



DEFENCE MATERIALS TECHNOLOGY CENTRE
2012 ANNUAL REPORT CAPABILITY THROUGH COLLABORATION





DMTC DEFENCE
TECHNOLOGY CENTRE

DMTC WAS ESTABLISHED AND IS SUPPORTED UNDER THE
AUSTRALIAN GOVERNMENT'S DEFENCE FUTURE CAPABILITY
TECHNOLOGY CENTRE (DFCTC) PROGRAM.
DESIGN AND ART DIRECTION BY BEYOND THE PIXELS.



CE MATERIALS
OLOGY CENTRE

605

37 PARTNER
ORGANISATIONS/
565 PEOPLE/
5 PROGRAMS/
36 PROJECTS/
\$52M RESEARCH/
1 TEAM

The Collaborative Solution

The Defence Materials Technology Centre (DMTC) drives the creation of Australian industry capability in advanced materials by leading collaborative research and commercialisation activities for Defence applications. The productivity increases, cost savings and creation of niche capabilities that are resulting from DMTC activities are making a significant contribution towards a more advanced and competitive defence sector.

DMTC is:

- › creating a more competitive and productive Australian defence industry;
- › increasing Australia's knowledge base;
- › enhancing Australia's technical capability;
- › creating stronger and more integrated supply chains;
- › reducing costs using a collaborative model;
- › the link between industry technical capability and the Australian Defence Force; and
- › supporting a more competitive Australian manufacturing industry.

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Reflections & Directions




Mark Hodge CEO



Tony Quick Chair

FROM THE CHAIR AND CEO

This has been another highly successful year of operation for DMTC. We are continuing to build on the strength of the DMTC model that is centred on the cost efficient enhancement of Australian defence industry capability and competitiveness. We are now seeing our capability enhancements deployed within our industry participants which are finding additional applications for technology transfer to other platforms. The collaborative partnerships that DMTC has formed are resulting in stronger Australian supply chains with many SMEs gaining direct and ongoing access to larger organisations and Primes.

Tony Quick
Chair

'Personnel Survivability' has commenced and has rapidly ramped up into full operation. The new program is operating under an enhanced structure to ensure effective integration with the Diggerworks adaptive acquisition model. Expanding to accommodate this activity has demonstrated the flexibility in the DMTC model to accommodate additional programs and further assist Defence and industry in faster technology advancement and progress within Australia.

We are now working hard towards securing the future of DMTC so that we may continue to develop Australian industry capability and support the effective performance of the Australian Defence Force. We remain driven by the ongoing need for these outcomes and believe that with there will remain a role for DMTC to deliver these results well into the future.

A special thank you goes all of our stakeholders who contributed to the excellent major performance review outcomes and additionally to my fellow Directors and management team for their continued efforts and support towards the future success of the Centre.

The 2012 year has seen more tremendous results as we maintain our track record of delivering high quality research outcomes with our project teams continuing to work effectively. We have successfully completed more projects and have commenced numerous new ones, further building on the capability advances already achieved. DMTC's reputation is building and we are increasingly well known in the Defence community.

Mark Hodge
CEO

As part of our new activities, we welcomed a range of new participants to our ranks and others have increased or extended their level of engagement with DMTC. This sustained level of support is validation of our model and gives me confidence that not only are we delivering on the expectations of both our research and industry participants, but that we are well positioned for the next phase of development of DMTC.

As part of our contract obligations, DMTC underwent a major performance review by the Commonwealth in February. The review report was very positive indeed, and in fact DMTC was found to represent best practice in a number of key areas. Critically, the report was strongly supportive of our efforts to develop new programs to extend our activities beyond the period of the current contract. We are now actively pursuing this and other recommendations from the report and believe this will further strengthen our collaborative model in the years ahead.

In this context I have realigned the DMTC management team to support continued delivery of outstanding research outcomes and building a resource to address the many new opportunities that continue to arise.

I have great pleasure in presenting the 2012 Annual Report and confidently look forward to the years ahead.

Increasing Competitiveness, Increasing Capability

VISION TO PROVIDE TECHNOLOGY SOLUTIONS ENABLING INDUSTRY
TO ENHANCE AUSTRALIAN DEFENCE CAPABILITY.



DMTC uses a collaborative model to develop and embed innovative solutions, technologies and niche capabilities in supply chains to enhance Australian Defence capability. DMTC enables collaboration by:

- › Fostering enduring cooperative relationships between SMEs, major manufacturers, research organisations, industry bodies and Defence;
- › featuring an IP model focused on rapid royalty free transfer to partner organisation's;
- › Simplifying the formalisation of collaboration with standardised agreements; and
- › Ensuring all participants receive outcomes which are greater than that of each participant acting independently through a supply-chain collaboration model.

\$16,738,806 Total Revenue 2011-2012

As a collaborative contributor to R&D activities our partners achieve greater technology and performance gains in less time and with less cost than by undertaking R&D alone. This year DMTC has continued to receive funding in near equal proportions from the Commonwealth, industry and research sectors, achieving significant cost efficiency from the funds invested from each stakeholder group.

BENCHMARKING

DMTC runs technical and productivity benchmarking activities with Australian companies to enable industry to understand the competitiveness of their capability. It also encourages companies to work together to provide complete solutions to the customer, rather than competing on a domestic level. Benchmarking activities have already resulted in productivity gains across all participating organisations. One such example has resulted in four collaborating companies halving their average machining times for a typical aircraft component.

42% \$6,956,599

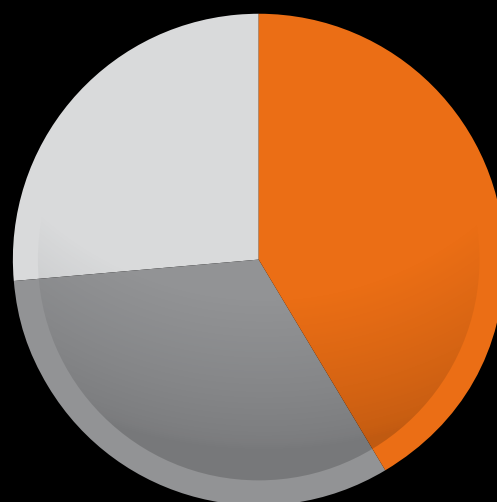
■ RESEARCH SECTOR

32% \$5,400,000

■ COMMONWEALTH GOVERNMENT

26% \$4,382,207

■ INDUSTRY AND OTHER INCOME



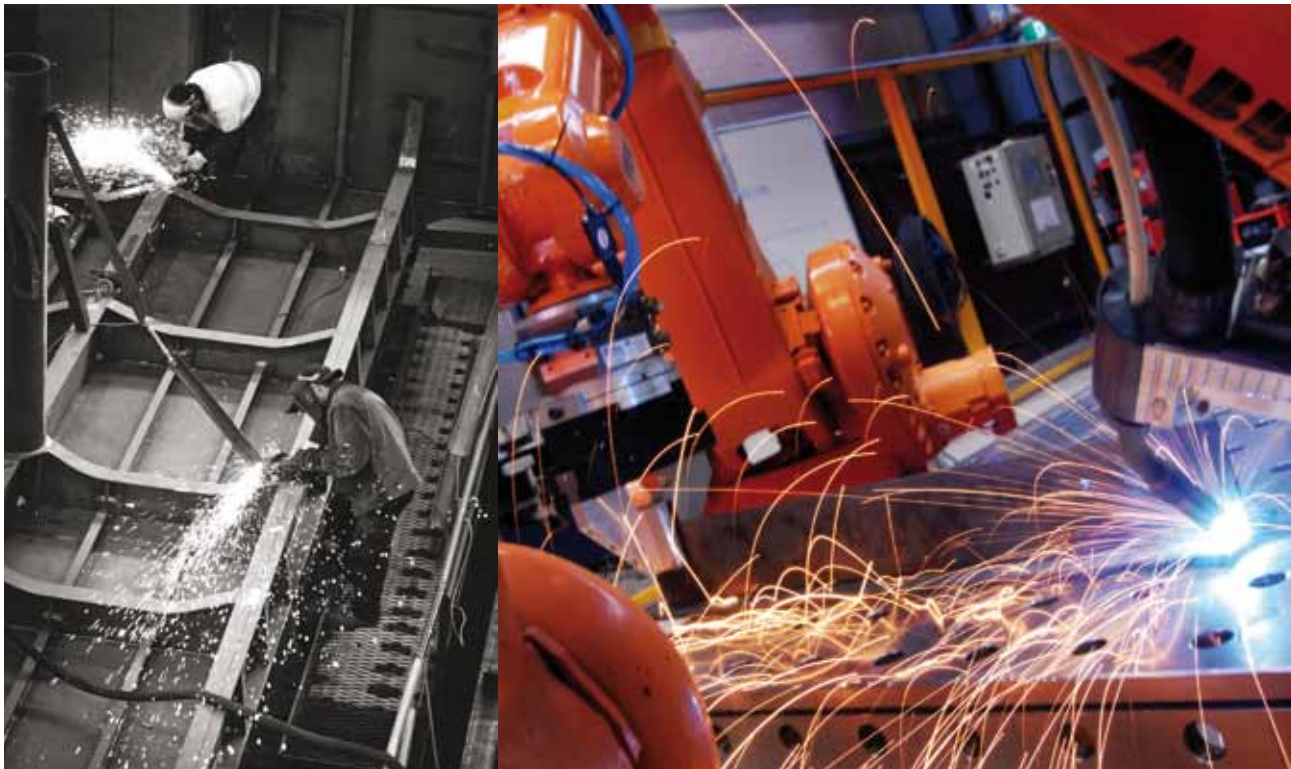
REVENUE SOURCES



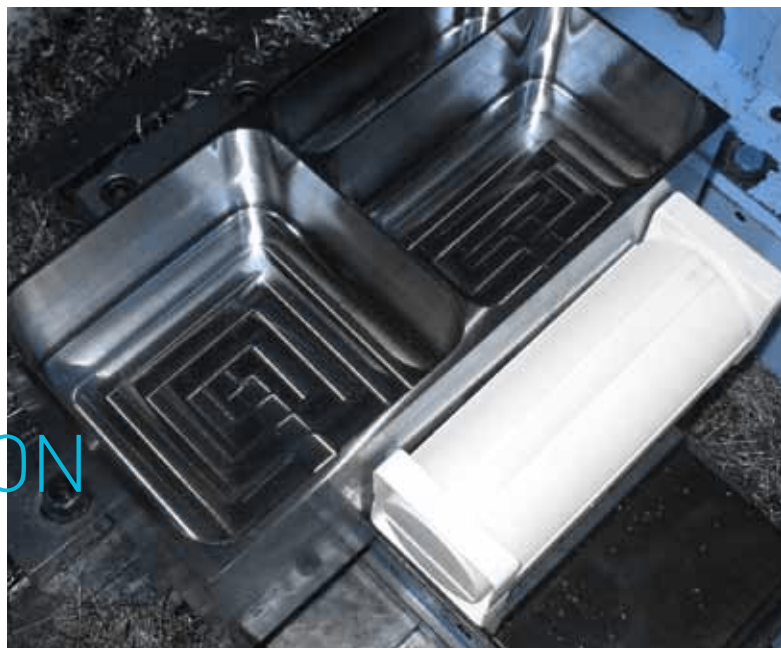
Increasing Productivity

DMTC'S RESEARCH PROGRAMS EMPHASISE IMPROVED PRODUCTIVITY THROUGH OPTIMISATION OF MANUFACTURING AND PRODUCTION PROCESSES. THE RESULTING OUTCOMES ARE MEASUREABLE INCREASES IN PRODUCTIVITY FOR THE DEFENCE SECTOR, INCLUDING:

- **REDUCED MANUFACTURING TIMES** DMTC research demonstrated the potential to reduce the programming time for the automated welding process used in the manufacture of Defence armoured vehicles by as much as 70%, resulting in reduced machine down-time.
- **REDUCED MANUFACTURING COSTS** DMTC research has increased the life of machining tools used in the manufacture of titanium aircraft components. This has reduced the number of machining tools needed by the manufacturers and increased production efficiency, resulting in overall manufacturing cost savings.
- **INCREASED PRODUCTIVITY** The integration of DMTC know-how and new technologies into welding processes for the Air Warfare Destroyer block has enabled manufacturer Forgacs to significantly reduce the distortion created in the steel plates during the welding process. This reduction in distortion has considerably reduced re-work, resulting in increased productivity.



MAXIMISING AUSTRALIAN MACHINING CAPABILITY THROUGH COLLABORATION



CASE STUDY

DMTC completed a machining benchmarking study with industry participants BAE Systems Australia, CUC, Naeco, Levett Engineering, Sutton Tools and Seco Tools to share and improve the machining process knowledge and capability of each organisation. The focus was to assess the different approaches involved in machining a thin-wall, deep pocketed titanium component for structural aerospace application with a particular emphasis on optimising the cycle time and tool geometries. Each participating organisation machined a sample titanium aerospace component 300mm x 150mm x 150mm using the same cutting tool type. The different machining strategies used by each participant were then shared, compared and evaluated.

Increasing the Metal Removal Rate (MRR) in the machining process was a desirable outcome for all participants in order to reduce overall machining time of their components. The MRR varied by a factor of four between the companies

involved in the study. The variations in MRR were due to the use of different cutting speeds, feed rates, cutting depth, cutting width and type of machine. It was found that the optimum MRR could be achieved by reducing the cutting speed, increasing feed rate, increasing depth of cut and increasing width of cut. The team further demonstrated that additional productivity improvement could be achieved using the larger spindle head. Further investigation demonstrated that the tool path was also a critical factor effecting metal removal rate, and altering this on the sample component resulted in a further doubling of MRR.

THE BENEFITS

This benchmarking exercise provided the opportunity for industry partners to evaluate their current machining techniques and immediately employ identified improvements to their commercial production of machined components. The importance of the open and cooperative collaboration between researchers and industry personnel, a process that requires the breakdown of inherent cultural barriers and management of competitive issues in an open and transparent forum, was crucial to the success of the benchmarking exercise.

Strengthening Australian SMEs

DMTC ACTIVELY ENGAGES SMES IN COLLABORATIVE RESEARCH AND SUPPLY CHAIN DEVELOPMENT.

It is well recognised that engaging in domestic and global supply chains can improve the chances of a consistent flow of work. The DMTC model actively identifies supply chain opportunities within each project and engages with new organisations that have the potential to further strengthen those supply chains.

This approach supports the growth and strengthening of Australian SMEs through:

- › Creating opportunities for SMEs to build relationships within supply chains, including larger organisations and Primes;
- › Embedding new intellectual property within SMEs, securing their position within the supply chain; and
- › Embedding the new capabilities within the whole of the supply chain resulting in superior capability retention.

ACTION	RESULT
Linking SMEs with research expertise and networks	› Technology transfer to industry; reduced time, cost, and potentially ineffective partnerships for the SME
Actively embedding SMEs into supply chains	› Increased supply chain opportunities, robust relationships, embedded technology
Facilitating R&D activities which are of direct relevance to Defence	› Increased contract opportunities for the SME, support for future Defence capability requirements
Cost efficiency in research and development	› Greater commercial gains for the SME per dollar invested (up to 10:1 leverage currently being achieved)

SME PROJECTS	STATUS
Advanced titanium alloys	In Progress
Numerical simulation of the protection of vehicles from IEDs	Complete
Protective fabrics to mitigate blast impact for use in military uniforms	Complete
Flame retardant treatment of nylon/spandex lightweight fabric with boron acid and ammonium polyphosphate	Complete
HVOF coatings capabilities	In Progress
Vibration isolation mechanism on seats in rigid hull inflatable boats	Complete
Supersonic particle deposition (SPD) for thin panel repair	Complete
Disruptive Camouflage Pattern Uniform (DCPU) fragmentation project	Complete
Numerical simulation of the manufacture and structural response of a composite military helmet	Complete



SUPER SONIC PARTICLE DEPOSITION (SPD) REPAIR CAPABILITY AT ROSEBANK ENGINEERING

CASE STUDY

The 'Supersonic Particle Deposition for Thin Panel Repair' project at Rosebank Engineering has achieved quantifiable results from the application of Super Particle Deposition (SPD) on damaged thin metallic aerospace skins and validated the observed behaviour through further analytical and finite element modelling.

A two phased approach to the project was adopted, with phase one building on existing collaborative work undertaken by Rosebank Engineering and Monash University and phase two identifying thin panels currently in service with typical cracking in order to develop a test regime and complete further analytical and FEA modelling.

The project identified and validated:

- › the reclamation and structural enhancement of damaged thin metallic aerospace skins including an analytical model produced to validate the observed test behaviour;
- › the potential to utilise the technology for other structural restoration/enhancement opportunities;

- › an understanding of application parameters of SPD on thin panels; and
- › an understanding of crack propagation behaviour in thin skins both with and without SPD which has led to the lodgement of patents.

These results can now be considered for adoption by the ADF for the effective repair on thin skins that will enhance platform availability and reduce through-life-maintenance costs. The technology is also easily transferable for use in other applications such as in the commercial aviation industry.

This research has expanded Rosebank's ability to provide through-life-maintenance support to the ADF and established enduring relationships with a network of research partners.

"Without the benefit of leveraging funding contributions through DMTC this project would not have proceeded and the significant outcomes we achieved would not have been possible."

MR NEIL MATTHEWS, CHIEF ENGINEER
ROSEBANK ENGINEERING

Enhancing Australian Skills

DMTC is improving the performance and capability of the Australian defence industry by increasing the skills and knowledge in the sector. By linking research expertise with industry needs researchers are gaining hands-on experience in the manufacturing environment and industry is gaining the knowledge and insight of leading technical research. This is achieved by:

- › Enabling researchers to participate in industry led technology development projects;
- › Increasing the pool of knowledge in the defence industry by facilitating R&D; and
- › Bridging the gap between research providers and industry.

In addition to the development of knowledge through direct participation in projects, DMTC provides scholarships to PhD and Masters students. DMTC had 26 PhD and 3 Masters students during the 2011-2012 year, each of whom were actively engaged in our projects.

Our programs increasingly transfer knowledge and ideas across applications as emerging technologies are identified and our people share their expertise.



Domain Technology Matrix

New manufacturing (additive manufacturing, laser assisted machining etc.)	●	●	●
Manufacturing process and component performance modelling, simulation and validation	●	●	●
New generation composite materials and manufacturing processes	●	●	●
Titanium component fabrication and repair technologies	●	●	●
Robotics, automation and lean manufacturing	●	●	●
Prognostic, detection and repair for aluminium alloys and composites	●	●	●
Advanced ceramics and coatings	●	●	
Smart textiles and fabric technologies		●	
New ferritic materials and joining technologies		●	●
	AIR	LAND	SEA





DOMAIN FOCUS

AIR DOMAIN



DMTC RESEARCH IN THE AIR DOMAIN IS CREATING IMPROVED CAPABILITIES IN THE PRODUCTION, SUSTAINMENT AND REPAIR OF AEROSPACE COMPONENTS.

PROPULSION SYSTEMS
PROGRAM LEADER
DR MATT DARGUSCH

AIR PLATFORMS
PROGRAM LEADER
DR SURESH PALANISAMY

A key challenge faced by the Australian Defence Force and Australian industry is the affordable manufacture and repair of components for new and legacy platforms. Significant activity in this program is focused on advancing maintenance and repair capabilities to support the current fleet of aircraft and reduce the manufacturing costs associated with titanium components to future platforms such as the Joint Strike Fighter. New machining strategies, cutting tools and advanced coolant technologies are being developed across a complete supply chain of companies participating in DMTC. Built into these activities are a number of benchmarking

exercises which aim to compare and optimise manufacturing processes currently used by Australian companies leading to the further enhancement of the competitiveness of these organisations.

Also highly relevant to the Australian Defence Force's aging aircraft is the need to monitor and repair corrosion. This is currently done at specified time intervals which contribute to more time out of service for the aircraft than may be necessary. This program brings together research and industry expertise to produce a single Corrosion Prognostic Health Management (CPHM) capability which will enable a move to condition based maintenance. This will significantly reduce time out of service and through life service costs to the ADF. The CPHM capability will consist of a prognostics tool-box incorporating a combination of sensors, models, monitors and management tools. Methods to repair damage from corrosion as well as wear or debris impact are also progressing with a cost effective laser cladding repair capability for an F/A-18 component being developed at Rosebank Engineering.

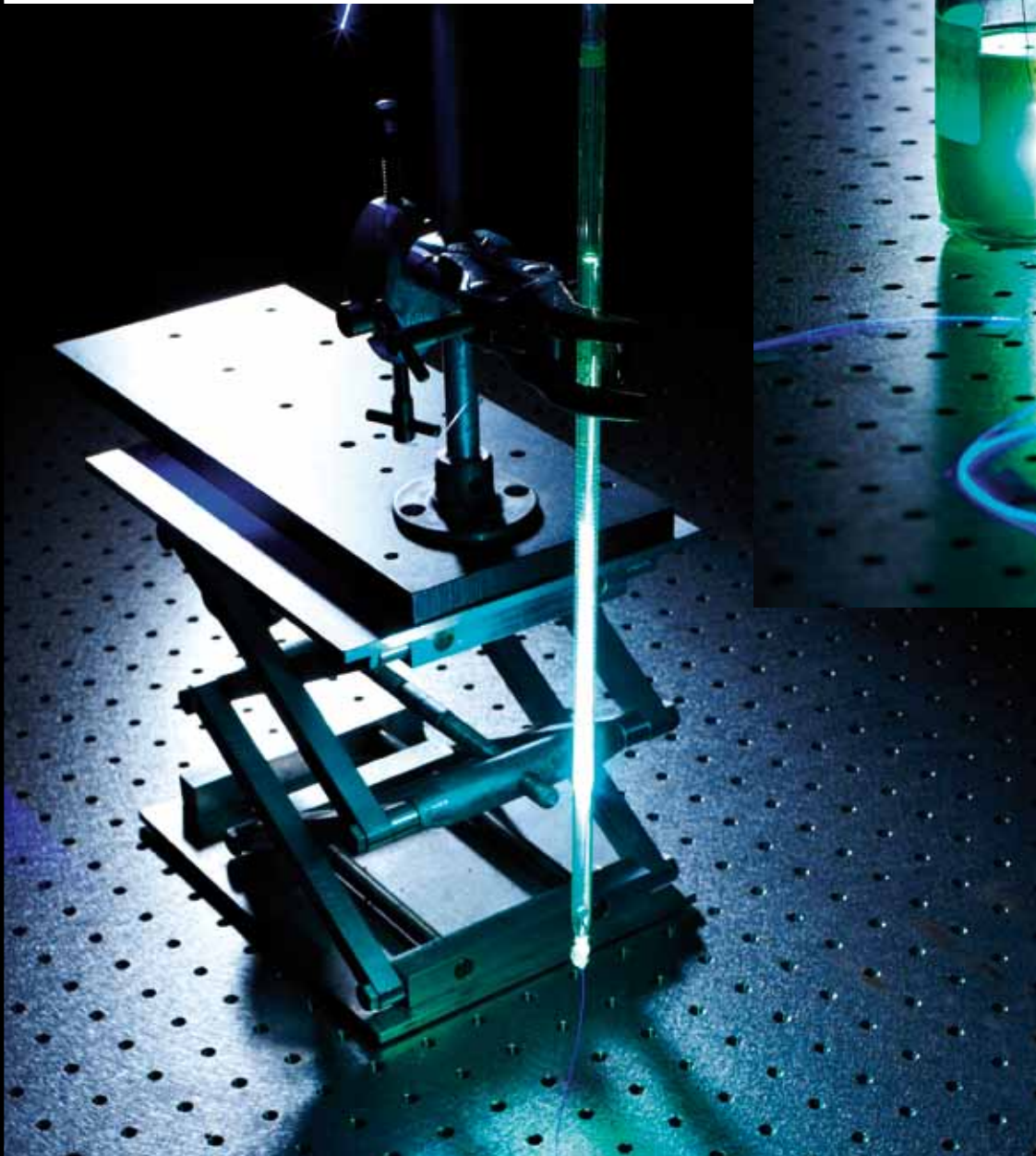
DMTC's air domain projects are driving the development of new materials capable of withstanding extended exposure to the extreme conditions associated with hyper and supersonic flight. BAE Systems has developed a deeper understanding of the complex hypersonic combustion environment and how to design components to withstand that environment. This has increased their capability to take hypersonic technology from research to concept demonstration and is maintaining Australia's position on the world stage in hypersonic technologies.

AIR DOMAIN HIGHLIGHTS

For more of our air domain achievements
and highlights, visit www.dmtc.com.au

- › **ADVANCING TITANIUM MACHINING TECHNOLOGIES** A tailored damping system has been designed and applied to the manufacture of JSF production components at BAE Systems Australia. The use of this damping system has resulted in high surface quality finish on thin-wall titanium components and is saving many hours of operator machining time. Sutton Tools has applied new tool coatings to cutting tools for high performance machining. Milling/drilling trials performed at Seco Tools have also shown that significant reductions in component cycle time and increases to tool life can be achieved by applying high pressure coolant instead of conventional flood and cryogenic coolant. The results have been provided to BAE Systems Australia and will inform future manufacturing process optimisation decisions.
- › **RECYCLING TITANIUM CHIPS** A process to recycle commercially pure Ti-6Al-4V machining chips has been developed using a melt-free equal channel angular pressing procedure. As the process uses machining chips instead of titanium sponge the titanium blocks which are produced are significantly cheaper compared with cast ingots. The recycling technique also has a low processing temperature energy consumption compared with conventional production of titanium. This work has attracted considerable interest from the commercial sector.
- › **NEW CORROSION MODELS** New models to simulate Inter-Granular Corrosion (IGC) and Corrosion Inhibiting Compounds (CICs) have been developed which will help form a comprehensive understanding and predictive capability of corrosion on military assets. The IGC algorithms have been formed largely through advanced x-ray techniques undertaken in the USA and Europe, with the capability to produce 3D images of corrosion initiation and propagation. The CIC investigation has progressed to a point where it can mimic operational situations closely including the inclusion of multiple test coupon orientations and realistic environmental exposures.
- › **LASER REPAIR OF F/A-18 ANTI-ROTATION BRACKET** A new laser cladding repair capability has been verified at Rosebank Engineering. The capability, which has been demonstrated on an F/A-18 anti-rotation bracket, has the potential to reduce the cost of repairing components and reduce the number of new components needing to be purchased by the ADF. The repair process is now being considered for other components with the aim of further increasing Australia's ability to provide in-country repair and reduce time out of service of ADF aircraft.
- › **ULTRA HIGH TEMPERATURE CERAMICS PROTOTYPE** Ultra High Temperature Ceramics (UHTCs) have application potential on hypersonic vehicles and missile vanes and are seen as the ideal material to be used on a small region of intense heating called the closure point or "crotch" of a scramjet engine. A pressure-less sintering process to produce near-net shape components of high quality UHTCs has been developed. Prototype components at approximately half-scale were fabricated at The University of Melbourne and survived high temperature testing with low degradation. Full scale components will be fabricated and tested in 2012-13.
- › **HOT GAS GENERATOR AT THE COMBUSTION TEST FACILITY** Scramjet combustors comprising of advanced materials solutions must be ground tested before being considered for flight test in the HIFiRE program. A Hot Gas Generator (HGG) has been designed and manufactured by The University of Queensland and DSTO to facilitate this ground testing. It is to be installed in the DSTO Combustion Test Facility and will provide the required heat load for combustor testing by burning kerosene fuel.

AIR DOMAIN CONDITION BASED MAINTENANCE USING CORROSION PROGNOSTICS AND HEALTH MANAGEMENT



CASE STUDY

The operating costs of ADF aircraft are influenced by the need to inspect airframes for corrosion and carry out certified repairs to any damage. This safety driven regime, which is unique to each aircraft type, is necessarily conservative and is generally based on time intervals rather than structural condition. Transitioning to a condition based maintenance regime has the potential to significantly reduce maintenance costs, increase aircraft availability and improve work planning.

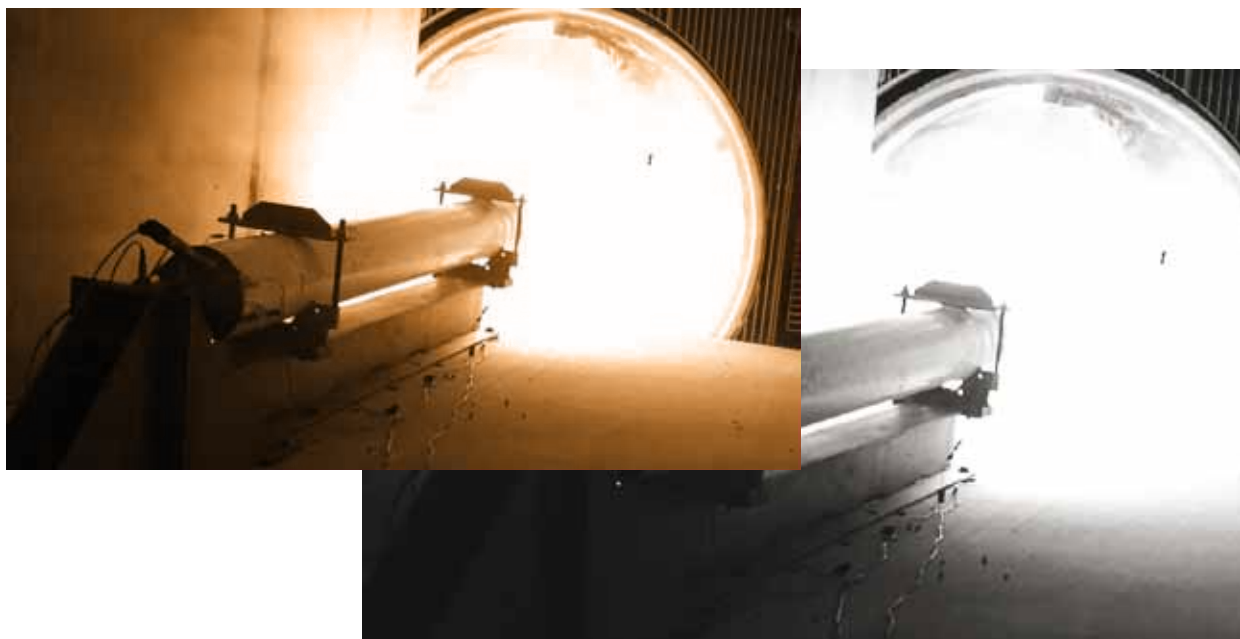
DMTC participants BAE Systems Australia, DSTO, RMIT University, The University of Queensland, Queensland University of Technology and Swinburne University are conducting a collaborative research project to develop five innovative sensing and modelling tools. These will be integrated into a Corrosion Prognostic Health Management (CPHM) capability to enable condition-based maintenance.

The primary barrier to corrosion on aircraft is paint coatings. In order to monitor this barrier, a unique Profluorescent Nitroxide (or PFN) molecule is employed to fluoresce when the coating is no longer protected from degradation by stabilising additives. The fluorescence of the PFN could give a measure of the cumulative oxidative damage to that coating. This technology is being developed for installation in internal regions of aircraft structures as small coupons coated in the treated paint scheme (known as witness plates). A PFN coated fibre optic system is also being developed as a point source measurement system that can be expanded to a distributed measurement system with multiple sensing regions. Mechano-chemical studies are also being performed on paint samples to understand the durability and performance of paint systems in the presence of environmental influences (such as humidity and heat) and airframe strains, which will produce a prognostics model.

Models are also being derived to simulate the initiation and propagation of Inter-Granular Corrosion (IGC). While less common than pitting corrosion, IGC can penetrate more deeply into aluminium components to act as a stress concentrator and significantly reduce the structural properties of aircraft components. Therefore the extent of IGC attack, as measured by the depth and/or volume, is of high importance from a structural maintenance perspective. Corrosion Inhibiting Compounds (CICs) are routinely used on aircraft as a short-term protection for exposed substrate, and various compounds are being studied in chambers for performance at different environmental conditions and orientations.

These results will be used to form a CIC prognostics model, which when integrated with the other DMTC and BAE Systems algorithms, will form a comprehensive modelling and prognostics capability of the entire corrosion process. This in turn has the potential to deliver direct benefits to the ADF by helping reduce the cost of maintaining aircraft constructed primarily of aluminium.

AIR DOMAIN ROCKET TESTING FACILITY



CASE STUDY

Teakle Composites is working with the Centre for Hypersonics at The University of Queensland and BAE Systems within DMTC Project 4.2 on the development and evaluation of high temperature materials for a range of demanding propulsion applications. Included in this work Teakle Composites, with the support of the Queensland Government Smart State Research Facilities Fund and The University of Queensland, have designed and constructed a static rocket motor test facility enabling BAE Systems to evaluate the high temperature ablation performance of advanced materials by placing them in a rocket motor's efflux.

BAE Systems' primary interest in the use of this facility is evaluation of materials for missile thrust vectoring vanes. Light weight, high strength and resistance to extreme temperatures (>3000 degC) are crucial in this application. Materials of most interest are Ceramic Matrix Composites (CMC's) and Ultra High Temperature Ceramics (UHTC's).

The facility is also used by Teakle Composites for their work on composite materials for rocket and hypersonic propulsion. This started in 2001, with the testing of an ablative silica-phenolic nozzle to solve problems with erosion of steel nozzles. It then progressed to all-composite rocket motor designs from 2003, a large shroud for the Mach 10 HyCAUSE scramjet launched in 2007, and manufacture of a composite expansion tube nozzle for wind tunnel testing above 10 km/s and components for scramjet prototypes. Concurrently with Project 4.2, Teakle Composites will be testing a new meteorological rocket motor in the facility.

The facility provides a crucial indigenous Australian capability of "relevant environment" testing for these applications. It will contribute to BAE Systems Australia's competitiveness in global supply chain opportunities for new supersonic missiles. It will also assist "Team Australia" on future collaborative hypersonic programs. The first test of a rocket motor in this facility took place successfully on 25 June 2012.

AIR DOMAIN

FUTURE DIRECTIONS

Research in the air domain will continue to focus on providing industry with the technologies to support new fleet acquisitions and the ongoing sustainment of older aircraft. New repair technologies will receive increasing focus to enable the cost effective repair and recovery of worn and damaged titanium components that would otherwise be scrapped. Research will also continue in the areas of robotic milling and welding of high strength aerospace materials.

The culmination of many areas of DMTC research will be integrated into a larger BAE Systems Structural Health Monitoring and Prognostics (SHM&P) system, based on the proven architecture of current fatigue/usage systems.

AIR DOMAIN PROJECTS	STATUS
Development of new titanium fabrication technology	In Progress
Next generation tooling development	In Progress
Advanced process monitoring tools and transfer to manufacturing supply chain	In Progress
Extended titanium machining benchmarking study	Complete
Evaluation of titanium direct/additive manufacturing and robotic machining	In Progress
Laser direct manufacturing of small scale high value JSF type components	In Progress
Aircraft prognostic tools to reduce corrosion impacts	In Progress
Distributed fibre optic paint degradation sensor	In Progress
Rapid and reliable detection and analysis of composite defects	In Progress
Repair technologies for current and next generation propulsion systems	In Progress
High temperature materials for hyper and supersonic flight	In Progress

LAND DOMAIN



DMTC IS ENGAGING INDUSTRY AND DEFENCE ACROSS A RANGE OF ACTIVITIES IN THE LAND DOMAIN, WITH A FOCUS ON IMPROVING THE MOBILITY, SURVIVABILITY AND SUSTAINABILITY FACTORS THAT AFFECT PERSONNEL AND VEHICLE PLATFORMS.

ARMOUR APPLICATIONS
PROGRAM LEADER
JAMES SANDLIN

PERSONNEL
SURVIVABILITY
PROGRAM LEADER
DEEPAK GANGA

The objective of the collaborative research and development activities are centred on protecting dismounted and mounted personnel from the full spectrum of threats which can range from fragments and small arms fire through to improvised explosive devices. Additional development activity is exploring power, uniform and signature management requirements for dismounted combatants.

Land based armour systems are subjected to some of the most rigorous service environments of any engineered protective materials. They must be sufficiently durable to perform in battlefield conditions which include a broad range of weather, dynamic loading conditions,

chemical exposure, blunt impact and rough handling while yielding consistent and reliable ballistic and blast performance. In meeting these service demands the research and development being undertaken in Programs 3 and 7 aim to improve the blast and ballistic response of armour systems, whilst reducing weight to increase both the non-armour payload and mobility of soldiers and vehicles. With a number of promising new and emerging materials becoming available, the program is also working to benchmark these materials against existing metal, ceramic and synthetic armour materials. Benchmarking allows the research and industry teams to understand their performance, potential applications and how they can be used to improve upon the in-service performance of existing equipment including durability, weight and multi-hit resistance.

With the similar aim of improving the mobility and survivability of soldiers in the field, the DMTC Land Program is investigating lighter weight power systems and more effective uniform fabrics. In the area of power systems the DMTC is developing generation, storage and scavenging systems to reduce the battery payload currently endured by soldiers. In the combat uniform space the DMTC is developing new fabrics and treatments with the promise of reducing both the soldiers' battlefield signature and the physiological impost associated with wearing the combat ensemble.

“Working with DMTC enables us to access Australia’s technical expertise and provide a pathway to insert new technologies directly into our equipment to offer our Diggers the very best protection.”

COL JASON BLAIN, DIRECTOR, DIGGERWORKS

LAND DOMAIN HIGHLIGHTS

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and highlights, visit www.dmtc.com.au

- › **CERAMIC BODY ARMOUR** Following the successful commercialisation of advanced ceramic armour strike face components at Australian Defence Apparel (ADA) DMTC is now looking at alternative armour components and materials which can be produced using this platform technology. In addition to torso strike faces ADA is working through the DMTC to develop extremity armour, vehicle armour and new grades of more cost effective armour grade ceramics for future use by the ADF.
- › **ARMOUR DESIGN SOFTWARE TOOL** A Knowledge Based Engineering (KBE) armour design tool with the capability of predicting the performance of ceramic based armour systems has been created utilising the significant database of knowledge and data accumulated in DMTC projects. This unique software is capable of predicting the behaviour of a ceramic plate subjected to ballistic impacts subsequent to an initial strike and will allow Australian and allied armour engineers to optimise armour plates for specific service requirements.
- › **ARMoured VEHICLE ASSEMBLY** Investigations into the design and performance trade-offs associated with bolted versus welded joints on armoured vehicles subjected to ballistic and blast loading has continued to be progressed. The installation and commissioning of the necessary hardware required to conduct sophisticated laboratory simulation of ballistic and blast loads on simulated vehicle joints has been finalised resulting in a High Strain Rate (HSR) laboratory which is one of a kind in the southern hemisphere and one of only a handful of facilities globally capable of testing armour grade steels.
- › **AUTOMATED OFFLINE PROGRAMMING** An Automated Off Line Programming (AOLP) capability has been implemented on the Thales production line in Bendigo. According to trial data, implementation of the technology has increased the efficiency of automated welding on the Bushmaster production line, with 77% of welds being conducted robotically as opposed to 30% prior to AOLP implementation.
- › **NEW VEHICLE ARMOUR** A number of explosively bonded panels have been tested as possible light weight and durable structural armour sections for vehicles. The tested panels included combinations of light alloys and ferritic materials. Also demonstrated was a new technology for measuring the velocity of a flying plate used in blast trials. This technology promises to significantly lower the cost of performing blast testing in future experiments and is available beyond DMTC to the ADF in general through DSTO.
- › **SOLDIER BORNE FUEL CELL** A commercial off the shelf high density, long life, power generation system with the potential to reduce the battery payload experienced by soldiers on unsupported patrols has been identified by DMTC. The size of a deck of cards, this technology relies on a solid state hydrogen unit to generate power. DMTC now plans to ruggedise and adapt the system to endure the battlefield conditions.

LAND DOMAIN AUTOMATED OFFLINE PROGRAMMING BRINGS HAWKEI CLOSER

CASE STUDY

Australian defence manufacturing industries face the increasing dynamics of innovation, shortened product life cycles, a continuing diversification of product range and at the same time are under pressure of high cost and shortage of skilled workers. Industrial automation can offer an excellent solution for both productivity and flexibility but the complexity of programming a robotic system remains one of the major implementation challenges for the Australian defence fabrication industry, which has small to medium production volumes with many product variants. Whilst automated assembly has existed within manufacturing for a number of decades, its application has traditionally been limited to simple and repetitive tasks which require a high degree of repeatability.

In the context of armoured vehicle assembly robotic programming has historically been undertaken by manually "stepping" the robot through a path that is memorised by the robot. The path is then repeated by the robot in operation. This process is slow and takes the robot out of operational use during programming (at the outset of a manufacturing activity and during design changes). Programming a simple movement may take a day, whilst complex operations, such as the welding paths adopted by Thales within the Bushmaster may take up to 12 months to program. The set up burden is further exacerbated by the limited production numbers and when changes to the robot's path are required to accommodate design modifications.





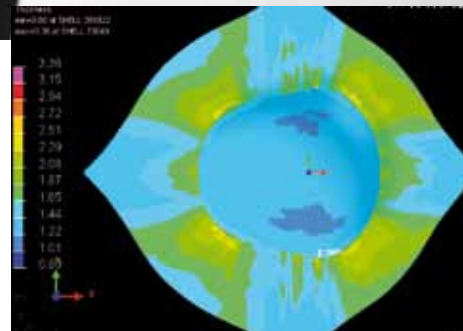
It is expected that within the coming year automation levels in excess of 90% will be achieved using this technology.

DMTC has been working with Thales to create an offline programming capability (AOLP) for the welding of Bushmasters. Bushmaster production is comparatively low volume, but requires a high degree of consistency, a complex robot setup, and the ability to rapidly implement design changes, AOLP is an ideal solution. Offline Programming involves the programming of robot movements from CAD models and has the advantage of limited disruption to manufacturing operations. The collaborative research effort has resulted in two key pieces of technology: the ability to use an optical camera to automatically create a 3D CAD model of an assembly, and the ability for the software to then automatically calculate and upload a path for the welding robot to follow.

As a result of implementing AOLP at Thales the automated assembly cell in Bendigo has been improved to accomplish 77% of the hull welds without human intervention. This represents a more than doubling of the percentage of welds performed within a year of the software being implemented. It is expected that within the coming year automation levels in excess of 90% will be achieved using this technology.

The technology and techniques developed are applicable wherever moderate volumes are required, part consistency is critical, part geometry is complex and customisation is desired. On the basis of the capability developed by DMTC, Thales is now looking to develop a more advanced version of the software for automating mechanical joining robots.

LAND DOMAIN NEXT GENERATION COMBAT HELMET



CASE STUDY

Current standard issue ballistic combat helmets are constructed from a combination of spliced Aramid based fabrics with a phenolic adhesive, and are laid up by hand in high cost matched metal press tooling. A new technology known as Double Diaphragm Deep Drawing (D4) has been developed for the manufacture of highly curved composite materials including armour grade fabric systems. The technique eliminates much of the requirement for manual lay-up and fabric splicing associated with traditional helmet manufacture. With a target date for pilot scale demonstration in the next financial year, the first product offering from this technology will be ballistic combat helmets.

A set of demonstration helmets has been manufactured which in prototype form demonstrate a 40% reduction in Areal Density for 10% higher level of ballistic resistance (when compared with current in-service helmets). The use of D4 for the manufacture of helmets

has allowed ADA, through its DMTC research collaborators to utilise the latest ballistic materials such as Ultra-High Molecular Weight Poly-Ethylene (UHMWPE) whilst delivering consistent and uniform performance across all manufactured parts. Having developed a ballistic solution the research is now focusing on ensuring durability, environmental resistance, geometric and structural requirements can be met prior to delivery of the first test quantities to the ADF. Once completed, the newer, lighter and more efficiently produced helmets will offer the option of a reduction in the weight a soldier must carry on their head, increasing combat performance and situational awareness without compromising the level of protection.

LAND DOMAIN

FUTURE DIRECTIONS

The land program now seeks to maximise the benefit to industry and the ADF through the adoption and commercialisation of DMTC technologies. DMTC will also be driving the opportunity for rapid technology development and adoption which has been established through the Personnel Survivability Program, including the identification of new and emergent technologies which could benefit the dismounted combatant.

LAND DOMAIN PROJECTS	STATUS
Evolution of vehicle amour requirements and development of improved systems and manufacturing techniques	Complete
Alternative 'next generation' ferritic armour system for vehicles	In Progress
Advanced personnel armour	Complete
Assessment of feasibility and design of alternative construction and protection systems for land platforms	In Progress
Lean automation technology for advanced manufacturing of armoured vehicles	In Progress
Development and commercialisation of ceramic protective components	Complete
Research, development, design and manufacture of a new combat helmet	Complete
Ceramic armour technology	In Progress
High curvature armour systems	In Progress
Improved anti-ballistic soft armour	In Progress
High strength fabrics for combat clothing	In Progress

SEA DOMAIN



DMTC'S RESEARCH IN THE MARITIME DOMAIN HAS CONTINUED TO FOCUS ON THE DEVELOPMENT OF NEW MATERIALS TECHNOLOGIES FOR SURFACE AND SUBMARINE APPLICATIONS INCLUDING THE ADVANCEMENT OF PLATFORM PRODUCTION, REPAIR AND MAINTENANCE CAPABILITIES.

MARITIME PLATFORMS
PROGRAM LEADER
DR STEPHEN VAN DUIN

Technologies have been progressed across a broad range of material application requirements such as the development of higher strength and more cost effective steels for use on new platform hulls, or through multifunctional composites where antennas and sensors are integrated into the load bearing structure.

In ship fabrication, advanced welding and joining technologies coupled with low cost lean automation and robotics are being used to reduce or eliminate production defects and improve manufacturing efficiencies, whilst in sonar manufacture, new processing routes are being developed to produce piezoelectric ceramics capable of transmitting higher power per unit area. To address the sustainment concerns of worn or corroded surface ship and submarine materials, pre and post processing techniques are being used to extend the service life of critical components. A study has also commenced to increase our understanding of the mechanisms of naval corrosion in Australia's unique Defence operating waters.

Several fabrication technologies have now been integrated by Forgacs into their manufacturing processes on the Air Warfare Destroyer (AWD) while other technologies still under development at DMTC are expected

to assume critical importance in the coming years in the context of the Land Helicopter Dock (LHD) amphibious ship and Sea 1000 Projects. Sustainment technologies will be equally important from the perspective of through-life support outcomes during the period of transition to new platforms.

SEA DOMAIN HIGHLIGHTS

For more of our sea domain achievements
and highlights, visit www.dmtc.com.au

- › **HSAL65 — A NEW STEEL FOR FUTURE PLATFORMS?** HSLA65 is a known candidate alternative material to replace the conventional DH36 because of its higher strength and potentially lower cost manufacturing routes. The project team consisting of DSTO, University of Wollongong and ANSTO have completed stringent mechanical testing of the steel in situations representing the unique Australian operating conditions. To assess its performance the results have been benchmarked against current shipbuilding steels and have shown it to be suitable for existing and future Defence applications. Further testing has demonstrated its superior weldability whilst the experimental determination of weld parameters has assisted in the development of welding procedures for correct fabrication. Positive results indicate that HSLA65 can be used to increase ship strength and also reduce future fabrication costs.
- › **HIGH PERFORMANCE CERAMICS FOR UNDERWATER SONAR** Thales and ANSTO are working together to optimise a number of new ceramic processing routes to produce a lower cost piezoelectric sonar transducer with greater sensitivity per unit area. Researchers have rapidly evaluated new powder milling techniques and have investigated novel near-net shaped ceramics by tape casting methods in an attempt to reduce manufacturing costs. Once optimised, the team will focus on determining how the new processes can be practically scaled-up to production volumes.
- › **BAD BUGS IN THE WATER** Microbiologically Influenced Corrosion (MIC) is responsible for accelerating aggressive corrosion damage of marine components during both the operational and idle time of Australia's naval fleet. However little is known about the specific microbes which lurk in Australian operating areas and ports. Research is now underway to measure what microbiological species are present in Australian harbours so that a strategy to mitigate their effect on the naval fleet can be taken.
- › **EXTENDING THE LIFE OF NICKEL ALUMINIUM BRONZE** Researchers have successfully demonstrated significant improvements in the wear and corrosion resistance of critical Nickel Aluminium Bronze (NAB) components when surface treated with selective laser glazing, friction stir processing or Equal Channel Angular Pressing (ECAP) processes. By gaining a better understanding of the corrosion and erosion mechanisms of this alloy, researchers have been able to develop a range of pre in-service surface treatment techniques which extend the useful life of critical surface ship and submarine components. For components already affected by wear, new robotic welding repair procedures have been developed and tested using a range of standard mechanical testing.
- › **INCONSPICUOUS ANTENNAS** There are a number of advantages in using conformal composite antennas in land, air and sea platforms. For aerospace applications, embedded antennas offer weight savings, reduced drag, FOD protection, multifunctional use and improved stealth capability. For Naval structures, topside masts similarly benefit from signature reduction as well as multifunctional capability such as dual sensing, diagnostics and condition monitoring. A technology demonstrator has now been built which allows the performance of new embedded antenna designs to be tested under varying physical conditions.

SEA DOMAIN

REDUCED WELDING RE-WORK – A FORGACS SUCCESS STORY





CASE STUDY

In recent years Australia has seen a rapid increase in shipbuilding activity which has required ship fabricators to quickly respond to the demands of advancing shipbuilding technologies and competitiveness. DMTC participants, Forgacs, University of Wollongong, DSTO and ANSTO have been developing new welding procedures using advanced welding technology to be used for the Sea 4000 Air Warfare Destroyer (AWD) Program. The design of the AWD is weight optimised, which involves joining steel plates of different thickness, thus increasing their susceptibility to distortion.

The new techniques developed through the DMTC project have reduced the creation of this distortion by up to 80%, avoiding costly straightening rework, and indicate a doubling of welding speed.

In early 2011, Forgacs invested in critical infrastructure that uses this technology within their Newcastle shipbuilding facility. This includes a new high speed panel line which utilises Tandem Gas Metal Arc Welding (T-GMAW) technology, and with the help of DMTC, has provided Forgacs with the necessary knowledge and tools to lower costs by improving production quality.

Following the success of adopting T-GMAW, Forgacs, University of Wollongong, DSTO and ANSTO are now developing new techniques to assist other parts of the process to reduce costly rework and straightening. In the past year Dynamically Controlled Low Stress No Distortion (DC-LSND) welding has been used to target fabrication areas where T-GMAW is less effective. By carefully applying heating or cooling to the surrounding fusion area during welding, residual stresses can be reduced below the buckling strength of the parent material. Through modelling and laboratory experimentation, researchers have successfully applied DC-LSND to T fillet joins commonly used in ship block construction and results indicate that further improved distortion control can be applied throughout the entire process. Onsite production trials are expected in the near future.

SEA DOMAIN

INCREASED CAPABILITY FOR NEW NAVAL VESSELS WITH HIGHER STRENGTH STEELS



CASE STUDY

There are many benefits in using high strength steel plate in modern naval vessels, including the potential for weight reduction, better stability, increased payload, increased mobility, and improved survivability. Better survivability through the use of higher strength steels was one of the key considerations in the DMTC project 'High strength steels for defence applications'. Survivability is the ability of a ship and its on-board systems to remain functional and continue its designated mission in a military environment.

In this project a test program was designed to represent the complex spectrum of loads and environments that naval ship structures could be subjected to during various operations and military loading events. A comprehensive set of toughness tests were conducted on candidate and current surface ship steels at various test

temperatures. These tests, which were carried out by DSTO and The University of Wollongong ranged from the high-strain-rate explosion-loading tests (test plates are pictured) to low-strain-rate quasi-static fracture toughness tests. To date the outcomes of the work show that hull steel resistance to fracture can vary dramatically under different conditions and that hull steel selection can positively influence the survivability of naval surface vessels. The work undertaken has shown that the candidate steel investigated, HSLA65 (450 MPa (min. YS)), will out perform current hull and superstructure steels, particularly at low operating temperatures. Data from this project will be used to identify the features (microstructural and/or compositional) in these steels that contribute to improved performance. These steels may become candidates for future surface ships.

SEA DOMAIN

FUTURE DIRECTIONS

The sea program continues to seek pathways to maximise the benefits to industry possible through the adoption of DMTC knowledge and technologies. We have increased our focus on sustainment issues in Australia's naval fleet by developing practical techniques to combat corrosion/erosion both in the operating field and dock repair sites, and look to expand on our ability to provide other solutions to sustainment issues in the future.

With the technical challenges currently facing industry, including Future Submarine, Collins Sustainment and surface ship sustainment, we believe there is an opportunity to grow the technical capabilities and knowledge within industry through additional DMTC led collaborative research and development activities. Existing areas of DMTC expertise which could be further leveraged to support these programs include: welding and joining technologies, fatigue, material analysis, corrosion, composites and repair of mechanical systems, material validation, providing improved steel manufacturing routes for submarine hull fabrication and getting ahead of the production cycle with pre-approved mechanical testing of modified steels and the development of welding procedures.

SEA DOMAIN PROJECTS	STATUS
High strength steels for defence applications	Complete
Surface processing technologies for repair and improved performance for submarine and surface ship components	In Progress
Technology development for multifunctional composite structures	In Progress
Lean automation technology for advanced manufacturing of marine defence components and assemblies	In Progress
Performance optimisation in PZT ceramic by advanced materials processing for sonar applications	In Progress

Board of Directors



MR TONY QUICK
CHAIR

Mr Tony Quick was the director of the Enterprise Connect Defence Industry Innovation Centre 2009 to 2011. Mr Quick was Director and General Manager of GKN Aerospace Engineering Services (now Quest Global Engineering) from 2001 to 2009. Mr Quick has spent most of his career in general management, international business development and program management within the aerospace and defence industries. Mr Quick is the former Chairman of the Design Victoria Advisory Board and a former member of the Future Manufacturing Industry Innovation Council. He was appointed as the Textiles, Clothing and Footwear Supplier Advocate in September 2011. Mr Quick is also an Adjunct Professor in the School of Aerospace, Mechanical and Manufacturing Engineering at RMIT University.



DR ROGER LOUGH AM
DEPUTY CHAIR

Dr Roger Lough is a Defence Scientist, having led several Divisions in the Defence Science and Technology Organisation (DSTO) from 1987 to 1999 before his appointment as First Assistant Secretary Science Policy at DSTO Headquarters. Dr Lough was a director of the DSTO Laboratory in Melbourne before his appointment as Chief Defence Scientist and CEO of DSTO in 2003. Dr Lough is a member of the Defence Council of Victoria, Defence Science Institute Advisory Board and Fellow of the CRC for Integrated Asset Management. He is a fellow of the Academy of Technological Sciences and Engineering. He was made a member of the Order of Australia in 2009.



DR JOHN BEST
DIRECTOR

Dr John Best is the Vice President of Technology, Research & Development at Thales Australia (formerly ADI Limited). Dr Best joined ADI Limited in 2003 and was appointed to his current role upon the formation of Thales Australia in 2006. He has overall responsibility for the technical capability of the company, which encompasses technical strategy, research and development, innovation, engineering process, engineering development and technical governance. Dr Best joined ADI Limited following a 15-year career with DSTO. Dr Best is a director of Eurotorp Pty Limited and member of the University of Technology Sydney Faculty of Engineering and IT Industry Advisory Network.

THE DMTC LTD BOARD COMPRISES OF SEVEN DIRECTORS. ALL DIRECTORS OF DMTC LTD ARE ELECTED BY THE MEMBERS. MR TONY QUICK, PROFESSOR JOHN NORRISH AND PROFESSOR DAVID STJOHN WERE RE-ELECTED AS DIRECTORS OF THE COMPANY AT THE 2011 AGM ON 9 NOVEMBER 2011.

THE DIRECTORS OF DMTC LTD HAVE A BROAD RANGE OF COLLECTIVE SKILLS AS REQUIRED IN THE CONSTITUTION, INCLUDING EXPERIENCE WITHIN THE DEFENCE INDUSTRY, SYSTEMS AND POLICIES, CAPABILITY DEVELOPMENT, RESEARCH, FINANCIAL AND RISK MANAGEMENT AND CORPORATE GOVERNANCE. THE BOARD IS RESPONSIBLE FOR OVERSEEING, GUIDING AND MONITORING MANAGEMENT AND SETTING THE COMPANY'S STRATEGIC DIRECTION.

BOARD MEETINGS

ELIGIBLE TO ATTEND	7	ELIGIBLE TO ATTEND	7	ELIGIBLE TO ATTEND	7
MEETINGS ATTENDED	7	MEETINGS ATTENDED	7	MEETINGS ATTENDED	7



MRS BRONWYN CONSTANCE
DIRECTOR

Mrs Bronwyn Constance has held senior executive positions in Australia and overseas, including Finance Director of Kraft Foods Limited Australia and New Zealand, Vice President Finance of Kraft Foods Asia, Executive General Manager Finance and Administration of Pasminco Limited and Finance Director of Nylex Limited. She spent her early career with the ACI Group of companies. Mrs Constance is an independent Director of the CRC for Advanced Automotive Technology Limited and Chair of the Audit Committee. She was appointed independent Director of Colorpak Limited and member of the company's Audit Committee in 2011. She is a former independent director of the Melbourne Market Authority, Plantic Technologies Limited and The Just Group Limited.



DR PETER JONSON
DIRECTOR

Dr Peter Jonson is an independent director and member of the Village Roadshow Limited Audit and Risk Committee and chairs the Remuneration Committee. He is an independent director and Chairman of Paranta Biosciences Limited. Dr Jonson is Chair Emeritus of the Melbourne Institute, having served as the Chair of its Advisory board from 1992 to 2002. He is a member of the Board of Trustees of RMIT University. Dr Jonson is a former Chairman of the Australian Institute for Commercialisation, Australian Aerospace and Defence Innovations Limited, Bionomics Limited and the CRC Committee. Dr Jonson was an economist with the Reserve Bank of Australia for 17 years, CEO of Norwich Financial Services Limited and Managing Director and Chairman of ANZ Funds Management.



PROF JOHN NORRISH
DIRECTOR

Professor John Norrish is Professor of Materials, Welding and Joining at the University of Wollongong. He holds a Bachelor of Science in Metallurgy and Masters of Science in Welding Technology. He is author of Advanced Welding Processes, originally published by the Institute of Physics in 1992 and revised and re-published in 2006. Professor Norrish has more than 150 publications in refereed journals and international conferences and has received numerous awards including the International Institute of Welding E.O. Paton Prize for 'a lifetime of contribution to welding technology'. He is a member of the Governance Board of the Physical Employment Standards Centre of Excellence and Vice Chairman of the International Institute of Welding Commission XII.



PROF DAVID STJOHN
DIRECTOR

Professor David StJohn is a director of Major Projects, Faculty of Engineering, Architecture and Information Technology at The University of Queensland. He is Chair in Materials Processing and Manufacturing and Director of the Centre for Advanced Materials Processing and Manufacturing. He has worked at RMIT University, CRA Advanced Technical Development (Perth) and CANMET (Canada). Professor StJohn was the inaugural Chair in Solidification Technology at The University of Queensland and joined CRC in Alloy and Solidification Technology in 1994. He was appointed CEO of CAST Metals Manufacturing CRC in 2003 and CAST CRC in 2005. Professor StJohn is a member of Materials Australia and The Minerals, Metals and Materials Society.

ELIGIBLE TO ATTEND 7
MEETINGS ATTENDED 7

ELIGIBLE TO ATTEND 7
MEETINGS ATTENDED 7

ELIGIBLE TO ATTEND 7
MEETINGS ATTENDED 7

ELIGIBLE TO ATTEND 7
MEETINGS ATTENDED 6

Committees & Advisory Panels

AUDIT, RISK & REMUNERATION COMMITTEE

The Audit, Risk and Remuneration Committee (ARRC) is a formal subcommittee of the Board. The Committee was formed to assist the Board in its decisions on financial reporting and statutory audit functions, internal control structures, risk management, compliance, and governance. The Committee is comprised solely of non-executive Directors of DMTC Ltd, a majority of whom are independent. The Committee Members are as follows:

- › Dr Roger Lough (Chair)
- › Mrs Bronwyn Constance
- › Dr John Best

The Committee met twice during the financial year.

RESEARCH ADVISORY PANEL

The Research Advisory Panel provides guidance to the CEO on technical research areas, including suggested areas of technology focus, linkages with research expertise and ensuring the research undertaken is of world-class standing. Panel membership is drawn from eminent researchers and industrialists with knowledge and experience relevant to the DMTC Ltd research programs. The Panel members are as follows:

- › Professor David StJohn (Chair)
- › Professor John Norrish
- › Professor Ian Polmear
- › Dr Bruce Hinton
- › Dr Richard Chester (DSTO)

DEFENCE ADVISORY PANEL

The Defence Advisory Panel provides advice and guidance to the CEO in relation to program structure and content to help ensure that DMTC continues to address issues of priority for Defence in terms of both current and future planned activities. The Panel comprises representatives from DMTC Ltd and the Commonwealth. The Panel Members are as follows:

- › Dr Roger Lough (Chair)
- › Mr Tony Quick
- › Dr Ken Anderson – Chief of Air Platforms Division, DSTO
- › Ms Deb Anton – General Manager, Competitive Industries Branch, DIISRTE
- › Major General John Caligari – Head Capability Systems, Capability Development Group
- › Mr David Marshall – Director General Capability Delivery Support, DMO
- › Mr Mark Reynolds – Head Commercial and Industry Programs, DMO

PROGRAM DEVELOPMENT PANEL

The Program Development Panel provides strategic advice on effective strategies, tactics and activities required to win new business for the DMTC, consistent with the strategic plan. The Panel advises on program opportunities that will deliver the greatest benefit to Defence industry and DMTC Ltd stakeholders.

Performance Measured & Validated

MAJOR PERFORMANCE REVIEW OUTCOMES

DMTC underwent its Major Performance Review in February 2012. The Major Performance Review was conducted by an independent panel and reviewed all aspects of the business. The review found that DMTC has good researchers, a sound path to market, excellent management, commendable industry support and a superior SME brokerage program. The panel made a number of recommendations which are already being implemented and will further strengthen the collaborative DMTC model in the years ahead. Feedback from the review panel included:

"SME collaboration and the facilitation processes put in place by the DMTC are highly effective."

"SMEs in particular found that their participation in the DMTC brought positive results. One SME representative commented that the relationship has given the SME more credibility, has given the SME confidence to pursue other linkages and has opened up further opportunities after successful completion of the DMTC projects."

"The Defence Material Technology Centre (DMTC) has an excellent governance and management structure and has a high quality board and advisory board members. This, together with first class management staff, gives the panel confidence that the DMTC is an extremely well run organisation."

"Overall, the quality of the research projects is high and DMTC is meeting the major objectives of providing Australia with important defence capabilities."

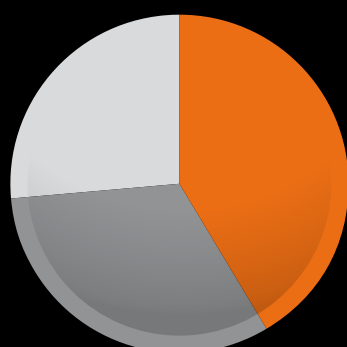
Financials at a Glance

DMTC Ltd receives funding from Commonwealth, State, industry and research sources. Income not fully applied in the year of receipt is recognised as a current liability (deferred revenue). As expenditure increases to accommodate growth in research activities, deferred revenue is applied to meet the gap between the revenue received and expenditure incurred.

DMTC continued its focus on successful delivery of existing projects during the year and commencement of Program 7, Personnel Survivability . Income from the Commonwealth Government, industry and research sectors and other sources totalled \$16,738,806. This included \$9,201,590 of in-kind contributions from Participants.

THE YEAR IN SUMMARY

Revenue (Total Cash & In-kind)	2012	2011
Commonwealth Government	5,400,000	4,300,000
Industry and Other Income	4,382,207	5,043,030
Research Sector	6,956,599	5,613,718
	16,738,806	14,956,748
Expenditure (Total Cash & In-kind)		
Education	259,853	517,870
Capital	37,678	493,415
Projects	15,731,488	14,469,802
Administration	1,498,464	1,470,216
	17,527,483	16,951,303
Deferred revenue liability	\$3,391,822	\$4,284,228
Full time equivalent staff in-kind contributions	48.7	44.6
Post graduate students	26	25
Centre management employees (including part time)	7	7



REVENUE SOURCES

42% \$6,956,599
■ RESEARCH SECTOR

32% \$5,400,000
■ COMMONWEALTH GOVERNMENT

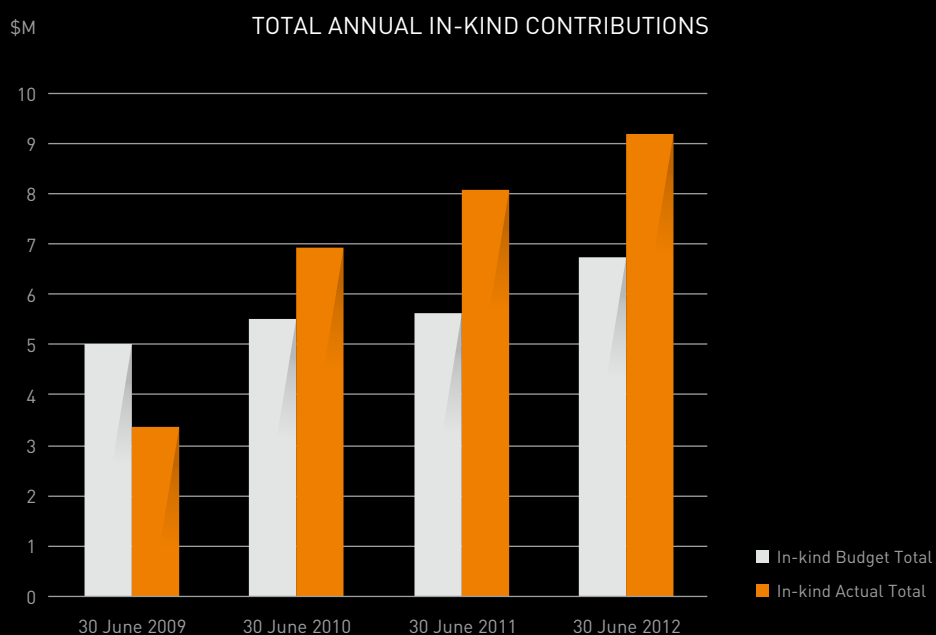
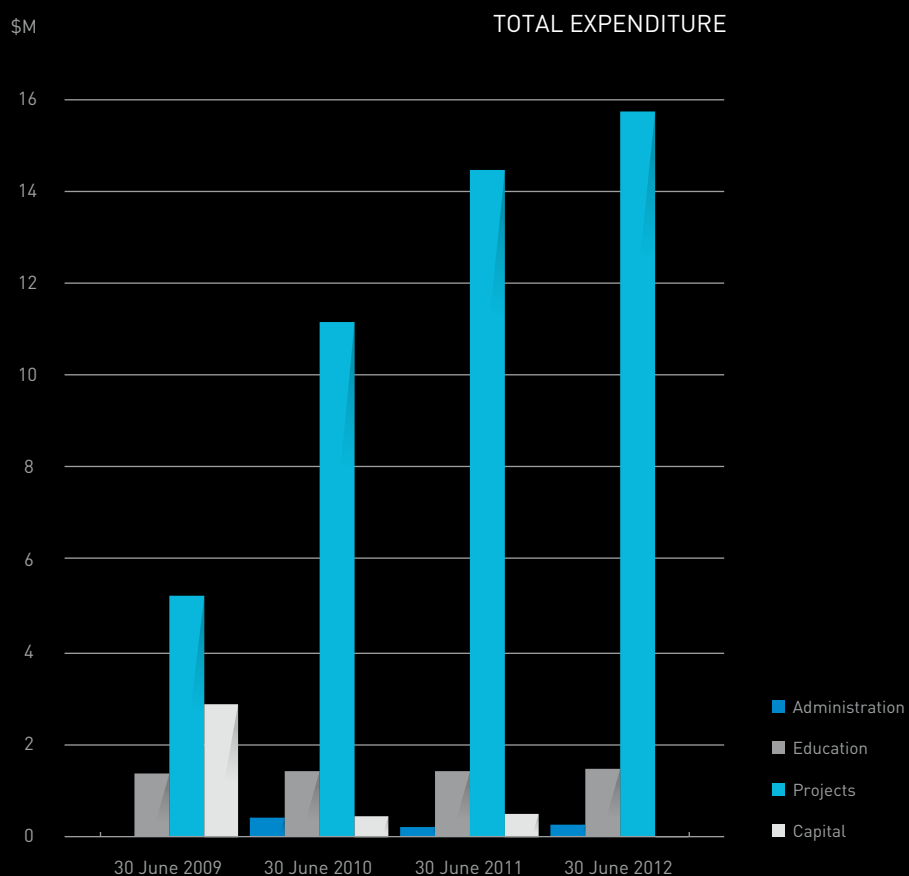
26% \$4,382,207
■ INDUSTRY AND OTHER INCOME

\$16,738,806
TOTAL REVENUE 2011-2012

In-kind contributions from DMTC Participants remained strong throughout the year, with contributions from industry and research exceeding budget on an annual and cumulative basis.

Current year contributions from the research sector were 45% higher than budget and the industry sector exceeded its current year budget by 21%. DSTO and other research organisations continued their strong support of DMTC projects during the year.

Various research activities which leveraged from research outcomes developed through core project activities continued during the year with a majority of these delivering successful outcomes by 30 June 2012.



The Management Team

THE MANAGEMENT TEAM AND PROGRAM LEADERS
DRIVE THE CONTINUED DELIVERY OF OUTCOMES
AND SMOOTH OPERATION OF THE CENTRE.



MARK HODGE
CHIEF EXECUTIVE OFFICER



DEEPAK GANGA
PERSONNEL SURVIVABILITY
PROGRAM LEADER



BRONWYNNE MCPHERSON
EXECUTIVE COORDINATOR



SURESH PALANISAMY
AIR PLATFORMS
PROGRAM LEADER



JIM ARTHUR
CHIEF OPERATING OFFICER



MATT DARGUSCH
CHIEF TECHNICAL OFFICER
PROPULSION SYSTEMS
PROGRAM LEADER



HEIDI GARTH
PROGRAM DEVELOPMENT
MANAGER/
COMMUNICATIONS



MILES KENYON
PROGRAM DEVELOPMENT
MANAGER/EDUCATION



JAMES SANDLIN
ARMOUR APPLICATIONS
PROGRAM LEADER



JANE TISDALL
FINANCIAL CONTROLLER



STEPHEN VAN DUIN
MARITIME PLATFORMS
PROGRAM LEADER

Participants— Are you part of the team?

RESEARCH PARTNERS

Australian Nuclear Science and Technology Organisation (ANSTO)

CAST Cooperative Research Centre

Commonwealth Scientific and Industrial Research Centre (CSIRO)

Defence Science and Technology Organisation (DSTO)

Queensland University of Technology

RMIT University

Swinburne University of Technology

The University of Queensland

The University of Melbourne

University of Wollongong

Victorian Centre for Advanced Materials Manufacturing (VCAMM)

INDUSTRY PARTNERS

Australian Defence Apparel

Australian Industry and Defence Network (AIDN)

Avoca Engineering

BAE Systems

Bisalloy Steels

BlueScope Steel

Bruck Textiles

FCST

Forgacs Engineering

Goodrich

Heat Treatment Australia

Henkel Australia

Lockheed Martin Corporation

Millatec

Pacific ESI

QuEST Global Engineering

RIAS Technologies (International)

Rosebank Engineering

SEAL Solutions

Seco Tools Australia

Sutton Tools

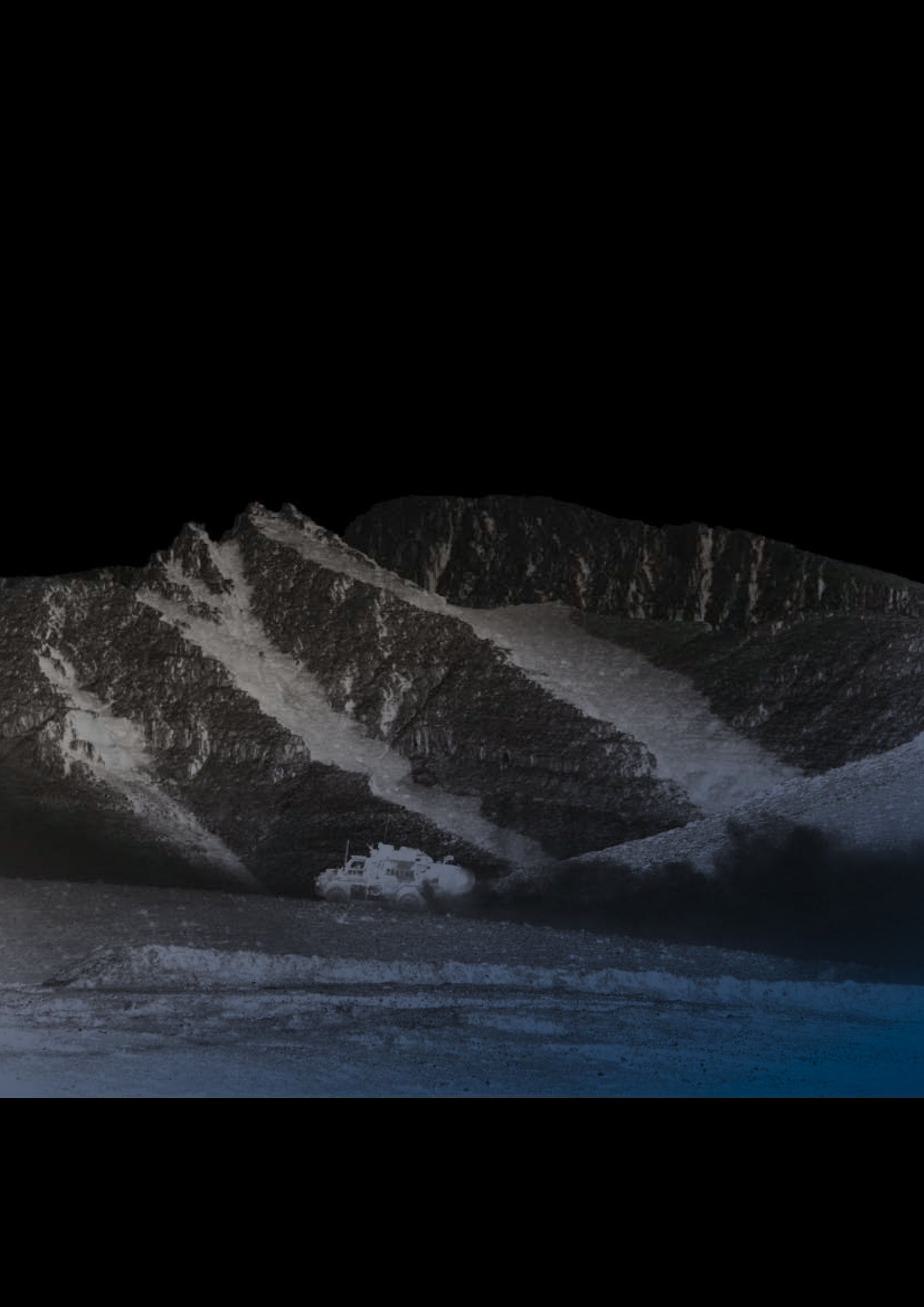
Thales Australia

United Surface Technologies

Ventou

Vipac Engineers and Scientists

3D Systems Asia-Pacific





DMTC Ltd

Level 2, 24 Wakefield Street
Hawthorn Victoria 3122 Australia
Phone. +61 (3) 9214 4447
Fax. +61 (3) 9818 0622
Web. www.dmtc.com.au
Email. information@dmtd.com.au