Australian Government
Department of Defence

More, together.

Defence Science and Technology Strategy 2030

Defending Australia and its National Interests
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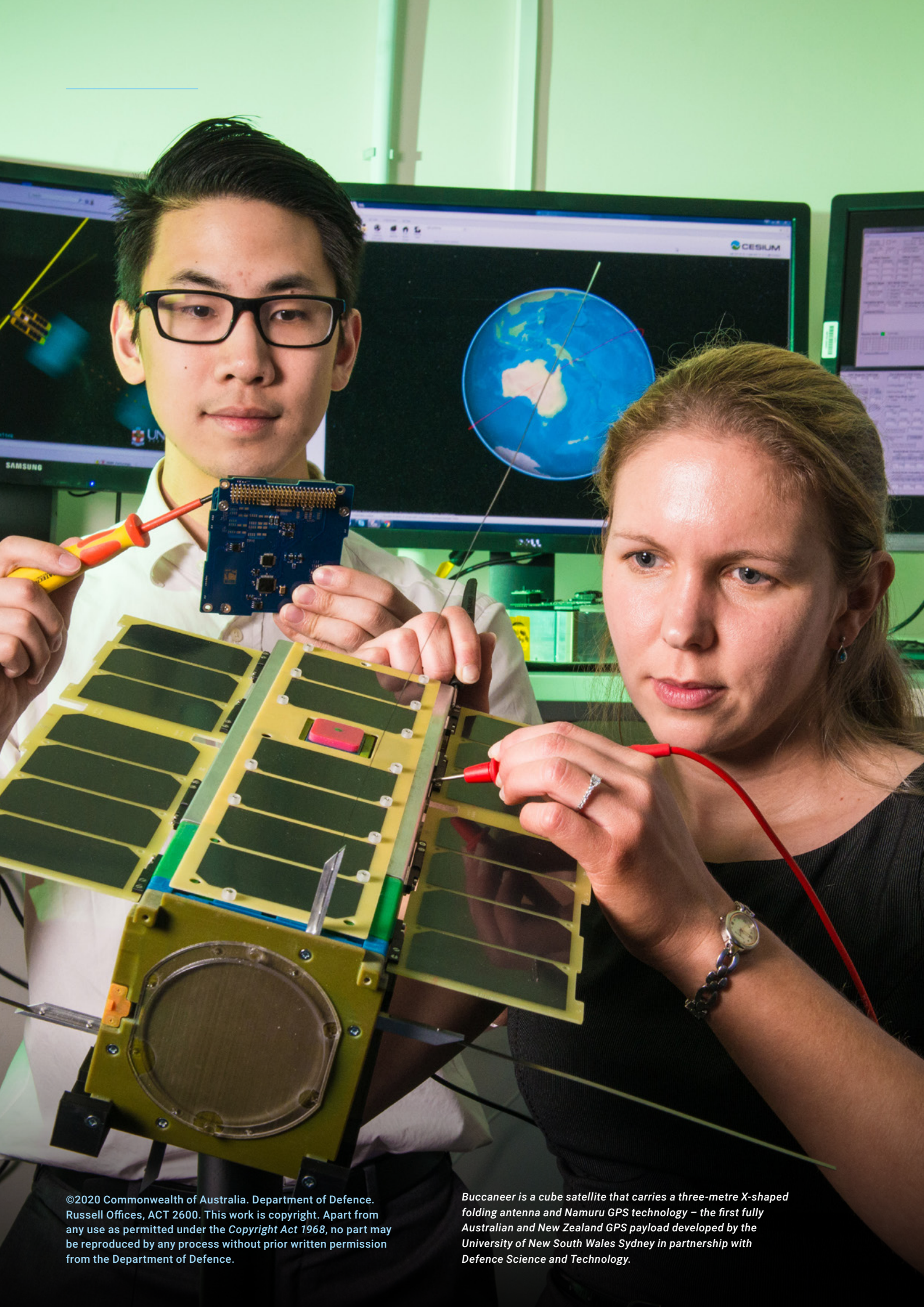


Buccaneer is a cube satellite that carries a three-metre X-shaped folding antenna and Namuru GPS technology – the first fully Australian and New Zealand GPS payload developed by the University of New South Wales Sydney in partnership with Defence Science and Technology.

Message from the Minister for Defence

Innovation, science and technology are important enablers for national prosperity and security, and are supported by substantial investment from the current Australian Government.

Within Defence, this investment was prominent in the *2016 Defence White Paper*, which established both the Defence Innovation Hub and the Next Generation Technologies Fund (NGTF) as important new technology development initiatives.

But Australia's strategic circumstances are changing more rapidly than anticipated at the time of the White Paper. Defence must remain agile and responsive in its assessment of, and reaction to, these shifting strategic circumstances, including the strategic challenges presented by emerging technology.

The Indo-Pacific is becoming more prosperous, but it is also becoming more complex and contested – US/China competition is intensifying, international rules and norms are increasingly challenged, and technological advances could potentially become highly disruptive.

As a highly capable defence force, our response to these strategic and technological trends must be innovative and cost effective. With our partners, we must also make the best use of emerging technologies in the platforms and systems we acquire.

Realising outcomes and generating impact from government investment in science and technology (S&T) is critical. For Defence, impact is clear if new technology contributes to enhanced operational capability, both for Australia and our allies. But S&T impact can also be realised through securing strategic advantage and the growth of sovereign industry capability.

This strategy provides guidance to ensure the national S&T enterprise is strengthened and explicitly leveraged to achieve scale to address the strategic and geopolitical challenges we face. It includes initiatives to focus resources on Defence's highest S&T priorities, and supports more streamlined transitioning of good technological ideas into capability.

Defence's STaR Shots program supports the outcomes of government's Next Generation Technologies Fund by ensuring there is an identified pathway from research to utilisation in solving priority defence capability gaps. Importantly, the NGTF remains the principal vehicle by which critical technology areas, that Australia must nurture for future Defence capabilities, are identified and pursued.

In a new era of strategic competition, this strategy aims to ensure our defence force is technologically superior and fully integrated into a joint Australian force to be seamlessly interoperable with our Allies and partners globally. To achieve this we need seamless collaboration with our trusted industrial base and academic partners in Australia.

SENATOR THE HON. LINDA REYNOLDS CSC
MINISTER FOR DEFENCE

Message from the Chief Defence Scientist

Australia's place in a rapidly changing world depends on our ability to focus our national science and technology enterprise on some of the biggest opportunities and shape the path from knowledge into impact in future Defence capabilities.

We live in an environment of great change across many dimensions, including technology. The scope of science and technology (S&T) is broadening and the speed of change is breathtaking. We see this in our daily lives through advances in artificial intelligence, our ability to harness data, new energy sources, robotics, medical science and space applications. These changes present Defence with both challenges and opportunities. We must work out how to translate these technological advances into new Defence capability.

The *2016 Defence White Paper* introduced a major new investment in science, technology, research and innovation, with funding to significantly grow the contributions of Australian industry and universities to the creation of new Defence capability. The response from the national S&T enterprise has been strong, but we are only just beginning this journey. To meet Defence's emerging challenges, we must expand these collaborations. We must ensure that Australia's strength in bringing together interdisciplinary teams is harnessed to deliver impact, to create solutions that confer strategic advantage and to generate opportunities for developing sovereign industry capabilities.

Defence Science and Technology (DST) is one of Australia's pre-eminent research institutions, and its inventions and research outcomes have enhanced Defence capability and supported operations for over 100 years. DST will continue to conduct research to solve those problems that can only be addressed within the Australian Government, and will remain committed to supporting operations and advising on the acquisition and sustainment of Defence capability.

Moving forward, DST will also play a stronger role in enabling and coordinating support to Defence from a national S&T enterprise, of which other publicly funded research agencies (PFRAs), universities, large companies, small to medium enterprises (SMEs) and entrepreneurs are all critical elements. We need to be clear about the S&T goals that Defence aims for, and make hard choices about what we do and what we do not do. A robust approach will be crucial if we are to prioritise and appropriately resource S&T activities, ensuring that good ideas are translated into capability.

Building on our proud history of Defence science, I am excited by the opportunity to partner with a broader community to achieve greater impact in safeguarding Australia. Through this strategy we will achieve more, together.

PROFESSOR TANYA MONRO
CHIEF DEFENCE SCIENTIST

CASE STUDY : COLLABORATIVE PROJECTS

HiFIRE high-speed flight

HIFiRE is one of a series of experiments on flight over Mach 5 conducted by DST and the United States Air Force Research Laboratory. Partners include the University of Queensland, Boeing, BAE Systems and DLR (German Aerospace Center). The knowledge gained from these experiments is supporting the development of future flight ramjets (scramjets).

Executive summary

Focusing our national S&T enterprise on mission-directed research will ensure Defence is best positioned to realise capability advantage in a rapidly evolving environment.

Defence science and technology (S&T) plays a critical role in Australia's defence and national security by ensuring that our forces maintain a capability edge. Defence research has yielded iconic capabilities such as the Black Box flight recorder, the Jindalee Operational Radar Network (JORN) and the Nulka active missile decoy. S&T support to operations, including the development of technology to counter improvised explosives, not only enhances operational outcomes but can also save lives. Expert advice supporting major Defence acquisitions – such as the Joint Strike Fighter and the Future Submarine – helps to shape future capabilities to meet Australia's unique needs, and provides a basis for robust and contestable investment decision-making.

The Defence S&T Strategy is an important step in taking us into the future. DST will continue to lead the development and application of S&T to support Defence's needs in acquisition, sustainment and support to operations, including strategic elements such as the Australian Signals Directorate. DST will also continue to lead the coordination of S&T for Australia's national security community through the National Security Science and Technology Centre[1]. This includes delivering S&T support to national security agencies and leveraging dual-use (defence and national security) technologies where DST has unique, sovereign and classified capabilities.

This strategy will generate a major transformation in the way we partner with the national S&T enterprise to achieve impact through strategic research. It is headlined by the introduction of a new concept – STaR Shots (Science, Technology and Research Shots). In the spirit of pioneering defence S&T achievements, STaR Shots will inspire and focus the national S&T enterprise on large-scale programs of work that lead to specific leap-ahead capabilities for the Australian Defence Force. A set of eight STaR Shots are introduced, each aligned to future Force Structure priorities and endorsed by at least one Defence 3-star sponsor. They represent the most challenging, high impact capabilities that are best solved through S&T. Importantly, each STaR Shot will be established with a developed path for introduction into service. To support the conduct of STaR Shots and a scaling up of the broader Defence science and technology program, this strategy also introduces three strategic pillars:

- **One Defence S&T capability:** leading, shaping and growing Australia's defence S&T enterprise and the coordination of S&T capability to support Defence's needs.
- **Brilliant people, collaborative culture:** developing a highly skilled and collaborative workforce, recognising diversity in partnerships and building a shared culture.
- **Outstanding research infrastructure powering innovation:** providing the necessary physical and digital research environments, building Defence precincts and embracing opportunities to share infrastructure.

This strategy document provides new guidance to achieve a sharper focus on key areas of S&T and increased scale to maximise impact for Defence. A forthcoming document outlining the Strategy Implementation Framework will provide further details on the governance, processes and systems that will be put in place to engage partners and deliver the strategy.

1 *More information on the centre can be found at https://www.dst.defence.gov.au/research-facility/national-security-science-and-technology-centre-nsstc*


FORCE DESIGN
NEEDS REQUIREMENTS
INNOVATION PATHWAYS
PROBLEM DEFINITION
INNOVATION PATHWAYS
KNOWLEDGE CREATION
INNOVATION PATHWAYS
KNOWLEDGE TRANSFER
INNOVATION PATHWAYS
KNOWLEDGE APPLICATION
Strategic environment
Australian R&D strengths
Emerging threats
Inspire STEM
Technology trends
Delivery pathways
CAPABILITY REQUIREMENTS
DEFINING THE PROBLEM
STAR SHOTS AND DOMAIN RESEARCH
SETTING THE COORDINATES
Deployed solutions
One Defence S&T capability
Sovereign industry capability
People and culture
IMPACT
DEFENCE CAPABILITY ADVANTAGE
R&D PROGRAMS
CREATING SCALE AND FOCUS
Strategic advantage
Research infrastructure
OUTCOMES
BUILDING OPPORTUNITIES
Intellectual property
Partner opportunities
New technology and solutions

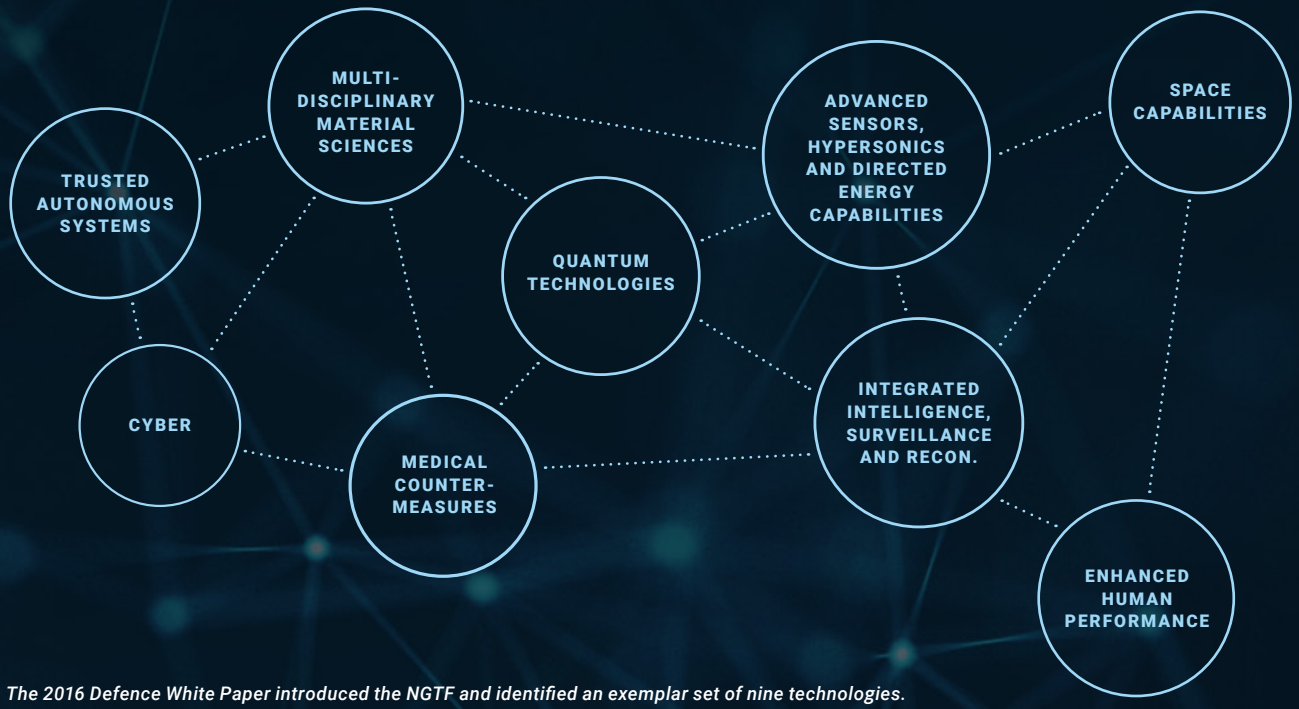
Context

The rapid rate of technological change, the globalisation and democratisation of technology, and an expanding diversity of threats to Australia's defence and national security mean that harnessing S&T has never been more important.

Australia faces a challenging and contested security environment over the next decade, where our determination to protect our interests will be tested more frequently. The *2016 Defence White Paper* identified key drivers shaping Australia's security outlook, including: the changing relationship between the United States and China, which is likely to be characterised by a mixture of cooperation and competition; challenges to the stability of the rules-based global order; the growing threat from terrorism and foreign fighters to Australia's security; state fragility, including in our immediate region; the increasing pace of military modernisation in our region; and increasing threats in cyberspace and space.

In response, the Australian Government is investing in an Australian Defence Force (ADF) that is more agile, capable and potent, with a broader range of capabilities. The government will ensure the ADF remains regionally superior, with the highest levels of military capability and technological sophistication.

Defence's international relationships underpin this effort, particularly S&T partnerships, which are important



The 2016 Defence White Paper introduced the NGTF and identified an exemplar set of nine technologies.
Note: the relative size and connectivity within this diagram is stylistic only.

diplomatic instruments. Through S&T collaboration, systems that are under development can be appropriately tailored to meet Defence's unique needs and new technological concepts can be explored.

There are some Defence capabilities that must be developed domestically, because overseas sources may not provide the assurances we need or the capability requirement might be unique to Australia. Through the 2018 *Defence Industrial Capability Plan*, the government is committed to growing Australia's ability to operate, sustain and upgrade Defence capabilities with the maximum degree of national sovereignty. A well connected, informed and vibrant defence S&T enterprise will be critical to this objective.

Australia benefits from having an industrial base comprising a large number of agile small to medium enterprises (SMEs), strengthened by a core group of global companies with access to international networks, supply chains and export markets. Together, Australian industry has a notable record of accomplishment, producing some of the world's most innovative defence technologies.

Australian universities have become large enterprises that successfully compete on the international stage as centres of undergraduate teaching excellence. The last decade has seen a focus on research excellence, and our universities have embraced this challenge, generating world-class, investigator-driven outcomes. They have also built very successful postgraduate training programs, providing an opportunity to inspire a large community of researchers with mission-directed research focused on Defence impact.

The government has demonstrated its commitment to innovation and to strengthening the national innovation sector through the initiatives of Innovation and Science Australia's *Australia 2030, Prosperity Through Innovation*. Defence has led by establishing the Centre for Defence Industry Capability, the Next Generation Technologies Fund (NGTF) and the Defence Innovation Hub. Australian companies and universities have embraced the opportunities and challenges presented through these programs. It is important to build on this investment to ensure good ideas are matured into Defence capability, and to contribute to the growth of Defence's innovation partners.

In response to the *2015 First Principles Review* (FPR) recommendation that DST articulate its value proposition, an independent analysis of 10 project case studies over the period 2003 to 2015 "conservatively assessed the tangible economic benefits of DST Group's research and support associated with the ten case studies as being approximately $5.1 billion" and concluded that an extension of the analytical approach across DST would show economic benefits of $20 billion to $25 billion.

The FPR also recommended strengthening DST's partnerships. The challenge now is to increase scale through focusing these partnerships on a smaller number of bigger research goals in order to deliver more impact.

Innovation scorecard – international comparison OECD+

Australia performs well in the area of knowledge creation, but this strength is not being reflected in transfer and application. The *S&T Strategy for Defence* provides a focused framework to advance innovation through supporting Defence and national security.

KNOWLEDGE CREATION	8/36	Highly cited publications top 1% in the world, all disciplines	3/36	Government and higher ed. researchers per thousand
KNOWLEDGE TRANSFER	18/37	Percentage of higher education R&D financed by Industry	27/38	Proportion of publications with industry affiliated authors
KNOWLEDGE APPLICATION	21/36	Business researchers per thousand employed in industry	16/37	Business expenditure on research and development

Source: Innovation and Science Australia (2016) Performance review of the Australian innovation, science and research system 2016. OECD+ countries include countries within the OECD plus China, Taiwan and Singapore.

Defence innovation pathways

Defence has made significant progress in creating a range of programs that foster new ideas for advancing ADF capability, maturing these ideas and leveraging the national S&T enterprise.

The *2016 Defence White Paper* introduced investment streams to initiate and mature new technologies for Defence through mobilising this broader S&T enterprise. Defence has an opportunity to build on these initiatives and move further towards realising integrated innovation pathways to ensure great ideas achieve impact in the form of Defence capability.

Defence's capability needs and requirements are shaped by the strategic environment, including technological trends and emerging threats, as well as lessons learned from existing capability. Needs and requirements allow the definition of research – a way of setting the co-ordinates for an integrated research program that includes large-scale STaR Shots and other capability-focused S&T. This integrated research program includes objectives that will be realised over horizons that extend from short (1–3 years) to medium (3–5 years) and long-term (5–10 years).

Through harnessing the creative talent of universities, industry (prime contractors and SMEs), publicly funded research agencies (PFRAs), international partners and importantly, Defence itself, great ideas can be matured into innovative solutions. With support from Defence's innovation programs, potentially augmented to accelerate transition, and industry co-investment, these innovative solution concepts can be trialled and demonstrated to assess their usefulness and, through focused innovation pathways, fed into Defence's Integrated Investment Program for introduction into service and capability advantage.

Security is an important consideration. Defence will ensure there are appropriate measures in place to protect intellectual property (IP), as well as our national security interests, before entering into any contracts. We expect our university and industry partners to be members of the Defence Industry Security Program, and have the necessary accredited infrastructure and cleared researchers to protect the IP created through our collaborations.

Right: Elizabeth Frost from the United States Air Force Research Lab (right) manages the Allied Impact Training Operators Console during Autonomous Warrior 2018 at HMAS Creswell, Jervis Bay.

International engagement

A key challenge for Defence in the coming decade will be determining which international collaborations to invest in. Defence will meet this challenge through adopting a more targeted, top-down approach to engagement. Shared goals that align with our STaR Shots will be a key driver behind international partnering decisions.

Developing new technologies with international partners will be critical if Defence is to create and sustain world-class capabilities. International S&T engagement allows Defence access to information, world-leading technologies, and facilities and equipment not otherwise available to Australia; it ensures Defence continues to be recognised as a valued international partner; contributes to Defence's broader objectives by deepening engagement with partners in the region; creates opportunities for defence industry and exports; and facilitates the sharing of information about emerging threats.

Defence's partnership within the Five Eyes community via The Technical Cooperation Program, and particularly our bilateral collaborations with the United States and the United Kingdom, has enabled Australia to play a significant role in the delivery of outstanding capabilities such as the electronic warfare suite on the EA-18G Growler, the Nulka active missile decoy and Mk48 torpedo.

Beyond its traditional Five Eyes partners, Defence recognises the considerable opportunities presented by further developing S&T partnerships with countries in the Indo-Pacific region. Japan, the Republic of Korea, Singapore and India consistently produce world-leading defence technology, and we share a variety of S&T interests and security objectives.

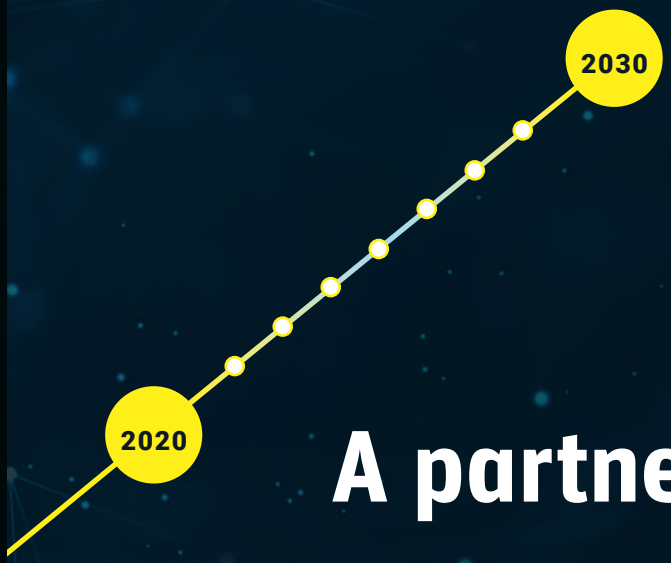
Pioneering past

Defence S&T research has been undertaken in Australia since 1907. For over 100 years, Defence scientists have established an impressive record of achievements.

Many of these accomplishments, including the Jindalee Operational Radar Network (JORN), were the ultimate outcome of fundamental research that was matured through a gradual process. Partnerships were critical, but the roles of partners tended to align with specific stages of that maturation process. Universities tended to be engaged early, with industry partners selected at a later stage of research translation.

Other landmark achievements that had their origins in Defence innovation, such as the Nulka active missile decoy, faced different challenges on the way to being introduced into service.

Over time the approach to defence S&T has evolved, and research is now undertaken through a more systematic engagement with partners.



A partnered future

This strategy will move Defence further towards a future where S&T is delivered through a more streamlined process.

Good ideas will become Defence capabilities in a timeframe that matches the rapid rate of technological change. Trusted relationships between Defence scientists and engineers, Australian universities and industry, and international partners will be formed from the outset to ensure early buy-in, mitigate potential disconnects in innovation pathways and shorten the time taken to translate innovative thinking into a Defence capability advantage.

To realise this vision, the Defence S&T Strategy introduces three strategic pillars: One Defence S&T capability; Brilliant people, collaborative culture; and Outstanding research infrastructure powering innovation.

Researchers and personnel engage in a range of analytical wargames – tailored, scalable, evaluation and analysis activity designed to increase understanding of current and future problems and inform better decision-making across the ADF.

Science, Technology and Research (STaR) Shots

Eight STaR Shots will be established to focus strategic research and proactively develop new leap-ahead Defence capabilities.

STaR Shots will be established to focus strategic research and drive the development of leap-ahead Defence capabilities.

This strategy introduces a new concept – STaR Shots – that will concentrate strategic research efforts on a smaller number of bigger, specific and challenging problems of the scale and impact of JORN. An ambitious schedule will be set, with the aim of demonstrating leap-ahead capability within 10 years.

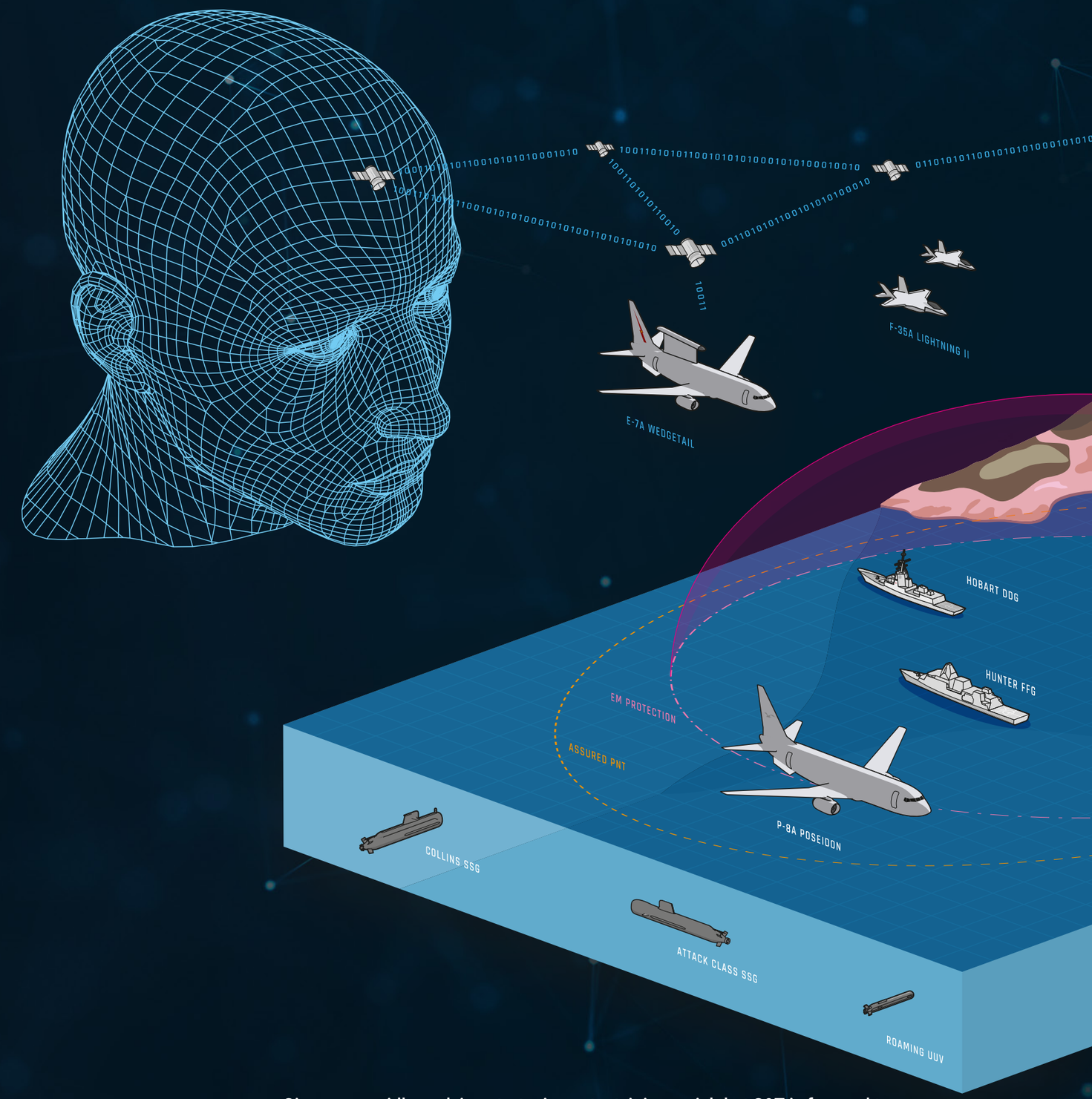
STaR Shots will be challenging, inspirational and aspirational, and will generate competitive capability best achieved through Australian investment. They will align with Defence strategic guidance, address future Force Structure priorities and be sponsored by at least one Defence 3-star leader. Crucially, they will have clearly defined transition pathways to take innovative ideas out of the laboratory and deliver real impact into the hands of the warfighter.

STaR Shots will focus the strategic research investment program but with an increase in scale and intensity that will be supported by investment from other innovation initiatives and partner co-investment.

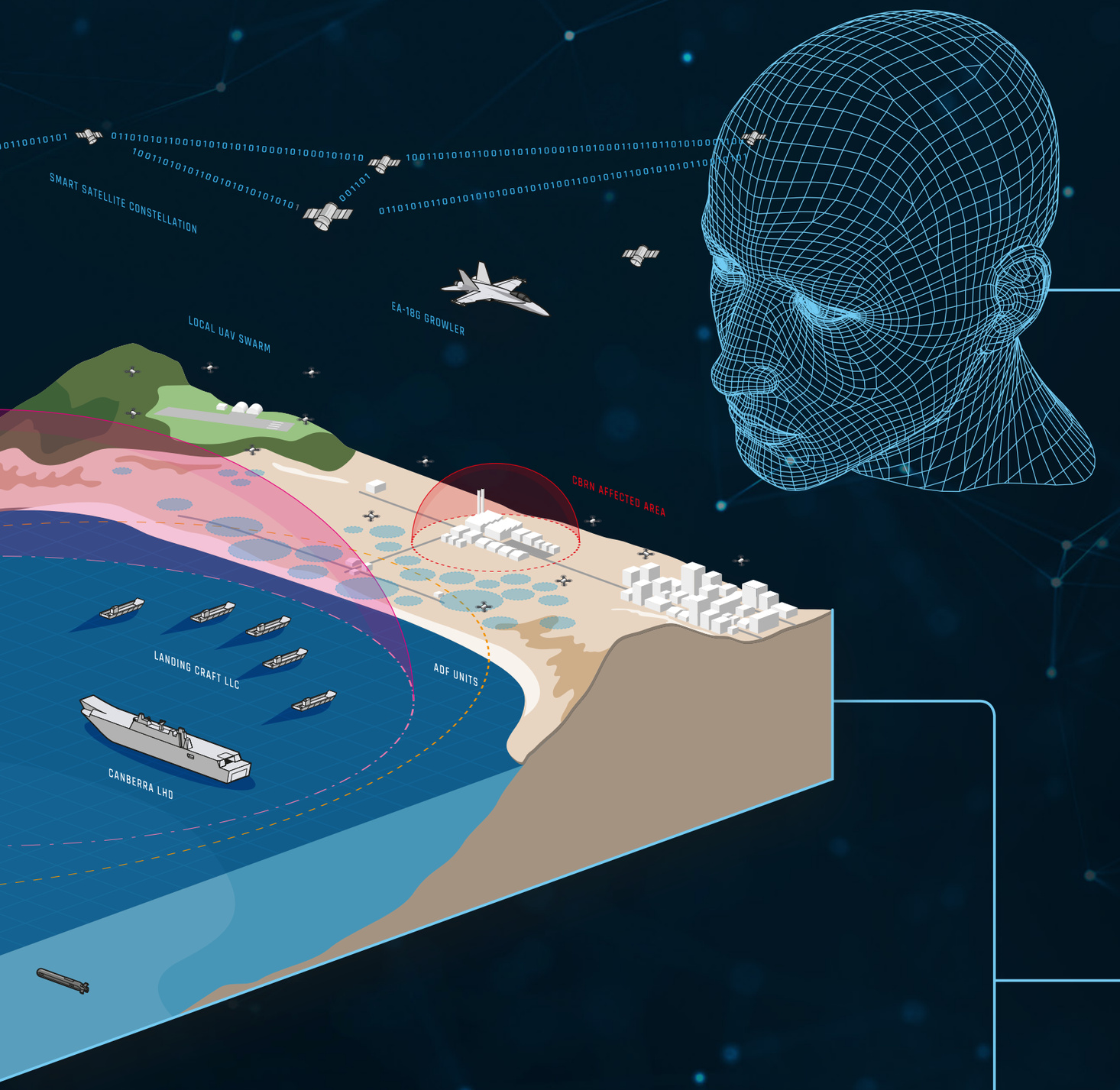
The initial eight STaR Shots will be established to collectively support Defence's ability to prevail in contested environments. Aligning with capability needs across each of the warfighting domains, they will enable Defence to get to the fight, shape how the ADF operates and generate new military effects.

STaR Shots will be supported though investment in modelling and simulation, wargaming, prototyping, experimentation and trials. They will culminate in technology demonstrations during ADF exercises.

The STaR Shots are deliberately ambitious and reflect Defence's enduring commitment to invest in science and technology. As our strategic context evolves, new STaR Shots could be established to ensure that leap-ahead capabilities which align with Defence's needs continue to be delivered.



Given our rapidly evolving strategic context, it is crucial that S&T is focused to equip the ADF to prevail in contested environments. The scenario above illustrates a representative amphibious operation, bringing together a range of capabilities across the air, land, maritime, space and information domains. As a medium-sized defence force, the ADF relies on advanced capabilities rather than mass. The STaR Shots concept introduced in this strategy will focus our efforts in innovation and S&T to generate new leap-ahead capabilities that will enable Australia to retain its technological edge.



The ADF's ability to understand the operational environment, manoeuvre and project force will be transformed through advances in sensing, information fusion and dissemination, artificial intelligence and human-machine partnership. The way Defence sustains its capabilities will be greatly enhanced, increasing platform availability and reducing costs. Technological change will improve our resilience, support a new level of agility in command and control, and give us new options for effects, whether kinetic or in the information domain.

RESILIENT MULTI-MISSION SPACE

Providing resilient global communications, position navigation and timing (PNT) and geospatial intelligence (GEOINT) capabilities direct to ADF users, enabled by a low earth orbit (LEO) SmartSat constellation.

INFORMATION WARFARE

Delivering blended awareness and resilient effects across the human, information and physical realms through a contested information environment.

AGILE COMMAND AND CONTROL

Developing a force-level capability edge at all levels to understand, shape and dominate the future multi-domain battlespace.

QUANTUM ASSURED PNT

Assuring position, navigation and timing (PNT) in a contested environment.

DISRUPTIVE WEAPON EFFECTS

Delivering emerging and disruptive weapon capabilities for multi-domain combat in highly contested environments.

OPERATING IN CBRN ENVIRONMENTS

Enabling the joint force to operate safely and effectively in contested chemical, biological, radiological and nuclear (CBRN) threat environments.

BATTLE-READY PLATFORMS

Delivering next generation data analytics and digital twin systems for the prediction of material state to guarantee platform availability and capability.

REMOTE UNDERSEA SURVEILLANCE

Developing above/below water sensors, information processing, communication and data fusion systems to provide remote surveillance of undersea environments over Australia's area of maritime responsibility.

One Defence S&T capability

Leading, shaping and nurturing Australia's national defence S&T enterprise and the coordination of S&T capability to support Defence's needs.

Shaping a national defence S&T enterprise

Defence will lead and shape a national S&T enterprise, complementing DST's own expertise with the best our domestic and international partners have to offer.

Defence will:

- Develop a One Defence capability plan that sets out priorities for S&T investment.
- Grow national capabilities in critical areas of S&T in partnership with external experts.
- Establish and be deeply engaged in innovation precincts that facilitate Defence's access to world-class facilities and partners.
- Leverage state-based defence research networks to encourage multi-partner collaboration.
- Support topic-based networks to share knowledge and promote opportunities.

Collaborations with universities will be security assessed and protected, providing assurance of an uncompromised ability to support Defence. Research partners will use the Defence Industry Security Program to apply the necessary levels of protection, and will be fully supported by Defence to make sure this process is as smooth as possible.

Assuring S&T capability

DST will lead the coordination and governance of S&T within Defence to ensure that a coherent, efficient and effective program of research provides high-impact for the ADF.

Role of the Chief Defence Scientist

DST, represented by the Chief Defence Scientist, is the principal S&T advisor to Defence. As principal advisor, the Chief Defence Scientist will lead the department's planning, sourcing and assurance of S&T capability.

Success measures

- Defence has a coherent program of S&T that aligns with strategic priorities, works with the best partners and maximises impact.
- Benchmarking assessment indicates the ability and value of Defence's collaborative S&T networks to deliver leap-ahead outcomes for the ADF.
- The department uses robust and consistent mechanisms to access external partners.
- Defence requirements for S&T are reflected in national plans for innovation, science and research, and influence national S&T investment decisions.
- Increased use of collaborative agreements.
- Better alignment of research to Defence priorities.
- Increased collaborative Defence-university-industry research, providing outcomes for Defence.
- National and international recognition of Australian expertise and excellence in S&T linked to Defence priorities.

CASE STUDY : TOPIC-BASED NETWORK

Human Performance Research network

Established in 2016, the Human Performance Research network (HPRnet) addresses research priorities set for Navy, Army, and Air Force to enhance the physical and cognitive performance of personnel. HPRnet brings together teams from Defence and universities that are signatories to the Defence Science Partnering Deed.

Background: Personnel undertake virtual reality (VR)-based cognitive performance assessments and training. VR allows a wide variety of situations and events to be explored by multiple personnel across different locations at the same time.

Brilliant people, collaborative culture

Developing a highly skilled and collaborative workforce, recognising diversity in partnerships and building shared culture.

Brilliant people

High-quality leadership in the S&T enterprise

Our high-performing leaders will actively shape the S&T environment and inspire others in the S&T enterprise to identify opportunities to partner within their own discipline and more broadly to deliver world-leading outcomes to the ADF.

Developing researchers

Defence will support our people to be highly networked leaders, equipped with the skills to develop and manage relationships across academia, industry and government. Opportunities for mobility within the enterprise will be promoted to build awareness and skills, and support ongoing, multi-disciplinary education. We will endeavour to make the best use of our workforce's experience in the training of the next generation of researchers. And we will identify where we can partner to ensure people in all roles within the S&T enterprise have access to opportunities to learn new skills.

Nurture the talent pool for the S&T enterprise

Through the implementation of Defence's *STEM Workforce Strategic Vision*, we will grow the future talent pool for the defence S&T enterprise. Our vision is supported by a set of STEM key workforce objectives: shape, partner, inspire, promote and retain.

Collaborative culture

Working together to achieve more

Defence will foster a responsive, agile, collaborative and dynamic culture that encourages and rewards boldness in innovation when tackling S&T challenges for Defence and national security. We will nurture a respectful, adaptive, safe and inclusive workplace where people feel valued and thrive. Defence recognises that our people are our greatest asset, and we must continue to invest in their development.

We will lead by example, shaping the culture within the defence S&T enterprise by promoting these workplace characteristics. While recognising the value of embracing a diversity of partners, we will build a collective security culture that protects sensitive information without unduly hindering innovation.

The *Defence Pathway to Change* cultural reform effort will guide us on how we work and act, at the individual level and as an organisation within the defence S&T enterprise.

Achieve greater diversity and inclusion

Defence will play a leading role in developing a strong narrative on inclusion across the S&T enterprise. We want to ensure that teams are diverse in background and experience, so that every person can contribute according to their capacity. We want to be regarded as a workplace of choice.

We will seek out opportunities to participate in promoting diversity across the S&T enterprise, particularly with a view to increasing the numbers of women and Aboriginal and Torres Strait Islanders in the S&T workforce.

Success measures

- Implementation of a research skills development roadmap to build the expertise, leadership qualities, career pathways and mobility options required to develop experience and skills across the S&T enterprise.
- The use of interdisciplinary teams from multiple partners working together to solve defence S&T problems becomes standard practice.
- Increased mobility of talent between Defence, industry, academia and international partners.
- Defence S&T staff are highly networked leaders with the skills to develop and leverage relationships with key partners across Defence, industry and academia.
- An increase in the number of students identifying STEM as a future career to establish a talent pipeline.
- More students pursuing STEM pathways into Defence.
- Defence has established partnerships in the education sector to ensure that the teaching of STEM subjects is aligned with the skills requirements of the future Defence workforce, as outlined in the S&T Capability Plan.
- The defence S&T workforce is aligned with school and university graduation rates for minority groups.
- Defence is an employer of choice for STEM professionals.
- Key metrics are established for inclusion and diversity initiatives, with regular review.
- A robust security culture is maintained across the defence S&T enterprise.

CASE STUDY : COLLABORATION

DST partnership with CSIRO in cyber security

DST established a strategic partnership with CSIRO's Data61 to support deep collaboration in cyber. Although the application domains of the two groups differ, there are common S&T foundations that underpin respective research goals. The partnership with Data61 has strengthened research depth in critical areas and filled gaps in individual expertise. Beyond specific research outcomes, the partnership is proving successful in nurturing an Australian cyber S&T community.

Outstanding research infrastructure powering innovation

Providing the necessary physical and digital research environments, building Defence precincts and embracing opportunities to share infrastructure.

Defence will work with partners across the defence S&T enterprise to ensure it owns or can access the research infrastructure required to maintain and deliver current and future capability.

Research infrastructure investment and modernisation will be based on clear S&T capability planning. Modern physical, digital and information research environments will be established to facilitate teamwork and S&T collaboration, while providing researchers with suitable knowledge systems and data sources.

Flexible and secure enabling infrastructure will be used to streamline collaboration with our S&T partners, both domestic and international.

Success measures

- The establishment of high-quality defence S&T precincts across Australia to foster closer relationships with industry and academia, creating economies of scale.
- Increased access to, and utilisation of, capital intensive high quality research infrastructure to support the distinctive needs of the defence S&T enterprise.
- Improved national self-reliance on critical sovereign S&T capabilities.
- Expansion of the talent pool and research capability through collaborative activities centring on S&T precincts.
- Stronger and more focused strategic alliances with universities and industry.

CASE STUDY : SHARED INFRASTRUCTURE

Defence precincts

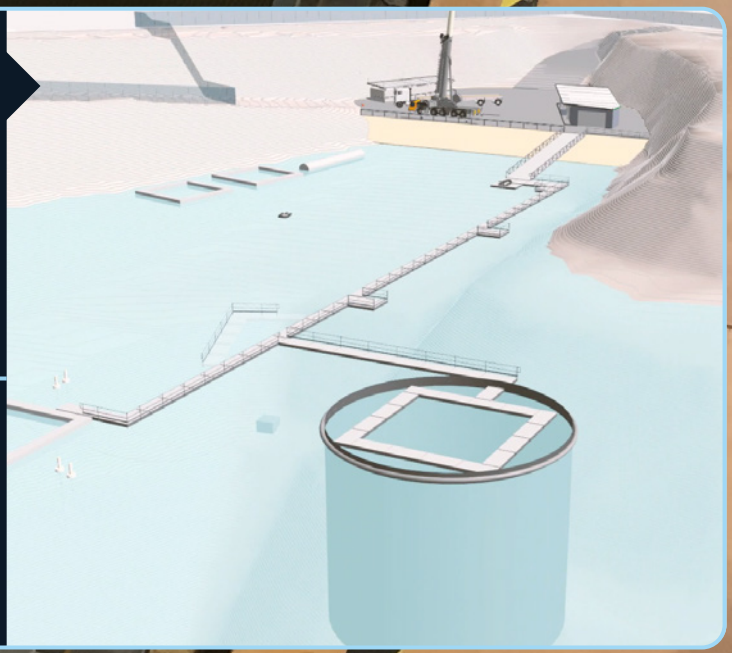
Defence and its partners are exploring new opportunities for co-location, with shared access to high-cost experimentation facilities, new facilities for research and education, staff and closer relationships between collaboration partners. Defence is currently considering new precincts in Victoria, South Australia, Queensland and Tasmania.

CASE STUDY : MULTI-USE FACILITIES

Maritime research facilities

Defence's new $10 million multi-use maritime research facility at Nagambie in central Victoria became operational during 2019. The facility supports a wide range of research activities to be undertaken by Defence, domestic and international defence companies and universities.

Background: Defence worked with the Australian Maritime College to develop techniques for mapping hydrodynamic loads. The program was undertaken with the Maritime Research Institute and Defence Materiel Organisation in the Netherlands, Defence Research and Development Canada, and the US Coast Guard.



More, together.

Defence Science and Technology Strategy 2030

Focusing on larger S&T programs supporting Defence strategic priorities.

Partnering within the national S&T enterprise and international alliances.

Delivering a capability edge through streamlined, secure innovation pathways.

FOCUS ››››››› **SCALE** ››››››› **IMPACT**

STAR SHOTS AND DOMAIN RESEARCH

STaR Shots: Challenging, inspirational and ambitious mission-directed programs to focus strategic research and drive development of future Defence capabilities.

INNOVATION PATHWAYS

KNOWLEDGE DEVELOPMENT → INDUSTRY DEVELOPMENT

ONE DEFENCE S&T CAPABILITY

Leading, shaping and nurturing the defence S&T enterprise, and coordinating S&T capability.

BRILLIANT PEOPLE, COLLABORATIVE CULTURE

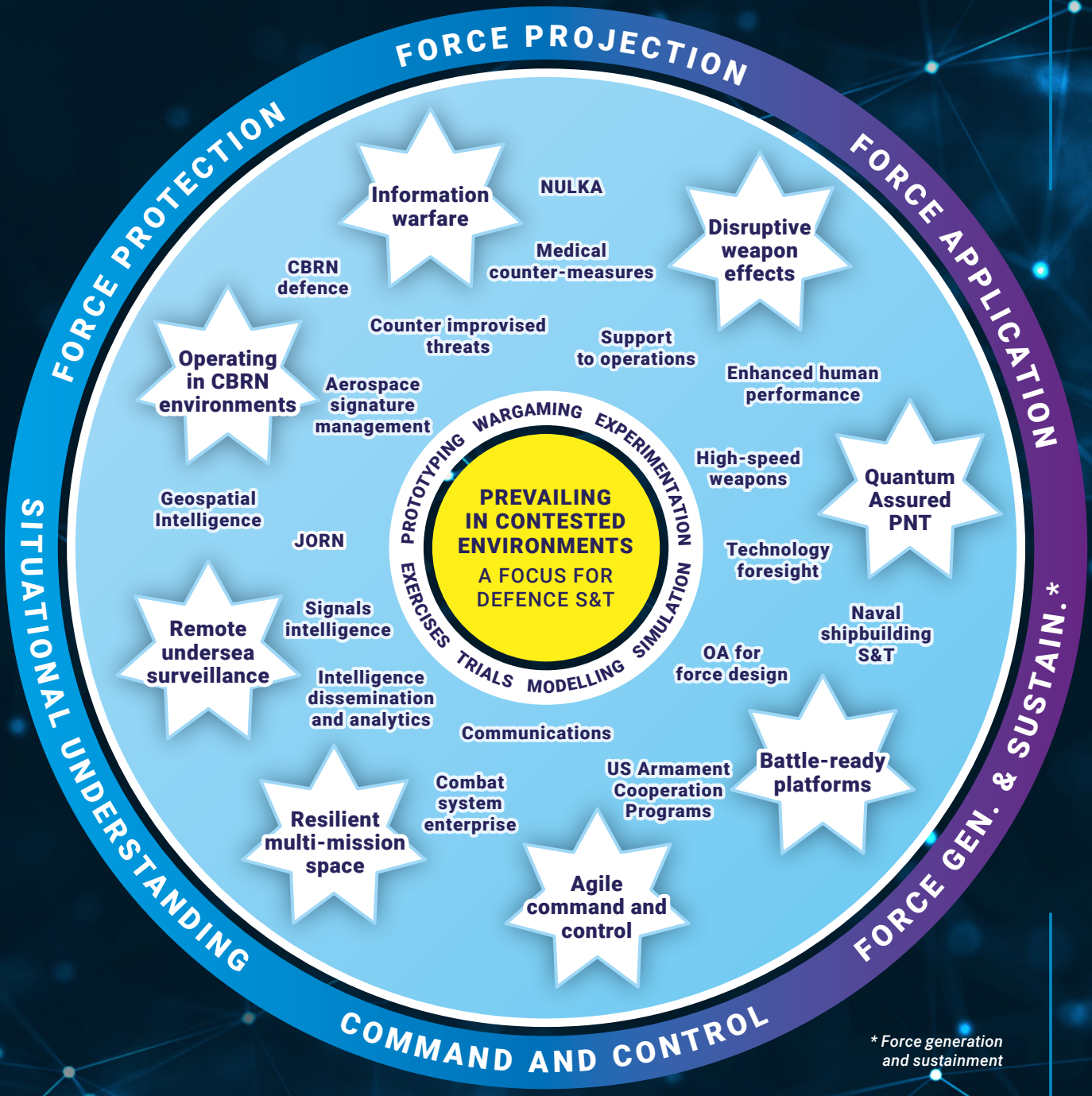
A highly skilled and collaborative workforce, shared culture, and diversity in partnerships.

OUTSTANDING RESEARCH INFRASTRUCTURE POWERING INNOVATION

Physical and digital research environments, building precincts and sharing infrastructure.

Taken together, STaR Shots have an overarching objective of equipping Defence to prevail in contested environments. They will enable Defence to get to the fight, shape how we operate and generate the technology to deliver new effects. STaR Shots will aim to demonstrate capability advantage in realistic environments, and will draw on capabilities in modelling and simulation, wargaming, prototyping, experimentation and trials. STaR Shots will not be the only S&T effort within Defence.

The diagram below shows examples of some of the many important S&T programs that will endure alongside STaR Shots. These include strategic research programs, support to Defence operations, and ongoing advice on capability acquisitions and sustainment.



** Force generation and sustainment*

Further information

For the latest information on the *Defence Science and Technology Strategy 2030*, STaR Shots, Foundational Pillars, events and consultations, we encourage you to view our website.

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DefenceScience

DSTOvideo

DefenceScience

Defence Science and Technology

Dr Sarah Cannard from Nova Group briefs personnel on operations in the waters off HMAS Creswell during Autonomous Warrior 2018. Held under the auspices of The Technical Cooperation Program (TTCP), Autonomous Warrior 2018 was led by DST and supported by the Navy. This dynamic demonstration provided an opportunity for industry to showcase the latest technology, and featured a set of multi-national scientific trials. Navy and Army also exercised their in-service autonomous and uncrewed assets during the event.


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