

**DMTC**

2022

# Annual Report

Capability Through Collaboration



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# Key Message Defence Capability



## Mr Chris Deeble AO, CSC

Deputy Secretary Capability Acquisition and Sustainment Group  
Department of Defence



Australian Army Sapper Guy Phillips from the 3rd Combat Engineer Regiment peeks from cover during a clearance of an enemy stronghold during Exercise Talisman Sabre at Townsville Field Training Area, Queensland on 27 July 2021.

Australian Industry and the broader innovation ecosystem continue to play a critical role in positioning Defence to deliver on the tasks and objectives set for it by the Australian Government.

My predecessor, Tony Fraser, spoke at DMTC's Annual Conference in April 2022 about the sense of urgency needed to bring smart ideas and the best technologies to bear in equipping and sustaining the Australian Defence Force. This sense of urgency has only grown in the months since.

Competing in a global market experiencing rapid technological change, Australia's defence industry needs to demonstrate its innovative and dynamic characteristics.

DMTC is working to build the capacity and capability of Australian industry, and particularly small businesses. At both a macro policy level and on the factory floor, these businesses need tangible support, not just well wishes, to become more resilient and more competitive.

Organisations like DMTC are helping defence industry meet the challenge to innovate and advance the development of key technologies. A broad focus on both technology advancement and, just as importantly, on technology transfer is delivering a genuine return on investment and clear benefits for the sector.

Guided by the outcomes of the Defence Strategic Review, Defence will continue to focus on providing the best level of protection and performance for our soldiers, sailors and aviators alike.

With clarity around strategy and requirements, supported by trust-based and respectful relationships with innovation partners like DMTC, we can take on this critical national task with great confidence.

I congratulate DMTC and its partners for their achievements in 2022, many of which are outlined in this Report.



## Key Message Science & Technology



Australia's Chief Defence Scientist, Professor Tanya Monro with DMTC CEO, Dr Mark Hodge at the ADSTAR Summit in Sydney in July 2022. The Enterprise Collaboration award acknowledged a DMTC-led project to advance naval shipbuilding steel developments, while the runner-up award was presented for the national Medical Countermeasures initiative that is now delivered through the Health Security Systems Australia division of DMTC.



### Professor Tanya Monro

Chief Defence Scientist  
Department of Defence

In the work that we all do to contribute to the profound and complex task of equipping and protecting our Australian Defence Force, both for today and anticipating future challenges, relationships are critical.

For more than a decade, DMTC and Defence Science and Technology Group (DSTG) have been establishing, refining and enhancing our relationship so that, together, we are best placed to leverage innovation and harness science and technology capabilities.

With significant change in global geopolitical circumstances and Australia's role as a trusted alliance partner, comes both challenges and opportunities.

Acceleration and urgency are important words in the context of our technology development efforts, not least because our potential adversaries are moving with increasing speed.

Promising ideas from research and development need to be identified, prioritised, supported and pulled through to new capability – either to counter a known threat or to give our forces a capability advantage.

This is fertile ground for generating sovereign industry capability, and organisations like DMTC have a pivotal role – working alongside and with us – to make those connections.

In July this year, we held the inaugural Australian Defence Science Technology and Research (ADSTAR) Summit. For me, ADSTAR was so much more than just a chance to network and engage. It was a wonderful collection of ideas and discussions, and a chance to

recognise the people at the forefront of turning ideas into reality.

I was delighted that two projects involving DMTC were acknowledged as the winner and runner-up, respectively, of the ADSTAR Enterprise Collaboration awards. Work to enhance naval ship steel and developments in medical countermeasures are great success stories, but also reflect the breadth and importance of DMTC's engagement with DSTG and with Australia's research and industrial sectors.

Another key thread of the ADSTAR event was the very evident diversity of thought that was on display. In my experience, diversity adds value. Embracing different perspectives is increasingly important in tackling group-think, removing bias and addressing skills shortages.

In achieving *More, Together* it's critical that we harness the skills, talents and expertise of the national innovation network to deliver the best possible outcomes for Defence and for the nation. This will allow us to leverage investment in industrially-focused R&D and depends on effective relationships and teaming between DSTG, Universities, other publicly-funded research institutions and industry, as well as innovation specialists like DMTC.

DSTG's partnership with DMTC is one of the critical enablers of our mission, and we will be looking to DMTC and its partners to further support our objectives in coming years.

I congratulate Mark and his team, but also all of the partners involved, on their collective achievements as showcased in this Report.

# Key Message Industry



**Megan Lilly**

Executive Director,  
Ai Group Centre for Education & Training

Effective partnerships between industry, governments and Universities have arguably never been more important.

Strong and successful partnerships take time to establish and are based on mutual trust, benefit and communication. The national partnerships that will deliver a highly-skilled and industry-ready workforce for Australia's future are no exception.

The Ai Group has long been a champion of Work Integrated Learning, or WIL, and sees it as one driver for a much bigger change around tertiary education and training. Rapid technological advances and other disruptions faced by industry (as we are seeing through digital transformation) should trigger major disruption in universities.

Different WIL frameworks and models have been developed to ensure best-fit for particular sectoral demands. These include initiatives involving the likes of BAE Systems Australia, an Ai Group member and long-time partner with DMTC, as well as Ai Group members such as Boeing, Stoddart, TEi Services and CSIRO.

WIL, however, it is yet to be universally regarded as a core activity for University students.

Ai Group believes Australia needs a system in which WIL is seen as fundamental to qualifications.

There is a quote I love from a Canadian report from 2019, that *'businesses are the classrooms of tomorrow'*. This is not to suggest Universities won't exist. On the contrary it backs up the view that disruptive changes

in industry must be mirrored by changes in academia.

I am delighted with the success of the WIL internship placements that are supporting the DMTC *Smart Enough Factory* program, with the support of Ai Group. This is a great example of students not only learning new skills but seeing them come to life in the classrooms of tomorrow, that is, the factory floors of participating small businesses.

The feedback from this program has been overwhelmingly positive and is a credit to all involved. Job opportunities have already been created and accepted.

Elsewhere, BAE is working with Ai Group to introduce a Degree Apprenticeship in Systems Engineering to Australia. Here is an example of WIL morphing into employment-based learning at the university level, where learners have a contract, similar to a traditional apprenticeship.

The worsening skill shortages over the last two years have led some companies to consider WIL – and not as a way to exploit students but to seize an opportunity to redesign roles and organisational structures, and to see students as part of a broader skills strategy for the business.

In a project Ai Group has supported involving South Australian University students being placed in defence companies across SA, feedback has shown that:

- most companies were first time users of WIL and used the program to introduce, develop and embed WIL practices in their workplaces

- 77% of students secured employment with their host (either during or after completing their degree), and
- 94% said their placement allowed them to demonstrate or practice the knowledge and skills attained through their course.

These results demonstrate that WIL is the champion of employability skills – it develops them.

WIL is working, and at the macro level there has been research demonstrating that WIL involvement leads to better employment outcomes.

To date the Australian Government has funded some limited pilots and programs including the Diploma of Digital technologies, Women in STEM Cadetships and Advanced Apprenticeships in Industry 4.0. Ai Group is hopeful that our refreshed *National Strategy for WIL* aimed for release early next year will help to continue to shake up this important, national conversation.

The key is to acknowledge the quest is a long-term one: it is evolving, increasing. It needs change agents and champions in industry working in with partners like DMTC to drive a vision that the future can be created with WIL.



Joshua Roos and Pareshkumar Patel from Parish Engineering, and ICD intern Alex Therapos, observe machine data displayed on a digital dashboard installed as part of Parish Engineering's participation in a Victorian cohort of DMTC's Smart Enough Factory program.

# Chair's Report



**Tony Quick**  
Chair, DMTC Ltd

The imminent release of the Defence Strategic Review, inevitably heralds some uncertainty. There will be winners and losers, however, it is very clear that there remains a compelling need to get on with the business of innovation and building underpinning industrial capability.

There is a sense of urgency in this work that is, perhaps, not universally understood. Accelerating technology development and strengthening supply chains are a key enabler of not only sovereign capability but of Australia's contribution to key alliance priorities and outcomes.

In this context, talk about mobilisation is not just a consideration for military logisticians or supply officers alone. Mobilising effort and harnessing expertise and resources is a key success factor in the business of collaboration.

I am proud of DMTC's continuing focus and capacity to make strategic investments in research and industrial capability and, through them, to deliver impactful programs of work for customers in the defence, national security and health security agencies of Government. These programs are driving the Company's growth.

The Board has considered the implications of this growth and has been pleased with the progress to date on establishing the Health Security Systems Australia division of DMTC. This division is the first, but not only, step in response to clear signals from Defence indicating the need to scale and future-proof the business. In this divisional structure, we are ensuring that attention and resources can be

directed to growth areas while retaining immutable connections to the systems, culture, agility and ethos of the Company.

The Board continues to be impressed by the resilience and professionalism of the DMTC team. The continuing growth in the business attests to their adaptability and resolute focus on achieving results.

Looking across both the Board and the Company as a whole, our unity of purpose is counter-balanced by our diversity and breadth of expertise and backgrounds. The practical ways in which diversity and inclusion are being pursued across the Company are summed up in the Diversity & Inclusion Strategy which the Board wholeheartedly endorsed and approved earlier this year.

The Board also retains its strong focus on discharging its corporate governance responsibilities in an effective manner, including the clear importance around our obligations in relation to cyber security.

Together with the structural flexibility in our operating model, this diversity continues to be a key source of competitive advantage and a very important ingredient in the Company's continuing success.

It is my great pleasure to present the DMTC Annual Report for 2022.



**Dr Mark Hodge**  
CEO, DMTC

While the COVID threat remains a very real one, the return of face-to-face engagements has been particularly notable this year.

I was delighted that we could again welcome partners and stakeholders to our own Annual Conference, as well as participating in other Defence trade expositions and events including DSTG's inaugural ADSTAR Summit. Recognition for some DMTC projects at these events is both very welcome and also timely as the attention of the sector has turned to strategic resilience and the need to accelerate our technology development efforts.

The depth of support for DMTC and the work of our partner group across national and state jurisdictions, across government stovepipes and across sectors has been reaffirmed this year and is a source of professional pride for our team. Our challenge in the immediate and longer term is to retain and build on that trust and support, and never to be complacent about it.

It's encouraging to reflect on the way that DMTC's appetite for industrial innovation, and our determination to deliver tangible outcomes for our customers, has stood the test of time.

Many commentators in defence and related sectors have remarked in general terms on the enormous defence-related research capacity in our universities, and to the capabilities of our domestic industry, but move on too quickly to either lament shortfalls in funding or shortcomings in outcomes achieved.

# CEO's Report

Rather than proposing pragmatic course adjustments or improvements, these laments are too often used as a platform for new 'white elephant' structures that would conservatively take years to mature, and are not necessarily guaranteed to deliver better outcomes.

At DMTC we know that 'overnight successes' take years to achieve, and that careful, deliberate action to build robust, scalable innovation management capabilities for the defence and national security sector involves stitching together myriad specialist skills and is a unique capability in and of itself.

In a strategic environment that is as complex as it is uncertain, and in a budgetary environment where the focus simply must be on extracting best value from a finite resource allocation, my strong belief is that DMTC can make a significant difference through its proven and established operating model and its deep networks.

Incumbency aside, the company has a great deal to offer in achieving **capability through collaboration**, for the benefit of our frontline operators across Australia's defence and national security agencies, and for the benefit of the nation.

The information assembled in this Report is only illustrative of many, many successes achieved across the reporting period, and I wholeheartedly commend the Report to you.





Royal Australian Navy sailor Petty Officer Maritime Personnel Supervisor Victoria Clarke marshals a Navy MH-60R helicopter during Fleet Certification Period 2022, conducted off Australia's east coast.

## About DMTC

### Our Vision

To develop technology solutions and provide advice enabling industry to enhance Australian defence and national security capability.

### Our Mission

To create and enhance Australian industrial capability and skills through designing and executing collaborative technology development and innovation activities in the defence, national security and related sectors.



### Our Approach

DMTC operates through an extensive network of innovation and technology development partners in Australia and across the world. DMTC works across multiple specialist disciplines to support the development of sovereign industrial capability for Australia's defence and national security agencies.

DMTC leads and manages collaborative efforts involving government, industry and research partners to enhance Australia's industrial capacity and capabilities. These efforts are backed by DMTC's internationally accredited program management framework. Our catchcry of **capability through collaboration** has been a mainstay of our business.



## Feature D&I Strategy Launched

DMTC's **Diversity and Inclusion Strategy** was officially launched at the 2022 DMTC Annual Conference in April.

DMTC sees diversity and inclusion as an essential enabler of future success and is committed to *"unlocking collaborative energy through diversity and inclusion, to generate improved business outcomes"*.

The session was an opportunity for DMTC to officially launch our Diversity & Inclusion strategy, which aims to unlock the increased collaborative energy that is created through diversity and inclusion, in order to generate improved business outcomes.

This strategy contains clear objectives under four major priorities that are integral to fostering a truly diverse and inclusive organisation. They are:

- to deliver a clear D&I strategy, which involves objectives, actions, metrics and governance;
- to ensure all DMTC employees actively promote diversity, support access to flexible working, and challenge unconscious bias;
- to ensure that we hire, retain, promote and support a diverse workforce; and

- to affirm that DMTC is acknowledged and respected for its commitment to diversity and inclusion, and the D&I principles of DMTC are embedded into our relationships with partners.

While driven by the DMTC Diversity and Inclusion Working Group, the strategy has been endorsed by the DMTC Board and involves the organisation as a whole. The strategy is just the start of our diversity and inclusion journey, and will be used as a tool to channel our actions into the future.

The conference session also included an explanation of the business case for, and benefits of, diversity and inclusion presented by from Diversity Partners Senior Associate, Kristy Macfarlane. DMTC partnered with *Diversity Partners* for expert advice during the creation of our Diversity & Inclusion Strategy and will continue the partnership as we work to create a more inclusive workplace.

The session was extremely well attended and resulted in a high level of engagement with attendees from across the research, technology and Defence industry landscape. DMTC looks forward to continuing to highlight the importance of diversity and inclusion for our own organisation and across the sectors in which we work.

## Feature Giving back to the sector

DMTC supports its people to contribute their time and knowledge to organisations and causes beyond the workplace.

DMTC's management team comprises experienced and highly-credentialed professionals from diverse backgrounds. This depth allows DMTC to make a tangible difference across multiple sectors and in numerous ways. Some highlights include contributions to charitable and professional organisations alike, as well as providing subject matter expertise to help shape Government crisis

response or policy formulation and contributing to boosting the representation of women in STEM fields. In all of these ways, and more, the DMTC team continues to share their experience for the benefit of defence and adjacent sectors.

The list below illustrates, by way of a point-in-time snapshot, some of the ways in which members of DMTC's management team are lending their expertise and insights for the benefit of relevant sectors and organisations.

### Mark Hodge

Chair, Australia-US International Multidisciplinary University Research Initiative (AUSMURI) Additive Manufacturing of Advanced Metallurgical Alloys Program

Member, Department of Defence Innovation Steering Group

### Leigh Farrell

Member, Walter & Eliza Hall Institute Commercialisation Committee

Member, National Measurement Institute Mask Testing Forum

Member, Medicines Australia Advisory Council

### Deepak Ganga

Member, Project Management Institute

Member, Industry Advisory Board – Centre for Materials Innovation and Future Fashion (RMIT)

### Martin Veidt

Member, NATO ET201 Working Group on Certification of Bonded Repair on Composite Aircraft Structures

Member, NDT 4.0 Working Group - Australian Institute of Non-Destructive Testing

Member, Australasian Association for Engineering Education

### Felicia Pradera

Member, COVID-19 Vaccines and Treatments for Australia, Science and Industry Technical Advisory Group

Australian National Lead and Science & Technology Lead, International Medical Countermeasures Consortium (UK, US, Australia & Canada)

Mentor, Industry Mentoring Network in STEM

### James Sandlin

Member, Engineers Australia College of Leadership and Management (Vic Division) Committee

Member, SmartSat CRC Victorian Node Steering Committee

### Steve Patrick

Board Member and NSW Director, Bravery Trust

Member, Standing Committee on National Resilience - Global Access Partners

### Stephen van Duin

Member, Naval Shipbuilding Industry Reference Committee

Member, International Ship and Offshore Structures Congress

### Miles Kenyon

Executive Committee Member, ARC Industrial Transformation Training Centre in Surface Engineering for Advanced Materials (SEAM)

### Matt Dargusch

Editorial Board Member, International Journal of Extreme Manufacturing

Editorial Board Member, Journal of Smart Materials for Manufacturing

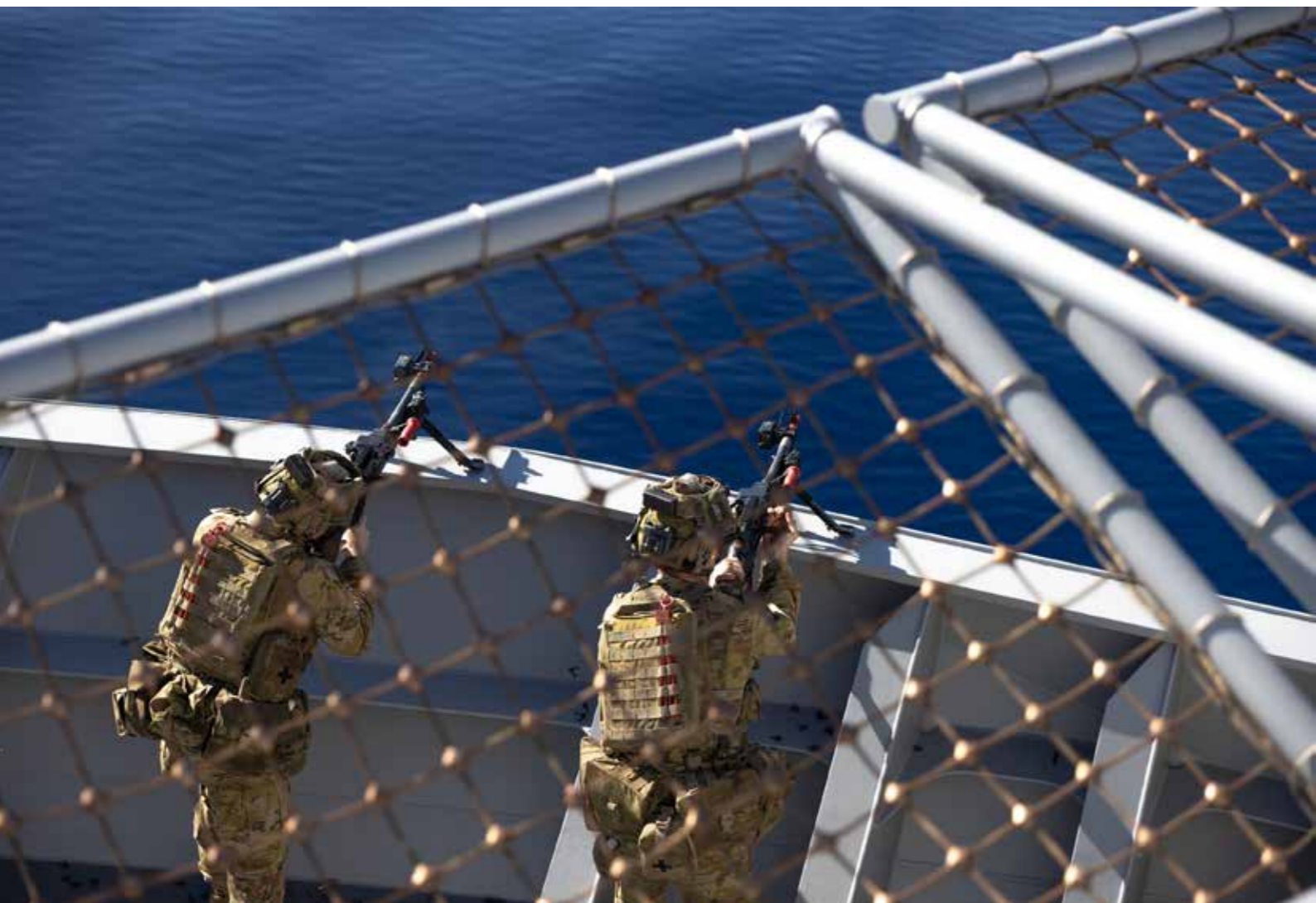
### Julia Cianci

Member, International Centre for Complex Project Management

### Scarlet Kong

Member, ATSE Elevate Advisory Group





Australian Army soldiers conduct a test firing off the starboard gun deck of HMAS Canberra, as she sails off the Queensland, during Exercise Talisman Sabre 2021.

## Program Partners



The AUKUS announcement in September 2021 set a new direction for Australia's approach to security and defence capabilities, in response to significant changes in the national and global security outlook. The AUKUS announcement's impacts included the heralding of a move away from plans for a conventionally powered Collins Class submarine replacement, to a nuclear-powered solution. Australia's defence industry eagerly awaits further information from the Nuclear Powered Submarine Taskforce, expected in 2023, to better understand their potential role in Australia's longest and largest Defence procurement program.

Above the sea, surface ship programs continue to make large strides across design, production and sustainment phases. The completion of a series of Hunter Class Frigate prototype modules is a key milestone in the commissioning of the new state-of-the-art Osborne Naval Shipyard in South Australia. From a sustainment perspective, the implementation of Navy's Plan Galileo is now addressing its Horizon Three objectives to deliver an integrated sustainment environment focusing on whole of life ship management. DSTG's STaR Shots Program is providing a focus on longer-term, aspirational S&T missions to ensure Australia stays at the leading edge of technology development into the future. All of these programs are playing key roles in shaping the future of the Maritime domain.

These macro elements are driving changes in DMTC's Maritime Program across all three of the program's

focus areas. The focus of all three programs is now firmly in the strategic application and translation of technology and of the industry capabilities being developed. A few highlights in this regard include:

- For the NNS Program this means incorporation of advanced welding techniques into the Osborne Naval Shipyard for the production of the Hunter Class Frigate and the certification pathway for additively manufactured repairs for the Collins Class Life of Type Extension (LoTE) Program,
- For the APMA Program, the focus is turning to the application of single crystal piezoelectric materials being produced for next generation sonar devices and the insertion points into Defence programs such as SEA 5012 and other undersea warfare programs, and
- The AMSTECH Program is moving from a technology feasibility phase, of how High Temperature Superconductors perform in a maritime environment, into detailed design studies for specific naval applications including the Hunter Class Frigate Program.

The next three sections outline current and future plans for each of these Program areas that outline the exciting future in store across the DMTC Maritime Program.

## Integrated Elements of a Whole of Life Ship Management approach

The outcomes of the DMTC NNS Program continue to highlight the importance of the whole of life ship management approach and integrated nature of the projects in the program. DMTC's NNS Program, with support and funding from the Capability Acquisition

and Sustainment Group, operates an integrated portfolio of collaborative programs across the Naval capability lifecycle from design to production to sustainment and operational capability assessments. Three integrated areas of activity are described here.

A sovereign industrial capability for the delivery of enhanced shipbuilding steels is a key enabler in Australia's Continuous Naval Shipbuilding Program. In this project, DMTC, Bluescope Steel, University of Wollongong and DSTG identified the link between

microstructural characteristics and low temperature material toughness of shipbuilding steels under high strain conditions. This resulted in an enhanced DH36 shipbuilding steel produced in-country by Bluescope Steel through a modified production process that has enhanced survivability characteristics which has the potential to extend the life of naval vessels. This project was awarded the DSTG Defence Science and Technology Enterprise Collaboration award for 2022.

The application of enhanced shipbuilding steels through advanced welding techniques is playing a key role in ensuring the Osborne Naval Shipyard produces vessels to the highest quality and production efficiency standards. In this project, DMTC, BAE Systems Maritime Australia, ANSTO and the University of Wollongong are developing advanced welding techniques to optimise the weld sequencing from panel to unit to block fabrication and consolidation, a streamlined process from weld

modelling inputs to robotic programming outputs (particularly for curved panels) and weld control programming, leading to smarter and optimised build sequencing.

Coupled tightly with these two activities is DMTC extensive Life of Type Evaluation work with partners ANSTO, DSTG, Swinburne University of Technology and the Australian Maritime College. This project is assessing the enhanced shipbuilding steel produced by Bluescope through high strain rate and fatigue tests, simulations and physical tests of blast performance of bulkhead structures and the integration of these into a life of type evaluation and assessment tool. The outcomes of this work have the potential to influence future design and production considerations of the Hunter Class frigate, demonstrating DMTC's NNSP Program approach to whole of life ship management.

## Harnessing a super power

As modern naval platforms are upgraded to account for evolving threat environments, design constraints with power, weight and space margins are an ever-present consideration. High Temperature Superconductors (HTS) offer an effective way to alleviate many of these challenges because of their increased capacity to carry electrical current coupled with minimal energy loss when compared to traditional conductors. The unique physical properties of HTS systems allow for either transmission of significantly more energy within the same weight allowance or, alternatively, the same energy requirements at reduced weight. Given the design constraints listed above, both attributes are desirable for through-life upgrades and the design of new platforms.

DMTC, in collaboration with and supported by DSTG, established the Australian Maritime Superconducting Technologies (AMSTECH) Program. The Program is collaborating with key defence stakeholders to develop risk assessed options for HTS applications mapped against specific Defence needs and technology insertion points for above and below water applications of HTS systems.

For surface combatants, HTS systems are intended to play a pivotal role in next generation propulsion, energy storage and degaussing systems. DMTC has worked with AMSTECH Program partners BAE Systems Maritime Australia, DSTG, Queensland University of Technology (QUT) and the University of Wollongong (UoW) to map the technology development requirements to incorporate HTS systems onto Naval platforms such as the Hunter Class Frigate.

For undersea warfare applications, AMSTECH Program partners QUT and UoW have developed HTS coils for next generation mine countermeasures (MCM) systems. In collaboration with program partner Thales Underwater Systems, this technology will allow a MCM system to be more deployable, more agile and more conducive with future upgrades. Several technology maturation milestones have been achieved and demonstrated the HTS capability for the prescribed requirements, allowing the full design of a MCM system to commence.

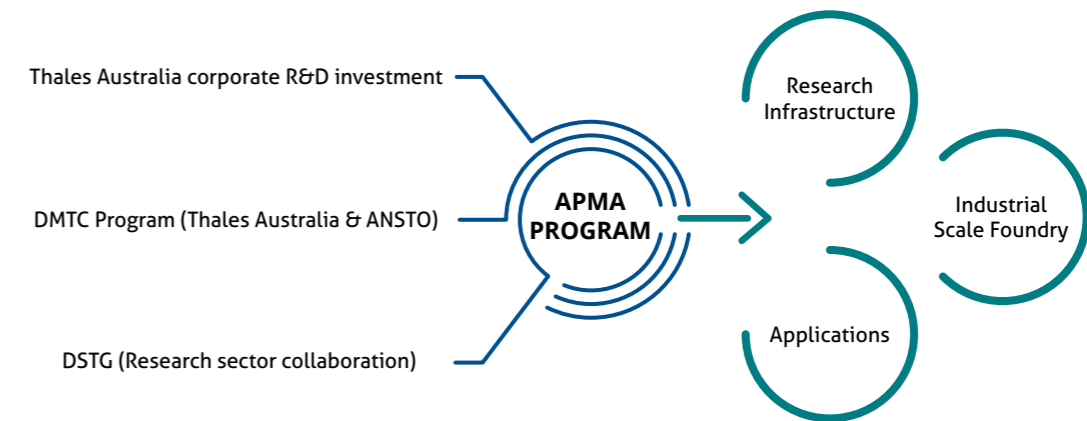
The two program activities described above have identified the requirements of a sovereign industry and research ecosystem to ensure HTS systems and subsystems can be supported in-country and fully aligned with RAN's operational requirements. This is also allowing opportunities for broader HTS applications within Defence UUV and USV platforms to be investigated.

## Crystallising a sovereign capability in piezoelectric materials

Single crystal piezoelectric materials are orders of magnitude more sensitive than their polycrystalline equivalent, which is an important material characteristic for sonars and other applications. For this reason, the Australian Defence Force requires access to these advanced materials to maintain operational superiority in both remote undersea

surveillance as well as other Defence domains such as sensors for aerospace platforms.

DMTC, in collaboration with DSTG's NGTF Program, has established the Advanced Piezoelectric Materials and Applications (APMA) Program. Defence, industry and research partners in the program have been investing in single crystal piezoelectric material development for more than a decade. The program brings together all of these elements through an overarching framework that is coordinating collaborative activities.



The APMA Program has established a series of foundational projects that extend along the entire pipeline from education and training to research and development and industrial capability, including making strategic investments in industrial-scale foundry facilities and research infrastructure.

The APMA Program is providing Australia with a capability to design and fabricate piezoelectrics for sonars, supported by a world-leading research and innovation ecosystem. This includes industrial scale production through Thales Australia, single crystal growth techniques through ANSTO and the University of Wollongong, material characterisation and performance through UNSW Sydney, the University of Sydney and the Australian National University and the application of piezoelectric materials to sensors and energy harvesting through Monash University and RMIT.

Collaboration between, and integration of, these intersecting APMA Program elements will be key to realising the long-term vision to establish a strategic national capability in the supply of advanced piezoelectric materials. The future outlook now turns to the application of single crystal piezoelectric materials in next generation sonar technologies for Undersea Warfare (USW) applications and ultimately in the hands of Royal Australian Navy sailors.

Workshops have been held with Defence representatives, industry and research partners to map requirements for the application of single crystal piezoelectric materials for future Defence applications.



DMTC's collaboration model accelerates technology development and supports rapid adoption of new technologies related to both the production and sustainment of land domain capabilities.

Projects in DMTC's Land Program align to Defence priorities and make extensive use of the Company's network of research and industry partners' expertise in delivering enhanced sovereign industrial outcomes.

One such project is the Networked Future Augmented Small Arms Technologies (or Networked-FAST) suite of research projects, that seeks to design and produce next-generation soldier systems for Australia's defence personnel.

The project consists of a series of parallel technical investigations and activities led by industry partner Thales Australia, with DMTC's contribution focusing on digitisation, lightweighting and advances in manufacturing.

**"Ours is a narrative of "and not or", of an ADF that is relevant and credible in all domains, and an Army that sends forth its women and men into the most complex and lethal land environments with the best probability of mission success, and the best probability of survival and returning home to families."**

**LTGEN Simon Stuart AO, DSC**  
**Chief of Army**  
**October 2022**

## Program Partners



Elsewhere in a multi-year project supported by funding from the Defence Innovation Hub and building on years of underpinning research led by DSTG, DMTC and partners are advancing the technology behind the development of Nano Protective Adsorbent Composite (NPAC) fabrics.

DMTC has brought together a diverse and multidisciplinary team to work on this complex challenge. Partners in the DMTC project include industry partners Bruck Textiles and NanoLayr along with DSTG, RMIT and CSIRO.

DMTC's work centres on a lightweight, prototype Chemical, Biological, Radiological and Nuclear (CBRN) suit to support the CBRN-Defence protection requirements of ADF personnel.

This innovation will achieve the twin aims of providing Defence with a capability that does not exist today and contributing to sovereign industrial capability outcomes.

The project is also expected to prompt further research collaborations in the area of advanced textiles and expand the knowledge base and skills of Australian and New Zealand industry related to nanofibre and composite fabric production, CBRN suit design and manufacture.

DMTC is regularly benchmarking and confirming the relevance of its work outputs through engagement with Defence programs such as Diggerworks and through monitoring of developments in current and future phases of Defence projects such as LAND 2110 and LAND 125.

DMTC and its partners are working to build Australian industry capability to capitalise on new technology horizons across the air domain. The span of this effort covers new technology developments, innovation in sustainment and advances in the use of existing additive manufacturing (AM) technologies and techniques.

DMTC is continuing to work with industry and research partners across a range of sustainment challenges for the Defence customer, ranging from detailed material characterisation and selection to inhibit corrosion to deposition techniques allowing for the restoration of parts that are used, worn

or damaged. Understanding the properties and performance of high-end, aerospace grade metals including ultra-high strength steels, titanium-alloys and/or nickel-alloys is vitally important.

DMTC is working with a number of Australian SMEs, including Amiga Engineering (illustrated below) to develop capabilities for in-country additive manufacturing of complex Defence components. This collaboration aims to benchmark the current level of capability in Australian industry and ensure the availability of a high-quality, sovereign industrial base of Australian suppliers for use by Defence and prime contractors.



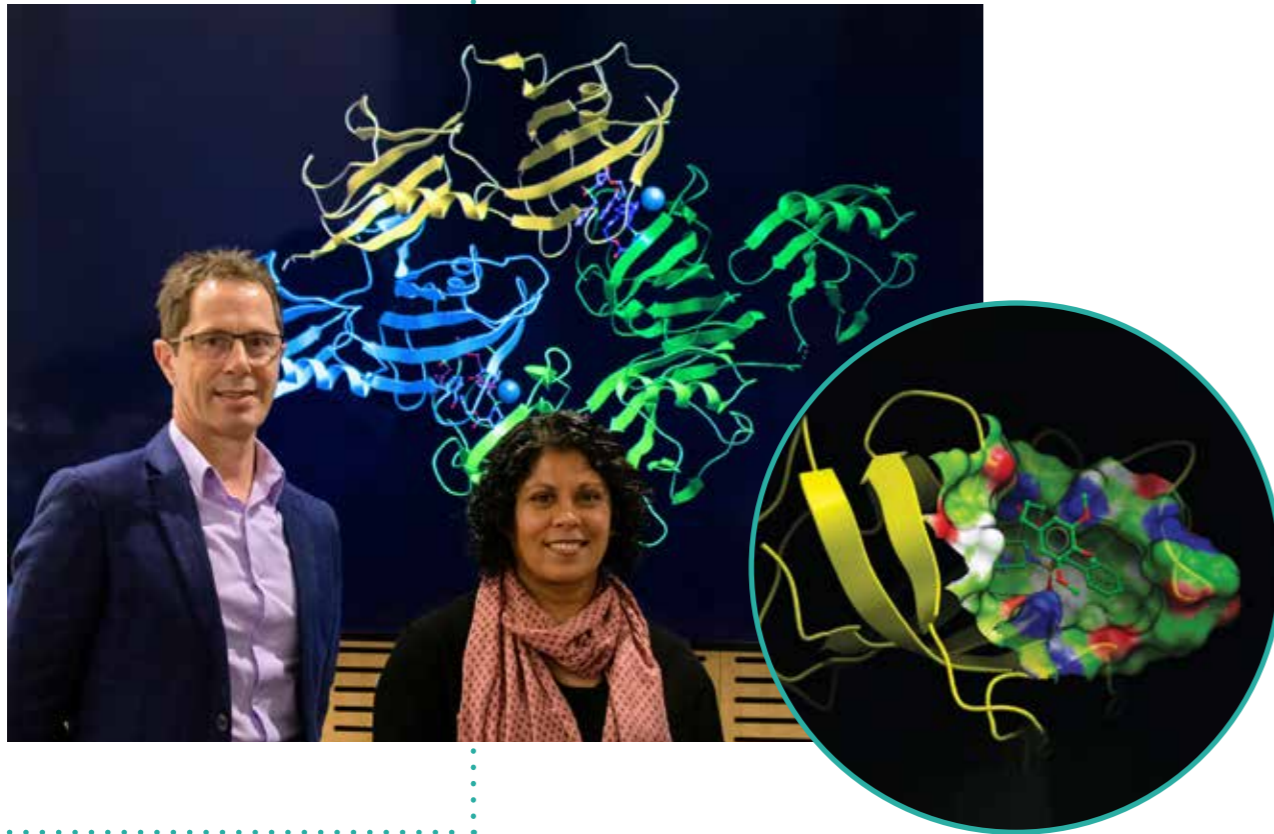
Mr Michael Bouchier (Managing Director, Amiga Engineering), Professor Suresh Palanisamy (Swinburne University), Dr Qianchu Liu and Dr Chris Wallbrink (DSTG) examine a bracket component produced as part of a collaboration between Amiga Engineering, Swinburne University, The University of Queensland, DSTG and DMTC.



## Program Partners







Since its establishment in mid-2021, Health Security Systems Australia (HSSA), a Division of DMTC, has shown its constant commitment to building in-country industrial and research capabilities that align with Australian national health security priorities.

HSSA pursues activities across all four phases of the Preparedness, Prevention, Response and Recovery (PPRR) Model to develop capabilities that enhance the protection of Australian and regional health security from Chemical, Biological and Radiological (CBR) threats. Through active management and leadership of collaborative research and industry teams, HSSA has progressed innovative and exciting concepts into maturity since its inception. More information on some of these projects can be found on Pages 29-35.

HSSA was officially launched in April at the 2022 DMTC Annual Conference, and Division Head Dr Leigh Farrell hosted an expert panel on antimicrobial resistance (AMR), with a focus on necessary actions to address the challenge it poses now and into the future.

In July, Dr Farrell participated in a panel discussion at the Australian Defence Science, Technology and Research Summit, where he discussed the importance of resilience in contested environments, and the role HSSA plays in supporting Australia's future resilience to CBR threats.

In October, members of the HSSA team presented on the wide range of technologies that the HSSA Division has progressed since its inception, at an industry brief event at the Land Forces exposition.

Throughout the reporting year, the HSSA team has been involved in numerous activities analysing

sovereign capabilities across the health security ecosystem. In collaboration with Biointelect, the HSSA team provided the Australian Antimicrobial Resistance Network (AAMRNet) with a report on national capability in research and development relevant to AMR in Australia, after an exhaustive audit. The HSSA team reviewed current technology within the Australian diagnostic landscape with the aim of creating a consortia of experts and industry specialists, focused on sovereign manufacture of a diagnostic targeting priority pathogens in the Indo-Pacific region.

In May, General Manager HSSA Dr Felicia Pradera presented at the CBRNe Conference in Lille, France, focussing on the evolution of the National Health Security Resilience Assessment (NHSRA). The NHSRA examines Australia's capability and capacity for research, development, manufacturing, supply chain resilience, and distribution of key products across the six key national health security sectors that comprise HSSA. Outcomes from the NHSRA were collected during this reporting year, and results were transformed into a user-friendly online navigator for stakeholders to view data and trends.

HSSA is now working to conceptualise/create a system that will utilise various data science methodologies to enable detailed insights into health security sector capability, capacity, products and services to inform prevention, preparedness, response and recovery planning for future priority CBRN threats. With funding from MTPConnect, the first focus area for this project will be to conduct horizon scanning for sovereign capabilities related to the growing threat of AMR.

## Program Partners



## Medical Countermeasures Program



As part of the HSSA Division, the Medical Countermeasures (MedCM) program has continued to progress novel vaccine, therapeutic and diagnostic technologies that help protect Australia's defence and civilian populations against a range of CBR threats, infectious diseases and pandemics.

The program currently has eight active projects, developing three vaccine, two therapeutic, one manufacturing, and two diagnostic technologies.

In April, highlights of the MedCM program were presented as part of the DMTC Annual Conference in Canberra. Keynote speaker Dr Anne Collins, Chief Operating Officer of Sementis, presented on the sovereign manufacturing ecosystem, and the technical expertise within the program was featured through presentations from early career researcher Rowan Pilkington, and post-doctoral researchers Dr Aleksandra Debowski and Dr Sanjaya Kc. In recognition of his commitment and the key role he plays as part of his project team, Rowan Pilkington was awarded the Early Career Award. More information on his work can be found on Page 38.

In October, a collaborative team comprising BioCifer Pty Ltd, University of the Sunshine Coast, The University of Queensland and CSIRO were awarded a High Commendation as part of the prestigious Land Forces 2022 Innovation Awards in Brisbane.

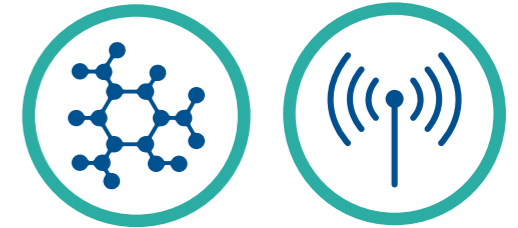
In July, at the ADSTAR Summit, the MedCM program received the Runner-up honour in the Enterprise Collaboration award category. This award is recognition of the MedCM program's dedication to collaboration to build national resilience and develop new sovereign capabilities. More information can be found on Page 4.

With support from Defence's Next Generation Technologies Fund, the MedCM program ran a call for new projects that focussed on priority themes, namely:

- anti-infective therapeutics, including against antimicrobial resistance
- vaccine products or platform technologies for infectious disease threats, and
- medical countermeasures against chemical threats.

The initial call for Expressions of Interest generated a large response, with submissions received from a wide variety of proponents across the country. Two projects have been selected from the two-stage process to progress to contract discussions.

## Modelling & Simulation and Sensing Systems Programs



The Modelling & Simulation and Sensing Systems sectors of the HSSA Division have progressed rapidly in the last reporting year.

Projects within the Modelling and Simulation program are developing models for prediction of CBR threat dispersion through complex environments; predicting and mapping levels of vulnerability to radiological threats; and progressing algorithms to provide chief decision makers with advice on how to optimally respond to biological outbreaks. Outcomes from this program will both enhance defence and national security capability as well as contribute to the depth of expertise in the wider hazard modelling community.

The Sensing Systems program is dedicated to the development of wearable and stand-off detection technologies to better protect both military and civilian personnel. Projects within this program are developing a wearable sensor to detect biological pathogens from the environment, develop a sensor to detect early changes within the body upon exposure to a pathogen before external symptoms arise, and build a system to connect and record information generated by sensing systems.

Currently, the Modelling and Simulation program comprises three projects, and four projects are underway within Sensing Systems. More information on some of these technologies can be found on Pages 29-35.

Highlights of some of the new Modelling and Simulation projects were presented in the Modelling and Simulation stream of the DMTC Annual Conference in Canberra. Dr Leigh Farrell introduced the new research sector within the context of the HSSA Division as part of DMTC. Keynote presenter LTCOL Simon O'Dea discussed the importance of Modelling and Simulation within the Defence system, and how progressing these technologies can benefit the warfighter. Dr Nick FitzGerald discussed the technical challenges the research in this sector is planning to address. Technical presentations from researchers Dr Peter Dawson (DSTG) and Dr David Bolst (University of Wollongong) illustrated the rapid progress within projects since their commencement.

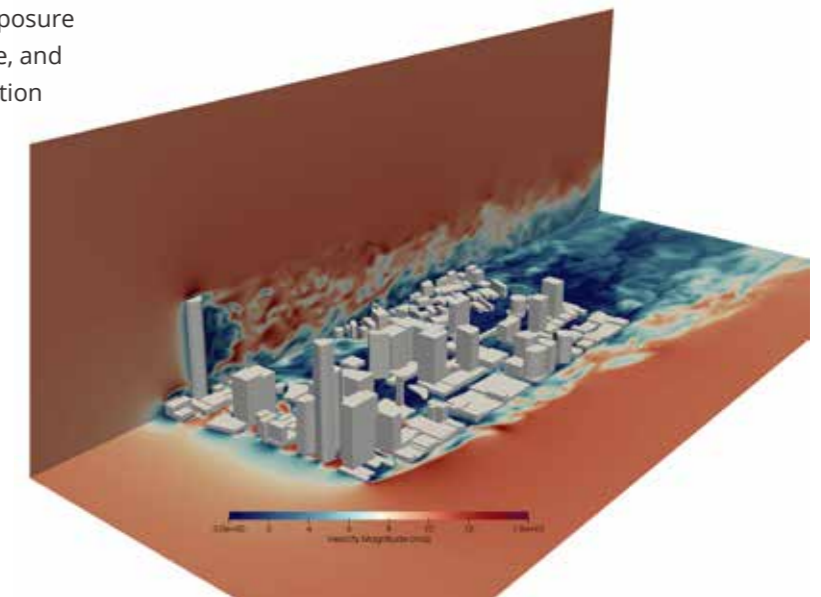


Image right: DMTC is leading a project involving researchers from the University of Sydney and DSTG to develop dispersion modelling technologies to predict the spread of airborne hazards within complex urban environments. This simulation capture featuring Brisbane CBD is an example of the high-fidelity dispersion model technologies the project team is progressing.



# Enabling Technologies

The development of platform-independent technologies has been a hallmark of DMTC's contribution to the defence and national security sectors for more than a decade.

Deep understanding and expert evaluation of the precise properties and performance of current and next-generation materials and structures is vitally important in this regard.

DMTC's Enabling Technologies Program works with a range of industry partners and is informed by latest Australian and international research in overcoming technical barriers and successfully mitigating technical risk as these cross-platform technologies advance along the readiness level continuum.

In one application, the Program team is working to extend and pursue new applications for functional antenna solutions.

Originally conceived for application in aerospace platforms and then successfully transferred to land vehicle applications, DMTC and its partners are now looking at opportunities in uncrewed aerial vehicles (UAVs).

Collaboration between industry partner Skyborne, DSTG and The University of Queensland (UQ) is developing functional antenna solutions for Skyborne's UAV platforms. This work includes exploration of 3-D printed communication antennas as a more rapid manufacturing solution.

For the application of functional antenna solutions to land vehicles, a major milestone was achieved with manufacturing three moulds of a spiral communication antenna. This milestone paves the way to progress to manufacture and further testing of the new antenna design, including recommended design and manufacturing considerations developed at UQ for the critical radio frequency ingress and egress connections.

For his leadership of this complex project, UQ Postdoctoral Research Fellow Dr Mitch Dunn was honoured with the Project Leadership Award at the 2022 DMTC Annual Conference. More information on the award is on Page 38.

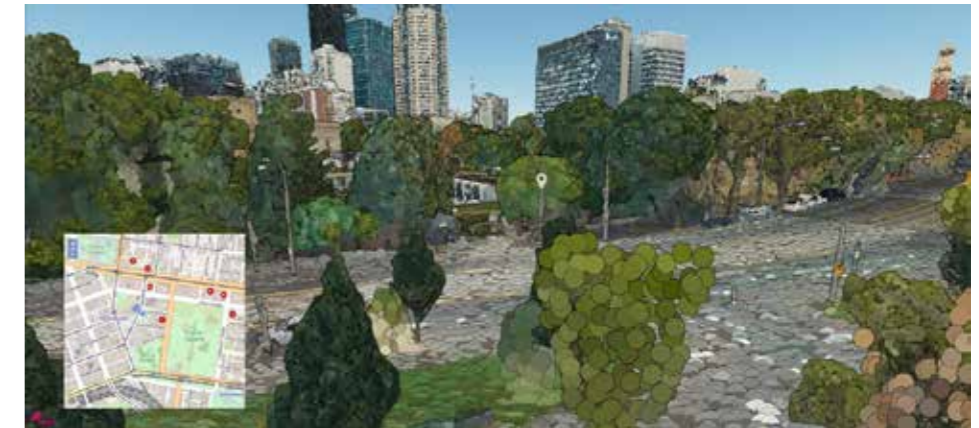
Other activities in the Enabling Technologies Program include a new project on high temperature polymer composite sub-assemblies for high-speed vehicles (see Page 33). Consideration also continues to be given to technology development and transfer activities in the design, manufacture and qualification of composite materials and structures.

The composites industry in general - and the defence industry specifically - needs reliable material data on the durability of composite materials, especially when operating in harsh Australian service conditions and under dynamic loadings.

One option being explored by DMTC is a development activity centred on the build of a composite demonstrator part, the specifications for which will be developed in consultation with defence primes.

# Geospatial & ISR

## A real-world picture, in near real-time



DMTC is working with an innovative Australian company and leading-edge researchers to demonstrate the benefits of three-dimensional geospatial data over conventional 2-D representations.

A coordinated program of activities with clearly defined milestones, proofs of concept and capability delivery off-ramps is being delivered to meet the requirements of a range of government agency stakeholders.

Near real-time synthesis of a range of data feeds into a comprehensive 3-D picture is a keenly sought-after capability with broad application in situational awareness, disaster response, operations planning and related activities.

Working with Australian SMEs and research partners, DMTC is delivering enhancements at each of the respective stages of data capture, ingest, and visualisation. Further Defence and Government use cases have been identified and a series of ongoing development activities are planned to develop specific capabilities for specific end users.

Current project partners include Australian small business Synthesis Technologies (Synth) and the University of Melbourne. Synth's state of the art 3-D visualisation tool can take data feeds from, and deliver an operating geospatial picture to, common user devices such as mobile phones, tablets and

laptops. Connectivity with virtual-reality applications and other collaboration tools is also being progressed.

The potential for technologies advanced in previous DMTC activities, including hyperspectral imagery solutions pursued under the High Altitude Sensor Systems program, to be used as data sources for the visualisation capability is also being actively considered.

This is a further demonstration of DMTC's agility across domains and technical disciplines, enabling rapid capability development responses to contemporary and evolving challenges.

### Building capacity and capability

DMTC's investment in this technology area has also contributed to the growing pool of industrial experts and researchers who will be critical to realising genuine sovereign capability outcomes across the sector.

At the 2022 DMTC Annual Conference, James Walker's efforts were acknowledged with the Early Career Research award. James is a developer at Synthesis Technologies who has been able to transfer his gaming development and programming experience to bring modern and innovative approaches to challenges encountered in this DMTC program.

## Program Partners





# Industry Capability Development

## Accelerating supply chain development

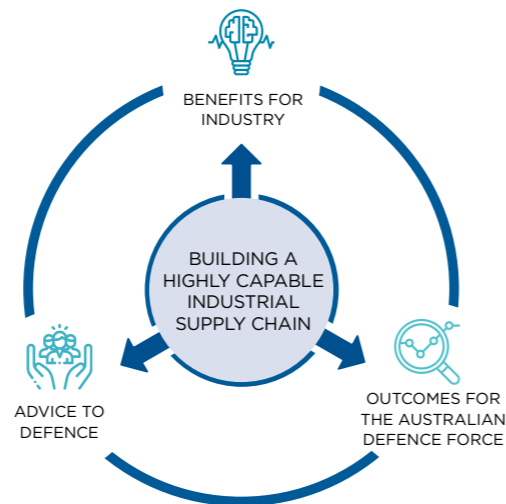
Through its Industry Capability Development (ICD) Program, DMTC is engaged in technology transfer for the benefit of Australian industry.

The ICD Program works alongside Australian companies, mostly small businesses, to address capability and capacity gaps and open doors to Defence opportunities. In 2022 the focus of the ICD Program has been the deployment of the Smart Enough Factory to showcase the adoption of Industry 4.0 fundamentals through simple, cost-effective technology.

Supported by Defence and State Governments alike, and with industrial context provided by Defence primes, the objective of the Smart Enough Factory program is to support Australian small businesses to become more resilient, diversified and competitive across domestic and international markets and supply chains. This is achieved by providing participants with a digitisation solution that is 'smart enough' – a practical, low-cost and low-code means to understand the value of data capture and analysis; quantify the benefits of factory connectivity; and optimise the performance of existing equipment.

Spurred on by their involvement in the Program, companies like Victorian-based Parish Engineering (see Page 7) have successfully embraced the digitalisation of their manufacturing processes as well as developing their defence-readiness and making aligned improvements to cybersecurity capabilities and digital literacy.

The Smart Enough Factory Program recognises that data-driven approaches are one of the keys to productivity improvements in modern manufacturing, and can help participating companies to realise points



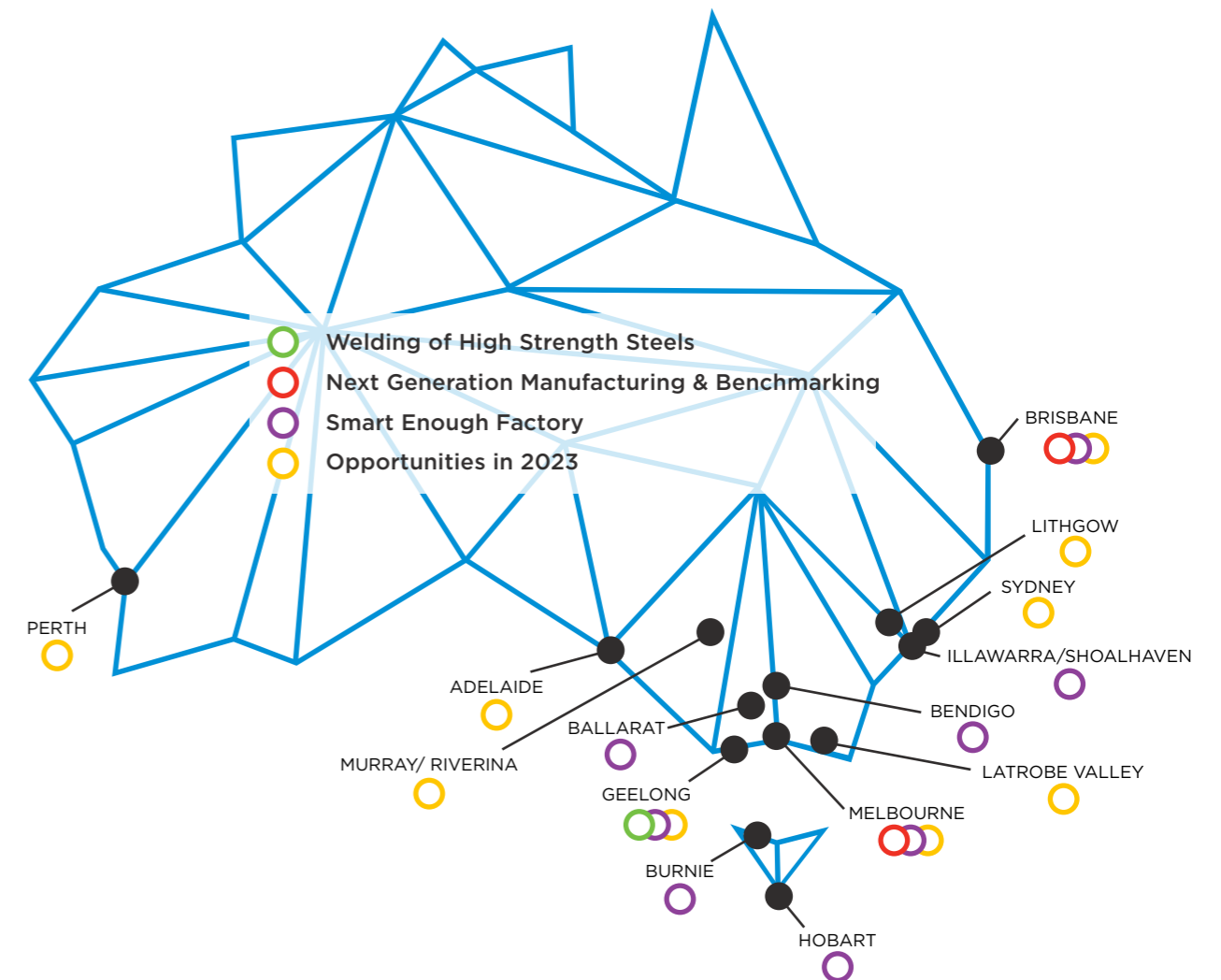
of difference and competitive advantage in bidding for work in the supply chains of prime contractors.

Experts engaged by DMTC provide mentoring and evidence-based feedback, both during workshops and in post-activity reports, highlighting improvement opportunities for each company. DMTC has also continued to work with Indigenous-owned cyber security company, Willyama. Together, the expertise provided by the delivery partners reflects the importance to the primes of technical excellence, objective quality data and cyber hygiene throughout their supply chains.

Program activities are also supported by a talented team of interns from several universities, delivered through a scheme supported by the Defence Science Institute (DSI). Contributions from interns are becoming an increasingly important part of the ICD Program delivery model, and highlight the benefits of joint investment in Australia's future sovereign industrial workforce and capability. Internships provide mutual benefits to students, who gain valuable work experience from the factory floor, and to industry partners, who receive hands-on assistance in their digital transformation journey.



<https://dmtc.com.au/icd/>



## Smart Enough® Factory Community of Practice



Community of Practice

Delivery Partners

# Project Highlights



Blowing in the wind:  
Revolutionising urban wind and  
plume transport modelling



LAMP technology:  
Establishing a low-burden  
detection capability

Achieving impact at scale



Building better tools for  
radiation protection

Bringing hypersonics  
research and development  
to the fore



Delivering novel  
therapeutics to target  
bio-threat pathogens

## Project Highlight

### Blowing in the wind: Revolutionising urban wind and plume transport modelling



DMTC is collaborating with researchers at the University of Sydney and DSTG to enhance atmospheric transport and dispersion modelling and simulation tools, that are used to predict the spread of airborne hazards in urban environments.

The collaborative project aims to deliver faster than real-time simulation tools to improve the modelling of how airborne chemical, biological and radiological (CBR) agents disperse in complex environments. Intended outcomes include the creation of a new paradigm for modelling, and enabling faster intervention against CBR releases.

Current models are reliant on the accuracy of existing models that include flow structures around characteristic building types, which can result in substantial error when applied to inconsistent geometries, representative of real-life urban structures. This project aims to improve accuracy in the predictive modelling tools that are currently used by Defence and the wider hazard-modelling community for forecasting urban dispersion with only minimal increases in simulation run-times.

This project aims to produce a novel modelling suite that will include new and accurate wind-field and dispersion models that are microscale, obstacle- and building-aware, with improved resolution or performance in comparison to existing models. Two streams of work will produce a simulation tool that can predict agent dispersion at an extremely high

resolution within 1-10 metres, and another model that will predict dispersion at a lower resolution but using substantially faster techniques. This work will progress current technologies in plume modelling methods, neural networks, and upscaling approaches.

The proposed modelling suite is named **Guwara**, which means 'high wind' in the language of the Dharug and Iyora Peoples of the Sydney and surrounding regions.

As well as advancing key modelling technologies, the project team is establishing a sovereign focal point for expertise in physics-based fast computation for atmospheric models, with the team organising multiple workshops over the past reporting year, bringing together both national and world experts in atmospheric detection. The DMTC project complements research commissioned by DSTG under an international cooperative agreement between Australia and the Republic of Korea.

Defence uses hazard-prediction models to estimate the effects of CBR releases and provide time-critical information to inform and support effective planning and response activities. If successful, this project will lead to significant improvements in hazard-prediction models, more accurately characterising the spread of a potential hazard in an urban environment in near real-time. These models are essential to supporting sovereign preparedness, planning and response to CBR threats for both Defence and civilian personnel.



# Project Highlight

## LAMP technology: Establishing a low-burden detection capability



DMTC has partnered with La Trobe University and DSTG to establish an agile, sovereign nucleic acid detection capability using Loop-mediated isothermal amplification (LAMP) technology.

A low-burden detection capability that is rapid, accurate, sensitive, and able to be easily utilised by Defence personnel is essential for the success of operations involving potential exposure to biological threats. Current technologies are capable of fast and simple assessments, but lack sensitivity, or are specific but require longer time and more advanced power requirements to generate results.

LAMP amplifies specific regions of a pathogen's DNA, but unlike traditional DNA amplification methods such as polymerase chain reaction (PCR), LAMP can be carried out at a single temperature, and has shown to be reliable using crude sample material, thereby negating the high equipment burden of PCR and other testing methods. The sensitivity of LAMP has been shown to be comparable, if not superior to, traditional methods. These features demonstrate that LAMP has the potential to be utilised as a rapid, accurate and simple to use point-of-need detection method for biological-threat agents by first responders or Defence personnel.

However, for LAMP to be reliable, the preparation method for the pathogen-containing sample is key. DNA must be released from the pathogen within the sample, and any potential contaminants within the sample matrix neutralised. This is a particularly important step as samples in a defence context could range from environmental samples such as soil or water, to various unidentified white powders potentially containing biological threats. To be a truly deployable technology, a sample preparation method that could be used for this vast range of samples is essential.

This project aims to test and evaluate a range of sample preparation methods to determine whether a single method is possible for diverse sample types for use with LAMP-based detection. The collaborative team are evaluating preparation methods to determine ease of use, compatibility with operational sample types, and suitability with LAMP technology.

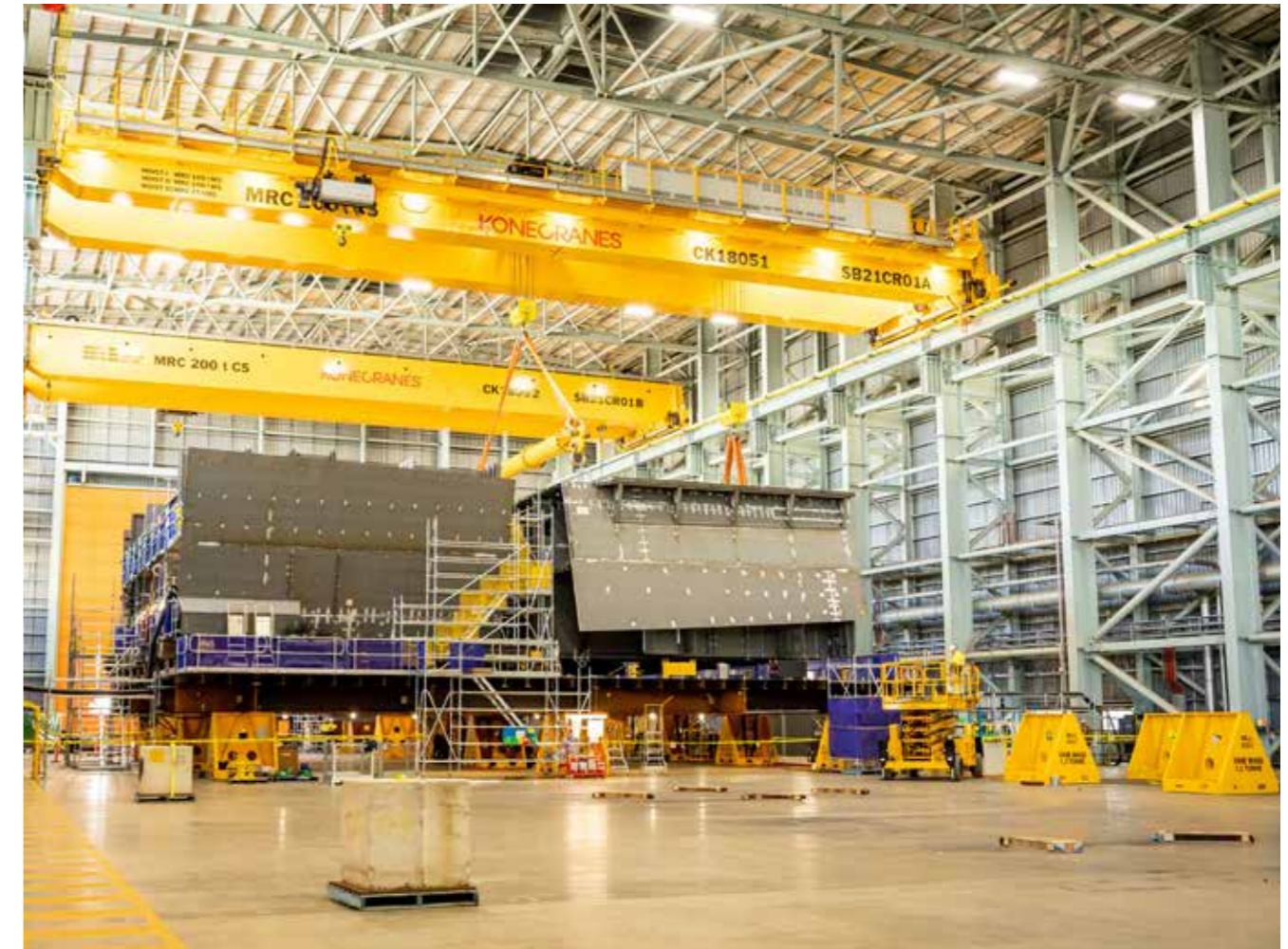
The long-term objective is to integrate these new sample preparation methods with LAMP and electrochemical detection technology, resulting in a simple test read-out from a handheld device.

# Project Highlight

## Achieving impact at scale

“This project will be transformative for block production across our shipyard by ensuring our manufacturing is smarter and includes efficiencies at every step of the welding process. We’re excited by the opportunities this will enable.”

**Jim Cuthill, Operations Director, BAE Systems Australia**



DMTC is working with shipbuilder BAE Systems Maritime Australia, ANSTO and the University of Wollongong to develop advanced welding technologies for use on naval shipbuilding programs. The two-year collaboration is expected to result in production efficiencies in the construction of complex warships – such as the Hunter Class Frigates being built at the Osborne Naval Shipyard – by incorporating artificial intelligence to cut weld rejection rates, increase throughput and improve workforce skills in shipbuilding. Optimised weld sequencing is critical in ensuring the stability and life of welded structures such as steel bulkheads and panels.



## Project Highlight

### Building better tools for radiation protection



DMTC has partnered with the University of Wollongong and DSTG to develop simulation tools to assess radiation from high intensity radiation sources and determine minimum levels of shielding necessary to protect the human body. Outcomes from this project will inform the development of physical protection equipment (PPE) concepts for Defence personnel.

Radiation is defined as the emission of energy, which is transported either as particles or waves. When absorbed by living matter, such as human tissue, this energy can damage cells and DNA through the breaking of molecular bonds, which can cause cellular mutations or cell death. Sensing of radiation levels and assessment of shielding from radiation is vital for protection from radiation hazards.

The project will develop a simulation tool using male and female 'phantoms', representations of the human body, that is able to calculate the levels of radiation absorbed by the whole body and in at-risk organs. This tool will then be used to assess lead shielding solutions to protect critical organs, such as the eyes, lungs, intestines and bones. The analysis is conducted using phantoms in various positions, and in different irradiation conditions, to create a more complete and accurate assessment than what is currently available.

To meet a key requirement in terms of the deployability of this technology, the simulation tool will be supplied with a simple user interface and user-guide, to ensure non-experts are able to access and use the tool.

To date, the project team have successfully created the simulation tool for both male and female phantoms, in both standing and kneeling positions, and completed calculations for radiation absorption resulting from various irradiating sources, including differences in source distribution, position and distance.

This early development work has shown that radiation doses in critical organs are higher when the phantom is in the kneeling position due to being closer to the radioactive source, located on the ground, and that doses are higher in critical organs when the phantom is facing the source of the radiation, due to a lack of protection from muscle and bone. Therefore, the effect of lead shielding has focused to date, on the source in this location.

The current focus of the simulation study is changing from using single large slabs of lead, which protect the entire body in the direction of the radiation source, to implementing smaller areas of lead to shield specific organs, for example, lead glass goggles to protect the eyes, or a lead apron to protect organs such as the small intestine.

The project will progress sovereign knowledge in radiation and shielding assessment tools, and increase the protection of Australian Defence Force personnel through the creation of a technology capable of assessing the level of shielding required to adequately protect critical organs from radiation sources.

## Project Highlight

### Bringing hypersonics research and development to the fore

DMTC is leading a new collaborative program to identify, analyse and test high temperature materials as a first step toward the future development of sovereign hypersonic aerostructures.

Hypersonic aerostructures are components of an aircraft's airframe capable of withstanding extreme conditions experienced during hypersonic flight (as much as five times faster than the speed of sound), including high heat loads. In consequence, the development of hypersonic materials has far-reaching and important defence and national security applications.

The first project, named Hype-X, will initially focus on the applicability of existing high-temperature materials for the manufacture of hypersonic aerostructures and provide Defence with a database of carbon-fibre-reinforced polymer (CFRP) material characteristics under various conditions applicable to high-speed vehicles. A CFRP database promises exciting opportunities to leverage stored material characteristics information for use in the design of future high-speed vehicles. The project will then seek to develop novel materials and manufacturing processes to fill capability gaps.

The collaborative team working on this project includes DSTG, Quickstep Holdings Ltd and the University of New South Wales (UNSW). Under the project, Quickstep will obtain commercialisation rights to any newly developed intellectual property (IP), with the IP ownership retained beneficially for Australia's sovereign defence capability by DMTC.

This partnership with Quickstep, a company well known for its advanced composite aircraft structures, and technical experts from DSTG and UNSW is further evidence of DMTC's capacity to bring together expertise from across the nation's leading defence R&D organisations for the benefit of Australia's sovereign industrial capability.

## Delivering novel therapeutics to target bio-threat pathogens



Sappers from the 2nd Combat Engineer Regiment conduct a chemical, biological, radiological and nuclear (CBRN) training serial with the Contaminated Casualty Handling system and CBRN Isolation Pod in the Townsville Field Training Area, Queensland.

DMTC has partnered with the University of Western Australia and Monash University to generate optimised compounds capable of inhibiting multiple bacterial pathogens of interest to Defence.

Potential bio-threat agents include *Burkholderia pseudomallei*, which causes melioidosis, and *Coxiella burnetii* which causes Q fever, both of which are endemic in northern Australia and nearby tropical regions. Military personnel deployed to these regions may contract these serious diseases, which can be highly infectious and transmitted by an airborne route. Antibiotic resistance is also increasing in these pathogens, highlighting the urgent need for novel anti-microbial countermeasures with broad spectrum activity.

Macrophage infectivity potentiator (Mip) proteins are found in a wide range of bacterial pathogens including *B. pseudomallei* and *C. burnetii* and are known to be important to the survival of bacteria within host cells. Mips are responsible for bacterial protein folding and by inhibiting their activity, the ability for the bacteria to survive within the host is severely limited. Targeting these proteins therefore disables the bacteria and provides the opportunity for the host immune system to fight against infection. The presence of Mips in a wide range of bacterial species also indicates that this is a good target for broad-spectrum therapeutic intervention – using a single drug to target multiple pathogens.

This project team has previously shown that a series of small molecules are capable of inhibiting the Mip proteins of various bacterial pathogens, including *B. pseudomallei* and *C. burnetii*. The inhibition of Mip resulted in increased clearance of *B. pseudomallei* in host cells, and a decreased rate of growth in *C. burnetii*, indicating that Mip is important for some bacterial species to cause disease, while in other bacterial species it is essential for growth.

The team is now designing and synthesising several new compounds to improve metabolic stability, while ensuring potent efficacy is maintained. These characteristics are essential to enable progression of the project through pre-clinical and clinical development, and the team are also establishing a product development plan and target product profile to map out the long-term development pathway.

The successful delivery of this project will progress a lead series of new compounds that target multiple bacterial infections, including those that are resistant to existing antibiotics, and future work aims to deliver a novel antimicrobial capable of protecting both ADF personnel and the public against the increasing threat of antimicrobial resistance.





## DMTC 2022 Annual Conference

DMTC hosted its 2022 Annual Conference in Canberra in April. Emerging from the challenges of the COVID-19 pandemic, DMTC's 2022 Annual Conference provided a much-anticipated opportunity to engage face-to-face with stakeholders and partners, while maintaining the option for virtual attendance and engagement.

The Conference continued to inform attendees about the cutting-edge technological advances being pursued across the DMTC community and highlighted the relevance of our work to advance Australian sovereign industrial capability.

Recognising the integral nature of collaborative relationships in the delivery of capability outcomes, the 2022 Conference brought together a diverse and expert audience. Following an evocative Welcome to Country by Mr Wally Bell, the conference began in earnest with a series of keynote addresses by Mr Tony Fraser AO, CSC (Head of Capability Acquisition and Sustainment Group at the Department of Defence), Mr Mark Hodge (CEO, DMTC), Mr Sam Bell (CEO, A.W. Bell), Dr Peter Shoubridge (Chief Land Division at DSTG representing the Chief Defence Scientist), and Ms Sharon Wilson (CNS Strategy Director at BAE Systems Australia).

The remainder of the conference featured a series of technical presentations and discussion panels from across DMTC's activity areas. These sessions highlighted project outcomes being achieved and capabilities being built. DMTC also places considerable emphasis on investing in future leaders of the defence and national security sectors. DMTC

was proud to support the attendance of a number of early career researchers connected to project teams, and students supported through the Company's Education Program, and to give a number of them the opportunity to present on their work.

On the evening of the first full day of the Annual Conference, DMTC hosted its Gala Dinner and Awards of Excellence ceremony. Before announcing the recipients of its Awards of Excellence, DMTC was honoured to welcome Dr Deborah Jeppesen, Director of Psychological Edge as a guest speaker for the evening. Dr Jeppesen shared her inspiring life story as one of the first two female pilots to join the RAAF in the 1980s.

Another key feature of this year's conference was the unveiling of DMTC's Diversity & Inclusion strategy (read more on page 12). Complementing this initiative, DMTC used the Conference to acknowledge some of the trailblazing women represented across DMTC's portfolio of projects, the defence sector and other related sectors critical to advancing Australia's national interests, through a poster series displayed in the venue foyer.

DMTC acknowledges the efforts of research and industry partners in coming together to make the Conference a success, and to the diverse presenter panel for lending their time and expertise for the benefit of all Conference attendees.

# Award Recipients

Through its Awards for Excellence, DMTC pauses each year to recognise project teams, individuals and early career researchers who have made considerable technical and personal contributions to DMTC and to Australia's defence innovation ecosystem.

Awards are presented across six categories: the Collaboration Award, Project Leadership Award, Industry Partnership Award, Research Partnership Award, Early Career Research Award, and the Soldier On Award.

The Collaboration Award is presented to an individual who embodies the spirit of collaboration integral to DMTC's strategic intent. This year's winner, **Charlotte Morris**, has made an enormous and long-standing contribution to DMTC over many years. At DMTC, Charlotte has been responsible for the Industry Capability Development (ICD) Program where she has engaged widely with State and local governments, and regional clusters of SMEs. Her commitment to Australia's small business community has been demonstrated in her continuing and tireless advocacy for growth of Australian sovereign supply chains, including opening channels for engagement with defence primes. Charlotte is widely regarded among her peers and colleagues as an expert with deep understanding of Australia's defence sector, and exemplifies DMTC's values, vision and mission.

**Dr Mitch Dunn** from the University of Queensland received the Project Leadership Award highlighting a leader who has demonstrated significant expertise in achieving desired project outcomes. Mitch has shown brilliant leadership attributes throughout his leadership of an exciting DMTC materials development project with significant potential for application across defence domains.

DMTC's Awards of Excellence also acknowledge an individual researcher who has contributed significantly to the capability of a DMTC industry partner. **Andrew Bailey** from the Defence Science and Technology Group (DSTG) took home the Industry Partnership Award for his pivotal role in the development of superconducting technologies under DMTC's AMSTech Program.

Honouring an Individual DMTC project team or member from industry who has provided critical industrial context to inform the application of research outcomes, the night's Research Partnership Award was presented to **Neil Matthews**. Neil has pioneered and revolutionised the use of Additive Technologies for component repair, in particular Supersonic Particle Deposition and more recently Laser Additive Deposition. Neil's industrial leadership over many years has been pivotal in guiding the research outcomes and ongoing successes of DMTC's Laser Additive Deposition projects.

**Rowan Pilkington** from the University of Melbourne and **James Walker** from Synth Technologies were announced as joint winners of the Early Career Research Award for their invaluable work on DMTC-led collaborations. Rowan's project involves the evaluation of a complex, 10-step manufacturing process for a pharmaceutical agent, and adapted the process from traditional batch chemistry to flow chemistry manufacture. James Walker is an advanced technical software engineer who has used his gaming development and programming experience to enhance technical project outcomes for DMTC through the design and build of bespoke 3-D and VR technology components.

Two winners were also jointly presented with the Soldier On Award, an honour that recognises quiet achievers and those who embody DMTC's value of integrity, trust, inclusivity and commitment in their work ethic. **Dr Alessandro Carcione** has demonstrated all of these attributes and more in working alongside small businesses involved in DMTC's Smart Enough Factory projects. He has also been instrumental in the DMTC-led functional antenna project activity. **Dr Nathan Edwards** was honoured for his contributions to multiple DMTC projects, enhancing the body of research knowledge on the behaviour of armour materials when subjected to ballistic impact, enabling further advancement of blast and shock modelling.



Milan Gandhi

In November 2021, DMTC's Innovation Capability Manager, Milan Gandhi, was selected among 18 recipients for a prestigious national postgraduate scholarship awarded by the General Sir John Monash Foundation.

Receiving the 2022 *Lee Liberman John Monash Scholarship* in the field of public policy allows Milan to undertake a Master of Public Policy (MPP) and Master of Science (MSc) in Public Policy Research at the Blavatnik School of Government, University of Oxford, where he intends to *identify policy solutions to safeguard Australia's democracy from the harmful effects of digital technologies such as social media platforms*.

As a recipient of this prestigious scholarship, Milan also gains access to the benefits of the John Monash Leadership Academy, including lifelong career support and ongoing professional development.

First invested in 2004, the John Monash Scholar cohort now numbers in excess of 230 individuals and all, like Milan, have been selected for their significant leadership potential, their expertise in a chosen field of endeavour and their aspiration to make the world a better place.

# Award Recipients

Joining DMTC in August 2020, Milan made a considerable impact across DMTC and its partner group. Extending far beyond what the role of Innovation Capability Manager might suggest, Milan has been an integral part of DMTC's Office of the General Counsel and made significant contributions to policy work within the HSSA division. In addition, Milan has drafted new and amended existing internal quality management policies and procedures, led DMTC's Education Program and was an active member of the working group that developed DMTC's Diversity & Inclusion Strategy.

Whether in areas of his own formidable expertise or new areas for him, DMTC has benefited enormously from Milan's perspective and capacity to drive innovation, but above all from his diligence, perseverance and humility. From his impact across many different areas of DMTC, it is clear that Milan has embraced and, in no small way, personifies DMTC's ethos of **capability through collaboration**.

DMTC wishes Milan all the best for the remainder of his studies and all future endeavours.



## Student Profile



Joanne Allard

Joanne Allard, an early career researcher at Defence Science Technology Group (DSTG) and PhD candidate at the University of Queensland, is making significant contributions to a DMTC-led collaboration that has the potential to deliver significant breakthroughs in combating the threat posed by potentially deadly nerve agents.

Nerve agents pose a genuine threat to both Defence personnel and to public health.

Current therapeutics against nerve agents are lacking, as they either only treat symptoms not the cause, or are narrow-spectrum therapeutics, or have unwanted side effects.

DMTC is working collaboratively with scientists from DSTG and UQ to produce a more cost-effective, broad spectrum therapeutic that targets nerve agents in the body, increasing levels of protection for both Defence and civilian populations.

Joanne has undertaken the bulk of the scientific work to progress this project to date, utilising innovative molecular mapping and protein engineering approaches to create completely novel constructs that express optimised therapeutic constructs.

Joanne has also analysed the key attributes vital to the future success of the intended therapeutic constructs. These include characteristics such as the stability and half-life of the construct – vital considerations in the storage and deployability of a future therapeutic.

In investigating novel avenues to respond to chemical threats, Joanne is engaged in work of interest both in Australia and internationally, and with applications in – but also far beyond – the defence and national security arena.

**"I consider Joanne to be an outstanding young researcher and role model for young Australians, particularly young women, pursuing careers in highly technical and scientific endeavours."**

**Dr Kate Shields, Group Leader, Genomics and Biotechnology to CBRN, DSTG**

## Student Conference



**"I loved the experience. To see the companies move forward with their desired projects and to also achieve cyber security standards has been great."**

**Thomas Hughes – Smart Enough Factory Intern**

As a Smart Enough Factory intern, Thomas Hughes played an integral role in assisting DMTC to boost the readiness of Victorian small businesses in the manufacturing sector.

Throughout his internship, Thomas worked with Melbourne-based companies SEM Fire and Rescue (SEM) and Carbon Revolution. In the case of SEM, an emergency services vehicles manufacturer with headquarters in Wendouree, Thomas helped realise the company's objectives by setting the scope of its Smart Enough™ Factory project and assisting in the creation of dashboards to better visualise business operations. As SEM General Manager Mark Thomas noted, *"The SEF program allowed us to develop a real-time problem-solving solution to the visibility of materials within our manufacturing plant, as well as providing critical information to our project supervisors on the status of such materials."*

Following his internship, Thomas accepted an offer from SEM to work with them in a part-time capacity while completing his mechatronic engineering studies. This outcome is a fantastic case study of the benefits of joint investment in Australia's future sovereign industrial workforce and capability. For Mark Thomas, the takeaway for other Smart Enough™ Factory participants is clear: *"I would recommend any participant company to consider what an intern like Thomas can contribute to your organisation."*

Through its education program, DMTC remains committed to boosting the pipeline of young, innovative Australians progressing from academic study to employment in defence industry and related fields. Whether by providing pathways for early-career researchers, or providing industry-focused internships to undergraduate engineering, computer science or software development students, DMTC is investing in the future workforce required to develop Australia's defence industrial base.

In August, DMTC held a student conference at its new headquarter in Kew. Bringing together PhD students from across DMTC's portfolio of projects, undergraduate Smart Enough Factory interns and PhD students from the Defence Science Institute (DSI), the 2022 Student Conference gave participants an opportunity to hone their communication skills, learn about the diversity of career opportunities available to them across defence industry, and network with like-minded students.

Over the course of the day, participants heard about the experiences of our Smart Enough Factory interns on projects that are assisting small businesses to upscale their Industry 4.0 capabilities, discussed career trajectories and education outreach opportunities with DMTC staff, and met past PhD students, Dr Rizwan Rashid and Dr Cameron Barr, who are now working as postdoctoral researchers with DMTC industry partner, Rosebank Engineering.

Research students also competed in a friendly 3-minute thesis competition in which they were tasked with communicating their research to a non-technical audience, accompanied by a single slide. DMTC congratulate Matthew Shipper for taking home the top honour for his presentation titled 'Single Crystal Piezoelectrics: Harvest Energy from Vibration and Airflow'.

DMTC looks forward to building on the success of this event in coming years.

# Snapshot Finance

In the reporting period, DMTC continued working closely with relevant Defence, National Intelligence Community, health security agencies and research and industry partners, to undertake a broad portfolio of research and development and innovation activities.

DMTC secured new funding for the year in relation to its activities from a range of sources, including from the Defence Innovation Hub through both individual innovation contracts and the negotiation of an extension to June 2023 of an overarching Collaborative Research, Development and Innovation services contract.

Through DMTC's co-investment model, this investment leveraged additional cash and in-kind investment from Australian industry, research agencies, State Government and other Defence Program sources.

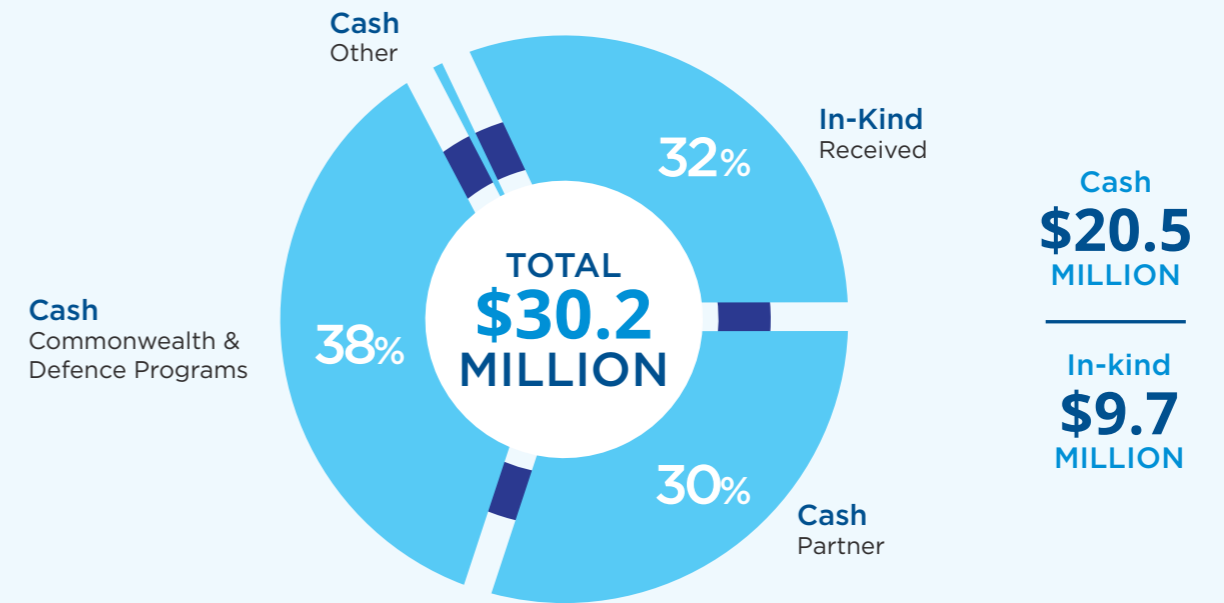
Cash funding and associated in-kind received for the financial year was \$30.2m, while resources applied for the financial year totalled \$28.4m, including \$9.7m of in-kind contributions from industry and research partners. Resources applied for the year represented an 8.3% increase over prior year activity.

A surplus of \$523k was recognised for the year ending 30 June 2022, which is lower than 2021, driven by an increased utilisation of the Program Opportunity Reserve to support heightened enabling research program activity.

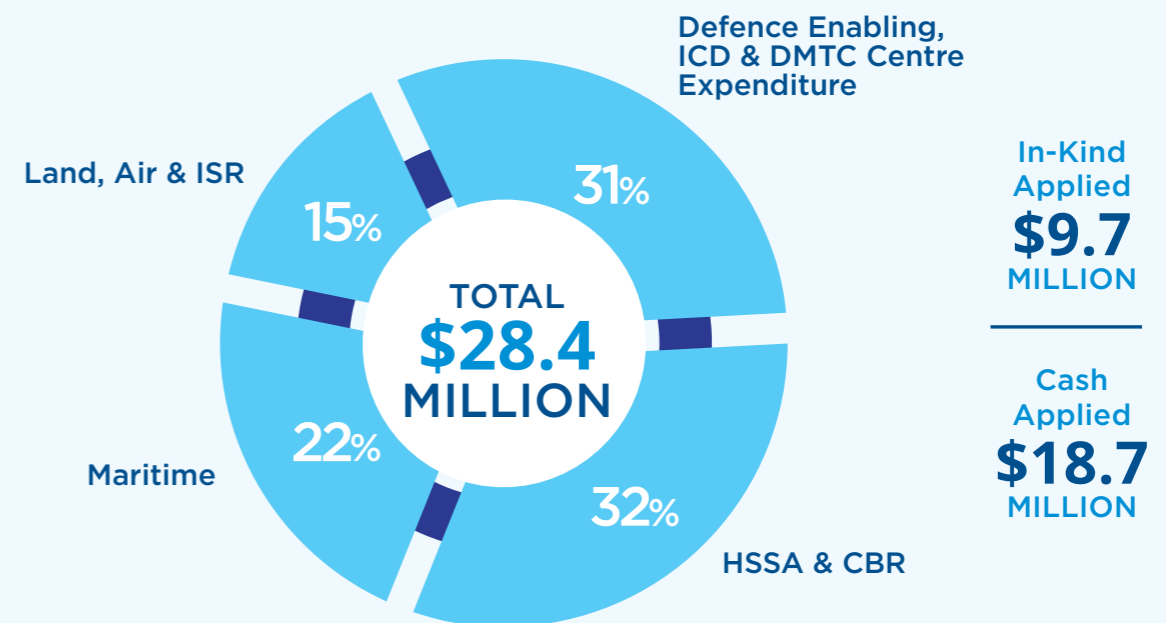
Cash reserves totalled \$32.9m at 30 June 2022 and included \$29.4m of unearned revenue from Commonwealth and Defence program funding. These funds have been committed to fulfil existing and new research activities in future periods.

Copies of the company's statutory financial report for the year ending 30 June 2022 are available on request.

# Year In Summary



Received



Applied

Cash  
**\$20.5**  
MILLION

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In-kind  
**\$9.7**  
MILLION

In-Kind Applied  
**\$9.7**  
MILLION

---

Cash Applied  
**\$18.7**  
MILLION



# Management Team



**Dr Mark Hodge**  
Chief Executive Officer



**Mr Jim Arthur**  
Chief Security Officer  
Chief Commercial Officer



**Mr Steve Evans**  
Chief Financial Officer



**Mr James Sandlin**  
Head of New Capability



**Ms Anthea Silom**  
Finance Manager



**Dr Stephen van Duin**  
Maritime Program Leader



**Dr Matt Dargusch**  
Chief Technology Officer &  
Air Program Leader



**Ms Charlotte Morris**  
Industry Capability Development  
Program Leader



**Dr Martin Veidt**  
Enabling Technologies  
Program Leader



**Mr Miles Kenyon**  
Head Maritime Strategy



**Dr Julia Cianci**  
Medical Countermeasures  
Program Leader



**Mr Steve Patrick**  
Head Strategic Projects &  
General Counsel



**Dr Leigh Farrell**  
Head HSSA



**Dr Felicia Pradera**  
General Manager HSSA



**Mr Deepak Ganga**  
Head Program Management



**Mr Steven Champion**  
Project Manager - Industry  
Capability Development



**Ms Bronwynne McPherson**  
Executive Coordinator



**Mr Fred Eske AM**  
General Manager Innovation &  
Maritime Capability Development

# Management Team



**Ms Amy Conrad**  
Modelling & Simulation and  
Sensing Systems Program Leader



**Mr Milan Gandhi**  
Innovation Capability Manager



**Ms Elisa Woodlock**  
Quality Assurance Manager,  
Security Officer



**Dr Emily Kibble**  
Project Manager – HSSA



**Mr Patrick Crosling**  
Associate - Government Relations



**Ms Megan Champion**  
Management Accountant



**Dr Scarlet Kong**  
Project Manager – APMA Program



**Mr Harry Baxter**  
Head Government Relations

# Diversity & Inclusion / RAP

## Embracing inclusion

DMTC is committed to diversity and inclusion because it is the right thing to do and has been demonstrated to support the achievement of better business outcomes.

DMTC is taking tangible and practical actions across our business, through our people. The Company's approach to diversity and inclusion encompasses issues of gender; sexual orientation; indigenous heritage; disability; cultural and linguistic diversity (CALD); and employment/education background based on both country and sector or discipline.

DMTC's Diversity & Inclusion Strategy was launched in April 2022 (for more information, see Page 12). The commitments made in both the Strategy and in the Company's Reconciliation Action Plan are being tracked and regularly reported at management and Board levels.

Information and training sessions on topics ranging from well-being and unconscious bias to respectful workplaces and cultural awareness are being offered for both the Management Team and Board members.

DMTC is working with stakeholders from across the sector to consider internship and job placement programs, including for Aboriginal and Torres Strait Islander peoples through the Career Trackers program, and for people living with low vision or blindness through Vision Australia.

DMTC is also a partner in the "Elevate: Boosting the Next Generation of Women in STEM" program being delivered by the Australian Academy of Technology and Engineering (ATSE).

## Walking together

Taking account of DMTC's size and reach, a key part of the Company's approach to both our RAP and to D&I Strategy has been to set goals and get to work on implementation within the Company, but also to encourage our partners to be engaged and to take their own tangible actions. The opportunities for this engagement are broad and include education programs, events and sponsoring and creating a pipeline for internship and recruitment opportunities.

## A call to action

In 2021, DMTC received approval from Reconciliation Australia to publicly release its Reflect Reconciliation Action Plan, or RAP. The RAP affirms a Company-wide commitment to tangible actions that contribute to greater understanding, respect and relationships between Aboriginal and Torres Strait Islander Peoples and other Australians.

In this context, DMTC sees the Uluru Statement from the Heart as a formative document in the national reconciliation agenda. While the 1967 referendum provided for Australia's First Nations Peoples to be counted, the Uluru Statement is a plea to be heard. For its part, DMTC has urged its own people and its partners to read the Uluru Statement for themselves, to hear and consider the call for action.

DMTC looks forward to working with our partner group in these and other ways to promote, and contribute to achieving, the goals of our Reconciliation Action Plan.



# Governance & Corporate Responsibility

The DMTC Board is responsible for overseeing the management and strategic direction of the Company. Each Director is elected for a two-year term by the Company's Members at the Annual General Meeting (AGM). As required by the company's Constitution, the Directors have a comprehensive and complementary range of skills and experience covering areas such as Defence Industry, Defence systems and policies, education and research, financial and risk management and corporate governance.

## AGM and Participant Workshop

The DMTC AGM was held on 16 November 2021 and in accordance with the Company Constitution, Directors Mr Tony Quick, Dr John Best, Dr John Harvey and Professor Caroline McMillen retired by rotation at the meeting, re-nominated and were subsequently re-elected to the Board of Directors.

The DMTC Partner and Stakeholder Workshop was also held on 16 November 2021. The workshop provided partners and Stakeholders with an update on the Company's achievements for the 2020-21 financial year, ongoing and planned program activities and an update on anticipated future activities.

## Audit, Risk and Remuneration Committee

The Audit, Risk and Remuneration Committee is a formal subcommittee of the DMTC Board. The Committee assists the Board in its decisions on financial reporting, internal control structures, internal and external audit functions, compliance, governance and risk management systems and remuneration policies. The Committee is comprised solely of non-executive Directors of DMTC, the majority of whom are independent.

## Environmental and Social Impacts

The DMTC Management Team continues to work towards realising its commitment to corporate social responsibility. During the reporting period, the Company continued to implement environmental and sustainability initiatives such as social impact procurements and eliminating avoidable business travel. More broadly, individual members of the management team are engaged in corporate volunteering programs.



# Board of Directors



Mr Tony Quick

Chair  
MA



Ms Patricia Kelly

Director  
BA, GAICD



Mr Marc Peskett

Director  
BBus, CA (Australia), FTI (Australia), MAICD



Mr Michael Grogan

Director



Professor Caroline McMillen AO

Director  
PhD, BA (Hons), FAHMS



Dr John Best

Director  
PhD, BSc (Hons), MBA, GAICD



Air Marshal (Retd)  
Dr John Harvey AM

Director  
PhD, MIS, MLitt, BSc, BA, GAICD

# General Counsel

## Consolidating Capability

The Office of the General Counsel supports DMTC's current operations and future planning, playing a key role in developing high levels of professionalism and outcomes in collaborative innovation, and contributing to the organisation's growth and evolution as a key stakeholder in sovereign research and development.

Reflecting the increasingly sophisticated nature of interactions between DMTC and its stakeholders, and the Company's steadily increasing work pipeline, the General Counsel function was established in 2020 to provide a dedicated, strategic legal coordination and advice capability. It supports the corporate and program leadership functions to ensure DMTC's enterprise and operational activities are ahead of legal compliance, and that key decisions are made in full consideration of all relevant obligations and implications. As multi-party, multi-jurisdictional projects, with sophisticated intellectual property arrangements become the norm, it is critical that pre-execution decisions are made in full contemplation of relevant factors and complexities.

Working closely with our partners and stakeholder agencies, the General Counsel Office ensures that DMTC's impressive output in development and innovation is properly buttressed by the right legal arrangements.

An in-house General Counsel function provides Program Leaders with fast, easy-reach support, increasing the tempo and quality of DMTC's operations. As a member of the Executive, the General Counsel also plays a role in ensuring DMTC is abreast of the ever-evolving strategic landscape and that its corporate and operational structures pre-empt and adapt to changing requirements.

The Office has taken carriage of advice on broader issues including, amongst others, Defence Export Controls, intellectual property, and Freedom of Information, ensuring that DMTC's stewardship of projects remains in accordance with the highest standards and that it retains its position as a trusted partner of Defence and defence industry.

As DMTC grows and adapts in response to the priorities of the Defence and national security community, the General Counsel will continue to provide advice to the management team and the Board on specific elements of DMTC's strategy, structure and systems.

# Quality Management

Quality systems accreditation remains a vital asset for DMTC in its engagement with the Department of Defence and, more broadly, in the Australian and international defence and national security sectors.

In the reporting year, DMTC was re-certified against ISO 9001:2015 and ISO 44001:2017 standards. The ISO benchmark represents a globally recognised endorsement of our systems and processes.

DMTC's focus on managing collaborative projects, as a specialist endeavour, pre-dates the development of the ISO 44001 standard. A focus on applying structural flexibility in the way that multi-party collaborations are managed, with a view to delivering value for all partners, has been acknowledged in the defence sector for many years, and more recently through this certification outcome.

The ISO certifications are a significant validation of DMTC's collaborative model, but the Company's approach to quality and improvement goes beyond an annual drumbeat of audits and compliance.

Building on a long history of involvement in the internationally benchmarked Supplier Continuous Improvement Program, DMTC continues to conduct

annual self-assessments. These are useful as a 'health-check' on the organisation and to monitor the ongoing strategic focus and alignment of ongoing continuous improvement initiatives.

Through both of these initiatives, DMTC continues to maximise the effectiveness and efficiency of its program delivery, together with its supporting corporate systems and operations.

Participants in DMTC projects, along with government agency customers, can have confidence that DMTC's focus remains squarely on the delivery of practical, tangible outcomes for Australia's defence capability and support for the local defence industry and research sectors.



# Security Assurance

DMTC continued to monitor and review security requirements and maintained its Defence Industry Security Program (DISP) membership during the year. Security training has been provided to all team

members to inform them of emerging risks and good practices, and the DMTC team members who hold formal security clearances have continued to comply with mandatory training and other requirements.





# Glossary

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<b>ADF</b>	Australian Defence Force	<b>N-FAST</b>	Networked Future Augmented Small-arms Technologies program
<b>ADSTAR</b>	Australian Defence Science Technology and Research	<b>NHSRA</b>	National Health Security Resilience Assessment
<b>AGM</b>	Annual General Meeting	<b>NGTF</b>	Next Generation Technologies Fund
<b>AM</b>	additive manufacturing	<b>PCR</b>	Polymerase chain reaction
<b>AMR</b>	Antimicrobial resistance	<b>PhD</b>	Doctor of Philosophy
<b>AMSTECH</b>	Australian Maritime Superconducting Technologies	<b>PPE</b>	Personal protective equipment
<b>ANSTO</b>	Australian Nuclear Science and Technology Organisation	<b>PPRR</b>	prevention, preparedness, response and recovery
<b>APMA</b>	Advanced Piezoelectric Materials and Application	<b>QUT</b>	Queensland University of Technology
<b>CASG</b>	Capability Acquisition and Sustainment Group	<b>RAP</b>	Reconciliation Action Plan
<b>CBR</b>	chemical, biological and radiological	<b>R&amp;D</b>	research and development
<b>CFRP</b>	Carbon-fibre reinforced polymer	<b>RAN</b>	Royal Australian Navy
<b>CSIRO</b>	Commonwealth Scientific and Industrial Research Organisation	<b>RMIT</b>	Royal Melbourne Institute of Technology
<b>DISP</b>	Defence Industry Security Program	<b>SME</b>	small to medium-sized enterprise
<b>DSI</b>	Defence Science Institute	<b>SUT</b>	Swinburne University of Technology
<b>DSTG</b>	Defence Science and Technology Group	<b>TRL</b>	Technology Readiness Level
<b>HSSA</b>	Health Security Systems Australia	<b>UAV</b>	Uncrewed aerial vehicle
<b>HTS</b>	high temperature superconductor	<b>UNSW</b>	University of New South Wales
<b>ICD</b>	Industry Capability Development	<b>UoW</b>	The University of Wollongong
<b>IED</b>	improvised explosive device	<b>UQ</b>	The University of Queensland
<b>IP</b>	Intellectual Property	<b>USW</b>	Undersea warfare
<b>LAMP</b>	loop-mediated isothermal amplification	<b>WAAM</b>	wire arc additive manufacturing
<b>LOTE</b>	life of type extension		
<b>MedCM</b>	Medical Countermeasures		
<b>MCMs</b>	mine countermeasures		
<b>Mip</b>	Macrophage infectivity potentiator		



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