Charles Darwin University

Submission to the Defence Strategic Review

November 2022

CHARLES DARWIN UNIVERSITY AUSTRALIA

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Australia's most connected University

Charles Darwin University's (CDU) vision is to be Australia's most connected university by being courageous and making a difference in the Northern Territory (NT), Australia and beyond.

Being a dual sector university allows CDU to meet the education needs of Territorians in campuses in Darwin, Alice Springs, Palmerston and Katherine and in study centres in Nhulunbuy, Jabiru and Tennant Creek. CDU has a proud history of delivering on country in some of the NT's most remote locations, bringing training to communities who need it in places such as Galiwinku, Maningrida, Borroloola, Wadeye and Hermannsburg.

At the heart of CDU is to engage First Nations students and support their attainment of vocational and higher education. The NT spans approximately one sixth of Australia's landmass and yet is home to just one per cent of the population, of whom 30 per cent are First Nations peoples. CDU is committed to reaching students from remote areas, who are predominantly First Nations students.

We embrace the vitality and resilience of the Northern Territory, which is the focus of the nation's most ambitious plans for future development – to unlock the vast potential of Northern Australia and to engage with our neighbours in the Asia Pacific. Due to our location, we are in an enviable position to contribute to the future prosperity of Northern Australia through innovative and impactful training, education and research.

CDU supports the NT Government's ambitious goal of reaching a $40 billion economy by 2030 by leveraging the strengths of the NT and its people.

Summary of submission and recommendations

CDU welcomes the opportunity to contribute to the Defence Strategic Review (DSR) and seeks to contribute our expertise in the delivery of training, education and research and as a major organisation headquartered in the NT. CDU's location is important: the NT makes a substantial contribution to Defence, with some six per cent of the Department's personnel (Australian Defence Force (ADF) and Australian Public Service (APS)) based in the Territory.

CDU recognises that the DSR's objective is to deliver recommendations to government to optimise Defence's capability to 2033, and beyond. In support of this, CDU assesses that the Higher Education (HE) and Vocational Education and Training (VET) sectors make two unique, vital, and irreplaceable contributions to Defence capability that should be captured in the DSR, namely that these sectors:

1. serve as *the* fundamental enabler of the Personnel Fundamental Input to Capability (FIC); and
2. provide a vital supporting role to all the FIC through Defence-relevant Research and Development (R&D).

CDU has developed four broad recommendations that, if reflected in the Review, will provide an enduring policy basis to support closer and more efficient cooperation between Defence and the HE/VET sector broadly, and for connected, regional institutions like CDU in particular. As discussed in this submission, CDU believes that such enhanced cooperation is essential to meeting Australia's long-term national security needs, and hence aligns well with the aims of the DSR.

Recommendations

That the Defence Strategic Review:

1. recognise that Australia's HE and VET sector is the fundamental enabler to achieving the Personnel FIC required by Defence to meet the DSR's aims. Defence and industry need trained people to deliver capability and that training at scale will, by necessity, be delivered by Universities and institutions such as TAFEs.

2. recognise the vital contribution of the HE sector to all nine FIC by providing one of Australia's largest sources of defence-relevant R&D. This capability is essential for Defence to meet its national security objectives.

3. recognise the uniquely valuable contributions to Defence capability made by connected, regional institutions, such as CDU. These include supporting recruitment and retention, by enabling Defence personnel to receive training close to where they are based, minimising separation from family, and specialist competencies providing unique insights into operational matters such as the effects of local environmental conditions on personnel and equipment. These outcomes are particularly important in the NT, home to some of Defence's most important bases, training ranges, and being on the front line of Australia's northern defence posture.

4. support the development of closer cooperation between the HE/VET sector and Defence to both achieve the long-term goals of the DSR and best leverage the sectors' capabilities for the Commonwealth. Key initiatives would include:
    a. the organisation of working groups to clarify and coordinate Defence's training and R&D needs, to allow these to be identified and efficiently delivered;
    b. sponsoring more Defence-specific positions at HE/VET institutions, within the framework of return-of-service obligations;
    c. preferential support for, and potentially expanding the range of, training for Defence personnel at connected, regional institutions, where desired by personnel; and
    d. establishing Centres of Research Excellence between Defence and those Universities which have unique advantages relevant to Defence.

The HE and VET sectors: meeting Defence's needs under the DSR.

As described in the Terms of Reference, the purpose of the DSR is to 'optimise Defence capability and posture to meet the nation's security challenges over the period 2023-24 to 2032-33 and beyond'. To achieve this, the Terms state the Review must provide recommendations on a broad range of strategic, investment priority, funding, force structure, and force preparedness issues – all with the aim of optimising capability.[1]

While capability can be considered in many ways, Defence already uses a comprehensive definition: 'the power to achieve a desired operational effect in a nominated environment within a specified time, and to sustain that effect for a designated period'.[2] Such effects can range from being able to have an asset (such as a ship) patrol a location, through to being able to deliver a munition to a specific target, to conducting Humanitarian Assistance and Disaster Relief activities.

Defence further defines that capability is generated through the combination of nine FIC.[3] These include Major Systems (such as warships and aircraft), Facilities and Training Areas (such as bases and weapons testing ranges), and Personnel (appropriately trained ADF and APS staff, and industry contractors).

Considering the above, one key purpose of the DSR will be to provide, implicitly or explicitly, long-term recommendations to Government on how to manage the nine FIC over the succeeding decade and beyond in order to deliver an optimised level of Defence capability.

Enabling the Personnel FIC

While all the FIC are important, Personnel is the most vital – as without trained staff even the most expensive piece of equipment becomes ineffective. This is recognised by Defence, with its Enterprise Learning Strategy noting, 'the quality of our people is the foundation of Defence's capability, effectiveness and reputation'.[4] The document observes that Defence is faced with increasing competition for skilled people, particularly in specialised domains such as cyber security, and that the ADF's capability edge may erode if Defence does not prioritise the 'recruiting, training, education and the continuous development of our personnel.'

Key to enabling the Personnel FIC is the capacity to attract and retain a skilled workforce. However, there exist challenges and opportunities that must be addressed to ensure the full benefit of growth can be fully realised.

Workforce Challenges

Workforce challenges are well articulated elsewhere, but must address

- an impending skills shortage defined by:
    - an ageing workforce requiring the mitigation of retirement trends to ensure current knowledge and skills are passed on to the next generation; and
    - ensuring a younger demographic understand the career opportunities in Defence and through relevant attraction and retention strategies;

[1] https://www.defence.gov.au/about/reviews-inquiries/defence-strategic-review
[2] https://www.dica.org.au/wp-content/uploads/2020/10/Capability-Life-Cycle-Manual-v2-1.pdf
[3] The nine FIC are: Organisation, Command and Management, Personnel, Collective Training, Major Systems, Facilities and Training Areas, Supplies, Support, and Industry. Ibid.
[4] https://www.defence.gov.au/about/strategic-planning/defence-enterprise-learning-strategy-2035

- greater female participation in the Defence workforce;
- ensuring HE/VET systems reflect Defence needs;
- skills shortages in traditional defence-related disciplines and ensuring that emerging workforce requirements, such as digitalisation, automation, robotics and data analysis are considered;
- impending competition from other sectors for skilled workers; and
- ensuring low socio-economic and equity cohorts are supported to participate.

The challenges faced by Defence will only increase as its workforce expands from the current approximately 75,000 permanent staff (ADF and APS) to a workforce of around 101,000 by 2040[5] Further, the defence industry sector now employs around 80,000 staff[6] and is forecast to grow further.

This means that today, 155,000 personnel critical to national security may require training yearly, and this will only grow. Furthermore, many new or existing staff will require specialised skills – either HE university degrees (such as in Engineering, International Relations or Nursing), or trade training (such as mechanics) through VET, or microcredentials (such as for upskilling in emerging technology).

Importantly, *only* the HE/VET sector has the capability and capacity to meet Defence's current and long-term personnel training needs. Recent data shows around one million HE students[7] and over four million VET students[8] were enrolled across Australia. These statistics demonstrate the capacity of Australia's HE and VET sectors to address at scale many of the workforce challenges outlined above through:

- the attraction and participation of more diverse student cohorts;
- targeted training programs to address Defence needs, both in traditional and emerging skills; and
- to provide alternative employment options for experienced staff as trainers and mentors, which embed rewarding service pathways.

CDU proposes that the DSR recognise the vital importance of the HE/VET sector to achieving Defence's long-term capability superiority via the Personnel FIC.

Recommendation 1

That the DSR recognise that Australia's HE and VET sector is the fundamental enabler to achieving the Personnel FIC required by Defence to meet the DSR's aims. Defence and industry need trained people to deliver capability and that training at scale, will by necessity, be delivered by Universities and institutions such as TAFEs.

Supporting all FIC through R&D

In addition to being the essential enabler of the Personnel FIC, the HE sector in particular supports *all* the FIC through defence-relevant R&D – and does so at an impressive level of scale and capability. Australia's universities have some of the most advanced and productive R&D programs in the world,[9] and have applications spanning the diversity of all the FIC.

[5] https://www.minister.defence.gov.au/media-releases/2022-03-10/defence-workforce-grow-above-100000
[6] https://www.abs.gov.au/statistics/research/australian-defence-industry-account-feasibility-study-outcomes
[7] https://www.universitiesaustralia.edu.au/wp-content/uploads/2020/11/200917-HE-Facts-and-Figures-2020.pdf
[8] https://www.ncver.edu.au/news-and-events/media-releases/vet-participation-up-nine-percent
[9] https://www.globalaustralia.gov.au/industries/education-and-research

For example, work conducted in Science, Technology, Engineering and Mathematics (STEM) fields can support Major Systems and issues such as remediating Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) contamination on bases and training facilities.[10] In turn, work in Psychology and Medicine assists to deliver enhanced personnel performance.

CDU recognises R&D is also conducted by Defence directly through the Defence Science and Technology Group (DSTG), which cooperates with universities and funds relevant HE research through the Defence Science Partnerships program.[11] Yet, a vital issue for the DSR is to recognise the broader scale of work conducted by the HE sector and its potential relevance to Defence. For example, DSTG's current budget is around $680 million, with the Commonwealth overall spending around $2.3 billion on R&D in 2020.[12] In contrast, the HE sector spent around $12.6 billion on R&D in the same year.[13] This provides a vast pool of resources that the HE sector can align to emerging priorities of national security interest, providing significant opportunities for R&D to better support Defence priorities.

CDU proposes that the DSR recognise the vital importance of the HE sector to achieving Defence's capability superiority goal through conducting R&D, and that as this capability is essential for Defence to meet its national security objectives in an increasingly technologically-driven security environment.

Recommendation 2

That the DSR recognise the vital contribution of the HE sector to all nine Fundamental Input to Capability (FIC), by providing one of Australia's largest sources of defence-relevant Research and Development (R&D). This capability is essential for Defence to meet its national security objectives.

The uniquely valuable contribution made to Defence capability by connected, regional institutions

While the HE/VET sectors clearly have a vital role to play in achieving Defence's capability objectives, much of the public discussion on the sectors' institutions is focused on large universities in Australia's major capital cities. While this outcome is understandable, there is an under-appreciated set of unique and important contributions that regional institutions, such as CDU, bring to Defence capability both in terms of personnel and R&D.

Recruitment and Retention

In terms of staff, Defence recognises that a key impediment to meeting its growth goals is both recruitment and, especially, retention with some 8-10 per cent of ADF personnel leaving each year – a loss of some 5,000-6,000 highly skilled individuals per annum.[14] A key factor driving retention is the impact that an ADF career has on family life, with deployments taking personnel away from partners and children.[15] Such stresses are only increased when staff are also required to conduct training at cities distant from where they are posted. This issue is likely to be further compounded by the growing need

[10] https://defence.gov.au/environment/pfas/managementactivities.asp
[11] https://www.dst.defence.gov.au/partner-with-us/university
[12] https://www.abs.gov.au/statistics/industry/technology-and-innovation/research-and-experimental-development-government-and-private-non-profit-organisations-australia/latest-release
[13] https://www.abs.gov.au/statistics/industry/technology-and-innovation/research-and-experimental-development-higher-education-organisations-australia/latest-release
[14] https://www.aspistrategist.org.au/where-will-defence-find-18500-more-people/
[15] https://www.smh.com.au/politics/federal/adf-boost-won-t-be-achieved-without-overhaul-of-recruitment-and-retention-policies-20220310-p5a3bx.html

for ongoing learning which will be required by defence staff to ensure they can continue to stay abreast of rapidly evolving technologies.

For regionally based personnel, Defence conducting more training at local institutions provides a key mechanism to address impacts on family life. This is particularly so for areas such as the NT – which requires long transits to major capitals.

Defence-relevant R&D: people, place, and systems

In addition to helping address personnel training, regional institutions offer unique and important R&D capabilities to Defence, driven by one or more of the factors of people, place, and systems. Put simply, researchers (people) tend to acquire expertise in their local environments (place) because it is accessible – and may develop specialised equipment or facilities to support the research (systems).

Major institutions in capital cities tend to develop expertise in various essentially subtropical environments. Yet these climates do not reflect the conditions that the ADF operates in both across Australia and globally. This is particularly for the highly strategic area of the tropics, where Defence has many bases and training ranges, and which is the principal geographic axis of threat to Australia. And while some major Universities have technologies such as climate chambers to support tropical research (which can simulate and control various environmental conditions) these cannot truly replicate the conditions in the relevant climate itself.

In contrast, institutions headquartered in those regions, such as CDU, have unique and world-class expertise on their local regions and can deploy this to support Defence. For example, heat stress on soldiers in the tropics has, tragically led to loss of life in the past.[16] Work to better understand the body's thermal management in such climates must be conducted in place to gain relevant data. Similarly, corrosion of equipment occurs differently in the tropics to elsewhere in Australia as the local biofilms (very thin layers of corrosion-causing bacteria) have a different make-up than they do in other climates. As discussed below, CDU has expertise both in these and other Defence-relevant fields.

CDU and Defence

As a leading regional institution, CDU is uniquely placed both geographically and in its specialist expertise, to deliver training, education and research services to Defence, to meet the short and long-term goals of the DSR.

CDU has established itself as an exciting and progressive research-intensive university with a regional focus that prioritises the complex issues facing Northern Australia and the Asia-Pacific. Research Institutes at CDU including the Research Institute for the Environment and Livelihoods,[17] the Menzies School of Health Research,[18] the Northern Institute,[19] Energy and Resources Institute[20] and their collaborative research networks, provide a strategic framework for research engagement. CDU invests in research that directly addresses critical issues facing Australia's north and the world's tropical zones.

[16] https://www.theage.com.au/national/soldier-dies-during-nt-training-exercise-20041112-gdyz7c.html
[17] https://www.cdu.edu.au/riel
[18] https://www.menzies.edu.au
[19] https://www.cdu.edu.au/northern-institute
[20] https://www.cdu.edu.au/eri

CDU's research outputs consistently outperform for our size and are evaluated as being well above world standards in areas of importance to Northern Australia. In 2022, Stanford University included 24 CDU scientists within the top two per cent of most Influential Scientists in the world.

The Times Higher Education World University Rankings list CDU within the top 400 universities internationally, with CDU research ranking at 348 globally. Within Australia, this places CDU 28th of 37 ranked universities, despite being one of the smallest. The Times Higher Education Impact Rankings, which assess universities against the United Nations' Sustainable Development Goals, saw CDU ranked within the top 200 participating universities in the world.

CDU's contribution to Defence

CDU has a history of providing valuable support to Defence across training, education and R&D, and is expanding on its successes.

Specifically, CDU is one of only six dual-sector (HE and VET) institutions in Australia. As such, it provides a comprehensive capability for meeting the spectrum of Defence's training needs – for personnel entering service, conducting ongoing professional development, or preparing for separation. CDU also has an extensive track record in providing VET training to local Defence industry personnel in the NT. With a footprint across the NT, CDU is located close to some of Australia's most remote bases and training ranges for all three Services, including HMAS *Coonawarra*, Robertson Barracks, and RAAF Darwin and RAAF Tindal.

CDU's history of collaborating with Defence to address important training and R&D opportunities include:

- Training local Navy and Army units in support of their use of a world-leading metal 3D printer developed by local company SPEE3D. Providing material science analysis of printed parts and developing testing/certification procedures. Several of these printers are currently being used to assess the potential to reduce the logistics burden on ADF units and are also being trialled by allied militaries.[21]
- Conducting important research into the prevalence and management of Complex Post Traumatic Stress Disorder (C-PTSD) in military populations.
- Completing a Scoping Study for the ADF on the effects of Heat Stress in Australia's Monsoon Tropics.
- Providing ongoing support to ADF personnel recovering from trauma through therapy provided at the Soldier Recover Centre in Robertson Barracks.
- Providing ongoing Indonesian language training to soldiers in 1 Brigade at Roberston Barracks.
- Completing a research program funded by the United States' Defence Threat Reduction Agency on the Meliodosis Bacteria, a potential bioweapon, which CDU has world-leading expertise on due to its occurrence in the NT.[22]
- Cooperating with Wodonga TAFE to deliver VET training to Defence in the NT.
- Providing environmental/ecological assessments, feral pest and fire management strategies for defence training grounds in the tropics.

[21] https://www.cdu.edu.au/enews/stories/3D-print-army

[22] https://www.menzies.edu.au/page/Research/Global_and_Tropical_Health/Melioidosis/

CDU is pursuing a range of further initiatives to support Defence, and also offers highly relevant and specialised qualifications aligned to Defence's needs, including:

- Establishing the North Australia Centre for Autonomous Systems, developing remote area drone operation techniques and technologies that can support ADF units.
- Delivering a new Diploma of Advanced Manufacturing to upskill the local Defence industry sector in advanced technologies suitable to support Defence's increasingly complex Major Systems.
- Offering a Humanitarian Assistance and Disaster Relief study program from the VET to the Master's level.[23]
- World leading capabilities in Cyber Security R&D and training, with staff ranked among the top one per cent of researchers internationally.[24]
- Potentially expanding the scope of language training delivered to 1 Brigade to include Tetum (Timorese).
- World-leading specialised expertise in defence-relevant tropical biosecurity, personnel thermal management, and equipment climate effects; and PFAS mitigation. CDU seeks to use these to engage with DSTG and other Defence areas on projects such as the OCE STaR Shot[25] and various biosecurity programs, working to develop an improved understanding of heat stress on women in particular (an important factor noting the ADF's increasingly gender-diverse workforce), characterising the effects of tropical biofilms on equipment, and supporting Defence's PFAS remediation efforts.

CDU proposes that the DSR recognise the unique contribution that connected, regional institutions can play in meeting the needs of the Personnel FIC and also in supporting Defence operations in various environments.

Recommendation 3

That the DSR recognise the uniquely valuable contributions to Defence capability made by connected, regional institutions, such as CDU. These include supporting recruitment and retention, by enabling Defence personnel to receive training close to where they are based, minimising separation from family, and specialist competencies providing unique insights into operational matters such as the effects of local environmental conditions on personnel and equipment. These outcomes are particularly important in the NT, home to some of Defence's most important bases, training ranges, and being on the front line of Australia's northern defence posture.

Enhancing cooperation between the HE and VET sectors and Defence

This submission has discussed in detail the unique, vital, and irreplaceable role that the HE/VET sector serves in meeting the needs of Defence now and into the future. Yet it is also true, as noted in the Universities Australia (UA) submission to the DSR, which CDU supports, that more can be done to expand, leverage and operationalise Defence-HE/VET cooperation.

[23] https://www.cdu.edu.au/study/humanitarian-emergency-disaster-management
[24] https://www.cdu.edu.au/research-and-innovation/higher-degree-research/find-supervisor/eng-tech/associate-prof-mamoun-alazab
[25] https://www.dst.defence.gov.au/strategy/star-shots/operating-cbrn-environments

From CDU's perspective, enhanced cooperation is vital from both a national security and efficiency perspective. For Defence to meet its objective to defend Australia and its national interests in an increasingly challenging strategic environment, it must be able to receive the training and R&D support it needs from the HE/VET sectors. Further, given the enormity of Defence's geographic responsibilities, CDU believes no investment can afford to be wasted if the ADF is to ensure Australia's future security and prosperity.

CDU assesses that a variety of measures could be proposed by the DSR to ensure more effective and efficient collaboration. In particular, as noted in the UA submission, the establishment of national working groups to ensure alignment between Defence (and defence industry) training requirements would be beneficial. Such groups could follow the model of the Universities Foreign Interference Taskforce to help assure effective outcomes.

As also noted in the UA submission, Defence may wish to consider sponsoring additional Defence-specific training positions at HE/VET institutions. Such positions would produce graduates that meet the Department's specific needs, and could be linked with return-of-service obligations, such as that the graduating students spend a certain period of time in the ADF or Defence APS.

Cooperation relevant to connected, regional institutions

CDU offers two further recommendations. Firstly, noting the potential impact on recruiting and retention, the University proposes that Defence offer preferential support for training personnel at regional institutions, where this is desired by personnel themselves. The personnel benefits could likely be increased by expanding the range of qualifications offered by regional institutions, as not every HE or VET provider offers all courses that may interest Defence. Achieving this may require additional investment by Defence to ensure courses are provided locally, but this cost may well be offset by expanded recruitment and retention benefits.

Finally, from an R&D perspective, CDU assesses that there remains scope for Defence to better harness, where they exist, the unique Defence-relevant competencies resident in certain Universities due to people, place, or systems. CDU suggests that the DSR recommend Defence consider opening cooperative Centres of Research Excellence with such institutions to most effectively achieve national security results from the Commonwealth's investment.

Recommendation 4

That the DSR support the development of closer cooperation between the HE/VET sector and Defence to both achieve the long-term goals of the DSR and best leverage the sectors' capabilities for the Commonwealth. Key initiatives would include:

a. the organisation of working groups to clarify and coordinate Defence's training and R&D needs, to allow these to be identified and delivered;
b. sponsoring more Defence-specific positions at HE/VET institutions, within the framework of return-of-service obligations;
c. preferential support for, and potentially expanding the range of, training for Defence personnel at connected, regional institutions, where desired by personnel; and
d. establishing Centres of Research Excellence between Defence and those Universities which have unique advantages relevant to Defence.