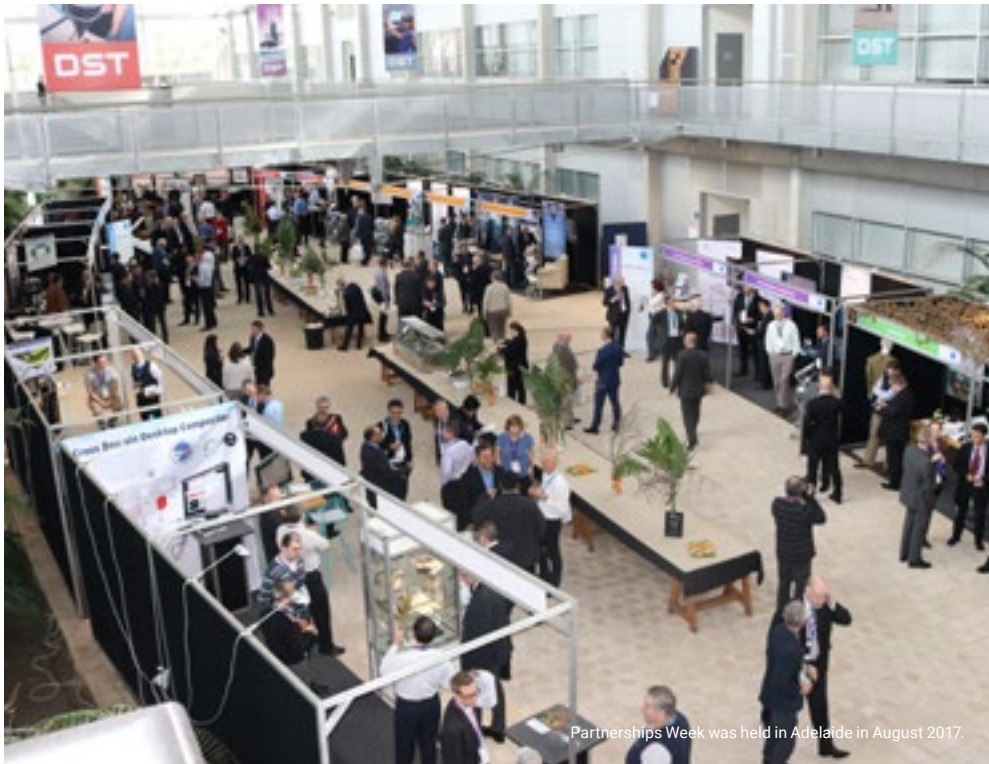
A series of forums, symposiums and workshops are being run under the Next Generation Technologies Fund to bring together Defence, small companies, defence primes, universities and government research organisations.

The goal is to exchange information and build professional networks. Participants are informed about Next Generation Technologies Fund programs and helped to explore collaboration and partnering opportunities. The Defence Innovation Portal has been an especially successful complement to these

initiatives to inform universities and industry about opportunities for engagement.

Highlights include:

- Partnerships Week, held at Defence Science and Technology's site in Adelaide in August 2017. This included the Small Business Innovation Research for Defence (SBIRD) workshop
- research community engagement leading up to the formation of the Defence CRC for Trusted Autonomous Systems, and
- two technology foresighting symposiums, which explored aspects of emerging and disruptive technologies and their value for Defence.



Partnerships Week was held in Adelaide in August 2017.



More than 500 visitors from industry, academia, government, the education sector and the scientific community attended Partnerships Week. Delegates participated in briefings, site tours, workshops, match-up sessions, industry pitches and networking opportunities over the course of the event. Speakers included:

- the CEO of DefendTex
- the CEO of the Precise Advanced Manufacturing Group, and
- the Deputy Vice Chancellor, Research and Innovation, from RMIT University.

The Deputy Vice Chancellor, External Relations and Strategic Projects, from the University of South Australia, provided insights into how better to engage with Defence.

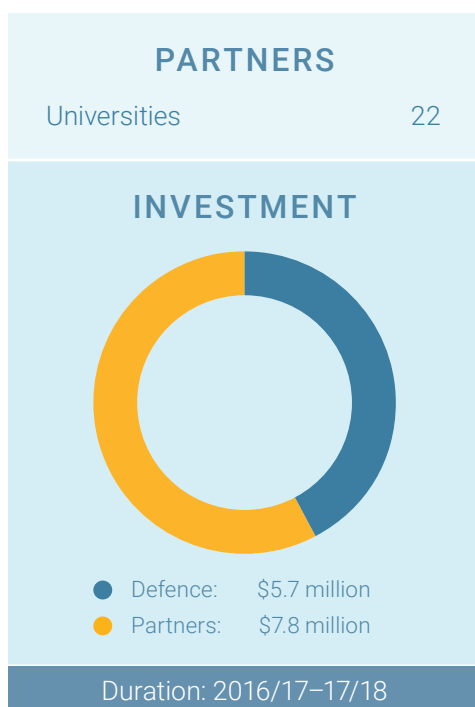
Potential applicants for the Next Generation Technologies Fund attended information sessions designed to help understand the broader partner engagement processes, what Defence is looking for, and the general characteristics of both successful and unsuccessful proposals. The aim was to help every applicant maximise the possibility of funding by preparing and submitting competitive proposals.

Events were also held on specific elements of the Next Generation Technologies Fund. For example, Small Business Innovation Research for Defence (SBIRD) workshops were held to brief participants on the program and explore concepts for possible future SBIRD calls. The workshops attracted 51 participants, including 26 representatives from small companies.

Industry, the research community and government responded enthusiastically to the first Defence CRC. Information sessions held across all states attracted:

- 386 attendees
- 100 expressions of interest from Australian universities, and
- 36 full proposals from Australian industry.

The Next Generation Technologies Fund is now establishing a national research network to address Defence interests in quantum technologies. The depth of research community engagement has resulted in a strong response to a call for proposals, and 80 submissions were received. The Quantum Technologies Research Network will commence in 2018–19.



Emerging and Disruptive Technology Assessment symposiums

The Emerging and Disruptive Technology Assessment Symposium (EDTAS) series is a key element of Defence’s horizon-scanning activity. The symposiums bring together internationally recognised thought leaders, Defence scientists, and other Defence groups and services to identify and explore potential game-changing technology.

Knowledge derived from the symposiums will help steer the evolution of the Next Generation Technologies Fund, ensuring the priority research being undertaken remains relevant throughout the program’s full 10-year life.

Emerging science and technology areas are studied to position Defence to exploit future opportunities as well as to prevent strategic surprise. For that reason, analyses consider how advancement of these technologies could realise critical Defence and national security capabilities, as well as result in emerging national threats to the nation’s security.

Combining the expertise of the broader science and technology community with Defence’s domain knowledge means the symposiums deliver an in-depth picture of future technologies and an understanding of their relevance to future Defence needs.

Defence scientists join with experts from academia and industry to consider how technological developments in human biotechnologies could be used in a 2040 timeframe

Two symposiums were conducted in the reporting period. Each comprised an open forum giving delegates relatively free reign to



Defence scientists join with experts from academia and industry to consider how technological developments in human biotechnologies could be used in a 2040 timeframe.

consider what form new technologies may take and what their impact may be. This was followed by a data distillation and analysis phase. Finally a restricted workshop was held during which a Defence and national security lens was cast on the results. The first symposium was held in Melbourne in

November 2017. This addressed advanced materials and manufacturing and was attended by 80 delegates from Defence, industry and academia. The second, held in Adelaide in May 2018, had 105 delegates and focused on human biotechnologies.

CASE STUDY

Emerging and Disruptive Technology Assessment Symposium: advanced materials and manufacturing

Advances in materials and manufacturing will have a profound effect on Defence and national security over the coming decades. Driven by the desire to continually seek lighter, stronger and more durable structures, new metals and alloys will be used in both Defence and non-Defence settings. Cheaper, energy-efficient production and manufacturing techniques will see increased use of specialised materials such as titanium and carbon fibre in many applications, and will also lead to the development of hybrid materials featuring embedded electronics and sensors. Additive manufacturing will also have important ramifications for the capability acquisition process of the ADF.

For example the ADF and Australian Defence industry could apply novel manufacturing techniques to achieve collaborative, rapid design and manufacture of next generation weapons, combat vehicles and other equipment. The ability to make small batches or even one-off products at low cost could revolutionise how the ADF acquires assets, allowing iterative improvements from one purchase unit to the next.

In November 2017 Defence joined with industry partner Noetic Group and academic partner Melbourne University to hold the Emerging and Disruptive Technologies Assessment Symposium on advanced materials and manufacturing. The task for the 80 delegates from Defence, industry and academia was to consider the impact of emerging materials and manufacturing technologies on society, industry and Defence in the 2040 timeframe. The format consisted of keynotes, panel speakers and supporting workshops across five defined themes:

- extreme environments
- unmanned vehicles
- stealth
- future sensors, and
- power generation, distribution and storage.



A follow-on workshop in February 2018 examined the potential military implications of these technologies. Seven key themes for advanced materials and manufacturing were identified through the EDTAS process:

- cross disciplinary teams for novel materials
- rapid modelling
- mass customisation
- sustainable manufacturing
- smart products
- the 'maker movement', and
- integrated computational materials engineering.

These themes highlight potential gaps in research, as well as opportunities for Defence. A big picture assessment report has been prepared on the workshop's outcomes to inform Defence's longer-term strategic planning.

Next Generation Technologies Fund operating framework

Defence has developed an operating framework for the Next Generation Technologies Fund. Its design was informed by successful research and innovation programs across the world, with the best being adapted to suit the Australian defence context.

The framework’s partnering options allow choice and flexibility in scale, and time-to-delivery for research program design—from ambitious Grand Challenges to lean and focused technology acceleration. This allows Defence to engage a range of research partners, individually or in teams, from start-ups to primes and national research organisations.

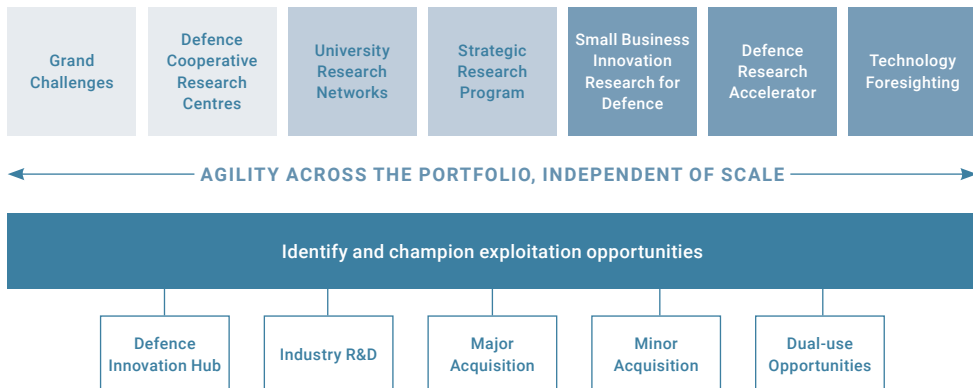
The science and technology priorities and challenges addressed through these collaborative vehicles are continuously informed by investigations on emerging technology and technology foresighting.

Partnerships and collaboration vehicles include:

- Grand Challenges
- Defence Cooperative Research Centres
- University Research Networks
- Strategic Research Programs
- Small Business Innovation Research for Defence, and
- Defence participation in national technology accelerator programs.

GRAND CHALLENGES

Grand Challenges provide the scale and intensity required to tackle formidable challenges which have no simple solutions. The design of the Grand Challenge program has been influenced by the US Defence Advanced Research Projects Agency (DARPA), Grand Challenges Canada, and the Bill and Melinda Gates Foundation. Participation by academic institutions, publicly funded research agencies, small agile companies, larger defence primes, and Defence itself, is essential to ensure optimal outcome delivery.



DEFENCE COOPERATIVE RESEARCH CENTRES

Defence Cooperative Research Centres (Defence CRCs) are Defence-led, industry-delivered collaborative programs, which draw on the leading national research capabilities of universities, industry and publicly funded research agencies. This program builds on the successful national CRC model with some modification in that it has a mission-driven focus. Each Defence CRC has specific goals and objectives that align with Defence needs. Research projects are only supported if they have an identified pathway for adoption by Defence.

As with the other Next Generation Technologies Fund programs, Defence CRCs improve the research skills and capabilities of participants and increase small company engagement in collaborative research. The goal is to make the Australian defence industry more efficient, productive and competitively priced.

UNIVERSITY RESEARCH NETWORKS

The Next Generation Technologies Fund is shaping the national innovation enterprise into targeted university research networks. It is advancing cross-disciplinary research and building academic communities across Australia and around the world. Built on open partnerships and mutual investment in the academic domain, these networks provide a robust mechanism to bring leading research teams together to address defence priorities with a strategic focus led by Defence. Defence benefits from enhanced access to Australia's leading academic expertise, while universities gain access to Defence scientists and specialist facilities to contribute directly to future ADF capability.

Initiatives include the Australia–United States Multidisciplinary University Research Initiative and state-based university research networks.

The Australia–United States Multidisciplinary University Research Initiative enables Australian and US universities to partner in an existing US program (the Multidisciplinary University Research Initiative (MURI)) and undertake research on focused topics of high priority for the future defence capabilities of both countries.

It helps Australian researchers to remain in-country and develop capability in key areas of science, while at the same time benefitting from working with the best US universities.

The Next Generation Technologies Fund is for Australian universities only, while the US Department of Defense provides funding to participating US research institutions, promising a valuable return on Australia's investment.

State-based university research networks are also bringing academics and Defence scientists together to collaborate on future game-changing technologies. The networks are co-funded by state governments and build on the success of the Defence Science Institute (DSI) model established in Victoria. The Defence Innovation Partnerships network has been established in South Australia, and a similar network has been established in New South Wales.

STRATEGIC RESEARCH PROGRAM

Where initial investigation of a new concept or technology shows the potential for disruption, the research activity may be scaled up and further focused to develop technology of particular importance for Defence, drawing on partners from across the innovation enterprise.

SMALL BUSINESS INNOVATION RESEARCH FOR DEFENCE (SBIRD)

The SBIRD program is modelled on international initiatives such as the long-standing and successful Small Business Innovation Research program in the US and the Small Business Research Initiative in the UK. SBIRD enables small business to conduct early stage, high-risk, high payoff research with the potential to mature into Defence capability. Funded activities run in two stages:

- researching the feasibility of a potential Defence technology over a six to nine month period, and
- evaluating the technology in the context of the specific Defence application. Promising results are evaluated for transition through the Defence Innovation Hub.

DEFENCE ACCELERATOR PROGRAM

A new generation of innovators is developing breakthrough products without the huge capital cost traditionally required for cutting-edge research and development. This agile approach leads to technology disruption, where inventions of new processes, products or systems are rapidly developed and applied to known problems in unexpected ways. Bringing this inventive approach to the market

for Defence and national security products improves capability outcomes. This program works with existing accelerators within the national innovation system, such as CSIRO's ON Prime program which supports the start-up community with an interest in Defence.

TECHNOLOGY FORESIGHTING

Defence conducts ongoing horizon-scanning to inform the science and technology priorities addressed by the Next Generation Technologies Fund. The purpose is to understand emerging science and technology areas across a broad spectrum over a 10 to 20 year span.

Investment portfolio versus priority needs

Through the Next Generation Technologies Fund, Defence is continuing to build a portfolio of research with investment in all science and technology areas agreed as priorities for Defence. These priorities are shaped by:

- technology foresighting as part of the annual Force Design process
- assessments of emerging threats, and
- the strategic directions set out by the chiefs of service in their long-term planning documents.



The identified priorities currently remain as stated in the 2016 Defence Industry Policy Statement.

The cumulative investment made² in each priority technology area is shown below as a percentage of the total investment made to the end of the reporting period. The Grand

Challenge to counter improvised threats is represented independently from the technology priorities.

The cost of delivering and assuring the Next Generation Technologies remains within 5% of overall funding.



● Trusted Autonomous Systems	51%	● Advanced Sensors	3%
● Counter-Improvised Threats	20%	● Quantum Technologies	3%
● Cyber	6%	● Enhanced Human Performance	1%
● Medical Countermeasure	6%	● Integrated ISR	0.5%
● Hypersonics	5%	● Space Capabilities	0.4%
● Multidisciplinary Material Sciences	4%	● Directed Energy Systems	0.2%

² 'Investments made' captures only the initiatives where agreements are fully executed.

FACTORS SHAPING THE INVESTMENT PROFILE

At any given time the scale of investment in a particular technology area depends on the:

- capacity of the national innovation system to undertake world-class research in that field, and
- maturity of Defence's understanding of the scope and potential of a targeted research program.

Each investment is shaped through the lens of one or more of the Next Generation Technologies Fund collaboration vehicles.

Major investments (\$5 to \$10 million per annum) have been made in the Defence CRC for Trusted Autonomous Systems and the Grand Challenge to counter improvised threats. The very broad application and potential impact of the investment in autonomous systems drove its selection as a Defence CRC. The focus on 'trust' in trusted autonomous systems originated from workshops with operational forces. These covered some of the challenges in creating autonomous systems which have military utility. The complexity and urgency of the impact of improvised threats in complex operational environments was another key to its selection as the initial Grand Challenge.

Mid-scale investments (\$1 to \$5 million per annum) have been made in:

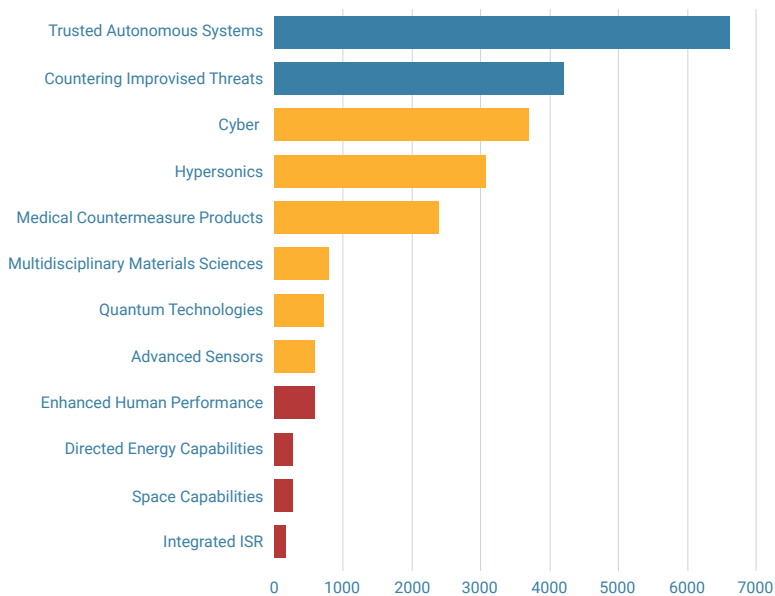
- cyber, through the Data61 partnership and hypersonics
- medical countermeasure products in partnership with the Defence Materials Technology Centre

- multi-disciplinary material sciences and quantum technologies through the Australia–United States Multidisciplinary University Research Initiative, and
- advanced sensors (hydrodynamics) through the Multidisciplinary University Research Initiative.

Defence has built these substantial research programs quickly:

- through strategic partnerships with Data61 (CSIRO) in cyber
- with CSIRO and others in medical countermeasure products, and
- by implementing the Australia–United States Multidisciplinary University Research Initiative to support Australian participation in its existing US Multidisciplinary University Research Initiative.

Smaller investments (< \$1 million per annum) have been made in collaborative research with Australian universities and in program development. Universities were selected competitively to conduct a broad range of investigative research aligned with Defence priority technology areas. It is anticipated that some of this research will become the basis of greater investment in the future as the potential for disruption or game-changing capability is revealed. Benefits should also be realised through cross-disciplinary approaches combining some of these areas of research.



Average investment per year in technology priority areas (\$k)

INVESTMENT IN TECHNOLOGY PRIORITY AREAS

The scale and nature of each initiative is a consequence of the investment context outlined above, taking into account, for example, the:

- partnering goals
- maturity of Defence’s understanding of the research needed in each area, and

- research community’s readiness to participate.

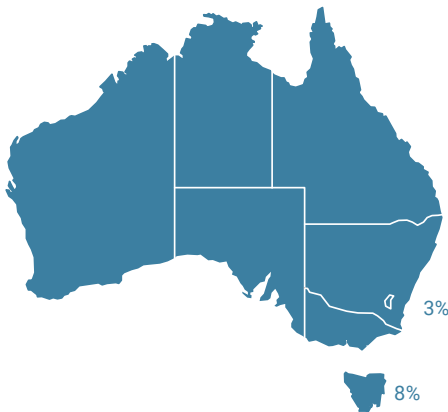
The Next Generation Technologies Fund initiatives underway are mapped into the Defence science and technology priority areas on the table that follows.

Research theme	Summary of investment
Cyber	<p>A strategic partnership with Data61 (CSIRO) and 11 universities covering the following themes:</p> <ul style="list-style-type: none"> • system design for resilience • data analytics • autonomous cyber, and • sensing to effects. <p>This core element of the cyber portfolio is supplemented through exploratory research with five universities to assess the range of topics of interest to Defence.</p> <p>The Grand Challenge to counter improvised threats includes aspects of cyber research.</p>
Space capabilities	<p>Exploratory research collaborating with three universities and one small company in aspects of domain awareness and precision tracking.</p>
Advanced sensors	<p>University of Tasmania research collaboration on hydrodynamics under the US Multi-disciplinary University Research Initiative with US universities.</p> <p>Research collaborations are also in place with four universities to investigate the potential of novel sensor systems, ranging from bacterial to fibre optic and radiation-sensitive sensors.</p> <p>The Grand Challenge to counter improvised threats includes research in advanced sensing.</p>
Hypersonics	<p>Collaborative research to understand the science behind hypersonic flight – including propulsion – flight dynamics, control surfaces and materials that support flight systems.</p> <p>Hypersonic flight trials.</p>
Directed energy capabilities	<p>Exploratory research collaborating with two small companies and one university in aspects of advanced laser systems.</p>
Quantum technologies	<p>Investment through the Australia–United States Multidisciplinary University Research Initiative at Griffith University, the University of New South Wales and the University of Technology Sydney to address Multidisciplinary University Research Initiative topic 1: integrated quantum sensing and control.</p> <p>Quantum research collaborations with three universities. Areas include precision sensing, navigation and timing, and communication and information.</p>

Research theme	Summary of investment
Integrated ISR	<p>Exploratory research collaborations with four universities on aspects of surveillance and target recognition.</p> <p>Scoping study with University of Melbourne for a new area of research: multi-function antenna.</p> <p>Scoping new developments in integrated ISR as part of the Grand Challenge to counter improvised threats.</p>
Trusted autonomous systems	<p>Establishing the first Defence CRC for trusted autonomous systems.</p> <p>Undertaking collaborative research with nine universities in machine cognition, persistent autonomy and human/autonomy integration.</p>
Enhanced human performance	<p>Pilot SBIRD initiative to develop the Fight Recorder concept. Two partner companies have been selected: Myriota and IMeasureU.</p> <p>Exploratory research collaborating with four universities to conduct research in virtual reality and operator workload.</p> <p>A technology foresighting symposium was held in May 2018 on human biotechnologies.</p>
Medical countermeasure products	<p>Collaborating with 17 industry, academic and government organisations through the Defence Materials Technology Centre to examine:</p> <ul style="list-style-type: none"> • antimicrobial resistance • point of care diagnostics, and • security sensitive biological agents. <p>A technology foresighting symposium held in May 2018 addressed human biotechnologies.</p>
Multidisciplinary material sciences	<p>Investment through the Australia–United States Multidisciplinary University Research Initiative in 2017–18 in Sydney University and the University of New South Wales addressing Multidisciplinary University Research Initiative topic 22: Material defect identification for metallic additive manufacturing.</p> <p>Collaborative research with seven universities in advanced multidisciplinary material sciences such as metamaterials. This is contributing to the knowledge base for new Defence capability in areas including active camouflage, ballistic protection and power and energy sources.</p> <p>A technology foresighting symposium held in November 2017 addressed the topic of advanced manufacturing and materials.</p>

Partner profiles

To deliver the Next Generation Technologies Fund over its 10-year lifetime, Defence is establishing a wide variety of enduring research partnerships to develop the disruptive technologies needed to provide future Defence capabilities. During the reporting period these partnerships have grown in number and profile, with 24 Australian universities, 17 companies and CSIRO as lead partners in Next Generation Technologies Fund projects, across all states and the Australian Capital Territory.



Distribution of Next Generation Technologies Fund investments

New initiatives such as the Grand Challenge to counter improvised threats and the Small Business Innovation Research for Defence (SBIRD) pilot have brought with them 14 companies new to the Next Generation Technologies Fund. These are diverse in their technology expertise and size, ranging from micro-businesses with less than five employees to established defence primes. They include companies entirely new to Defence business, such as RFTeq (Grand Challenge) and IMeasureU (SBIRD).

For a number of universities, partnerships have grown in depth and breadth through larger investments from the Multidisciplinary University Research Initiative and the Australia–United States Multidisciplinary University Research Initiative, through which five Australian universities are partnering with 15 US academic institutions.

Similarly, the Grand Challenge to counter improvised threats is extending investment in and expanding the research profile of eight Australian universities to address the Grand Challenge in collaboration with their industry partners.

The National Innovation and Science Agenda noted that, relative to many of its OECD peers, Australia ranked poorly in terms of levels of industry–research collaboration. The Next Generation Technologies Fund is one of a raft of Government initiatives which is redressing this national performance shortfall. Teaming arrangements established under the Grand Challenge to counter improvised threats and through the medical countermeasure products initiative with the Defence Materials Technology Centre are making a positive contribution to the national profile of industry–university collaboration. This will grow rapidly as other initiatives are launched and mature, such as the Defence CRC for Trusted Autonomous Systems.

UNIVERSITY PARTNERS

Next Generation Technologies Fund partnerships with Australian universities are varied in scale and breadth. Total awards made to individual universities since the launch of the Next Generation Technologies Fund range from less than \$100,000 to more than \$4 million. Eight universities have been awarded \$1 million to \$5 million,³ two universities have received

³ Either as sole recipients or as leads where awards have been made to teams.

\$500,000 to \$1 million, and the remaining 14 received less than \$500,000.

Factors which have contributed to this variation include the breadth and depth of a university's engagement with Defence and the degree of alignment that a university's research capabilities have with priority Defence research themes. Working from a position of impartiality, Defence is taking steps to ensure all universities that aspire to be partners under the Next Generation Technologies Fund can be competitive bidders. Every university with Defence interests has been assigned a senior Defence scientist to provide direct support as a science and technology partnership manager. University-specific resources are also being developed to help each university apply to Next Generation Technologies Fund initiatives.

Victoria, South Australia and New South Wales have established institutes to encourage university-based, defence research. Defence recognises the value of these state-based institutions in developing a truly national defence research enterprise, with support provided through the Next Generation Technologies Fund.

The following summary profile of each university's cumulative engagement in the Next Generation Technologies Fund portfolio also details the support for state-based Defence science institutes. Projects and funding are associated with lead university partners only: in some cases, other universities are receiving a share of the funding through collaborative arrangements.

Partner university	Priority technology areas	Number of projects	Defence investment
Australian National University	Exploratory research in quantum technologies and trusted autonomous systems Participant in the Data61 strategic partnership (cyber)	5	\$869,000
Curtin University	Exploratory research in space capabilities	1	\$85,000
Deakin University	Exploratory research in enhanced human performance	4	\$349,000
Edith Cowan University	Exploratory research in cyber	2	\$197,000
Flinders University	Exploratory research in advanced sensors	1	\$100,000
Griffith University	Exploratory research in trusted autonomous systems Australia–United States Multidisciplinary University Research Initiative lead in Quantum Technologies	2	\$3,097,500

Partner university	Priority technology areas	Number of projects	Defence investment
La Trobe University	Exploratory research in advanced sensors Further research agreement in medical countermeasures	2	\$211,000
Macquarie University	Exploratory research in directed energy capabilities Participant in the Data61 strategic partnership (cyber)	2	\$239,000
Monash University	Exploratory research in multidisciplinary material sciences	1	\$100,000
University of Newcastle	Exploratory research in trusted autonomous systems	1	\$99,500
Queensland University of Technology	Exploratory research in multidisciplinary material sciences and integrated ISR	2	\$199,500
RMIT	Exploratory research in enhanced human performance, multidisciplinary material sciences, and trusted autonomous systems	7	\$642,000
Swinburne University	Exploratory research in cyber Participant in the Data61 strategic partnership (cyber)	2	\$160,000
University of Adelaide	Exploratory research in advanced sensors, cyber, integrated ISR, and multidisciplinary material sciences Trusted autonomous systems Participant in the Data61 strategic partnership (cyber) Further research agreements in medical countermeasure products and advanced sensors Grand Challenge to counter improvised threats lead	16	\$2,114,500
University of Melbourne	Exploratory research in cyber, enhanced human performance, multidisciplinary material sciences, and trusted autonomous systems Participant in the Data61 strategic partnership (cyber) Participant in medical countermeasure products	11	\$1,030,000

Partner university	Priority technology areas	Number of projects	Defence investment
University of Queensland	Exploratory research in quantum technologies Participant in the hypersonics research program Participant in the Data61 strategic partnership (cyber) Grand Challenge to counter improvised threats lead	6	\$4,376,000
University of South Australia	Exploratory research in cyber, space capabilities, and trusted autonomous systems Chair for the Defence CRC in Trusted Autonomous Systems Investigation supporting early stages of the Grand Challenge to counter improvised threats Participant in the Data61 strategic partnership (cyber)	8	\$1,500,000
University of Sydney	Exploratory research in advanced sensors, multidisciplinary material sciences, and trusted autonomous systems Participant in the Data61 strategic partnership (cyber) Australia–United States Multidisciplinary University Research Initiative lead in multidisciplinary material sciences	6	\$3,446,000
University of Tasmania	Exploratory research in enhanced human performance Multidisciplinary University Research Initiative lead in hydrodynamics (advanced sensors)	1	\$3,097,000
University of Western Australia	Participant in medical countermeasure products Grand Challenge to counter improvised threats lead	2	
University of Western Sydney	Exploratory research in space capabilities	1	\$100,000
University of New South Wales	Participant in the Data61 strategic partnership (cyber)	2	\$170,000
University of New South Wales, Canberra (ADFA)	Exploratory research in cyber, integrated ISR, quantum technologies, and trusted autonomous systems	5	\$420,000

Partner university	Priority technology areas	Number of projects	Defence investment
University of Wollongong	Exploratory research in multidisciplinary material sciences Further research agreement in advanced sensors	2	\$308,000
State-based research institutes Defence Science Institute – Victoria Defence Innovation Partnership – South Australia Defence Innovation Network – New South Wales	Funding to support development of defence-related university research in respective states	N/A	\$902,000

Industry engagement in the Next Generation Technologies Fund

The Next Generation Technologies Fund is supporting defence innovation research across the broad spectrum of industrial entities. Partners include every category of business, ranging from small businesses with

less than five employees to the Australian branches of defence primes. In line with guidance from the *2016 Defence Industry Policy Statement*, emphasis has been placed on building collaborative programs with small to medium enterprises.

A summary profile of each industry partner's engagement in the Next Generation Technologies Fund is given below. Projects and funding are associated with lead partners only.

SMALL COMPANIES (ONE TO 19 EMPLOYEES)

Industry partner	Priority technology areas	Number of projects	Defence investment
Aether Photonics	Directed energy systems	1	\$72,000
L3 Microe	Grand Challenge to counter improvised threats	1	\$1,056,000
Myriota	Enhanced human performance SBIRD Space capabilities	2	\$580,000
RFTeq	Grand Challenge to counter improvised threats	1	\$2,360,000
IMeasureU	Enhanced human performance SBIRD	1	\$298,000
Solinov	Trusted autonomous systems	1	\$180,000
Teledyne Defence	Grand Challenge to counter improvised threats	2	\$803,000
Australian Rickettsial Reference Lab	Medical countermeasure products	1	\$150,000

MEDIUM-SIZED COMPANIES (20 TO 199 EMPLOYEES)

Industry partner	Priority technology areas	Number of projects	Defence investment
DefendTex	Grand Challenge to counter improvised threats	1	\$1,224,000
Lucigen	Medical countermeasure products	1	\$45,000
MiniFAB	Medical countermeasure products	1	\$600,000
Tectonica	Grand Challenge to counter improvised threats	1	\$1,848,000
Hydrix	Medical countermeasure products	1	\$70,000

LARGE COMPANIES (OVER 200 EMPLOYEES)

Industry partner	Priority technology areas	Number of projects	Defence investment
Certara	Medical countermeasure products Australian capability audit	1	\$300,000
Lockheed Martin Australia (STELaRLab)	Grand Challenge to counter improvised threats	1	\$497,000
Planet Innovation	Medical countermeasure products	1	\$280,000
Bio21	Medical countermeasure products	1	\$70,000

PUBLICLY-FUNDED RESEARCH AGENCIES

The Next Generation Technologies Fund is leveraging the expertise of Australia’s national science agency, CSIRO, in a range of science domains and a variety of programs. CSIRO is a strategic partner and co-investor in two major multi-year initiatives:

- the research program in the domain of medical countermeasure products, conducted through the Defence Materials Technology Centre, and
- a partnership in cyber with Data61.

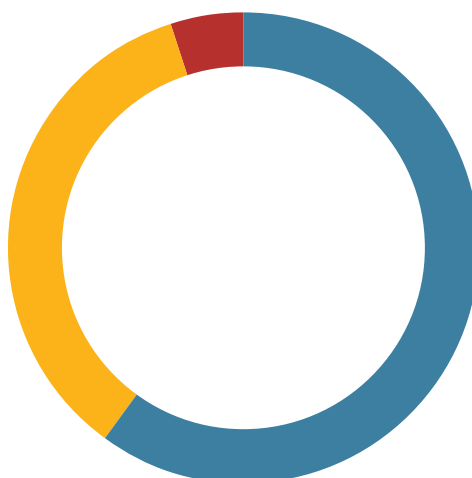
As a component of the Next Generation Technologies Fund technology acceleration program, Defence is collaborating with CSIRO to run a defence-oriented stream in the NISA-funded national technology accelerator On Prime. This will give researchers a unique opportunity to fast-track their science or technology proposition with expert guidance from experienced innovators.

Working with Wollongong University, CSIRO has been funded to deliver hyperspectral imaging technology under the Grand Challenge to counter improvised threats.

Priority technology areas	Defence investment
Grand Challenge to counter improvised threats	\$1,614,000

Funding distribution by organisation type

At the conclusion of the reporting period, 35% of all investments made since launch have been with industry partners, 60% with universities and 5% with publicly funded research agencies. These figures will continue to change significantly once projects under the Defence CRC in Trusted Autonomous Systems are initiated, and further large-scale, multi-party investments are confirmed.

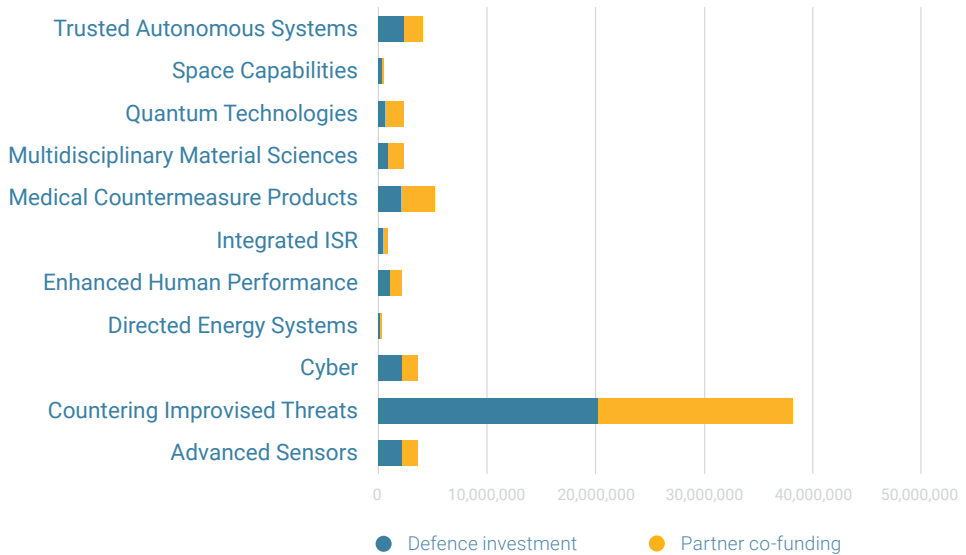


Universities	60%
Industry Partners	35%
Research Agencies	5%

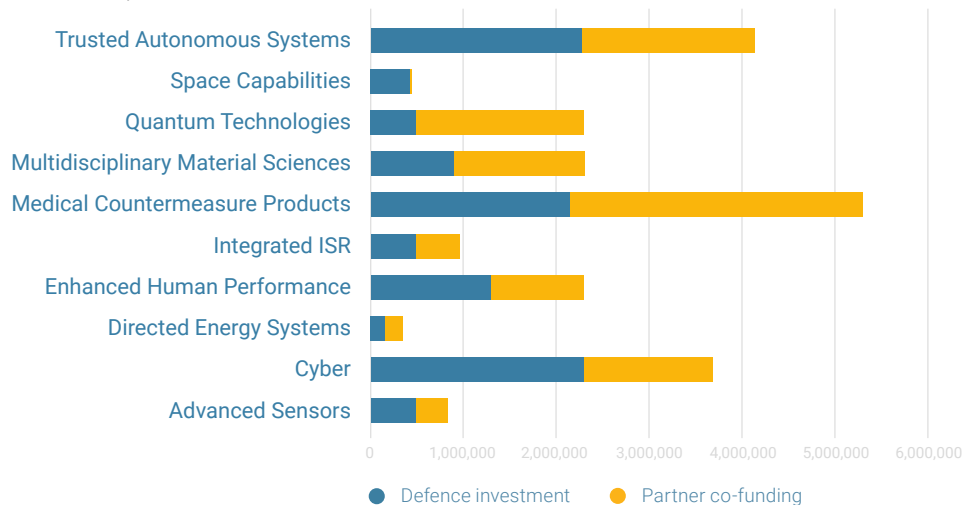
PARTNER CO-INVESTMENT

Across the Next Generation Technologies Fund portfolio, the ratio of Defence investment to indicated partner co-investment⁴ is 49:51. The ratio of Defence investment to partner co-investment across technology priority areas is shown below.

With counter improvised threats



Without counter improvised threats



⁴ Partner co-funding includes cash and in-kind.

Research quality performance assessment

The *2016 Defence Industry Policy Statement* clearly articulates how Defence's new innovation initiatives, including the Next Generation Technologies Fund, must be established. The policy states that Defence will systematically remove barriers to innovation by changing both its culture and its business processes.

In the case of the Next Generation Technologies Fund, Defence Science and Technology Group was charged with delivering a program of high-quality research, featuring collaborations across the full span of Australia's innovation enterprises and with our allies. Defence Science and Technology Group has delivered on that charge—the program is now fully operational with commitments to date of more than \$100 million to support collaborative research. This includes across every one of the inaugural priority areas identified in the *2016 Defence Industry Policy Statement*.

The Next Generation Technologies Fund has been designed with a future-looking focus, and will have a clear and measurable impact in terms of Defence's capability. While in most cases impact will be long term, trajectories are being designed for each of the research projects.

Research activities are not confined to the academic community. A number of the program's initiatives include collaborative partners drawn from industry. While it will be possible to assess the outcomes of basic research in terms of the number of peer reviewed publications generated for applied programs—which aim to address specific,

future capability needs—a different set of measures is required.

Quality assurance processes are being developed to address specific needs that arise from adopting a risk-tolerant, high-reward research model. As a consequence, it may be necessary to 'fail fast' elements of the research. This is likely to occur, not because the research is inherently poor quality, but because it has informed understanding of the problem and, as a result, the research must be significantly refocused.

Next Generation Technologies Fund support for engagement with Australia's allies is already delivering results. Research engagement between the University of Tasmania and seven universities from the United States has significantly enhanced Australia's ability to undertake world-leading research in hydrodynamics and cavitation. The ultimate outcome is to significantly enhance Australia's ability as a world-leader in naval shipbuilding.

Multinational research projects in two other priority theme areas—quantum technologies and multidisciplinary material sciences—have also been initiated under the program. Four Australian universities will work closely with 11 US universities across the next three years, delivering leading-edge research.

Continuous improvement

Throughout 2018 a comprehensive review was undertaken on the first two years of the Next Generation Technologies Fund.

The first phase of this review captured information and experiences from a wide range of senior Defence and external stakeholders, including Australia's international partners. Experiential data was captured from universities and companies that have partnered with Defence under the Next Generation Technologies Fund.

Entities such as the Australian Industry Group were also consulted to ensure the organisations they represent can continue to engage with Defence as the environment for innovation evolves.

For example, a detailed independent assurance review was conducted when the initial Grand Challenge was established. An independent technical working group ensures the challenge delivers tangible and timely outcomes and also identifies refinements that will benefit the program.

A subsequent phase, to be completed by end of 2018–19, will implement a mature operating model. This will provide a scalable set of procedures to ensure the program is agile and maintains appropriate levels of security, probity, assurance and risk management across all of the Next Generation Technologies Fund collaboration vehicles.



Defence Innovation Hub

The Defence Innovation Hub enables collaboration on innovation technologies that can be developed into advanced capability for Defence.



Program performance of the Defence Innovation Hub is reported over the following pages. Strategic measures are reported qualitatively, supported by quantitative performance information.

PROGRAM IMPACT STATEMENT

Measuring success.

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CASE STUDIES

How Defence capability is being enhanced through innovation.

56 60 63 64 70

ENHANCING DEFENCE CAPABILITY THROUGH INNOVATION

Strategic approach to investment.

55

PROFILE OF DEFENCE INNOVATION HUB PARTNERS

14% new entrants to Defence.

68

INVESTMENT PORTFOLIO VS PRIORITY NEEDS

84% of investments align with top three investment priorities.

61–62

TABLE OF INVESTMENTS

50 Innovation contracts awarded in 2017/18 FY.

73

Program impact statement

The Defence Innovation Hub's core focus is to deliver a program that enhances Defence capability through innovation and, in doing so, build the capability and capacity of the Australian defence industry and innovation sector.

By investing in innovative technologies, Defence is better able to maintain a capability edge over adversaries. By backing smart ideas that have the potential to deliver game-changing and cutting-edge capability, the Defence Innovation Hub provides the capital needed for innovators to further develop promising ideas.

In 2017–18 the Defence Innovation Hub entered into 50 multi-year contracts representing a total investment of more than \$70.3 million in Australian industry and research organisations. In delivering this program, Defence is supporting the Government's National Innovation and Science Agenda, which seeks to transform the Australian economy so it is more innovative and entrepreneurial.

The Defence Innovation Hub is creating a portfolio of innovation investment directly linked to Defence's capability needs. The Hub's investment portfolio now includes projects under each of the priority capability streams. Defence capability managers value the capability enhancements offered by innovations presented by Australian industry and research organisations through the Defence Innovation Hub.

"The program has continued to mature and is proving to be a very effective mechanism for encouraging and developing innovative ideas from across Australian industry. Navy is excited by the capability opportunities that the program is providing."

COMMODORE PHILIP SPEDDING, DIRECTOR GENERAL
NAVY PROGRAM SUPPORT AND INFRASTRUCTURE

The Defence Innovation Hub uses a two-stage procurement process. The first involves an initial innovation pitch and the second requires a detailed proposal that outlines specific activities and outcomes to be completed as part of a project phase. Australian innovators are achieving great success through the Defence Innovation Hub. Almost 65% of respondents that progress to the second stage of assessment are awarded a contract to develop their ideas.

A key measure of success is the progression of innovation projects towards completion, and transition to the next phase of innovative technology development. The Defence Innovation Hub develops innovative technology in four phases: concept exploration, technology demonstration, prototype system, and integrated capability development.

In this reporting period, the Defence Innovation Hub celebrated the first completion of a phase one project. This was subsequently awarded a contract for the next phase of innovation development. The Defence Innovation Hub is also monitoring the progress of a project at the fourth phase of innovation technology development that will complete its contract in the second half of 2018 and is a candidate for introduction into service with the Australian Defence Force.

"The Royal Australian Air Force highly values the contribution of home grown innovation to its capabilities. Air Force appreciates and supports the opportunities the Next Generation Technologies Fund and Defence Innovation Hub provide to engage and explore options for force enablement and enhancement."

AIR COMMODORE MARK GREEN,
DIRECTOR GENERAL AIR CAPABILITY ENABLERS

Enhancing Defence capability through innovation

STRATEGIC APPROACH TO INVESTMENT

Defence’s Force Design function assesses the planned and future force, provides preparedness assurance, and recommends force structure options to guide the development of a balanced and affordable future force.

The strong link between the Defence Innovation Hub’s investment priorities and Force Design guidance is delivering better capability outcomes for Defence, and is giving industry the confidence that their investment in research and development activities is aligned with capability requirements. The Defence Innovation Hub’s investment priorities are assessed and updated every year in line with Defence’s Force Design cycle.

Industry has responded well to the published Defence Innovation Hub investment priorities. More than 84% of proposals received in 2017–18 aligned with the top three priority streams for innovation investment. This response rate means that Defence can assess the best and brightest ideas from industry and research organisations, and invest to develop technology where it matters most.

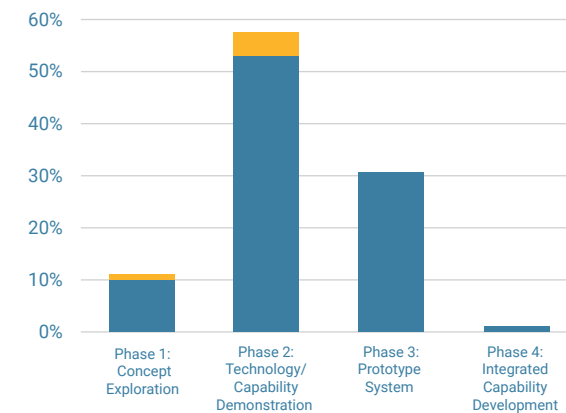
ADVANCEMENT IN INNOVATION DEVELOPMENT

The Defence Innovation Hub develops innovative technology in four phases (explained above). Since the Defence Innovation Hub was launched in December 2016, 88% of investments have been in the second and third phases, with the aim to progress more proposals into phase four in coming years.

“Force Design primarily provides a capability lens to the relationship between the trinity of our strategy, resources and capability. Our gaps and opportunities are analysed and prioritised to inform the annual Defence Innovation Hub priorities. This means that the investment decisions made by the Defence Innovation Hub align with the needs of the current and future force, so that we can best achieve our military strategy.”

**BRIGADIER JASON BLAIN,
DIRECTOR GENERAL FORCE OPTIONS
AND PLANS, FORCE DESIGN DIVISION**

PERCENTAGE OF INVESTMENTS (INCL GST) AGAINST PHASE

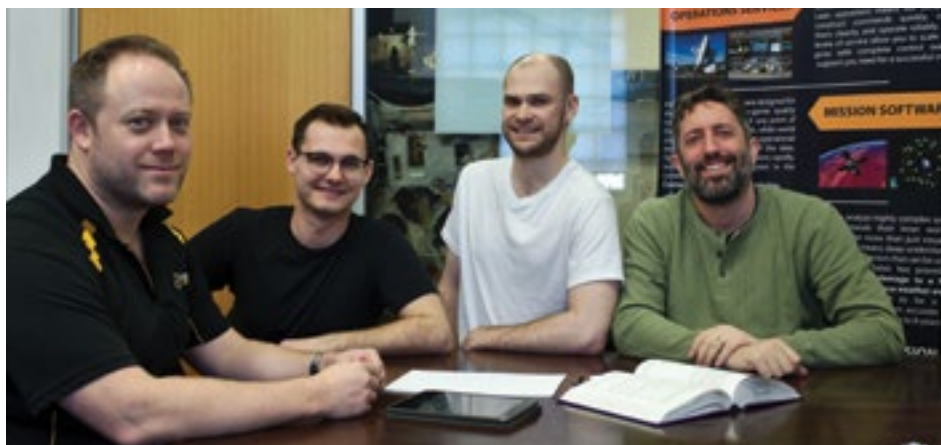


● Investments by phase Against Total Funds Allocated to Date

● Special Notice

CASE STUDY

Saber Astronautics – celebrating progress in innovation development with the first phase transition for Defence Innovation Hub



Innovation proposals submitted to the Defence Innovation Hub are examined across four phases of innovation development. This year the Defence Innovation Hub marked the first phase transition of a project with Saber Astronautics. Phase transition is achieved when a project completes innovation development at its contracted phase, and the entity is awarded a subsequent contract to continue maturing the technology.

In August 2017 the Defence Innovation Hub invested \$355,000 with Saber Astronautics to develop an ability to autonomously identify and model electronic signals in the electromagnetic spectrum, a capability of interest to Air Force. The project commenced at phase one which involved defining the route of the technology and developing a basic model.

The phase one project was completed in January 2018 when Saber Astronautics was able to demonstrate it could successfully model signals in the electromagnetic spectrum. The modelling demonstrated suitable potential for use as an enabler in the electromagnetic spectrum environment.

As one of the first new Defence Innovation Hub contracts to be completed, this project also became the first to test the flexibility of

the innovation contract framework, which is designed to mature innovative technology development at a higher technology readiness level under a new procurement process. The innovation contract contains standard terms which are not subject to negotiation, and this approach helps progress between contract phases following the successful completion of an original contract phase.

A phase two technology demonstration contract was awarded to Saber Astronautics in May 2018, with a further Defence Innovation Hub investment of approximately \$1.4 million.

The aim of the second phase of work is to further develop the model and test it on alternative areas of the electromagnetic spectrum. This first innovation contract 'phase transition' was an opportunity for the Defence Innovation Hub and industry to work collaboratively, and lessons learnt will be applied in future contract phase progressions.

Should the innovation continue to demonstrate potential—and be successful in gaining investment in later development phases—it will provide an enhanced electromagnetic spectrum operations decision support capability for Defence.

SPECIAL NOTICES UNDERWAY

Special Notices are novel challenge-based solicitations that seek innovative solutions to meet specific Defence capability challenges. A Special Notice allows capability managers to call for industry and research organisations to submit proposals in response to specific capability challenges.

Following successful pilots of the service in the second half of 2017, the Defence Innovation Hub launched Special Notices in May 2018. Three Special Notices were piloted, enabling Army to seek innovative ideas in:

- the next generation of portable small unmanned aerial systems
- the next generation deployed wireless environment, and
- weapons, countermeasures against weapons, and effects in the signature management of systems including weapons, vehicles, facilities, IT and cyber streams, in partnership with Army Innovation Day 2017.

Through the pilot Special Notice phase, opportunities were identified to improve:

- guidance on expectations for timelines and scope, and

- engagement with industry decisions by the Defence Innovation Hub.

These improvements have been implemented.

Industry has responded well to the Special Notice service. About 28% of all proposals received by the Defence Innovation Hub in 2017–18 were in response to these Special Notice challenges. This is proving an effective way for Defence’s capability managers to directly approach the market in search for the best and brightest ideas to solve challenges through potentially game-changing innovation.

Developing the next generation UAS

The Defence Innovation Hub set a challenge for industry on the next generation of portable small unmanned aerial systems. A total of 47 proposals were received, and of these, 18 respondents were selected to attend an Army presentations on the challenge. These respondents were then invited to provide a more detailed proposal of their innovation. Three Special Notice contracts with a combined value of \$784,000 were awarded through the process to Australian innovators from the University of Sydney, SYPAQ Systems and JAR Aerospace.

University of Sydney	Develop a lightweight Small Unmanned Aerial System that contains both vertical take-off capabilities and forward flight speed and endurance. The system will be supported by enhanced communication, control and sensor features.	\$250,000
SYPAQ Systems	Develop further the Corvo X Small Unmanned Aerial System that features a vertical take-off and landing capability and extended flight time. The ground control operating system will be compatible with Windows and Android platforms.	\$259,000
JAR Aerospace	Develop a hybrid, vertical take-off and landing fixed wing Unmanned Aerial System with target tracking, encryption and acoustic sensing and analysis at an extended range.	\$275,000



A joint kick-off meeting was held for the three innovators at the School of Artillery at Puckapunyal in April 2018. This valuable opportunity enabled static and live displays to be viewed of current unmanned aerial system capability. Army personnel were available to discuss and answer questions, and further inform development of the next generation small unmanned aerial systems.

Developing the next generation wireless environment

Twenty-two proposals were received for the next generation wireless environment Special Notice challenge. Nine of these were selected to attend an industry day and invited to submit more detailed proposals

for assessment. Canberra firm Penten was awarded a \$1.3 million contract from the Defence Innovation Hub to develop its Altocrypt technology, which aims to deliver secure wireless devices to counter new cyber threats, and streamline information in deployed headquarters (see page 60).

Army Innovation Day 2017

The Army Innovation Day Special Notice attracted 48 submissions from Australian industry and research organisations. Of these, 19 companies were selected to demonstrate their inventions to a panel of capability specialists and decision makers at Army Innovation Day in November 2017.



"Innovation is vital for Army's capability development. It is important that we continuously innovate in our development of concepts, processes and technology."

MAJOR GENERAL KATHRYN TOOHEY, HEAD OF LAND CAPABILITY

After further assessment, the Defence Innovation Hub awarded the following contracts:

Thales Australia	Enable Defence to gain an improved understanding of the SMASH system integrated Thales F90 rifle, capable of providing automatic target detection, tracking and assisted shot release.	\$227,000
DefendTex	Provide Defence with an improved understanding of low profile body armour using high hardness steel.	\$957,000
DefendTex	Explore the feasibility of a light weight, multi-shot electronically fired stacked projectile 12 gauge shotgun system.	\$1,036,000

CASE STUDY

Penten – Special Notice: enabling secure wireless access to secret networks



Canberra-based cyber security company Penten is focused on protecting classified information from Australia's most sophisticated cyber adversaries. Recognised as the Australian Business of the Year at the 2018 Telstra Business Awards, Penten has grown from a team of four to 55 in three years and its AltoCrypt Stik solution was the winner of Australian Infrastructure and Platforms Innovation of the Year at the 2018 iAwards.

In November 2017 the Defence Innovation Hub signed a \$1.3 million contract with Penten, in collaboration with Army, under the new Special Notice service. The contract will demonstrate and mature the AltoCrypt Stik for potential integration into deployed Defence systems and deliver next generation secure wireless capability.

The device is a highly portable, easy-to-use, secure mobility solution that simplifies access to classified computer networks. It achieves this by integrating the crypto, routers and security appliances into one small wireless USB which allows rapid deployment, eliminates the need for cabling, reduces costs and provides more secure protection against cyber threats.

AltoCrypt Stik represents a new generation of high-assurance encryption capability for government and meets key Defence needs including improved mobility and

agility, and protection against modern and future sophisticated cyber adversaries. This world-leading cyber solution also integrates Australian technologies from Data61 and the Quintessence Labs. AltoCrypt Stik has been developed in partnership with UK cyber security company Amiosec with the support of the Australian and UK governments.

Army's Land Network Integration Centre (LNIC) is the capability sponsor for this project, and has provided the vision for Army's requirements. It has worked collaboratively with Penten to integrate and test the technology. The Defence Innovation Hub project collaboration included the Australian Signals Directorate, the Chief Information Officer Group, 1st Signal Regiment and staff of the Deployable Joint Force Headquarters. Penten supported LNIC on a successful trial of a next generation wireless capability for Army using the AltoCrypt Stik during Exercise HAMEL 2018. This field trial was conducted in an operational environment and confirmed the solution's technical maturity for integration into deployed Defence systems.

Investments in Australian developed technologies such as Penten's AltoCrypt Stik ensure Defence maintains its manoeuvre advantage and security edge in an increasingly hostile cyber battlespace.

PILOT OF RAPID ASSESSMENTS

The Defence Innovation Hub launched a limited pilot of Rapid Assessments in June 2018 for procurements of up to \$500,000. These assessments:

- are designed to connect industry, academic and research institutions
- enable collaborative analysis
- answer specific questions about capability availability or maturity in the market, and
- inform Defence's business requirements.

Rapid Assessments benefit both industry and Defence by identifying market options and foreshadowing the need for specific technologies through investigation and analysis of Defence capability related challenges.

They differ from Special Notices as the outcome is a report to mature Defence's understanding of a particular topic, rather than technology development. The assessments are expected to take less than six months to complete once in contract.

The Rapid Assessment pilot will continue during 2018–19. Defence is exploring a number of contracting models to support different industry engagement once the assessments are launched.

Investment portfolio – Priority Innovation Notice

The Defence Innovation Hub accepts proposals to its open call for submissions (the Priority Innovation Notice) 365 days a year. Defence seeks proposals aligned with the priority capability streams that make up the Defence Integrated Investment Program.

In 2017–18 Defence identified six capability streams for investment through the Defence Innovation Hub's Priority Innovation Notice:

1. Intelligence, Surveillance, Reconnaissance, Electronic Warfare, Space and Cyber
2. Key Enablers
3. Land Combat and Amphibious Warfare
4. Strike and Air Combat
5. Maritime and Anti-Submarine Warfare, and
6. Air and Sea Lift.

Further information on Defence's investment priorities is available from the Defence Innovation Portal.

PROPOSALS SUBMITTED BY CAPABILITY STREAM

The percentage of Defence Innovation Hub proposals submitted by capability stream is shown below.



● ISREW, Space and Cyber	31%
● Key Enablers	25%
● Land Combat & Amphibious Warfare	28%
● Maritime & Anti-Submarine Warfare	12%
● Air & Sea Lift	3%
● Strike & Air Combat	1%

INVESTMENTS BY CAPABILITY STREAM

Of the 337 proposals submitted, 77 respondents were invited to proceed to the second stage of assessment by preparing a more detailed proposal. These were reviewed by the Defence Innovation Hub's technical assessors, capability managers and investment advisory group, 43 contracts were awarded and the quantity and value by capability stream is shown below.

INVESTMENTS BY CAPABILITY STREAM



● ISREW	22	\$37,157,000
● Key Enablers	6	\$7,463,000
● Land Combat and Amphibious Warfare	10	\$13,942,000
● Maritime & Anti-Submarine Warfare	3	\$4,344,000
● Air & Sea Lift	1	\$2,424,000
● Strike & Air Combat	1	\$714,000

Investment portfolio – Special Notices

In this reporting period, the Defence Innovation Hub undertook three Special Notice procurements which are detailed on page 57. Seven contracts were awarded in 2017–18 to respondents.

Of all the proposals received by the Defence Innovation Hub in 2017-18, 28% were in response to Special Notices. The total investment made in Special Notice contracts for 2017–18 was \$4.3 million:

SPECIAL NOTICES BY CAPABILITY STREAM



● Key Enablers	1	\$1,310,000
● Land Combat and Amphibious Warfare	6	\$3,003,000

CASE STUDY

Nova Systems – enhancing operational training and testing by developing a realistic target for air and ground based defence systems



In December 2017 the Defence Innovation Hub signed a \$924,000 contract with Nova Systems to explore technologies and technical solutions for a Mobile Ground Target for Defence platforms and weapon systems.

Nova Systems had previously been developing the concept through an internal innovation project to enhance its training, test and trials service offering. "This is an exciting project for our innovation team," says Nova Systems Group Chief of Capability and Strategy, Nick Kemp. "We have put a lot of thought into adapting commercially available all-terrain vehicles for unmanned applications. This

option could provide Defence a low cost, expendable, high speed option that enhances their operational training and testing."

The Mobile Ground Target project's main objective is to explore a full scale, automated, high speed agile target that is capable of significant control stand-off and that can represent real operational scenarios where engagement can happen from any direction.

The vehicle can manoeuvre at speed off road, as well as on sealed and unsealed roads. It aims to provide operationally representative targets for training and testing of Defence's Air and Land capabilities and weapons systems.

CASE STUDY

Defence Materials Technology Centre



The Defence Materials Technology Centre (DMTC) creates and enhances Australian industrial capability. It leads, facilitates and manages collaborative research and development and innovation activities in the defence and related sectors in manufacturing, engineering and applied science. Defence and national security agencies, industry and research sectors are key stakeholders.

DMTC makes an important contribution to Defence innovation and supports the Defence Innovation Hub through its unique capabilities

and networks. It attracted an additional \$20 million in co-investment from industrial and research sector partners and Defence program offices in 2017–18. This enabled a range of collaborative technology development activities to occur, aligned with the Defence Innovation Hub and DMTC's shared goal of enhancing Defence capability through innovation. This investment involves 32 projects harnessing the expertise of 39 industrial partners and 16 research sector collaborators, many of which are engaged in more than one project.

Grow the capability and capacity of the Australian industry and innovation sector

DEFENCE INNOVATION HUB PARTNERS PROFILE

The Defence Innovation Hub is investing around \$640 million to 2025–26. It aims to build the innovation capabilities of Australian industry, universities and research institutions to deliver innovative solutions for Defence capability.

7900+

PEOPLE EMPLOYED

The Defence Innovation Hub welcomes submissions from all types of businesses and is committed to building a vibrant and globally competitive Australian industry and innovation sector. Defence Innovation Hub industry partners⁵ employ more than 7900 people and in 2017–18 had a combined annual turnover of \$3.4 billion.

Supporting the growth of Australia's defence industry

Australia benefits from an industrial base consisting of a large number of agile small to medium enterprises. The Defence Innovation Hub proudly invests in Australian industry and research organisations of all sizes and recognises that great ideas come from a wide range of participants. The program provides equal opportunity for all participants to put forward their great ideas and to collaborate in developing innovative technology.

⁵ Data collected from Defence Innovation Hub partners questionnaire with a response rate of 49%.

\$3.4B

COMBINED ANNUAL TURNOVER

To date 78% of investments made by the Defence Innovation Hub have been with Australia's micro, small and medium sized enterprises. Together these enterprises have a track record of producing some of the world's most innovative defence technologies. The Defence Innovation Hub underscores the growth of these entities by supporting their development activities. In doing so, the Defence Innovation Hub helps Australian industry to become more globally competitive.

For example, Defence Innovation Hub partner, Kord Defence, achieved success recently in signing a contract worth almost half a million Australian dollars with the US Marine Corps to test and evaluate a wireless control system. Kord developed the system for the Australian Defence Force and in 2017, through investment from the Defence Innovation Hub, was able to further develop the technology for the Australian Army. The Minister for Defence Industry announced Kord's export success in June 2018.

PERCENTAGE OF INVESTMENT VALUE BY COMPANY SIZE



● Micro (0 – 4 employees)	7%
● Small (5 – 19 employees)	23%
● Medium (20 – 199 employees)	48%
● Large (Over 200 employees)	11%
● Research organisation	11%

Defence is collecting data on the number of jobs created as a direct result of investment by the Defence Innovation Hub. This will measure the program’s impact on building and sustaining Australia’s defence industry and innovation sector. It is estimated that during 2017–18 more than 39⁶ jobs were created in micro, small and medium sized businesses as a result of investment from the Defence Innovation Hub.

DEFENCE INNOVATION HUB INVESTMENTS MADE BY STATES AND TERRITORIES

Since the launch of the Defence Innovation Hub in December 2016, the majority of investment has been with New South Wales, South Australia, Victoria and ACT-based partners. The higher investment rate in these locations corresponds with the high number of proposals coming from those areas. For instance, between 5 December 2016 and 30 June 2018 more than 25% of all proposals across the Defence Innovation Hub’s program were received from New South Wales.

The following map indicates the location and value of Defence Innovation Hub investment from the launch of the program on 5 December 2016 to 30 June 2018.

⁶ Data collected from questionnaire of Defence Innovation Hub partners, with a response rate of 49%.

ANNUAL TURNOVER RATES OF CONTRACTED ENTITIES

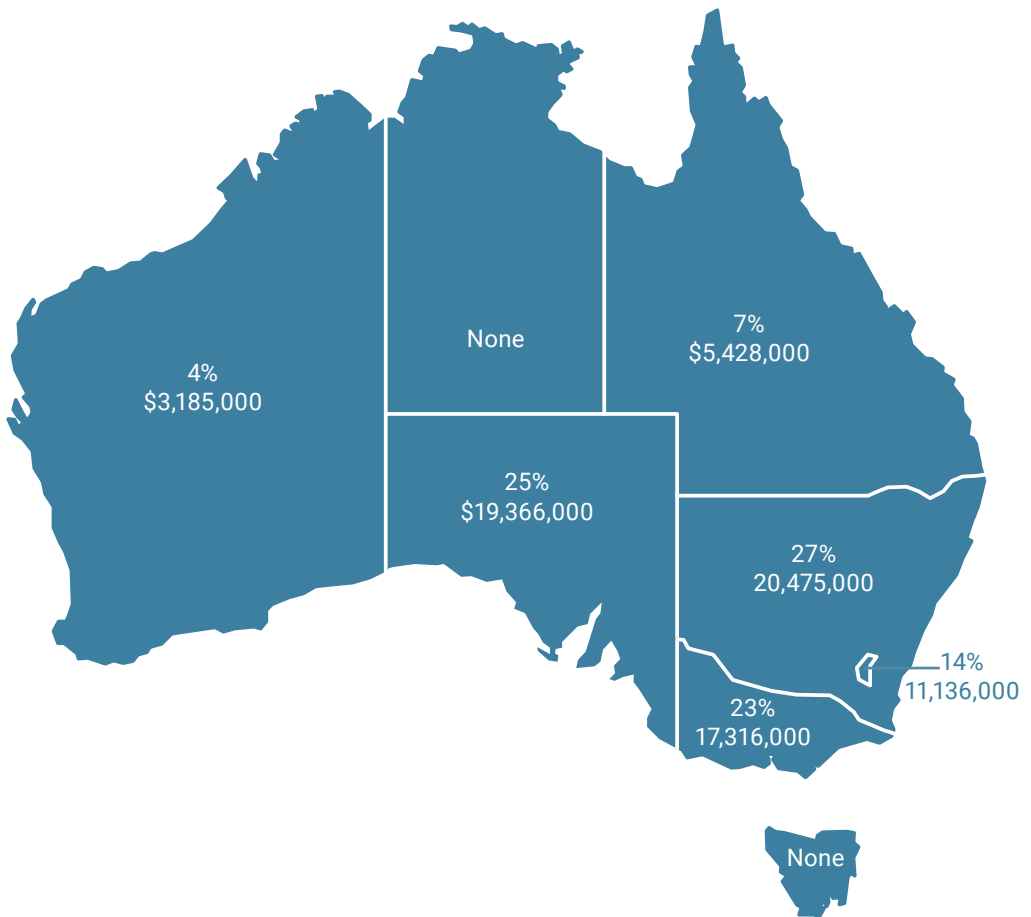


● \$0 to \$249,999	5%
● \$250,000 to \$999,999	20%
● \$1,000,000 to \$9,999,999	36%
● Over \$10,000,000	22%
● Research organisation	17%

Northern Territory and Tasmanian companies accounted for less than 2% of proposals received and have not been awarded Defence Innovation Hub investments. The Centre for Defence Industry Capability (CDIC) is engaged with industry in all states and territories. As part of its advisory and facilitation services, CDIC promotes opportunities through the Defence Innovation Hub and helps companies to develop and submit proposals.

“Today’s frontline soldiers carry numerous electronic devices on their body and weapon, but all these devices have separate individual controls that make them difficult to operate quickly and accurately, and increase the cognitive load on the soldier. We have developed a system that allows soldiers to remotely operate all their electronic devices from one central location without taking their eyes off the task or hands off their weapon – EYES ON, HANDS ON. We are so pleased for the support from the Defence Innovation Hub and Centre for Defence Industry Capability, which has been instrumental in our success.”

**DR PETER MORAN, MANAGING DIRECTOR,
KORD DEFENCE**



NEW ENTRANTS TO THE SECTOR

In the six months since the release of the 2017 Defence Industry and Innovation Program’s first year report, there has been a 4% increase in the number of new entrants to the defence sector entering into contract with the Defence Innovation Hub.

For example, Synthesis Technologies (Synth) is an Australian start-up with a vision to shift the mapping paradigm from centuries of two-dimensional maps, to hyper-reality 3D and 4D (real-time) maps. The Synth team is made up of former Defence and IT alumni. It works with games development graduates from the Academy of Interactive Entertainment, and 3D data scientists from the Australian National University. The Synth team saw the Defence Innovation Hub as a vehicle to help operationalise its specialist technology and to support Defence with the cutting-edge capability it needs in today’s security environment.



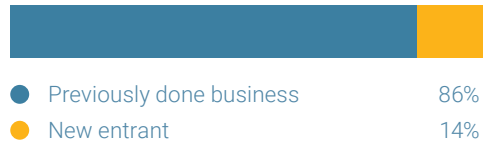
“People aren’t aware that Silicon Valley and many technologies used in mainstream society had their genesis out of the defence sector, or that the core technology behind Google Maps was originally built in Sydney! The Hub is directly helping us continue these legacies by enabling us to build initially for the Defence mission. We want to then use this technology for our other passions: civil technology applications like smart cities and community development, humanitarian aid and emergency management – growing and contributing to Australian-borne innovation.”

SANELE ELEMANI JR,
CEO – SYNTHESIS TECHNOLOGIES

Defence recognises that innovative capability solutions come from companies and research organisations whose expertise may lie beyond Defence. The Defence Innovation Hub welcomes proposals from both traditional and

non-traditional organisations, 365 days a year. The Centre for Defence Industry Capability complements the Defence Innovation Hub by helping new starters to Defence with tailored advice, support, information and guidance on doing business in the defence market.

PARTNERS THAT HAVE PREVIOUSLY DONE BUSINESS WITH DEFENCE SINCE LAUNCH⁷



⁷ This reports on partnerships since the launch of the Defence Innovation Hub. This information has been collected from AusTender and Defence Innovation Hub partner questionnaire responses.

The Defence Innovation Hub has identified multiple instances where industry and research organisations are collaborating—using subcontracting arrangements—to develop innovative Defence technology.

Examples include:

- QuintessenceLabs, which was awarded a contract in July 2017 with an investment value of around \$3.2 million to develop quantum key distribution secured communications. QuintessenceLabs has subcontracted the University of Queensland to work on the project.
- The Defence Innovation Hub invested \$2.7 million with BAE Systems Australia to explore laser technology’s potential to detect low intensity signals. Monash University is subcontracted to conduct research into micro-lensing.
- Synthesis Technologies won a Defence Innovation Hub contract in May 2018 with an investment value of \$601,000. It will develop Synth Maps—ultra high-definition 3D real world map streams to browsers, mobile and virtual reality platforms. Synthesis Technologies is working

collaboratively with researchers from the Australian National University and University of Vienna (Austria) to deliver the project.

- Unmanned Aerial Systems Pty Ltd signed a Defence Innovation Hub contract in April 2018 with an investment value of \$368,000. It will develop a StopRotor vertical take-off and landing unmanned aerial system in collaboration with the RMIT Aerospace Research Centre.

While the majority (90%) of Defence Innovation Hub investment is with industry, there are many examples of industry and research organisations using subcontracting arrangements to collaborate on innovative technology.

PERCENTAGE OF INVESTMENT VALUE BY ENTITY TYPE SINCE LAUNCH



CASE STUDY

Deakin University – Innovating in the development of a sovereign fast jet training capability



Deakin University – Innovating to develop a sovereign fast jet training capability

Defence recognises the outstanding achievements of legacy innovation programs which have been integrated into the Defence Innovation Hub to deliver a simplified, streamlined and balanced portfolio of innovation investment.

One of the legacy projects that transitioned to the Defence Innovation Hub is the Low-Cost High-G Centrifuge—a Phase 3 project valued at approximately \$1.9 million between Defence and the Institute for Intelligent Systems Research and Innovation (IISRI) at Deakin University.

The aim of the project is to design, develop and test a short-radius high-G centrifuge prototype to provide efficient pilot training in a highly reliable and safe environment. The technology aims to provide high-G inoculation through a short-radius centrifuge system that will deliver rapid onset rates and sustained G-forces

typical of those experienced in modern high-performance fighter aircraft.

The centrifuge system could provide high-G training for aircrew undertaking initial fast jet training, as well as refresher training for qualified crew. In addition to high-G exercises, the system could provide training for:

- spatial disorientation
- situational awareness
- upset prevention and recovery, and
- motion sickness desensitisation.

The goal of the centrifuge system is to increase Defence capability in aeromedical training, some of which is currently conducted overseas. This system could complement various aerospace capability programs directly addressing identified Defence needs for simulation and training in fourth and fifth generation aircraft.

GLOBAL SUPPLY CHAIN

During the reporting period, six Defence Innovation Hub partners⁸ reported they were part of a global supply chain.⁹ With the Centre for Defence Industry Capability committed to building the effectiveness of the Global Supply Chain Program, it is expected that future supply chain opportunities for local companies will be maximised.

Continuous improvement

The Defence Innovation Hub listens to feedback and fosters engagement between government and industry.

RAPID ASSESSMENTS PILOT

The Rapid Assessments pilot will continue during 2018–19 and explore different procurement and contracting models. Rapid Assessments allow Defence to approach the market and request information and analysis on capability questions. The outcome is a report that matures Defence's understanding of a particular topic. Rapid Assessment is not used to procure technology or for technology development. The service will be reviewed after the pilot before being launched as a new offering.

REFINE PROGRAM ENGAGEMENT AND EFFICIENCY

Transparency and clarity around Defence's innovation investment priorities has provided more certainty about Defence's capability requirements for industry and research organisations. These have responded well to the published priorities—84% of all proposals received between 5 December 2016 and 30 June 2018 aligned with the top three capability priorities for innovation investment. The Defence Innovation Hub is working with Force Design to ensure investment priorities are available earlier in the financial year. This will ensure that industry and research organisations understand the priorities at the start of the new financial year.

Since the launch of the Defence Innovation Hub, decision-making processes and timeframes have improved. In rolling out three simultaneous programs (open call for submissions, Special Notices and Rapid Assessments) the Defence Innovation Hub has continuously reviewed processes and received industry feedback. As the Defence Innovation Hub matures, it is actively identifying opportunities to achieve efficiencies in processing times and improve feedback to industry.

EXPLORE PATHWAYS TO ACQUISITION

Since the Defence Innovation Hub launched in December 2016, 99% of investment has been in projects at the first, second and third stages of innovative technology development. The majority of investment (58%) has been in phase two technology demonstration.

8 A Defence Innovation Hub industry partner is an entity that has been in contract with the Defence Innovation Hub during the reporting period, excluding research organisations.

9 Data was collected through responses to a short questionnaire sent to Defence Innovation Hub partners. The response rate was 49%.

As successful innovation projects mature, there will be more projects that present as candidates for phase transition and enter the more mature phases—three and four—of innovative technology development. It is at this point that the investment values increase and pathways for introduction into service become more important. Exploring potential pathways to acquisition for more mature innovation projects in consultation with other Defence stakeholders will be a greater focus for the Defence Innovation Hub over time.

MULTI-PARTY COLLABORATION

The 2017 Defence Industry and Innovation Programs' first year report identified multi-party collaboration as an area of focus for continuous improvement for the Defence Innovation Hub's procurement and contracting model. To address this the Defence Innovation Hub engaged with industry and research organisations to further explore the concept. A workshop with representatives from industry and research bodies discussed the likelihood of requiring such a procurement and contracting model, and agreed this was low.

Industry representatives highlighted circumstances where the market had identified an opportunity for multi-party collaboration, and had organically formed commercial partnerships. The intent was to facilitate greater collaboration between industry and research organisations to achieve game-changing technology for the war fighter, however taking account of the views of stakeholders and the lack of any real requirement, it was decided to not pursue this model further.

Collaboration between different stakeholders was a key feature of the Defence Innovation Hub's operations in 2017–18. The Defence Innovation Hub received many high quality proposals from Australian industry and research organisations, and these featured other Australian entities as key subcontractors, indicating that the market is successfully collaborating to develop and deliver the innovative technologies required by Defence.

DEFENCE INNOVATION HUB TABLE OF INVESTMENTS 2017–18

The Defence Innovation Hub awarded 50 innovation contracts during the year with values ranging from \$74,000 to more than \$8.5 million, and a total investment of more than \$70.3 million. Investment value includes Defences' total investment in the project, including direct contract costs, government furnished materials and other project costs. In 2017–18, the Hub received more than 330 proposals and released more than 77 individually tailored requests for proposals.

At 30 June 2018 the Defence Innovation Hub also managed a portfolio of 16 legacy innovation projects worth approximately \$49.2 million.

The following table details the innovation contracts entered into during the reporting period, excluding contracts that—due to the sensitive nature of the project—are unable to be reported publicly. Those contracts not reported in this table account for a total investment value of \$496,000.

Company	Contract overview	Investment value
	ACT total	\$8,820,000.00
Quintessence Labs	Explore feasibility of establishing highly secure communications links between two points, both fixed and over line of sight in free space.	\$582,000
Kord Defence	Develop a wireless soldier control system using Bluetooth Low Energy technology to interface with current Australian Defence Force in service devices.	\$758,000
Quintessence Labs	Develop a resilient encryption method.	\$3,767,000
Data 61 – CSIRO	Continue development of the award winning Cross Domain Desktop Compositor technology, allowing users to view and work across multiple Defence networks from a single monitor, while maintaining the integrity of each network.	\$529,000
Nova Systems	Explore development of a low cost, high speed direct mobile ground target that could be used as a realistic direct target for air and ground based Defence systems.	\$924,000
Seer Security	Explore the viability of the technology in applicable use cases and environments, including through development of a prototype, and testing to create the technical data.	\$349,000
Synthesis Technologies	Explore an ultra-high resolution mapping solution to provide Defence with 3D real-world maps technology, enhanced 3D situational awareness, and global 3D coverage, including in deep-water oceans.	\$601,000
Pen10 *Special Notice: Army Sponsored	Deliver secure wireless devices to counter new cyber threats and streamline information in deployed headquarters.	\$1,310,000
	NSW total	\$19,582,000.00
Ron Allum Deepsea Services	Explore the feasibility of a novel, high-performance autonomous glider for long-endurance undersea surveillance.	\$4,092,000
University of Newcastle	Explore development of enhanced resilience training for Australian Defence Force personnel through a set of virtual reality based training sessions involving controlled exposure to adverse environments.	\$2,463,000
Sonartech Atlas	Investigate the potential of improving sonar performance and classification of underwater acoustic signals.	\$1,497,000

Company	Contract overview	Investment value
RingIR	Develop and demonstrate an innovative technology to enhance Defence capability.	\$4,566,000
Jenkins Engineering Defence Systems	Explore a cost-effective microwave-band radar electronic support system to provide automated warnings and recording capability of potential threat signals without the need for a dedicated expert operator.	\$356,000
Saber Astronautics	Explore development of an innovation that will use machine learning technology for autonomous identification, and model electronic threats.	\$355,000
Trang Imagineering	Explore development of 3D sensors used in the mining industry for potential use by Defence for threat monitoring in conflict zones.	\$238,000
Macquarie University	Explore development of unique ultra-high energy laser technology to enable interaction with longer range and harder targets to provide faster kill times with improved eye safety for personnel.	\$342,000
Ron Allum Deepsea Services	Undertake trials related to the operation of an undersea glider, informing further concept and design development.	\$529,000
Omega Dev Group	Conduct detailed research and provide evidence of the value and opportunity for continued development of the Gatlin personal protective equipment.	\$74,000
Unmanned Aerial Systems	Demonstrate a new, useful aircraft platform capable of both fixed and rotary wing high speed flight combined with both hover and cruise efficiency.	\$368,000
Aerospace & Mechanical Consulting Engineers	Design lightweight armour solutions for the ADF C-130J aircraft using panels designed with new materials and ballistic protection level required by Air Force.	\$714,000
Saber Astronautics	Continuing on from Saber's initial contract, the project will continue to explore development of an innovation that will use machine learning technology for autonomous identification and modelling of electronic threats.	\$1,428,000
Codarra Advanced Systems	Further develop the Hielamon system to provide detection and counter-measures for a range of commercial drones.	\$1,808,000

Company	Contract overview	Investment value
Jar Aerospace *Special Notice: Army Sponsor	Develop a hybrid, vertical take-off and landing fixed wing Unmanned Aerial System with target tracking, encryption and acoustic sensing and analysis at an extended range.	\$275,000
University of Sydney *Special Notice: Army Sponsor	Develop a lightweight Small Unmanned Aerial System that contains both vertical take-off capabilities and forward flight speed and endurance. The system will be supported by enhanced communication, control and sensor features.	\$250,000
Thales Australia Ltd *Special Notice: Army Sponsor	Enable Defence to gain an improved understanding of the SMASH system integrated Thales F90 rifle, capable of providing automatic target detection, tracking and assisted shot release.	\$227,000
	VIC total	\$17,106,000.00
Deakin University	Explore feasibility of developing a functioning hot fire training system using haptic (touch) force feedback, high fidelity visuals, and realistic heat experience to improve firefighting training for Navy.	\$2,509,000
Grollo Aerospace	Explore feasibility of an affordable re-usable supersonic sea skimming target missile, designed in Australia, with potential to offer a world leading capability optimised for the Australian Defence Force.	\$2,423,000
Agent Oriented Software	Explore concept of an autonomous teamed intelligent software agent capability resilient to cyber-attacks. Could also be integrated with existing Defence systems.	\$408,000
SYPAQ Systems	Explore development of software based systems that effectively train networks to learn how to interpret non-standard intelligence products and convert them to comply with appropriate format standards.	\$319,000
XKG	Explore development of a more easily transportable and efficient modular hybrid power generation system.	\$870,000
DMTC Ltd	Explore an improved integrated soldier protection system to develop an enhanced version using advanced manufacturing processes and techniques.	\$345,000

Company	Contract overview	Investment value
SYPAQ Systems	Explore potential to investigate the operational performance of blending SWIR and EO video in a miniaturised lightweight handheld format. Explore potential integration with multiple platforms including Unmanned Aerial Systems.	\$420,000
UAV Vision	Integrate the developed micro-gimbal system on board an Unmanned Aerial System.	\$2,433,000
MEMKO Aviation Aerospace	Take DST radio frequency technology to create representative electronic attack methods.	\$5,127,000
SYPAQ Systems *Special Notice: Army Sponsor	Develop further the Corvo X Small Unmanned Aerial System that features a vertical take-off and landing capability and extended flight time. The ground control operating system will be compatible with Windows and Android platforms.	\$259,000
Defendtex Pty Ltd *Special Notice: Army Sponsor	Provide Defence with improved understanding of low profile body armour using high hardness steel.	\$957,000
Defendtex Pty Ltd *Special Notice: Army Sponsor	Explore feasibility of a light weight, multi shot electronically fired stacked projectile 12 gauge shotgun system.	\$1,036,000
	SA total	\$15,775,000.00
Daronmont Technologies	Build prototype radar capability that could replace existing technology used by Defence that is approaching end of life.	\$8,671,000
Data to Decisions Co-Operative Research Centre	Explore feasibility of developing a cyber-threat intelligence capability that could assist enterprise and mission systems in identifying and treating potential adversary exploitations.	\$1,234,000
BAE Systems	Explore the potential use of laser technology to detect low intensity signals.	\$2,751,000
Mincham Aviation	Explore potential technologies and technical solutions in response to a stated Defence capability priority need.	\$338,000
Silentium Defence	Build a prototype space situational awareness radar capability to replace existing technology used by Defence that is approaching end of life.	\$974,000

Company	Contract overview	Investment value
Clinical Universe	Explore a health care software capability to capture digital output from multiple 'point of care' devices and transfer it in standardised formats to relevant e-health systems. The proposed innovation could enable situational awareness of medical incidents, trends and patterns across geography and time.	\$1,068,000
Silentium Defence *Special Notice: Army Sponsor	Build a prototype space situational awareness radar capability to replace existing technology used by Defence that is approaching end of life.	\$739,000
QLD total		\$5,428,000.00
Teledyne Defence Australia	Develop a vehicle-mounted Improvised Explosive Device detection and clearance capability that uses an advanced radar system that could be integrated with existing ADF deployable vehicles.	\$3,625,000
Explosive Protective Equipment	Explore integration of a Cobham Amulet Ground Penetrating Radar into an existing unmanned ground vehicle to detect improvised explosive devices.	\$336,000
Griffith University	Explore development of a portable device that enables real-time detection of airborne biological threats, such as fungi spores, viruses and bacteria.	\$211,000
Explosive Protective Equipment	Develop a portable improvised explosive detector to help detect homemade explosives, chemical warfare agents, narcotics and gases.	\$1,256,000
WA total		\$3,185,000.00
L3 Oceania	Explore development of an underwater acoustic sensor that could provide significant benefits within the Australian Defence Force's maritime domain.	\$3,185,000



Centre for Defence Industry Capability (CDIC)

The Centre for Defence Industry Capability (CDIC) is a key program in the Government's agenda to build a world-class, globally competitive Australian industry as a fundamental input to Defence capability.



The Centre for Defence Industry Capability (CDIC) program performance is reported over the following pages. Strategic measures are reported qualitatively, supported by quantitative performance information.

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PROGRAM IMPACT STATEMENT

The CDIC is a key program in the Government's agenda to build a world-class, globally competitive Australian industry as a fundamental input to Defence capability. The CDIC's primary focus is to partner with Defence and industry to maximise Australian industrial outcomes from the Government's high level investment in Defence capability. The primary role of the CDIC is to work with industry to build Australian supply chains critical to the transition of work to Australia to support Defence's major capital equipment programs.

The CDIC's strategic approach to providing advisory services and facilitating engagement between businesses and investors, government agencies and industry organisations has allowed the CDIC to:

- help businesses upskill their workforce
- help improve business maturity to realise innovations in products and business systems

- support the transition of capabilities from commercial endeavours to the defence market, and
- support major Defence projects.

The CDIC also connects Australian innovators, researchers and academic institutions to Defence's two innovation programs – the Defence Innovation Hub and the Next Generation Technologies Fund. It provides strategic advice to government and key sector stakeholders on developing a sustainable defence industry in line with Australia's defence priorities, and identifies strategic industry capability gaps and solutions which may be funded through Industrial Capability Projects.

CASE STUDY

Leveraging a reputation for reliability

Camco Engineering has been in business since 1995 servicing the mining, oil and gas and power generation industries. It specialises in machining, fabricating and fitting, and has the second largest machining and fitting facility in Western Australia. Camco has now turned its attention to gaining defence work with help from the Centre for Defence Industry Capability.

Business Development Manager, Greg Carson, says CDIC has been very helpful in outlining the expectations and helping to identify Defence primes that may align with Camco's core business.

"The CDIC was very useful, especially in the beginning," Greg says. "Now we know the people we need to contact. Our business adviser from CDIC visited us and pointed us in the right direction." The company is attending CDIC events and pushing ahead as it responds to requests for quotes from primes.

Camco does not design defence products. The company manufactures components for original equipment manufacturers. So far the Camco team is mostly being asked by the defence primes for quotes for small to medium sized components, and Mr Carson says the defence projects are one to two years away from the building end when his company would be involved.

"Even though you are a much larger facility and close by, you are battling uphill if a prime still wants to send the work offshore to someone they regularly engage," he says.

"There is no question that we can manufacture the components they want. The issue is getting the opportunity to do it," Mr Carson says.

Materials can also be an issue, especially when it is not critical to a specific purpose. Mr Carson says manufacturing with non-Australian materials is possible and many of the original equipment manufacturer drawings identify European standard materials. But cost, lead time and minimum quantity orders impact competitiveness and cost efficiencies from



Australian service providers. He says this can mean having to source a few metres of material from overseas when only a tiny amount is needed.

"For most materials required, there are Australian equivalents. Original equipment manufacturer drawings that identify Australian equivalent materials will help to keep costs down in building these vessels and reduce continuous requests for material dispensations between the parties," he says.

Mr Carson says Camco, which has 300 employees, has skill sets and equipment directly transferrable to Defence.

"We're used to working to exacting standards because of the risk to human life in the mining and oil and gas sectors. We're very confident that we can meet the demands of Defence. We're at a pivotal stage in our development – we're big enough that we have critical mass, but still small enough that we can respond quickly and dynamically when required. That's been seen as a very positive aspect by our customers. It doesn't matter if the phone rings at 5pm on Friday, we can always respond."

The company is serious about its commitment to meeting the needs of Defence and the primes. If successfully engaged by a prime, they will be injecting significant capital and assets to develop a standalone division with personnel dedicated to the specialised requirements of defence manufacturing.

Enhancing Defence capability

READINESS AND CAPABILITY

A key role of the CDIC is providing Defence with an up-to-date, accurate understanding of Australian industrial capability and capacity, and innovative approaches to investment.

In July 2017 the Secretaries of the Departments of Industry, Innovation and Science (DIIS) and Defence met to discuss how to build on their collaboration established through the inception of the CDIC.

DIIS and Defence are working together to better understand the broader benefits to the Australian economy of the Government's:

- new approach to defence innovation
- its industry agenda, and
- its unprecedented levels of investment, and how it aligns with the National Innovation and Science Agenda (NISA).

An important part of this work is identifying opportunities for Australian industry in supply chains delivering and sustaining Defence capability. CDIC advisers work closely with Australian businesses to ensure industry is aware of Defence's strengthened Australian Industry Capability (AIC) program. This program has led to prime contractors becoming increasingly alert to the benefits of maximising opportunities for Australian defence industry involvement in capability programs.

Fundamental to the CDIC is building the capability and capacity of Australian industry so it can position itself to realise increased opportunities in the defence market. While the capacity of CDIC facilitators and advisers to generate improved

awareness among Defence procurers, primes and small to medium enterprises (SMEs) is impressive, the CDIC is seeking to secure a national solution to the long-standing challenge of collating, analysing and verifying Australian industrial capability information from which Defence draws across all industry sectors.

Throughout 2017–18 the CDIC worked closely and collaboratively with Defence and Austrade to support implementation of the Defence Export Strategy. This recognises CDIC's role in developing Australian industry to achieve export success and as the lead for industry advice, assistance and development. Expanded CDIC export support services include:

- sustaining and expanding the Global Supply Chain program with an additional \$3.2 million a year to help more Australian SMEs access the supply chains of global primes
- building the capability of SMEs to compete internationally with up to an additional \$4.1 million a year in grants, and
- supporting SMEs to grow and develop with a balanced portfolio of customers, both domestically and internationally.

The CDIC's commitment to enhance Defence capability continued through 2017–18. The CDIC collaborated with Defence to develop the 2018 Defence Industrial Capability Plan and associated Sovereign Industrial Capability Priorities. CDIC also helped SMEs after the plan's release with follow-up enquiries, particularly those related to the Sovereign Industrial Capability Priorities, and continues to provide advice, assistance and support as required.

The CDIC has also developed strategic relationships with Defence major projects such as the Joint Strike Fighter (JSF) program, and is developing a relationship with the SEA

5000 Future Frigate program. Using the JSF relationship as a benchmark, this highlights how the CDIC can help businesses to engage in these programs by facilitating access to supply chains and maximising opportunities for Australian industry. The relationship and activities with these two major projects will be leveraged into future industry engagement activities for other Defence major programs.

CONTRACTING WITH DEFENCE

The CDIC works closely with industry to build the capability and capacity of Australian businesses so that increased opportunities in the defence market can be realised. Advice to industry on engaging in defence supply chains and promoting tender opportunities is instrumental for Australian industry wishing to leverage these new opportunities. The CDIC has a major focus on supporting Defence's continuous shipbuilding programs to maximise Australian industry involvement.

The Government is committed to maximising the opportunities for Australian businesses—particularly innovative SMEs—in the defence market. The CDIC works closely with industry to increase capability to adapt rapidly to changing market demands and technology, as well as capacity constraints relating to knowledge and innovation.

Through the Global Supply Chain program, the CDIC continues to partner with Defence and industry to enable the development of a world-class, globally competitive and sustainable Australian defence industry as a fundamental input to Defence capability.

In response to the significant demand from aspirational Defence businesses, the CDIC continued to undertake broad industry engagement activities throughout 2018,



underscoring its reputation as the front door for industry access to Defence.

A series of 'Introduction to Defence Industry' seminars were conducted for SMEs in all state and territory capitals and key regional cities between March and May 2018. These focused on new entrants to the Defence sector to help remove barriers and increase awareness of defence industry amongst local businesses. The seminars also provided an opportunity for businesses new to Defence to engage one-on-one with a Defence industry facilitator and receive tailored advice on how to access the full range of Australian Government levers.

Through the website business.gov.au/cdic – and by delivering tailored presentations and targeted outreach events – the CDIC is helping business to navigate and prepare for opportunities within the domestic and international Defence market.

The CDIC's specialist facilitators and advisers have communicated with thousands of personnel in the defence industry through public forums, local and international trade shows and contact centre referrals.

CASE STUDY

Saving costs remotely

Perth business Remote Imaging Solutions may have only been in business a year, but it is already helping the Royal Australian Navy make significant time and cost savings.

Director and Chief Pilot, Ben Durnin, says his company loves solving problems.

“We come from engineering and technical backgrounds, and it’s our passion to work with clients to find practical and cost-effective solutions rather than chasing expensive time consuming elements.”

In May 2017 the company undertook an internal inspection for the Navy, using an unmanned aerial vehicle (UAV) inside HMAS Sirius’ large fuel tanks. The company was engaged by Neptune Asset Integrity Services to trial using UAVs instead of traditional methods for two of the 12 tanks.

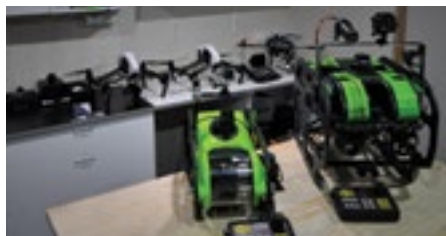
“There had been problems overseas before doing this kind of work, so we looked at those and researched how we could overcome the issues,” Mr Durnin said.

“Although we knew the tanks would be clean and obstruction free, there would be no GPS signal, and no reference point to hold the UAV steady – we had to fly it off the stick by sight. There were also elements of working inside a confined space on a tanker ship that made the job unique and challenging,” he said.

The company had to come up with a lighting solution to make sure the inspection was safe, and the inspector could see what they needed to sign off the work – otherwise they may have had to use scaffolding and rigging which wouldn’t have saved any time or money.

“It was a great success, and certainly an Australian first,” Mr Durnin said. Both the Navy and the senior surveyor from Lloyd’s Register were happy with the outcome. We need to ensure we close the loop on the technology and process, so we can use UAVs in this type of situation now we’ve proved it can work. It’s a significant milestone in Australia.”

Mr Durnin said the great thing about the Australian shipping community is that potential customers



find out what you’re doing. As a result of their work on HMAS Sirius, BAE contacted the company about a ship coming out of maintenance which needed its night navigation lights checked to see how far the light could be seen around the ship. The problem was that there was another ship in the way. Instead of having to move one of the ships, the company used their drone at night to do the visual check. They did the work in two hours, had it verified, and the job signed off. Mr Durnin says, “It wasn’t a huge leap of the technology, but a good use of it.”

Remote Imaging Solutions hopes to grow its business further over the next two years with the support of the Centre for Defence Industry Capability.

“I’ve heard great things about the CDIC and its Defence business advisers. We really want to get more Defence work, and build some momentum,” Mr Durnin says. “The challenge is to help Defence understand what remotely operated aerial and underwater systems can be used for, so we can help save time and money while reducing risk to personnel.

“Defence needs to work with people they can trust. We hold a Remote Operators Certificate through CASA and are very proud of our skillset and experience in using both UAVs and remotely operated submersibles. The risks of using inexperienced or unlicensed operators can be quite high,” Mr Durnin said.

“We have experience in a large range of markets, but now we’re looking to see how we can help Defence. With the help of the Centre for Defence Industry Capability, we’re hoping to do a lot more in the next year or two.”

Grow the capability and capacity of the Australian industry and innovation sector

CAPABILITY AND PRODUCTIVITY

Australia needs a robust defence industrial base that is appropriately diversified and competitive on the international stage. The CDIC supports eligible SMEs to improve their business capabilities, extend networks and take advantage of growth and collaboration opportunities within the sector. The CDIC's access to Defence and other government networks supporting defence industry programs and mechanisms—as well as industry—is allowing the CDIC to establish itself as a key implementation lever to help the Government and Defence build Australian industry's capacity to contribute to major defence acquisitions. In 2017–18 the CDIC received 267 online applications for advisory services, of which 244 were approved and progressed to engagement planning with CDIC advisers.

As a result of detailed engagements with industry, the CDIC is increasingly looked to by Defence for knowledge of industrial capabilities and gaps, and for provision of value adding services in the interface between Defence and industry. In 2017–18, CDIC received almost 200,000 unique views on its website on business.gov.au and received more than 1500 enquiries through its contact centre.

The CDIC Advisory Board provided independent guidance and direction to develop the Defence Industrial Capability Plan released in April 2018. The plan announced the initial 10 Sovereign Industrial Capability Priorities and

a dedicated annual grants program of up to \$17 million which will be delivered by the CDIC. This program is to support the capacity and resilience of SMEs contributing to a Sovereign Industrial Capability Priority.

In the next year, the CDIC will continue to support Defence Industry Policy Division, particularly with the development of the Sovereign Industrial Capability Priority implementation plans and Integrated Investment Program Capability Stream industrial strategies. The CDIC will also continue to deliver industry development projects to address sector-wide needs identified by industry, the CDIC, Defence Industry Policy Division or a capability program area within Defence. The CDIC supports Defence Industry Policy Division's reporting framework by developing and conducting an annual defence industry capability survey.

CASE STUDY

First for local Albury company



Australian Aerospace Engineering Pty Ltd (AAE), based in Albury, manufactures aerospace products, maintains, repairs and overhauls aircraft and aircraft components, and distributes aerospace and military-specific products.

When the precursor of the CDIC carried out a business maturity diagnostic in mid-2016, it was recommended the company upgrade its quality system beyond just CASA certification. AAE took on the challenge and became the only organisation in Australia to be certified to all three aerospace quality standards. It now meets the requirements of the major defence primes.

AAE engineering manager, Adam Johnston, said it was a significant achievement that would help the business grow. "This is a terrific milestone for our team, our business, but most importantly our customers," he says.

"The strengthening of our business systems is a great enabler and will allow us to handle future growth and more complex projects. Complying with all three aerospace standards

and meeting the Civil Aviation Safety Authority's requirement was a challenge, but by collaborating with our stakeholders and with the assistance of the CDIC, we were able to achieve it quicker than I thought possible.

"With the help of the CDIC, we developed our processes and quality manual, based on what we had already been doing for years. Only now our system is much stronger, and we're certified for the future," Mr Johnston said.

AAE is an approved supplier for over 150 aviation and aerospace companies in Australia. Over the past 18 months it has quadrupled its distribution business orders. It has also grown its manufacturing business. The company has been nominated for the Aerospace Australia Innovation Awards.

Mr Johnston said "there is still much to be done as AAE grows and navigates the Defence landscape, and the next steps include working again with CDIC to improve systems and set a longer term strategic direction. We certainly could not have done what we have without CDIC's help, guidance and prodding".

INNOVATION FACILITATION

Innovation is critical to advancing Defence capability and providing opportunities for Australian industry to grow. The CDIC plays a very important role working with industry to enhance its business processes, assist with innovation proposals and facilitate discussion with Defence.

In 2017–18 CDIC specialist innovation facilitators supported 120 innovation facilitation proposals and assisted almost 250 entities to engage with the innovation systems which include the commercialisation of associated outcomes. The demand for this kind of support is trending upwards on the first 12 months of the CDIC's operation.

The CDIC provides specialist advisers to help businesses and organisations engage with the Defence innovation system. The CDIC works closely with industry and academia to:

- identify high quality, new and innovative ideas or products with the potential to enhance Australia's military capability, and
- facilitate collaboration on joint proposals.

Adelaide company Daronmont Technologies is tapping into the opportunities and available support to help keep the Australian Defence Force at the leading edge of communications and surveillance technologies. Daronmont's Hub procurement for its passive radar is a good example of the CDIC working closely with a business as it developed its proposal.

FEATURE

CDIC adviser profile – Peter Moorhouse

For CDIC innovation facilitator Peter Moorhouse, there's a lot of pride in helping Australian businesses to work with Defence.

"There's an element of national pride in the CDIC. It's about providing new capabilities for the defence of Australia, while also sustaining Australian businesses. It's a real passion for me to take an idea and provide an edge to Defence," Mr Moorhouse said.

CDIC business advisers have a range of backgrounds and experience. Peter is a civil engineer who has spent most of his career in the private sector in regional New South Wales, but is now based in Canberra. "Although I specialise in innovation, I'm backed by the CDIC network of advisers around the country.

"The Government is putting \$195 billion into Defence, including \$1.6 billion into innovation funding over 10 years. Our role as advisers is to identify companies that may be successful in having their ideas adopted by Defence.

"There are some extraordinary ideas. Business, industry, cooperative research centres, universities, and ideas straight out of people's heads – anything at all could be the next innovation for Defence. Most ideas are good, but they need to fit with Defence capability and where Defence is going", Mr Moorhouse explained.

"It's good for people with an idea to talk to an adviser before applying for innovation funding. The application starts with a simple proposal, but if you talk to someone in the CDIC, we can confirm that your idea is of interest to Defence before proceeding too far down the track.

"If the idea suits, we will try and find someone in Defence that people can talk to.

"We can also identify ideas where two or three companies might be able to work together to meet Defence needs and tackle some of those issues together."



Peter says that there are lots of opportunities for Australian companies to be involved in Defence industry. "Where we are strong, we can develop that patch into a bigger patch, and develop it into industrial complexity where Australia becomes globally competitive", he says.

"There's a lot of pride in identifying areas where we have an advantage—logistical, resource or intellectual—and being able to capitalise on that innovation so it works for the defence of Australia, and also provides an economic benefit to our country."

CASE STUDY

Tapping opportunities to innovation

Daronmont Technologies designs and integrates electronics, communications, radar and surveillance technologies. While it sells and supports some products directly to the Australian Defence Force and overseas customers, much of its work is integrating products from multiple suppliers to build systems for Australian defence customers.

The company immediately appreciated the expanded opportunities afforded by the CDIC. Marketing and Business Development Manager, Lee Stanley, says the CDIC has been a hugely positive experience. "When they kicked off and the Innovation Hub structure was announced, we saw a real opportunity", he says. "From that moment we've been working hand in glove with a defence business adviser who has helped us through the process, from proposal submission to funding.

"The advisers are absolutely first-rate. They've taken the time to understand our business, so they've been able to connect us with other companies doing complementary work, and to help us tap into universities with the skill sets we need for our projects."

Mr Stanley says the company is fully committed to supporting Defence, both directly and through its partnerships with prime contractors.

"We have a mixture of skills in electronic system design, software integration, communications engineering and signal processing", he says. "Our mechanical engineers design high-end C4I cabins for deployment in harsh operational environments.

"Our signature project to date is the work we've done with Air Force to refurbish and continue to evolve its deployable air defence system. Air Force and Capability Acquisition and Sustainment Group have been great to work with – we've implemented a number of upgrades to the capability since 2011 and Air Force has allowed us to do a lot of innovative design under the support contract."



Other projects of significance include a situational awareness system for the Collins Class submarine that the company successfully exported to New Zealand and Canada, and work with Raytheon to build a mobile command and control system for the Woomera Test Range.

"We're also excited to be conducting research with Defence Science and Technology Group into surveillance technology. We hope to commercialise that research and realise it into an operational technology with the help of Defence Innovation Hub funding," Mr Stanley said.

The Defence Innovation Hub is part of the Australian Government's investment in the Australian defence industry, with a focus on stronger, more strategic partnerships and closer alignment between industry investment and Defence capability needs.

"The CDIC is a straightforward way for companies like Daronmont to access programs like the Defence Innovation Hub and Team Defence Australia. Team Defence Australia is supporting our participation in trade missions to the US and South East Asia to help us assess export opportunities.

"We can see a genuine pathway from the work of CDIC to tangible projects that we can deliver for Defence. From our perspective, CDIC been one of the best initiatives the Government has taken for industry", Mr Stanley said.

CASE STUDY

Certification opens opportunities in global supply chain

The Nupress Group in Newcastle is a manufacturer of precision-machined components and assemblies. Established in 1971, the company was a hidden gem until it was revealed in a meeting with members of the Defence Industry Innovation Centre—CDIC’s predecessor—over five years ago. The team immediately saw the firm’s potential to contribute to defence industry and Defence capability.

Nupress is a pioneer in hot-section engine component manufacture in Australia. It is in the process of becoming part of Pratt & Whitney’s global supply chain for the F-135 engine, which powers one of Defence’s headline projects, the fifth generation F-35 Lightning II fighter aircraft.

When Nupress first met with the CDIC the company wasn’t ready to become part of the defence industry. However CDIC is committed to fostering long-term relationships, and took the time to position the company to enter the defence industry.

In this case it was five years after its first meeting with CDIC that Nupress was ready to go global. At this point, the CDIC ramped up its involvement to help position Nupress in this venture.

“The CDIC team helped guide us through the processes required to be successful in the defence space,” said Craig McWilliams, Nupress CEO. “It has provided us with significant knowledge around the technical requirements of the global supply chain.”

Gaining AS9100 certification is key to demonstrating maturity in the aerospace industry, and this was an important recommendation made by the CDIC to increase Nupress’ competitiveness. Nupress successfully attained this certification at its first attempt, opening up a number of opportunities for the business including engagement with Pratt & Whitney, Safran, Rheimetall, BAE, Raytheon, Thales and Boeing.

Nupress is engaged in a number of other opportunities through the Global Supply Chain Program, and was named as a successful partner with the LAND 400 program. The Global Supply Chain Program funds defence prime contractors to identify bid opportunities for Australian small to medium sized enterprises across their defence and commercial businesses.

*“Anyone who’s interested in entering the defence industry needs to recognise it’s a long game,”
Mr McWilliams said.*

“Make contact with the CDIC early—even before you’re ready to enter—to understand the requirements and see if you really do have a product that will contribute to defence capability. That early engagement will pay off when you’re finally ready to enter the market and compete for defence contracts.”

FACILITATING COMPETITIVENESS AND EXPORTS

Defence is truly a global market, both in terms of supply and demand. By facilitating exports, the CDIC helps Australia's defence industry to:

- benchmark its competitiveness internationally
- achieve economies of scale across global supply chains
- improve competitiveness, and
- grow and sustain business across acquisition lifecycles by accessing international markets.

The CDIC Advisory Board provided independent advice and guidance to Defence in developing the Defence Export Strategy, which was released in February 2018.

Throughout 2017–18 the CDIC delivered the Global Supply Chain (GSC) program and Team Defence Australia (TDA). It also supported a broad range of SMEs to become globally competitive and to win export contracts.

On 1 July 2018—and as foreshadowed in the 2018 Defence Export Strategy—TDA moved from the CDIC to the Defence Export Office. CDIC will however remain the front door to export facilitation, working with Defence primes to identify opportunities for Australian businesses within their international supply chains.

At 30 June 2018, seven primes were contracted under the GSC program:

- Raytheon
- Boeing
- Lockheed Martin
- Northrop Grumman
- Rheinmetall

- BAE Systems, and
- Thales.

GSC program outcomes reached \$1 billion during 2017–18.

Throughout 2017–18, Defence primes through the GSC program have actively supported Team Defence Australia events. The GSC program is instrumental to the Team Defence Australia's success, which saw record numbers of Australian companies participating in international trade events. In 2017, 50 Australian companies travelled to London for the Defence and Security Equipment International (DSEI) event, which was supported by four GSC program primes and five state governments.

CDIC had the largest Australian delegation ever to promote its business overseas. Forty-five businesses exhibited on the Team Defence Australia stand, and over 115 representatives from state and territory governments, along with industry representatives, participated in the trade mission. Of the 50 companies at DSEI, close to three quarters were exporting to the region or tendering for contracts. The remainder of companies were new to exporting or testing the market. The GSC program primes support companies with matched capabilities. This support has increased in line with the higher participation rates.

In 2018, 52 Australian companies participated at the Singapore Airshow, another 27 participated at Defence Services Asia in Kuala Lumpur, and 20 Australian companies participated at the Sea–Air–Space Exhibition in the US.



In June 2018, 48 Australian companies participated in a mission to EuroSAT to showcase their products and technologies on the Australian stand, They also:

- visited the headquarters of GSC program prime contractors Rheinmetall, BAE Systems and Thales
- viewed the Type 26 Frigate in production
- inspected Rheinmetall's Puma Infantry Fighting Vehicle, and
- travelled to the Thales' Optronics facility in Glasgow.

During the visit, companies had opportunities to pitch their products, network with primes and their major suppliers, and speak with

key procurement, engineering and program management staff.

EuroSAT is the first trade mission to include a program of visits to multiple GSC program prime contractors, and is an excellent platform for future GSC program missions. Up to 24 companies participated in each leg of the mission, which also included a visit to the French Ministry of Defence in Bourges organised by the Victorian Government.

The Minister for Defence Industry, Christopher Pyne, spent a day on the Australian stand at EuroSAT meeting with companies and hearing about their technologies. Australian companies participating in the trade mission were also

provided with market and prime contractor briefings in the lead up to the event.

Participation in Team Defence Australia initiatives provides a low cost option for companies looking to participate in and promote their products at international trade shows. Participating companies have:

- achieved success through sales
- increased international contacts and networks
- established links to key international decision-makers, and
- enhanced their international profile.

Under the 2018 Defence Export Strategy, Team Defence Australia transitioned from the CDIC to the Australian Defence Export Office at the beginning of July 2018. The CDIC will maintain its vital facilitation and communications role, bringing export ready businesses to the Australian Defence Export Office to participate in Team Defence Australia events. The CDIC will continue to help SMEs prepare for export and get the most out of trade missions, including leveraging relationships with Defence primes participating in the GSC program.

SECTOR-WIDE SOLUTIONS

Five industry development projects have been approved since the CDIC launched. These programs are designed to support identified sector-wide needs.

For example, the ongoing development of the Defence Business Maturity Framework seeks to provide a standardised framework to assess business readiness to provide products and services to Defence or as a part of a defence supply chain. By developing this

tool in partnership with stakeholders such as peak bodies, state and territory governments, SMEs and prime contractors, it will help align available support to benefit Defence industry outcomes.

In 2018 the CDIC also conducted the first phase of a highly successful Cyber Security Maturity Program (DICSMP). The program was created by the CDIC and Australian Signals Directorate to improve the cyber resilience of Australia's defence sector SMEs against advanced cyber threats, which pose a risk to national security. Phase 1 of the DICSMP supported a small group of defence SMEs in the Strategic Defence Supply Chain. A range of threats were workshopped to discover the challenges SMEs face and enable them to develop a set of tools to help improve their cyber security maturity. The CDIC developed a good understanding of the challenges SMEs face in protecting intellectual property and defence-related sensitive information.

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Phase 1 activities concluded on 30 June 2018 include:

- conducting a national cyber security awareness roadshow with the Defence Security and Vetting Service, Australian Cyber Security Centre and the Australian Security Intelligence Organisation, which reached over 150 SMEs across Australia
- undertaking compromise assessments of strategic defence SMEs
- establishing templates for NIST 800–171 to support new US Defense Federal Acquisition Regulation Supplement compliance requirements
- developing maturity and risk assessment tools for defence SMEs
- achieving positive participant feedback for a trial of cyber security resources for SMEs, including incident response plans and cyber security best practice templates
- establishing collaborative networks across Defence, ASIO and the Australian Cyber Security Centre, and
- improving participant cyber security capabilities through Capability Improvement Grants.

Providing leadership and partnership

RAISING MARKET AWARENESS

Domestic industry events and trade expositions are critical activities for the CDIC and provide three key outcomes:

- attracting potential clients for CDIC services
- demonstrating the capability and capacity of the CDIC, and

- providing a forum to build capability and capacity in Australian industry.

During August 2017—and in conjunction with the Australian Cyber Security Centre and the Australian Government Security and Vetting Service—the CDIC delivered seven Defence Industry Security and Cyber Awareness Forums to more than 150 businesses across Australia.

In October 2017 at Pacific, the CDIC hosted a panel session entitled 'Defence Industry and Innovation: perspectives from the CDIC Advisory Board'. More than 130 Defence and maritime industry participants attended.

The CDIC has presented to an estimated 3,000 participants at industry briefings in support of the continuous naval shipbuilding public presentations.

In 2018 a series of 'Introduction to Defence Industry' seminars were held for SMEs in key regional centres and state and territory capitals throughout March, April and May. Sixteen seminars were presented with more than 1000 businesses taking part from across the country to:

- learn about the defence market
- meet with CDIC business advisers and Defence personnel, and
- network with other businesses.

Over 300 businesses requested one-on-one consultations with CDIC business advisers. The seminars also supported the National Defence Industry Skills and Jobs Information Campaign 'The Workforce Behind the Defence Force' and the release of the Defence Export Strategy. Businesses that attended the seminars reported that they particularly valued the networking opportunities, and the chance to hear first-hand from specialists and other



businesses about their experience in the defence market. The overwhelming majority of attendees said the seminars gave them a greater understanding of the defence market.

In April 2018 the CDIC ran 'Introduction to the Defence Industry' seminars in Adelaide and Darwin, which were especially tailored for Indigenous businesses. The CDIC's experienced business advisory team partnered with IPS Management Consultants to help Indigenous businesses assess the defence market and understand how to pursue opportunities.

In May 2018 the CDIC joined government and industry partners and organisations to provide government small business and technology advice at National Manufacturing Week. The event included top government and industry experts from:

- Austrade
- the Export Finance and Insurance Corporation (Efic)

- the Australian Government's Entrepreneurs' Programme
- the Innovative Manufacturing CRC (IMCRC)
- Defence Materials Technology Centre (DMTC), and
- the Advanced Manufacturing Growth Centre (AMGC).

This three-day event is the largest annual gathering of Australia's manufacturing community, where attendees are provided with advice on how to compete and win on the world stage.

Experts including Director of Corporate Strategy for the Heat Treatment Group of companies, Karen Stanton, presented at the event, and a CDIC Advisory Board member gave a presentation on the defence market.

FEATURE

CDIC people profile Paul Hosie



Western Australia business adviser, Paul Hosie, has already helped a range of small and medium businesses this year to get growing through Defence opportunities.

Providing advice through the CDIC, Mr Hosie connects businesses with Defence industry opportunities. “We are always looking for new ways of doing things and feeding that into Defence. If we find a new technology or innovative maintenance in the oil or gas sector, it may be applicable to Defence.

“I can help businesses with their technology to make sure Defence is aware of what they can offer, and connect them with other opportunities”, Mr Hosie said.

The Australian Government is investing \$200 billion to ensure Defence is capable, agile and potent, and can respond to security threats to Australians at home and overseas. This unprecedented investment provides opportunities for Australian businesses to grow

their involvement in the Defence industry sector through the CDIC and its business advisers.

Mr Hosie supports a range of West Australian businesses who want to work with, or expand their work with Defence, including materiel, maritime sustainment, infrastructure and construction, and support services for training and exercise grounds.

As a former weapons and electronic engineering officer on Collins Class submarines, Mr Hosie is well placed to connect businesses and Defence. “We keep a close working relationship with the West Australian Government, research institutes, Defence industry, business associations, and their networking events. Maintaining relationships is a really important part of the job to make sure everyone knows about current and future opportunities as well as the support available to grow their business”, Mr Hosie said.

STAKEHOLDER SATISFACTION

The CDIC is establishing a strategically-driven and standardised approach to industry engagement and facilitation to:

- help Defence capability managers engage with industry, and
- provide greater transparency about Defence's needs so SMEs can invest and position their industrial capability.

Throughout 2017–18 the CDIC continued to expand its support to develop business skills in the defence industry with a series of Capability Improvement Grants. The CDIC received 36 grant applications in 2017–18, of which 34 have been approved with a combined value of \$1.175 million.

The CDIC grants have helped:

- businesses access professional management courses for senior technical and management personnel
- hire consultants to develop the company's business and marketing skills, and
- pay for specialist training to develop and manufacture electronic warfare equipment, an essential part of Australia's security requirements.

Through the grants, CDIC helps Australian businesses to deliver cutting-edge technologies, be more competitive, and gain access to international export markets.

STATES AND TERRITORIES

Strong partnerships between Defence and state and territory governments are integral to supporting and growing Australia's defence industry.

In 2017–18 the CDIC worked with Defence on a more coordinated and collaborative approach to Defence engagement with state and territory governments. This ensures that Australian industry, regardless of its location, is able to receive the support it needs to grow its capability and capacity in support of Defence.

Areas of collaboration included:

- developing the Defence Industrial Capability Plan and the Sovereign Industrial Capability Assessment Framework
- mapping Australia's defence industry capabilities
- identifying and implementing sector wide industry development projects
- ensuring all related initiatives work off common information base knowledge by aggregating, managing, analysing and sharing information and data
- aligning federal, state and territory industry development and support programs, and
- exploring the potential of co-delivery of services such as the CDIC-state collaboration nodes.

To develop these partnerships, CDIC worked with the Defence State and Territory Industry Advisory and Engagement Forum.

CDIC ADVISORY BOARD

The CDIC Advisory Board provides strategic oversight of the CDIC. This includes advice to government and recommendations to the CDIC program delegate. The board includes representatives from Defence, industry, and industry groups.

Industry representation on the board enables input into activities that are intended to benefit business. The board meets at least quarterly and has met four times in the last 12 months.

The CDIC Advisory Board works closely with the CDIC Steering Group to:

- discuss and provide advice on emerging industry issues
- endorse the CDIC's annual budget, priorities and activities, and
- monitor CDIC's performance.

In 2017–18 the CDIC Advisory Board received a number of briefings and provided feedback to Defence on the development of the Defence Industrial Capability Plan and Defence Export Strategy.

Board Co-Chair Paul Johnson visited SMEs and industry associations around the country, and the board had a number of engagements throughout the year including a panel session for industry at Pacific 2017.

During 2017–18 one board member resigned and two vacancies were filled. The new board members are:

- Mr Chris Williams, Managing Director of H.I. Fraser, National Defence Council Executive of Australian Industry Group, and Chairman of the Sydney Aerospace and Defence Interest Group. H.I. Fraser is a defence sector advanced manufacturing and maintenance business with global relationships.
- Ms Christine Zeitz, Managing Director, Leidos Australia. Leidos is a global leader in integrated information technology and engineering solutions, including for the Australian Department of Defence. Christine has worked in the defence industry for more than 25 years, including senior positions with BAE Systems and Lockheed Martin. She is currently a member of the Defence Council of Victoria and the Council of Flinders University.

CASE STUDY

CDIC opens new innovations, opportunities and career paths



Paul Johnson,
Co-Chair of the CDIC
Advisory Board

Paul Johnson, Co-Chair of the CDIC Advisory Board, believes the CDIC has made a significant contribution since it was established in December 2016. "Since it commenced, there's been a change in attitude between Defence and industry. I've been in Defence – either in uniform or in the defence industry – for over 50 years. I haven't seen this degree of collaboration before", Mr Johnson said.

CDIC Advisory Board member, Chris Jenkins echoes this sentiment. "With our current model and structure, we've had a considerable effect for defence industry already. In all the organisations I talk with, the relationships between industry and Defence are opening up for new innovations, opportunities and career paths, which is really positive", Mr Jenkins said.

"The CDIC has an important role in assisting industry to properly understand and exploit the opportunities that now present as a result of the Government's new policies. I see that as being the CDIC's biggest value-add", Mr Johnson said.

"I've never seen this level of opportunity that's being presented to Australian industry. Small and medium businesses are now receiving detailed feedback on defence prospects, and starting to have confidence about the changes and increased opportunities for Australian industry. This also means they have to ramp up capability to enjoy the benefits – the work is being done by Government, but it also has to be done by industry too.



Chris Jenkins,
CDIC Advisory
Board member

"As the major projects start to come online, the role of the CDIC will be increasingly important to helping the local Australian defence industry meet the projects' objectives. The work and skills of the CDIC will continue to evolve over the next five to 10 years to support industry's needs," Mr Johnson said.

Chris Jenkins believes that because of the CDIC and current way of operating, Australia is now well placed to be competitive on the world stage.

"There is a real passion for Australian defence industry to be globally competitive. People quickly jump to the view that if we're doing it locally, it costs more, and that's not the case. With the efforts of the CDIC, there's a real drive to make sure we're globally competitive and can deliver the most advanced and innovative capabilities, both by Defence primes and small Australian businesses.

"With our combination of primes and small business, Australian industry is creating the unique capabilities the ADF needs that is good value-for-money. There is no magic light switch – things of this scale of change take time – but the proactive approach the CDIC is taking with exports, the activation of the Innovation Hub, and the Government's support – they all combine to create a sense of confidence in industry, so they can act and start to build their capability for the future," Mr Jenkins said.

Continuous improvement

AN AGILE OPERATING MODEL – LEVERAGING AUSINDUSTRY, INDUSTRY DEVELOPMENT FOCUS

Australia's defence industry has grown and matured significantly in recent years in response to political, economic, technological and environmental forces, and global defence industry supply chains connectivity. The CDIC's national presence has also grown across states and territories. This provides a solid foundation to meet Australia's defence capability needs and support industry over the next decade. This includes achieving a substantial step change in the supply of services and support to industry's business-as-usual activities, and bespoke services to Defence major projects.

Understanding the current state of the defence industry partnership will enable the CDIC to further strengthen it in the future. The CDIC will continue to work with key stakeholders including Defence, industry and academia to drive the development of industry capability and capacity in support of the Australian Defence Force.

As Defence establishes new defence industry and innovation systems to meet defence and industry capability needs, the CDIC is developing complementary systems to implement industry as a fundamental input to capability as well as industrial growth. The CDIC's highly skilled and experienced workforce will continue to underpin our operations for 2018–19. The CDIC's workforce will provide a strong base to meet the challenges of the continuous shipbuilding program, one of the largest, most complex and ambitious projects in Australia's history.

The CDIC is also looking forward to harnessing further opportunities to work with defence industry through other Government programs delivered through the Department of Industry, Innovation and Science, such as the Cooperative Research Centres program, the Venture Capital program, the Entrepreneurs program and the Research and Development Tax Incentive program. These will serve as a bridge for businesses to reach a point where they are ready to take advantage of the programs and services offered through the CDIC.

The CDIC will continue to operate as the front door for industry to engage with Defence and to grow exports. It will maintain its facilitation and communication role, bringing export ready businesses to the Australian Defence Export Office to participate in Team Defence Australia events.

The CDIC will also:

- oversee the new Defence Global Readiness Grant Program announced in the Defence Export Strategy
- collaborate with Defence to implement appropriate measures to support the Sovereign Industrial Capability Priorities needed to underscore the Australian Defence Force, and
- deliver the Sovereign Industrial Capability Priority Grant for SMEs.

CASE STUDY

Exporting to the world – securely

Melbourne business Ronson Gears has benefited from early advice and support from the CDIC. Now it is benefiting from a CDIC Capability Grant to improve its export controls and grow its business with Defence.

Sales and Marketing Manager, Gavin New, said it was a new era for Ronson Gears. "Export controls can be really difficult for a small business to manage and adhere to because your workforce is quite small and diverse, and you don't have the expertise yourself," Mr New said.

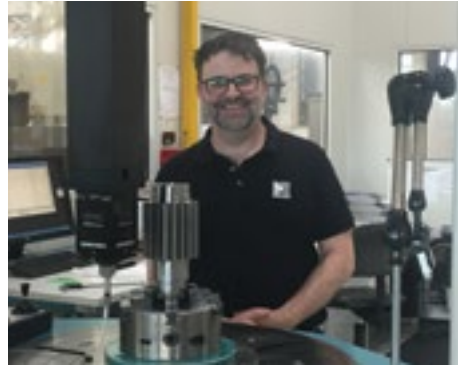
"While this journey has taken several years, it has been really worthwhile. We haven't got to full potential yet, but we will, and it will reduce the risk to ourselves and our customers."

Ronson Gears manufactures precision machined components and gears. It is an Australian company established in 1954, manufacturing precision gears for the rail, mining, construction, off-highway, waste, aerospace and defence industries.

Today the company is an important Defence supply chain partner, providing parts to both second-tier and prime Defence contractors that use the company's geared components for defence forces around the globe. Ronson Gears is the only Australian gear manufacturer to hold AS9100C, and can make unique, one-off products, or produce in production batches, to meet its customers' needs.

"Thanks to the government grant and Windrose International – our consultants on this program – we'll have additional export controls in place, which gives our customers and their customers further confidence in dealing with Ronson Gears," Mr New said.

"We believe it's now a competitive advantage for Ronson, to be able to demonstrate we have the quality and export controls to ensure we meet Defence's requirements, which flow from Defence to prime contractors all the way through the supply chain to us.



"Our business employs 37 people and is growing, and aerospace and defence now represents 16% of our turnover. Having our export controls in order means we can continue to work with confidence in the ever growing Defence space.

After getting advice and support from the CDIC, the company applied for and received an \$8000 Capability Improvement Grant through the CDIC. This has offset a portion of the cost to engage a consultant to help them make the improvements needed. Mr New said Windrose International was able to simplify the process and made it suit a company of their size and resources.

Ronson Gears has also been helped by the Team Defence Australia program, which supported their attendance overseas at Defence and Security Equipment International in London, to build their European network.

"Team Defence Australia has helped put our Australian business into global markets, make some connections and build networks we couldn't have done as easily on our own," Mr New said.

"We've also been in a number of talks with Defence primes through the CDIC's Global Supply Chain program. We're hopeful of some new work in the future through this program, with the support of our business adviser from CDIC," he said.

Industry policy impact and engagement through the Integrated Investment Program

Progress continues on implementing key initiatives of the *2016 Defence Industry Policy Statement*. Defence has sought to:

- create the long-term policy settings to shape our defence industry
- incorporate industry as a fundamental input to capability across Defence business processes, and
- support industry development and innovation.

The integration of Australian industry as a fundamental input to capability ensures Defence fully considers the industrial capability and capacity of Australian businesses to deliver Defence capability.

In 2017–18 Defence launched a range of policy and program initiatives to enhance Australia's defence industry to better support Defence capability. These include the following initiatives.

DEFENCE EXPORT STRATEGY

Released in January 2018, the Defence Export Strategy supports a strong, resilient and internationally competitive Australian defence industry. Since then Defence has moved quickly on implementation, with key achievements including the:

- release of the 2018 Australian Military Sales Catalogue in March 2018
- opening of the Australian Defence Export Office—and appointment of the first Australian Defence Export Advocate—in April 2018, and
- inaugural meeting of the Defence Export Forum in May 2018.

The Defence Export Strategy signals the Government's intent to support industry in pursuing success in export markets. It is symbolic of the significant shift Defence is making in how we engage with, and support, our defence industry. Support for defence exports will enhance the sustainability and competitiveness of our defence industry across peaks and troughs in Defence demand.

The Defence Export Strategy sets an ambitious and long-term plan to achieve export success. This includes building a stronger, more sustainable and more globally competitive Australian defence industry to support Defence capability. It puts in place a comprehensive system to help industry build its ability to

identify export opportunities and achieve export success. The initiatives provide a framework for closer and more coordinated collaboration between Australian defence industry and all levels of government.

The Australian Defence Export Office (ADEO) is the focal point of the whole-of-government effort to support Australia's defence exports. ADEO is responsible for a range of tasks such as trade exhibitions, developing market intelligence and working with industry and government. It has also consolidated existing functions, including Australian Military Sales and Team Defence Australia, with the intent to expand successful programs through Strategy funding.

DEFENCE INDUSTRIAL CAPABILITY PLAN

Released in April 2018, the Defence Industrial Capability Plan outlined the Government's vision for Australia's defence industry over the next decade. It identified:

- 10 initial Sovereign Industrial Capability Priorities, and
- a Sovereign Industrial Capability Assessment Framework to provide a top-down, strategy-led framework which provides a repeatable methodology to identify Sovereign Industrial Capability Priorities.

The plan outlines the Government's vision for Australia over the next decade to build an innovative domestic defence industry that is better placed to meet Defence's capability needs. The plan also highlighted opportunities for Australian industry across the delivery of the Integrated Investment Program.

The plan:

- provides a stronger definition of Australian defence industry
- introduces a Sovereign Industrial Capability Assessment Framework
- lists 10 Sovereign Industrial Capability Priorities, and
- brings together in one place all of the existing and new initiatives and support programs available to defence industry.

The plan also announced a Sovereign Industrial Capability Priorities Grant to support Australian small to medium enterprises to supply operationally critical capabilities to Defence.

To support the development, enhancement or maintenance of the Sovereign Industrial Capability Priorities, implementation plans for each priority—as well Australian Industrial Strategies for each Integrated Investment Program Capability Stream—will be released from mid-2019. Engagement with industry has already commenced in understanding the industrial base.

Defence is also developing a Defence Industry Participation Policy. This will provide a more consistent approach to considering Australian industry at the national and local levels for Defence procurement over \$4 million. The new policy is expected to be released in the second half of 2018.

AUSTRALIAN INDUSTRY CAPABILITY PROGRAM

The Australian Industry Capability (AIC) program is the major lever for Australian industry involvement in supporting defence capability and the long-term development of our defence industry. The program, which maximises the involvement of Australian industry in meeting Defence's capability goals, was strengthened in late 2016 to better align with Australia's defence capability and defence industry goals.

This involved requiring tenderers to be more explicit about how they:

- intend to maximise Australian industry involvement
- propose to transfer supply chains
- will increase innovation and research and development in Australia
- identify opportunities for increasing Indigenous business involvement, and
- promote defence export opportunities to enhance industry sustainability and international competitiveness.

In 2017–18, 21 AIC plans were published on the Defence AIC website. These can be found at defence.gov.au/spi/industry/PublicPlans.asp

Strengthened requirements have been included in a number of requests for tender including SEA 1180 (Offshore Patrol Vessels), LAND 400 Phase 2 (Mounted Combat Reconnaissance Capability) and JP 9711 (Core Simulation).

In late June 2017, the strengthened AIC Plan template was formalised within the Australian Standard for Defence Contracting template. The requirements have now

been rolled out across all major materiel projects of \$20 million and above, including integration into the SEA 1000 Future Submarines contracts.

Work is also ongoing to align the AIC Program with the Defence Industrial Capability Plan. Previously, any materiel project of any value required an AIC Plan where a Priority Industry Capability (PIC) was identified. This requirement is being phased out and the Sovereign Industrial Capability Priorities will replace PICs in the AIC framework.

NATIONAL DEFENCE INDUSTRY SKILLS AND JOBS INFORMATION CAMPAIGN

'The Workforce behind the Defence Force' campaign ran from November 2017 to June 2018. It raised awareness across Australia of the opportunities for Australian business involvement and employment in Australia's defence industry.

The campaign highlighted career opportunities in defence industry to the wider public and supported a stronger defence industrial base by making Australians aware of the opportunities. The campaign included advertising across TV and radio, press, out of home, social media, search, and culturally and linguistically diverse and indigenous media in metropolitan and regional areas. Defence will continue to leverage the brand for skills support activities including attending jobs fairs across capital cities to promote opportunities in defence industry.

Defence recently established a Workforce Behind the Defence Force presence at major state and territory career fairs. This is a collaboration with Defence Force Recruiting, defence industry and peak

industry bodies, and builds on the success of the broader 'Workforce Behind the Defence Force' campaign.

Participating in career fairs helps:

- promote Defence industry's increasing and rewarding long-term careers as the number of major projects ramps up over the next few years
- highlights that defence industry requires a highly skilled workforce to deliver on the Government's investment in Australia's defence capability
- inform young people and job seekers about the opportunities for future employment in the defence industry sector.

SKILLING AND STEM

The School Pathways Programme

The School Pathways Programme is delivering a suite of activities to help reduce skills shortages in defence industry by increasing the pool of STEM educated students. It also promotes employment opportunities and pathways into defence industry (including the naval shipbuilding sector) to young Australians.

The program, which has been funded since 2009–10, is currently funded to 30 June 2020 at a value of \$600,000 for each state each year. It is administered through an intergovernmental arrangement with the South Australian and Western Australian Departments of Education.

Grant recipients use funding to deliver initiatives that:

- facilitate an understanding of defence industry in secondary school students
- provide access to career experiences, and mentoring and networking opportunities, and
- encourage participation in STEM activities and subjects that lead to more young people with the knowledge and skills to pursue defence industry careers (including naval shipbuilding careers).

A total of \$1.4 million is available under the grants program in 2018–19.

The Defence Industry Internship Program

The Defence Industry Internship Program (formerly the Defence Engineering Internship Program) was established in 2012 to address leakage from tertiary education to defence industry by creating engineering pathways into the defence industry sector.

The program provides third and fourth year engineering students with an opportunity to gain industry experience with a 12 week internship in a defence industry small to medium enterprise. The program will be relaunched in 2018–19 with an indicative budget of \$850,000 year.

In May 2018 the Minister for Defence Industry appointed a National Defence Industry Workforce and Skills Facilitator to support development and implementation of the Defence Industry Skilling and STEM Strategy. In this role, Mr Stephen Hayes provides strategic advice to and support consultation with a range of stakeholders on:

- Australia’s defence industry skill and STEM challenges
- risks and gaps, and
- opportunities for better investment coordination between industry, Defence and state and territory governments.

materiel and industry cooperation between Australia and the United Kingdom.

In October 2017 a memorandum of understanding was signed for Australia–Israel Defence Industry Cooperation. Initiatives such as these are an opportunity to share lessons on how to enhance defence capability through developing respective defence industry and innovation sectors.

INTERNATIONAL ENGAGEMENT

In 2017–18 considerable progress was made to strengthen Australia’s defence industry and innovation international cooperation. This included engagement at a government to government level through ministerial visits, senior Defence official engagement, working groups and policy exchanges.

The Minister for Defence Industry visited a number of countries during the year—including France, India, Israel, Malaysia, Singapore, the United Kingdom and the United States—to raise awareness of the world-class capabilities of Australia’s defence industry, support export opportunities, and drive closer industrial cooperation with key partners.

The inaugural Australia–United Kingdom Defence Industry Dialogue—a dialogue between Australia’s Minister for Defence Industry and the United Kingdom Secretary of State for Defence—was held in July 2017. A second Ministerial-level dialogue was held in November 2017. Its purpose was to strengthen defence

Defence alignment with the National Innovation and Science Agenda

The 2016 Defence Industry Policy Statement and Defence's industry and innovation programs are aligned with, and support the:

- Innovation and Science Australia 2030 Strategic Plan, and
- four pillars of the National Innovation and Science Agenda (NISA).

Culture and capital, to help businesses embrace risk and incentivise early stage investment in start-ups

The Next Generation Technologies Fund portfolio includes several new ways in which businesses, especially small to medium enterprises, are partnering with Defence:

- The Grand Challenges program and Defence Cooperative Research Centres are enabling major new industry-university teaming arrangements.
- The Small Business Innovation Research for Defence Program is funding small businesses in ambitious research and technology development projects.
- Defence is also collaborating with CSIRO in the NISA-funded technology accelerator program to include defence themes. One defence-oriented start-up has been established as a result of this collaboration.

The Defence Innovation Hub encourages Australian business of all sizes and from

all sectors to submit innovation proposals that are ready to enter the engineering and development stages of the innovation process. Since the launch of the program, 14% of the Defence Innovation Hub's partners have been new entrants to the defence sector, and 78% of investment has been made in micro, small and medium sized enterprises. The cornerstone of the Defence Innovation Hub program is procuring innovative technology for Defence where Defence provides the capital needed for Australian industry to further develop bright ideas.

With Centre for Defence Industry Capability support, Australian businesses are being connected with market opportunities to grow their business ideas and commercialise emerging and future technologies.

Collaboration, to increase the level of engagement between businesses, universities and the research sector to commercialise ideas and solve problems

Closer collaboration between Defence, state and territory governments, industry and research organisations is needed to jointly develop game-changing innovation, and to provide greater benefits to the Australian defence industry and innovation sector. Defence is working with the best of businesses, universities and the research sector to minimise risk and solve complex and challenging problems. The Centre for Defence

Industry Capability helps form connections and collaboration.

The Next Generation Technologies Fund Grand Challenges program and Defence Cooperative Research Centres provide the scale and intensity needed to make a difference. The programs require small agile companies—including start-ups, larger companies and researchers—to form collaborative teams and work alongside Defence Science and Technology Group scientists. Both the Grand Challenge to counter improvised threats and the pilot Small Business Innovation Research for Defence program brought together small companies with no awareness of each other's capabilities before their involvement in these initiatives.

In 2016 NISA identified that Australia's rate of collaboration between industry and researchers is the lowest in the OECD. In 2018 the Defence Innovation Hub identified multiple instances where industry and research organisations were collaborating organically, and using subcontracting arrangements to develop innovative technology in their projects with the Defence Innovation Hub. While the majority (90%) of Defence Innovation Hub investment is with industry partners, there are many examples of where industry and research organisations are recognising the benefits of working collaboratively and are doing so in practice. In 2017–18 the Defence Innovation Hub also commenced a pilot of a new service offering, Rapid Assessments, to collaborate with industry and research organisations through investigation and analysis of capability related questions.

Talent and skills, training students for the jobs of the future and attracting the world's most innovative talent to Australia

Defence has a comprehensive program that supports student interest in STEM, provides training opportunities, and aims to attract and skill students to develop careers directly in Defence, defence industry or undertake research of relevance to Defence in universities, CSIRO and other publicly funded research agencies.

The Defence Industry Skilling and STEM Strategy is being developed to:

- identify defence industry workforce and skills issues
- enable early engagement of students on career choices and relevant study
- help get more students into defence industry
- help develop existing workers skills, and
- improve industry development, retention and upskilling.

The Next Generation Technologies Fund is supporting Defence activities to build the STEM pipeline needed to attract and retain a talented workforce. This support includes investing in PhDs through several Next Generation Technologies Fund programs, especially Defence Cooperative Research Centres and the Australia–United States Multidisciplinary University Research Initiative.

Defence has also established a talent pipeline under the Australian Postgraduate Research Internship program (APRI) of the Australian Mathematical Sciences Institute. Through APRI, up to 100 PhD students will be placed as interns with Defence over four years. Supported by the Department of Education and Training, APRI will post PhD students to Defence laboratories for periods of between four to six months to work on multidisciplinary projects.

Paths to employment will be facilitated for high-performing interns. To date, 27 interns have been supported, with 12 of these new in 2017–18.

Some 70 Defence scientists are involved in the STEM Professionals in Schools Program. Managed by CSIRO, the program creates partnerships between Defence researchers and teachers to bring 'real-world STEM' into the classrooms of Australian schools.

Defence is committed to increasing the number of women in STEM careers. The Defence Science and Technology Group has introduced Women in Science Undergraduate Scholarships to encourage more women to take up science careers. Fourteen of these scholarships are now underway or being developed with five universities across four states and the ACT.

Defence is a major sponsor of the Aiming for Impactful Results (AIR4) initiative which is opening up pathways for future generations of female leaders in STEM disciplines. The program launch brought together 1500 schoolgirls and 300 teaching staff from across Australia to immerse in a fully collaborative STEM experience with disruptive global leaders. AIR4 will give students a platform to discuss the careers and life choices needed in a new technological era.

The Defence Science and Technology Group runs a STEM cadetship program through which suitably qualified candidates are placed in key science and technology areas such as cyber and autonomous systems. There are currently 35 cadetships in place, with plans to grow this number to 55 in 2018–19.

The Defence Science and Technology Group has also established a partnership with the Aurora Education Foundation to build the Indigenous STEM pipeline. Aurora promotes

Aboriginal and Torres Strait Islander success in education, delivering initiatives that support Indigenous students at all stages of education. Under the partnership, Defence sponsors two scholars to complete a Doctor of Philosophy in STEM fields at Oxford University. It also supported the 2018 Aurora Indigenous Scholars International Study Tour, which exposed high performing students to opportunities at leading universities overseas. In collaboration with Aurora, Defence will also host five Indigenous STEM interns in 2019 and host an outreach day for Indigenous high school students interested in STEM careers.

Government as an exemplar, to lead by example in the way government invests in and uses technology and data to deliver better quality services

Defence is leading by example and delivering innovation programs with streamlined, agile processes, and is taking calculated risk to harness bright ideas. To remove barriers to innovation and deliver a streamlined, agile, single innovation pipeline, the Defence innovation system has adopted:

- agile business processes and calculated risk-taking to harness bright ideas
- new contracting frameworks
- new intellectual property policies, and
- new governance, assessment and funding models to allow quick decision-making.

CASE STUDY

The Defence Engineering Internship Program

The Defence Engineering Internship Program (DEIP) aims to increase engineering students' level of interest and participation in defence industry careers, particularly with small to medium enterprises. DEIP provides eligible Australian defence SMEs with the opportunity to market defence industry as an innovative, interesting and viable career path to students who undertake a sponsored work placement in their firm.

DEIP attracts high performing engineering students and exposes them to defence work. With better capability, defence SMEs are then better placed for commercial success in an increasingly competitive global market place. It aims to increase the:

- number of engineering students exposed to defence SMEs, and
- the likelihood that interns pursue employment in defence once they complete their study.

Over six rounds of DEIP, 27% of interns were offered ongoing work with their host SME at the conclusion of their internship. Across the program's first five rounds, 10 interns were employed by Defence and a further 22 were employed in the Australian defence industry by other companies.

A total of 93% of interns indicated that DEIP expanded their awareness of Defence industry. A total of 85% of interns indicated that they were now more likely to pursue a career in defence industry.

CASE STUDY

Supporting a STEM and defence industry career pathway through the school pathways programs

The Australian Government regards high-quality STEM education as critically important for our current and future productivity, as well as for informed personal decision making.

Encouraging interest and curiosity in STEM subjects—and demonstrating that great careers are built on STEM—is important to ensuring young Australians are equipped with the necessary skills to undertake careers in defence industry.

Defence continues to fund the School Pathways Programme to help address skills shortages in defence industry by increasing the:

- pool of young people with STEM skills, and
- awareness of Australia's defence industry as a viable career pathway.

Through the program a number of initiatives are supported. These include the STEM Defence + Innovation Program – a business commercialisation initiative developed by RDA Hunter's ME Program that is delivered in partnership with the Business Centre.

As part of the program, industry mentors impart life-long business and entrepreneurship skills to students in years 11 and 12 at St Philips Christian College in the NSW Hunter region. The three-month program, made possible by

Defence's Schools Pathway initiative, involves industry, education, professional services organisations and government collaborating to immerse students in 'real-life' innovation and entrepreneurship activities. These complement the technical STEM skills they are learning at school.

It culminated in the STEM Innovation and Defence Pitch Night where students presented their innovations—including mind-controlled prosthetic hands, autonomous trollies and stealth drones—to an expert panel including representatives from the Royal Australian Air Force, Boeing Defence Australia, and the business centre.

Judged against professional criteria, the pitches resulted in immediate outcomes for the 11 participants, with commercial interest in their innovations from Boeing Defence, Obelisk Systems, Robotic Systems, RAAF and a range of schools, as well as niche work placements for students at Boeing.

Through school and industry collaboration, the ME Program delivers a range of activities that provide secondary school students with STEM and enterprise skills in preparation for—and as a pathway—to careers in Defence and defence industries. It is funded by Defence's Schools Pathway Programme.

CASE STUDY

The Naval Shipbuilding College

Announced in April 2018, the Naval Shipbuilding College was established to support a coordinated, national approach to workforce development and skilling across the naval shipbuilding enterprise. The contract for the college was awarded to the Naval Shipbuilding Institute (Aust) Pty Ltd, a joint venture between Huntington–Ingalls Industries and Kellogg, Brown & Root Australia.

The college has established the Naval Shipbuilding Workforce Register which enables first time entrants, people looking to transition from adjacent industries, or those wishing to up-skill within the industry, to connect with potential employers or education providers and build awareness of the long-term career opportunities across the continuous shipbuilding enterprise.

The college has established strong relationships with industry and is working with shipbuilding and sustainment firms to refine workforce demand as part of the coordinated approach to skills needs at an enterprise level.

The college is also working with education and training providers to rapidly enhance

education and training programs (including refining curriculum and delivery models) to reflect the requirements of Australia’s modern shipbuilding and sustainment industry. This includes establishing a network of endorsed education and training providers under a national hub-and-spoke model.

The college is also undertaking community engagement activities across Australia and is working with industry and education providers to support STEM and skilling pathways and opportunities into the industry. This engagement is vital to support the increased student enrolments with endorsed providers that are required to meet the workforce growth projected toward the mid-2020s. Over the longer term, the college will continue to expand educational and work placement pathways for students, graduates and qualified workers from allied industries to meet increased workforce demand.

Further information is available at www.navalshipbuildingcollege.com.au

nsc



NAVAL
SHIPBUILDING
COLLEGE

Governance

Industry and innovation expertise

The Next Generation Technologies Fund, Defence Innovation Hub and the CDIC are underpinned by a unified framework to ensure investment is strategy-led. Governance and operational arrangements have been established to provide strategic oversight and coordinate the Defence innovation system, ensuring visibility of funding recommendations and linking innovation investment to capability priorities.

In establishing and developing the industry and innovation programs, Defence has sought input from a range of defence industry and innovation experts. The programs are underpinned by a governance framework that incorporates private sector and Defence representation.

The Defence Innovation Steering Group includes two external representatives:

- Dr Megan Clarke, Head of the Australian Space Agency, non-executive Director at Rio Tinto and former CEO of CSIRO, and
- Jim Whalley, co-founder of Nova Systems.

Dr Clarke and Mr Whalley:

- provide feedback from industry and research organisations on the performance of the Defence innovation system
- advise the Defence Innovation Steering Group on innovation practices in organisations outside Defence, and
- provide feedback on the implications for industry and research organisations on proposed changes to the Defence innovation system.

The Next Generation Technologies Fund also uses independent experts from industry, academia and international defence science and technology organisations to review and validate the selection processes to identify research partners. These experts engage in areas where they have an acknowledged reputation. They include:

- Professor Hugh Durrant-Whyte, NSW Chief Scientist and Engineer
- Professor Ian Chubb, CRC Advisory Committee member and former Chief Scientist
- AVM Neil Hart (Rtd), co-author of the Defence White Paper and Force Structure review, co-author and former head of First Principles Review Implementation
- Mr Paul Mellow, former CEO of GD Defence Australia and General Manager Defence Australia
- Mr Guy Powell, Principal Technologist at Dstl UK, and
- Professor John Close, ANU, Member of the SRC College of experts.



ANNUAL REPORTING TO GOVERNMENT

This is the second Defence Industry and Innovation Programs Update Report, and the first by financial year. The reporting framework reflects the Department of Finance Commonwealth Performance Framework Guidance, with strategic measures reported qualitatively, supported by quantitative performance information.





