DMTC

DEFENCE MATERIALS TECHNOLOGY CENTRE
2011 ANNUAL REPORT HIGHLIGHTS

VISION

To provide technology solutions enabling industry to enhance Australian Defence capability

MISSION

DMTC will lead, facilitate and manage cooperative research in the defence sector in materials, manufacturing and related themes with the Defence customer, industry and research sector as key stakeholders

STRATEGIC INTENT

Capability through collaboration

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.

Chair's Report

> We have a proven model that can be applied to a range of Defence capability needs.

In my first year as Chair, I have witnessed DMTC achieve a number of significant research and strategic outcomes. At our last Participants Conference I said that it was important that we moved from establishment to delivery and I am confident that we are now firmly in the delivery phase. DMTC's core projects have overcome many technical barriers and in a number of cases adoption of the technology by industry has begun. DMTC is now embracing a new program and looking to future opportunities to continue our mission of increasing defence industry and therefore Defence capability.

The DMTC model supports the development of innovative solutions which set Australian defence industry apart from its international competitors. By leveraging the talent of Australian researchers and the ingenuity of our defence industry, creative solutions are being developed and a stronger defence industry base is being formed. This year DMTC developed a Strategic Plan which outlines how we plan to remain a sustainable and effective organisation. The Strategic Plan will further increase our focus on transferring high impact outcomes to industry and remaining adaptable to meet the changing needs of industry in response to Defence priorities.

The year ahead will be an exciting time to be a part of DMTC activities as more projects reach maturity and the outcomes are commercialised by our industry participants. Furthermore, the commencement of the new soldier survivability programme will see an increase in the number of DMTC participants and projects. We are now approaching our critical Third Year Review with the Commonwealth which will provide an opportunity for all to reflect on DMTC's achievements to date and the potential for improved and expanded operations in the future.

I would like to acknowledge the significant support provided by our many participants, stakeholder organisations and individuals who were involved with this year's achievements. I also thank the management team and my fellow Directors for their dedication and expertise, which they have given tirelessly to the benefit of Defence and defence industry.

Tony Quick
Chair

CEO's Report

This has been a highly successful and eventful third year of operation for DMTC. We have continued to deliver value to our participants through our research and have taken significant steps towards being recognised as a preferred capability partner for Defence and the defence industry more broadly. Our research partners are also enjoying the benefits of engagement with DMTC with several august publications in international peer-reviewed journals and success in winning additional funding support for work allied to that undertaken through DMTC.

Most importantly, DMTC has also continued the transfer of technology and process improvements to industry which is repeatedly yielding tangible benefits. This is the most fundamental key performance indicator for us, and continued success in this regard is vital to our plans to migrate the DMTC model into a long-term sustainable activity.

I am delighted to confirm that participant contributions are continuing their upward trend. Combined with DMTC's well-established research base, this has resulted in our research outcomes meeting or exceeding our plans. DMTC has also experienced a large increase in the number of participants and partner organisations engaging with us in various activities. I am pleased to see the increase in support from our research and industry participants and believe this is largely due to the value of outcomes our participants are receiving in return for their contribution to DMTC.

Of major significance this year was the announcement by the Commonwealth that our new program in Personnel Survivability has been approved for funding. This program will provide significant opportunity for current and new DMTC participants to leverage the contributions of others to develop increased industry capabilities in this area. This success is an endorsement of DMTC's model and our progress to date, all of our allied organisations can stand rightly proud of this achievement. Significantly, the success of the Personnel Survivability proposal also provides a potential model for DMTC's long-term viability beyond the current contract period. In line with this, and with input from a range of sources, I have developed a Strategic Plan for the future of DMTC which has been endorsed by the Board of Directors, and which I look forward to sharing with stakeholders in coming months.

Following the retirement of Peter Preston at the 2010 Annual General Meeting, Tony Quick was appointed as the Chair of DMTC. The transition has been a smooth one, and we are fortunate to have had two successive Chairs of this calibre. I have great pleasure in presenting DMTC's 2011 Annual Report Highlights and look forward to sharing ongoing success with our partners in 2011-2012 and beyond.

> "DMTC has demonstrated tangible improvements to Australian defence industry capability."

Mark Hodge
CEO

This is DMTC

At the conclusion of our third year of operation DMTC Ltd has continued to deliver outcomes and provide tangible technology and capability improvements to the Australian defence industry. The core technology development activities of the Defence Materials Technology Centre have reached a high level of maturity and industry is actively engaging in the adoption of these outcomes.

Partner contributions remain above agreed contribution levels demonstrating the high level of value our industry and research partners place on the resulting outcomes of their continued participation. The first new program since the formation of DMTC Ltd was formally announced and we are now looking toward future opportunities to enable continued collaborative outcomes for the sector.

OUR ORGANISATION

The Defence Materials Technology Centre (DMTC) is a collaboration of defence industry and research providers that have the primary objective of generating outcomes that can be readily transitioned into service in the Australian Defence Organisation through commercialisation or increasing defence industry capabilities. Since its formation the Centre has grown significantly, increasing the number of projects in progress and entering into new partnerships with domestic and international industry organisations.
DMTC works across five core program areas: Air Platforms, Maritime Platforms, Armour Applications, Propulsion Systems and our new Program, Personnel Survivability. In addition to this, DMTC has a strong focus on Small-to-Medium Enterprise (SME) engagement, and we have established a number of additional projects which directly support the increase of industry capability within these organisations.

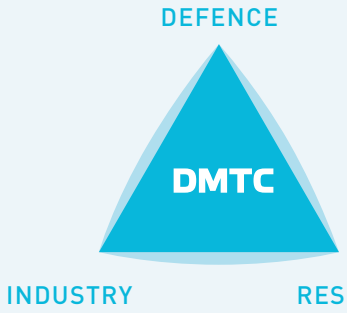
Research within our programs deliver new materials and manufacturing technologies that are reducing the costs and increasing the capability of defence related products and services available in Australia. Research outcomes are leading to increased material strengths, performance and durability. New manufacturing processes are increasing production efficiencies, reducing costs and waste, enabling quicker and more flexible equipment customisation for specific Australian requirements and ultimately opening up new domestic and export opportunities for Australian industry.

Our operational funding is drawn from several sources including the Commonwealth Government, State Governments, industry and the research sector. Centre activities are now approaching $110 million over the life of current contracts. DMTC is a public company, limited by guarantee.

Our head office is located in Hawthorn, Melbourne with operational nodes throughout Australia.

ORGANISATIONAL CONTEXT

DMTC was established in 2008 under the Commonwealth Government's Defence Future Capability Technology Centre (DFCTC) program. The DFCTC program is based on the successful Cooperative Research Centre (CRC) program however, it focuses on delivering outcomes which will be of direct benefit to the Australian Defence Force (Defence). DMTC considers key Defence policies and documents in framing its research outcomes to ensure that DMTC generated technology and processes will be applicable to Defence requirements and can be adopted by the defence industry. As part of this process outcomes of DMTC programs are aligned with the Priority Industry Capabilities (PICs) and Strategic Industry Capabilities (SICs) as defined by Defence.



The DMTC model leverages contributions from its stakeholder groups to deliver technology outcomes that are significantly greater than what could have been achieved on an individual basis. Each of our stakeholder groups has its own unique set of cultures, expectations, operational drivers, timelines and success definitions. With a capacity to plan, execute, manage and promote utilisation of research that is unique within the Australian context, the DMTC model provides the framework through which our stakeholders often competing elements can be effectively leveraged. DMTC's unique position underpins our strategic outlook and our future opportunities to continue to achieve defence sector capability outcomes.

DMTC's commercialisation and utilisation strategy is strongly focused towards the adoption and utilisation of developed technology by our industry participants. The DMTC model encourages this process through our approach to handling Intellectual Property (IP). Our IP policy provides automatic rights to utilise IP created in projects to each participant who contributed significantly to the development of that IP, consistent with their level of involvement. This removes the need for negotiation of usage licences after the IP has been developed. The policy also provides security to participants who contribute background IP to projects with rights to that IP remaining with the participant.

A Year of Achievements

DMTC's success is primarily assessed through our ability to deliver tangible capability outcomes to the Australian defence industry. Some significant achievements occurred this year with our technology reaching sufficient maturity such that our industry participants have been able to commence commercialisation of a number of outcomes.

The Hon. Warren Snowdon MP, Minister for Defence Science and Personnel, the Hon. Jason Clare MP, Minister for Defence Materiel and Major General John Caligari AM, Head of Modernisation and Strategic Planning – Army, at the launch of DMTC's advanced armour grade ceramics facility, March 2011.

KEY TECHNOLOGY ACHIEVEMENTS

Successful commercialisation of advanced ceramic armour strike face components at Australian Defence Apparel in Bendigo.

A reduced heat welding procedure that will significantly decrease the assembly time of armoured land vehicles once qualified for production line integration.

Significant reduction in machine-tool vibration during the manufacture of Joint Strike Fighter components at BAE Systems in Adelaide.

Design and pilot scale production of improved combat helmets.

Increase in tool life and performance of cutting tools manufactured at the Advanced Surface Solutions Facility, Sutton Tools in Melbourne.

Demonstration of a capability to repair components to original performance and dimensions through laser cladding at Rosebank Engineering in Melbourne.

Successful implementation of low distortion advanced welding techniques for the fabrication of ship panels at Forgacs Engineering in Newcastle.

A Year of Achievements

DMTC also achieved significant organisational successes this year, which will contribute to our continued delivery of project outcomes.

KEY ACHIEVEMENTS

Approval for a new $20 million Program in Personal Survivability was announced by the Commonwealth Government.

The 2nd Annual Review of DMTC was conducted in Canberra on 18 April 2011 by the Defence Future Capability Technology Centre (DFCTC) Committee.

The 3rd Participant Workshop and 2nd Technical Conference was held in Melbourne.

The Special Projects initiative was established with 4 projects having already commenced and early impact from these projects confirmed.

11 additional SMEs joined DMTC.

9 SME projects commenced.

9 seminars and workshops were facilitated.

10 new PhD scholarships were awarded.

4 undergraduate students awarded summer vacation scholarships.

ADA upgraded their membership to become a full participant.

Our Partners

Active research and industry partners are critical to DMTC.

Our research partners contribute expertise in materials technologies and manufacturing processes that enable new and innovative solutions to be developed.

Our industry partners work closely with our research partners to ensure that all research is grounded in line with commercial needs and they create a utilisation pathway for the technologies that are developed. DMTC continues to attract more core and supporting industry partners from a broad cross-section of the industrial and technology supply chain supporting Australia's defence capability.

DMTC's strategic intent is expressed as 'capability through collaboration', and naturally DMTC's collaborative focus is on developing and maintaining links with defence-related businesses and researchers to support this strategic direction.

DMTC enables collaboration through the following activities:

- Fostering enduring relationships between the Members and other participants through high levels of communication, integrity, cooperation, transparency and information sharing;
- Simplifying and streamlining the formalisation of collaboration by having standardised project agreements;
- Ensuring all participants add value to each other so the performance of the Centre is greater than that of each participant acting independently;
- Having mechanisms in place for technology transfer and commercialisation of DMTC IP to ensure the maximum benefit is gained by the Australian defence industry; and
- Providing education and training for the professional development of those working in the defence industry, as well as students who will work in the industry in the future.

RESEARCH PARTNERS

Australian Nuclear Science & Technology Organisation (ANSTO)

CAST Cooperative Research Centre

Commonwealth Scientific & Industrial Research Organisation (CSIRO)

Defence Science and Technology Organisation (DSTO)

RMIT University

Swinburne University of Technology

The University of Queensland

The University of Melbourne

The University of Wollongong

Victorian Centre for Advanced Materials Manufacturing

INDUSTRY PARTNERS

ACSA*

Australian Defence Apparel

Australian Industry and Defence Network (AIDN)

AMOG Consulting

ASC

Avoca Engineering

BAE Systems Australia

Bisalloy

BlueScope Steel

Bruck Textiles

Composite Materials Engineering

CUC

Exel Composites*

FCST

Forgacs Engineering

Formero

GKN Aerospace Engineering

Goodrich

Hardchrome Engineering

Heat Treatment Australia

Henkel

Levett Engineering

Lockheed Martin

Morgan AM&T*

Millatec

Pacific ESI

Quickstep

SEAL Solutions

Seco Tools

Sutton Tools

Rosebank Engineering

RIAS Technologies

Thales Australia

United Surface Technologies

Ventou

VIPAC

* Participants for part year only

Board of Directors

The DMTC Ltd Board of Directors is responsible for the strategic direction of the company. Our Board consists of seven Directors, inclusive of the Chair and Deputy Chair. Under the Constitution, all Directors of the DMTC Ltd Board are elected by the Members at the Annual General Meeting (AGM). The 2010-2011 AGM was held on 11 November 2010. This year, the Board welcomed two new Directors, Mrs Bronwyn Constance and Dr Peter Jonson, following the retirement of Dr Peter Preston and Air Vice-Marshall (retired) Peter Nicholson AO. DMTC Ltd Directors 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.

TONY QUICK
CHAIR

Mr Tony Quick retired as Director of the Enterprise Connect Defence Industry Innovation Centre in June 2011. Mr Quick has spent most of his career in general management, international business development and program management within the aerospace industry. Mr Quick was Director and General Manager of GKN Aerospace Engineering Services from 2001 to 2009. He is a member of the Future Manufacturing Industry Innovation Council and is also an Adjunct Professor in the School of Aerospace Mechanical and Manufacturing Engineering at RMIT University. Mr Quick was appointed Supplier Advocate for the TCF industries on 7 September 2011 by the Minister for Innovation, Industry, Science and Research.

ROGER LOUGH
DEPUTY CHAIR

Dr Roger Lough has been a Defence Scientist for over 45 years. He led several divisions in the Defence Science and Technology Organisation (DSTO) from 1987 to 1999, before becoming First Assistant Secretary Science Policy at DSTO. In 2001 he became Director of the DSTO Laboratory at Fisherman's Bend in Melbourne and in 2003, Chief Defence Scientist and CEO of DSTO. Dr Lough retired from the public service in July 2008. He is a fellow of the Academy of Technological Sciences and Engineering (ATSE) and holds a graduate diploma from the Australian Institute of Company Directors. He was made a member of the Order of Australia in 2009. Dr Lough chairs DMTC's Audit, Risk and Remuneration Committee.

JOHN BEST
DIRECTOR

Dr John Best is the Vice President of Technology, Research and Development at Thales Australia (formerly ADI Ltd). Dr Best joined ADI Ltd after a 15 year career with DSTO. He was appointed to his current role upon the formation of Thales Australia in 2003. He is responsible for the technical capability of the company, which encompasses technical strategy, research and development, innovation, engineering process, engineering development and technical audits. He holds a Bachelor of Science with First Class Honours in Physics from the University of Queensland, a PhD in Mathematics from the University of Wollongong and an MBA from the University of Adelaide. Dr Best is a member of DMTC's Audit, Risk and Remuneration Committee.

BRONWYN CONSTANCE
DIRECTOR

Mrs Bronwyn Constance has held senior executive positions in Australia and overseas, including Finance Director of Kraft Foods Ltd Australia and New Zealand, Vice President Finance of Kraft Foods Asia, Executive General Manager Finance and Administration of Pasminco Ltd and Finance Director of Nylex Ltd. Her early career was spent with the ACI Group of companies. Mrs Constance is an independent director and chairs the audit committees of The Melbourne Market Authority and the Co-operative Research Centre for Advanced Automotive Technology Ltd. She is also a director of Colorpak Ltd. Mrs Constance is a member of DMTC's Audit, Risk and Remuneration Committee.

PETER JONSON
DIRECTOR

Dr Peter Jonson is a Director of Village Roadshow Ltd and Paranta Biosciences Limited. He has served as Chair of the Australian Institute for Commercialisation, Australian Aerospace and Defence Innovations Ltd and Bionomics Ltd. Dr Jonson was Chair of the Federal Government's CRC Committee from 2005 to 2010 and is currently the Chair Emeritus of the Melbourne Institute. Dr Jonson was an economist at the Reserve Bank of Australia for 17 years, including 7 years in its most senior economics post. He was also CEO of Norwich Financial Services Ltd and Managing Director and then Chair of ANZ Funds Management. Dr Jonson is a fellow of the Australian Institute of Company Directors and of the Academy of the Social Sciences in Australia.

JOHN NORRISH
DIRECTOR

Professor John Norrish is Professor of Materials, Welding and Joining at the University of Wollongong. He has a Bachelor of Science in Metallurgy and a Master of Science in Welding Technology, and has worked in welding research for almost 40 years. Prof. Norrish is author of Advanced Welding Processes, published by the Institute of Physics in 1992. The book was revised and re-published in 2006. Prof. Norrish has more than 150 publications in refereed journals and international conferences and is the recipient of many awards including the International Institute of Welding E.O. Paton Prize for 'a lifetime of contribution to welding technology'.

DAVID STJOHN
DIRECTOR

Professor David StJohn is Director of Major Projects in the Faculty of Engineering, Architecture and Information Technology at the University of Queensland. He holds a Chair in Materials Processing and Manufacturing and is a Director for the Centre for Advanced Materials Processing and Manufacturing in Perth and CANMET in Canada. Prof. StJohn became the inaugural Chair in Solidification Technology at the University of Queensland and joined the newly-established CRC in Alloy and Solidification Technology in 1994. He was appointed CEO of the CAST Metals Manufacturing CRC in 2003 and CAST CRC in 2005. Prof. StJohn is a member of Materials Australia and The Minerals, Metals and Materials Society (TMS). He is a graduate of the Australian Institute of Company Directors.

Board and Governance

Six board meetings were held during the 2010-2011 year, excluding the AGM. The attendance record for Directors is presented below:

Name	Organisation	Eligible to Attend	Directors Meetings Attended
Mr Tony Quick	Independent	6	6
Dr Roger Lough AM	Independent	6	6
Dr John Best	Thales Australia	6	6
Mrs Bronwyn Constance	Independent	4	4
Dr Peter Jonson	Independent	4	4
Professor David StJohn	The University of Queensland	6	6
Professor John Norrish	The University of Wollongong	6	5
(Retired) Dr Peter Preston	Independent	2	2
(Retired) Air Vice-Marshall Peter Nicholson AO	BAE Systems Australia	2	1

AUDIT, RISK AND REMUNERATION COMMITTEE

The Audit, Risk and Remuneration Committee (ARRC) is a 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. Membership of the ARRC changed during the year, with Mr Tony Quick retiring from the Committee after his appointment as Chairman, Mrs Bronwyn Constance joining the committee after her election to the Board as a Director and Mr Marc Peskett of MPR Group retiring from the committee following Bronwyn's appointment. The ARRC met five times during the year.

ADVISORY PANELS

In addition to the ARRC, DMTC also operates several advisory panels. These panels provide a mechanism to bring in expert external advice on matters of relevance and concern to Centre Management.

DMTC currently operates three such advisory panels, namely:

Research Advisory Panel

The Research Advisory Panel provides guidance on technical research areas, including suggested areas of focus, linkages with research expertise and ensuring the research undertaken is of world-class standing.

Defence Advisory Panel

The primary purpose of the Defence Advisory Panel is to provide strategic advice to DMTC in relation to its program structure and content to help ensure that DMTC continues to meet its obligations to address issues of priority to Defence in terms of both current and future planned activities.

Education Advisory Panel

The Education Advisory Panel oversees the successful Education Program, providing direction on what courses will provide maximum benefit to industry and research providers.

The Management Team

MARK HODGE
CEO

SUGANTHINI ATHITHTHAN
ASSISTANT ACCOUNTANT

MATT DARGUSCH
TECHNOLOGY MANAGER & PROPULSION SYSTEMS PROGRAM LEADER

DEEPAK GANGA
MEMBERSHIP LIAISON OFFICER

HEIDI GARTH
MANAGER PROGRAMS AND COMMUNICATIONS

BRONWYNNE MCPHERSON
OFFICE MANAGER

SURESH PALANISAMY
AIR PLATFORMS PROGRAM LEADER

JAMES SANDLIN
ARMOUR APPLICATIONS PROGRAM LEADER

JANE TISDALL
FINANCIAL CONTROLLER

STEPHEN VAN DUIN
MARITIME PLATFORMS PROGRAM LEADER

VIKTOR VERIJENKO
OPERATIONS AND EDUCATION MANAGER

Financials at a Glance

DMTC Ltd receives funding from Commonwealth and State Government sources in anticipation of project and administration expenditure over the life of the Centre. 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 current year revenue received and expenditure incurred.

During the 2010-2011 financial year, DMTC continued to focus expenditure on the delivery of projects, while maintaining a steady education and training budget. DMTC received $14,956,748 of income from the Commonwealth Government, industry, research sector and other sources during the year. This included $8,083,126 of in-kind contributions from Participants.

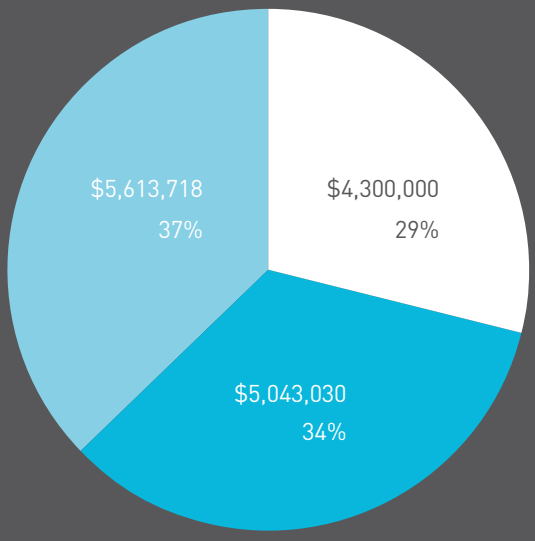
THE YEAR IN SUMMARY

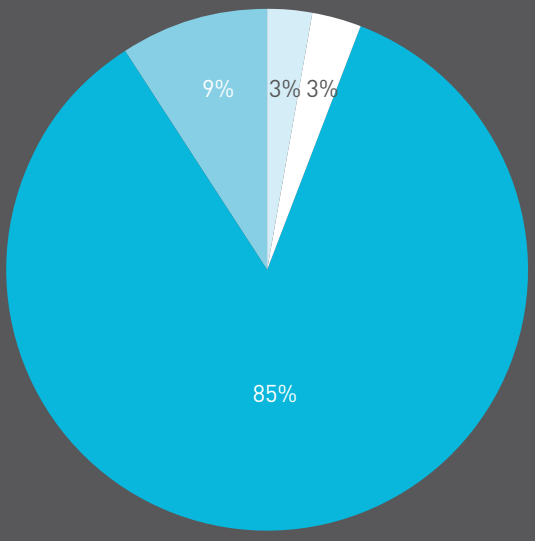
Revenue (cash and in-kind) – all sources	2011	2010
Commonwealth Government	4,300,000	4,000,000
Victorian Government	–	4,200,000
Industry and Other Income	5,043,030	3,354,966
Research Sector	5,613,718	5,774,969
	14,956,748	**17,329,935**

Expenditure (cash and in-kind)		
Education	517,870	315,286
Capital	493,415	429,300
Projects	14,469,802	11,218,880
Administration	1,470,216	1,386,874
	16,951,303	**13,350,340**

Deferred revenue liability	$4,284,228	$6,443,600
Full time equivalent staff in-kind contribution	44.6	38.3
PhD students	25	15
Centre management employees*	7	6

* Includes part time





REVENUE SOURCES

- Commonwealth Government
- Industry and Other Income
- Research Sector

Total Revenue 2010-2011: $14,956, 748

TOTAL EXPENDITURE

- Education
- Capital
- Projects
- Administration

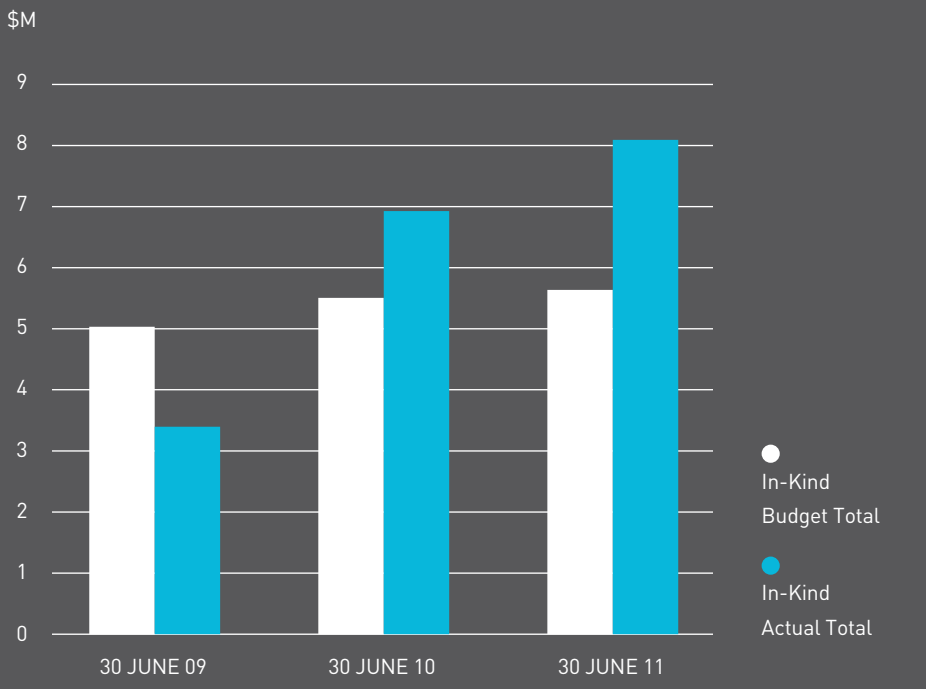
Total Expenditure 2010-2011: $16,951,303

** Note: 2010 numbers have been restated consistent with this year's accounting practice.*

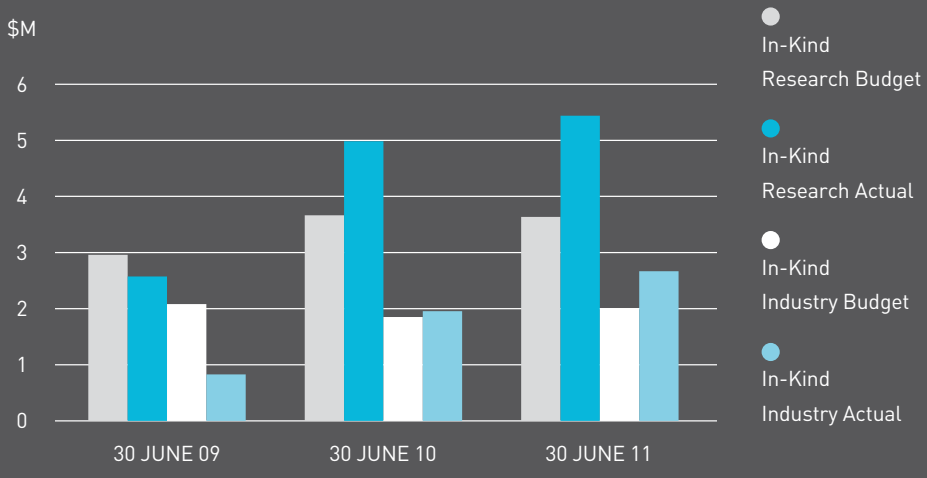
DMTC Participants continued to provide strong contributions throughout the 2010-2011 financial year. Total in-kind contributions exceeded budget on an annual basis and reached parity with budget on a cumulative basis by 30 June 2011. This occurred after several organisations responded positively to DMTC's request to develop a cumulative in-kind recovery plan.

Research Participant staff and non-staff in-kind contributions were approximately 50% higher than the forecast values specified in the Commonwealth agreement. The favourable result was predominantly due to the acceleration of staff and non-staff in-kind contributions from DSTO. Industry Participant staff and non-staff in-kind contributions were 22% higher than the minimum contributions specified in the Commonwealth agreement for the 2010-2011 year. The increase is reflective of continued efforts to catch up on prior year commitments and an extension of various research activities which have leveraged from research outcomes developed from core project activities.

DMTC Participants as a whole were positive and highly engaged in DMTC activities during the 2010-2011 financial year.



Includes in-kind contributions from core and supporting Participants and Associate Members of DMTC Ltd.



Includes in-kind contributions from core and supporting Participants and Associate Members of DMTC Ltd.

DMTC Research Programs

NEW MANUFACTURING (ADDITIVE MANUFACTURING, LASER-ASSISTED MACHINING ETC.)	MANUFACTURING PROCESS & COMPONENT PERFORMANCE MODELLING, SIMULATION & VALIDATION	NEW GENERATION COMPOSITE MATERIALS AND MANUFACTURING PROCESSES	TITANIUM COMPONENT FABRICATION & REPAIR TECHNOLOGIES	ROBOTICS, AUTOMATION AND LEAN MANUFACTURING	PROGNOSTIC, DETECTION & REPAIR FOR AL ALLOYS & COMPOSITES	ADVANCED CERAMICS AND COATINGS	SMART TEXTILES AND FABRIC TECHNOLOGIES	NEW FERRITIC MATERIALS & JOINING TECHNOLOGIES	
●	●	●	●	●	●			●	AIR PLATFORMS
●	●	●	●	●	●			●	MARITIME PLATFORMS
●	●	●	●	●	●	●	●	●	ARMOUR APPLICATIONS
●	●	●	●	●		●			PROPULSION SYSTEMS
●	●	●				●	●		PERSONNEL SURVIVABILITY

Research Program
Air Platforms

Developing and integrating next generation manufacturing and sustainment technologies to increase industry competitiveness

PLANNED OUTCOMES

Embedding of advanced manufacturing technologies for titanium alloy aircraft components in primes and SMEs, providing them with a competitive edge in both cost and capability terms and allowing them to participate in global supply chain opportunities such as the Joint Strike Fighter (JSF) and a range of through-life-support and sustainment contracts.

Development of predictive tools for incorporation into existing prognostic health management systems to enable in-service diagnosis.

Development of key knowledge in the area of lean manufacturing and composite panel defect inspection.

OVERVIEW

In the Air Platforms program researchers are targeting the development of a more competitive aerospace manufacturing industry and the increase in domestic aircraft sustainment capabilities. The research activities in this program can be grouped into two major categories: enabling the cost effective manufacture of aircraft components; and increased effectiveness of sustainment methods of Defence aircraft. These activities will be achieved through partnership with industry and researchers to identify key capability gaps in Australia's supply chain and in areas such as the affordable manufacture of difficult-to-machine materials through to developing prognostic health monitoring systems for detecting component degradation.

This program involves a very multidisciplinary team with specialists in chemical, mechanical, materials and aerospace engineering. BAE Systems Australia is the key industry participant and leader in this program and they have been actively involved along with a number of SMEs over this time period. Projects within this program address the two Strategic Industry Capabilities 'Composite & Exotic Materials' and 'Repair, Maintenance & Upgrade of Aircraft'.

ACHIEVEMENTS

Projects in this program have progressed well during the 2010-2011 financial year, and industry participants have continued to maintain a high level of involvement. In the machining projects significant research activities have been carried out on the vibration monitoring mainly focusing on Stability Lobe Diagrams. At BAE Systems, a series of experiments were designed to evaluate damping materials used to support thin wall sections during machining. Modal analysis was then used to investigate the vibrational properties (natural frequency, damping and stiffness) of different materials. The results have been applied to minimise vibration in the production of JSF components.

In the area of titanium chips recycling, mechanical ball milling has been employed to refine the CP-Ti chips and to breakdown and disperse oxides. A detailed investigation is also underway to compare advanced coolant technologies (cryogenic and high pressure) with the future focused on implementing a technology at an industry partners' facility. These investigations complement the work carried out in the tooling development project at Suttons where a significant improvement in cutting tool life has been demonstrated during drill testing of a modified TiN coating developed on the INNOVA coating unit in Advanced Surface Solution Facility (ASSF).

In the aircraft prognostic tools project, the work has continued on witness coating trials under conditions simulating an aircraft body in the outdoors. The investigation of cracks in P3 wing fastener paint has established an in-depth understanding on the performance of primer and top-coat during crack propagation. Further intergranular corrosion initiation experiments were successfully carried out at Swiss Light Source, Switzerland. In the composite defects detection project, code improvements were completed in several of the main computational stages of the software to enable faster analysis of scan data. The software has been proven in its ability to identify and characterise defects. A database of defects is being established to assist in the risk assessment of all defects that are found.

Several new projects which complement the existing projects have commenced with the support of new industry participants including Lockheed Martin, CUC and Levett Engineering. Furthermore, a sub-project commenced in support of the machining projects (extended benchmarking) and corrosion prognostics project (fibre optic sensors) to address the revised Commonwealth milestones.

1.1.1a
Development of new titanium fabrication technology

1.1.1b
Next generation tooling development

1.1.2
Advanced process monitoring tools and transfer to manufacturing supply chain

1.6
Aircraft prognostic tools to reduce corrosion impacts

1.7
Rapid and reliable detection and analysis of composite defects

2011 HIGHLIGHTS

The reduction in machine-tool vibration during the manufacture of Joint Strike Fighter components at BAE Systems in Adelaide.

The increase in tool life by 20% and performance by 40% in cutting tools manufactured at Advanced Surface Solutions Facility, Sutton Tools in Melbourne.

Developed a new method of coolant delivery system to deliver a range of coolants including liquid nitrogen coolant during the machining of titanium components at Seco Tools in Sydney.

Established understanding of crack propagation through primer and top-coats used in the prevention of aircraft corrosion.

Research Program
Air Platforms

> Programs at BAE Systems, including our Joint Strike Fighter contract, have benefited significantly from our participation in DMTC - through earlier access to machines and the development of improved machining processes.
>
> TONY STRUDWICK
> BAE SYSTEMS

PROJECT HIGHLIGHTS

ADVANCED PROCESS MONITORING, COOLING AND CUTTING TOOL TECHNOLOGIES

Titanium is an extremely difficult to machine material and the increasing proportion of titanium being used on new military and civilian aircraft is forcing the development of cost effective solutions for the machining of this material. These DMTC machining projects have brought together research expertise from The University of Queensland, The University of Melbourne, CAST CRC, Swinburne University of Technology and industry partners BAE Systems, Sutton Tools and VIPAC Engineers & Scientists to optimise titanium machining techniques to reduce costs and cycle times. The new tooling development work is being carried out at ASSF in Sutton Tools. Advanced cooling methods to machine titanium are being evaluated with Seco Tools and BAE Systems.

Together this research will contribute to increased tool life, reduced cycle times, a reduction or elimination of the need for rework or hand-finishing and avoid scrapping parts. As knowledge grows and processes are refined, component costs will fall continuously as a result. The goal is to reduce direct machining costs by up to 30 per cent, while increasing productivity by as much as 50 per cent. This will help improve Australian industry's international competitiveness. This research will lead to the development of a predictive tool which can model the optimum titanium machining process and achieve the right balance between machining time and cutting tool consumption rates. The outcomes of this research are being implemented in the machining of components for Joint Strike Fighter at BAE systems successfully.

PROJECT HIGHLIGHTS

AIRCRAFT PROGNOSTIC TOOLS TO REDUCE CORROSION IMPACTS

The operating cost of different ADF aircraft types is driven partly by the need to inspect airframes for corrosion and carry out properly 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 the aircraft's apparent condition. Detailed inspections can be manpower-intensive and time-consuming, mandated repairs are expensive, and the inspection/repair cycle can restrict aircraft availability for missions such as lengthy maritime or overseas deployments. There could be a significant potential benefit to be gained, therefore, from transitioning to on-condition maintenance rather than a time-based regime.

Under this project the DMTC, its industry partner BAE Systems Australia, DSTO, RMIT and the University of Queensland (UQ) are conducting research to develop a Corrosion Prognostic Health Management (CPHM) capability which can then be validated and certified by the ADF's Directorate General of Technical Airworthiness (DGTA). They aim to be able to predict the location and extent of corrosion using a knowledge base of coating performance, structural material characteristics and operating environment.

The research is following three concurrent paths: understanding why and how paint and other coatings degrade; understanding corrosion mechanisms for a range of aerospace-grade aluminiums and the time delay between the occurrence of paint damage and a specific threshold level of corrosion in the affected part;

and developing a CPHM tool kit to measure the age, thickness and porosity of paint coatings and detect cracks in them. This includes techniques such as infra-red spectroscopy to measure the decay of fluorescent additives in various paint layers applied to non-structural 'witness plates' attached to the airframe. These wouldn't interfere with certified structural components and coatings and wouldn't require electronic data logging, but would alert inspectors to the corrosivity of the environment, and indicate the remaining protection of existing coatings.

For the ADF the research should deliver direct medium-term benefits by helping reduce the cost of maintaining aircraft constructed primarily of aluminum such as the Hawk, Seahawk, Black Hawk, Chinook, C-130 Hercules, AP-3C Orion, A330 MRTT and F/A-18A/B Hornet.

Research Program
Maritime Platforms

Delivering new materials technologies for maritime platform production, maintenance and repair

PLANNED OUTCOMES

Improvements in hull strength, manufacturability, repair, sustainment and materials resilience issues; for example allowing maritime platforms to better resist damage from more aggressive underwater weapons whilst retaining performance capability, or by introducing advanced joining and automation techniques to Australian naval shipyards that will sustain the nation's Defence manufacturing and repair capabilities. Achieve low distortion production, dimensional stability and manufacturing consistency/ repeatability by using automation and new materials processing technologies.

OVERVIEW

In DMTC's Maritime Platforms program researchers are developing new materials technology for use in surface and sub-surface applications, including platform production, repair and maintenance. The technologies in development for the Defence maritime sector in Australia will assume critical importance in the coming years with shipbuilding tempo increasing across Australia in the context of Air Warfare Destroyer (AWD), Landing Helicopter Dock (LHD), Amphibious Ship and Sea 1000 Projects. This will be equally important from the perspective of through-life support outcomes as likely schedule slippage for new platforms, and Defence announced SRP cost savings objectives cause a renewed focus on sustainment.

Technologies being developed in this Program span a broad range of material types from the development of higher strength steels for marine Defence applications through to multifunctional composites where antennas, sensors, wiring and connectors are integrated into the structure while at the same time reducing weight, improving stealth characteristics and hardening the antenna/sensor structure against external threats such as foreign object impact. The program also has a strong focus on advanced welding and joining technologies for increased productivity and improved distortion control as well as activities centred on the repair and maintenance of submarines, including evaluation of laser treatment techniques and the development of low cost high productivity automation and fabrication options for manufacture and repair of Defence equipment.

2011 HIGHLIGHTS

The successful implementation of low distortion advanced welding techniques for the fabrication of ship panels at Forgacs Engineering in Newcastle.

Welding distortion reduced by up to 80% on production steel plate used on the AWD.

Innovative and multifunctional carbon reinforced plastic conformal antennas have been successfully developed.

Significant improvement in corrosion/erosion resistance for surface treated metallic submarine components.

High Strength Low Alloy Steels determined to be a suitable candidate material for future surface ships.

Research Program
Maritime Platforms

ACHIEVEMENTS

In support of developing future capability, DSTO, UOW and ANSTO are evaluating prospective candidate high strength steels using microstructural analysis, weldability trials, thermal profiling and weld modelling. Results are being benchmarked against current steels to assess performance suitability for existing and future applications which can be exploited by Australian steel manufacturers and marine platform fabricators.

New surface repair technologies for the improved service life of metallic submarine components are being evaluated with respect to the cavitation-erosion and corrosion resistance. Weld repair in combination with various surface treatments for Nichol Aluminium Bronze alloy have successfully been used with a significant improvement in corrosion/erosion resistance. A key outcome is to exploit the technology to extend the life of in-service critical components, while reclamation using welding techniques can repair eroded components through more cost effective rapid reclamation methods. This research is being undertaken by DSTO, Swinburne University and the University of Wollongong.

Thales and ANSTO have recently joined forces in a new DMTC project that investigates the development of advanced materials processing technologies for piezoelectric ceramic materials used in sonar devices. The technologies are intended to be implemented into a production environment to achieve enhanced performance of sonar equipment by improving acoustic functionality of transducers and arrays in defence systems.

ASC and Swinburne University have commenced a joint project which investigates one of the most aggressive forms of corrosion in ship board systems, known as Microbiologically Influenced Corrosion (MIC). The proliferation of the microorganisms commonly associated with MIC depends upon local environmental conditions in the ports and harbours in which Australian naval vessels operate (e.g. water temperature, levels of pollution). Work will be undertaken to identify local characteristics, and seasonal effects, related to MIC from target locations at which RAN vessels are based. The corrosion of military marine platforms forms a key component of the maintenance requirements for these vessels and has a significant impact on the maintenance related downtime and associated costs.

DSTO, RMIT University and GKN continue to develop new multifunctional conformal antennas using conventional materials and techniques. Conventional micro-strip antennas may be accommodated within composite sandwich panels to enhance antenna performance. Substantial additional gains may also be realised by incorporating advanced materials, such as meta- and nano-materials, within multifunctional structures. In the past year a bathtub antenna structure using Carbon Fibre Reinforced Plastic (CFRP) was manufactured and tested and the results indicate that the antenna can operate at X band without degrading the mechanical strength. This is the first time a load bearing antenna structure using CFRP has been reported.

PROJECT HIGHLIGHTS

LEAN AUTOMATION TECHNOLOGY FOR ADVANCED MANUFACTURING OF MARINE DEFENCE COMPONENTS AND ASSEMBLIES

During the past year the Maritime Program has secured an increase in support from Forgacs Engineering as a result of several successful trials at University of Wollongong (UOW) and Defence Science Technology Organisation (DSTO), who have been developing new welding procedures to be used for the Sea 4000 Air Warfare Destroyer Program. Both distortion control and rapid welding techniques have been demonstrated on the production steel plate used in the AWD program with results indicating a significant reduction in distorted sections (>80%) previously requiring rework using costly straightening techniques or restrictive welding practices.

Research has demonstrated a doubling in weld speed that directly impacts production rates in the shipbuilding process. Forgacs Engineering has welcomed the results and has subsequently supported the project by committing capital to critical infrastructure that uses this technology within their Newcastle shipbuilding facility. This includes a new high speed panel line which utilises low distortion technology, and with the help of DMTC, will provide Forgacs with the necessary tools to lower costs while improving production quality; such as dimensional stability of fabricated sub-sections.

> As a direct result of DMTC research, Forgacs Engineering have invested in a new panel line utilising technologies that result in a 113% increase in deposition rates, 20% reduction in longitudinal distortion and 63% reduction in angular distortion.

STEPHEN VAN DUIN,
MARITIME PROGRAM LEADER - DMTC

Research Program
Armour Applications

Delivering superior platform and personnel protection capabilities with improved manufacturability

PLANNED OUTCOMES

Development of better capability options for future ADF procurement activities, in terms of an improved product offering and a technical support capability, for both vehicle and personnel applications.

Outcomes will focus on reducing the cost of ownership, improving survivability and increasing industry productivity.

OVERVIEW

Research in the Armour Applications Program is focused on the development, characterisation and production of high performance armour materials with improved cost-effectiveness and manufacturability that increases the level of protection offered to ADF vehicles and personnel. The program includes improvement of existing metallic armour materials and exploration of the capacity of armours from alternative material classes to match the performance and structural integrity of metal armours. Protection from threats ranging from small arms fire to improvised explosive devices, rocket-propelled grenades and a range of other threats currently being experienced in theatre are critical to Defence capability. Developed systems must have a high consistency in their blast and ballistic performance and be affordable and durable in typical service environments. The aim is to reduce weight and increase payload and mobility, while providing superior platform and personnel protection. The program also seeks to develop new materials and benchmark their properties against existing steel armour materials for ballistic performance, blast resistance, structural properties and multi-hit capability.

ACHIEVEMENTS

The Armour Applications Program this year expanded from five to seven projects with the addition of Projects 3.6 – Ceramic Protective Equipment and 3.7 – Manufacture of Ballistic Helmets. Project 3.1 Evaluation of Vehicle Armour Requirements and Development of Improved Systems and Manufacturing Techniques has completed its technical objectives and has now entered the commercialisation phase which will focus on industry adoption of the developed technologies.

A key welding output of the Project 3.1 has the potential to significantly reduce pre-welding heat treatment requirements, resulting from a comprehensive study of weld hydrogen content, significantly reducing the manufacturing time of armoured platforms. This output is currently being assessed for inclusion in relevant standards prior to first implementation by Thales.

Studies on potential next generation armour steels (Project 3.2) which include TRIP (Transformation Induced Plasticity), TWIP (Twinning Induced Plasticity), DP (Dual Phase) and new commercial grades of overseas and domestic armour steels were undertaken this year. Recent work has demonstrated the potential of explosive bonding techniques

for hybrid metallic armour systems. This manufacturing route could lead to an ability to produce “no-compromise” armour plate having the hardness required for ballistic resistance, combined with the toughness required in vehicle structural applications.

Project 3.4 – “Comparison of Mechanical and Welded Joints for Construction of Components for Armoured Vehicles” has been working toward an upgraded High Strain Rate (HSR) testing system for armour steels and bolted/welded vehicle joints. The collaboration has also manufactured and acquired the necessary HSR hardware for testing of armour materials. With the HSR laboratory now coming online, for the first time a domestic resource of this type is available to industry and the defence research community.

The technology under development within Project 3.5 “Lean Automation Technology for Advanced Manufacturing of Armoured Vehicles” centres on creating an automated ability to determine the required path taken by an industrial assembly robot and generate the required control program. During the most recent project review, University of Wollongong demonstrated their offline vehicle assembly modelling capability to end user groups, which is projected to yield up to 70% savings in the production downtime it takes to reconfigure automated assembly activities of armoured platforms.

2011 HIGHLIGHTS

Reduced pre-heat requirements for armour grade steels.

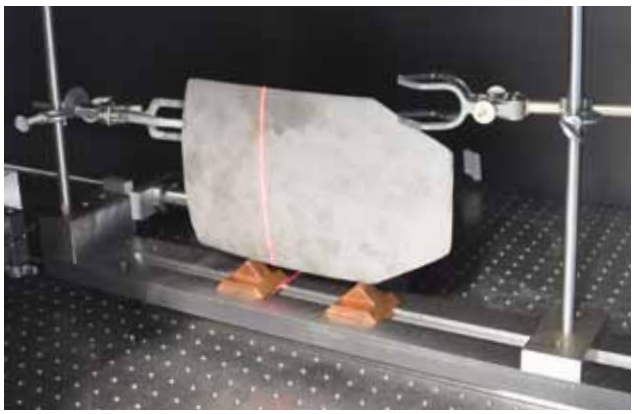
Adoption of off-line programming automation solutions for armoured vehicle manufacture.

Initial manufacture of low profile body armour and flexible extremity protection.

Commercialisation of ballistic ceramics.

Lighter and more protective combat helmet prototyped.

Research Program
Armour Applications



Our partnership with the DMTC has resulted in our internal R&D program transforming into something far greater. We have become a part of a scientific community where the sharing of expertise has enhanced our ability to produce high performance and competitively priced products that will be used to protect our soldiers.

DR. IAN CROUCH,
AUSTRALIAN DEFENCE APPAREL.

PROJECT HIGHLIGHTS
IMPROVING ARMOUR FOR PERSONNEL

Research into Advanced Personnel Armour has achieved a number of significant milestones over the year in multi-hit modelling, extremity protection and low-profile armour systems.

ADA in cooperation with FCST developed an undershirt that demonstrated that the flexible and breathable ballistic fabrics developed as part of the project could be used for protecting areas not currently covered by the MCBAS (Modular Combat Body Armour System) utilised by the ADF. A working simulation for predicting the integrity of a hard armour plate already subjected to previous impact has also been developed. A first of its kind, this software is being evaluated by ballistics experts within the Defence Department before being packaged for broader use by industry and allied defence organisations.

The Project 3.3 team has also successfully demonstrated a series of prototype SAPI (Small Arms Protective Insert) plates, where armour thickness was minimised for a given ballistic resistance. These low profile plates have already generated interest in the ‘special forces’ and ‘security’ communities, and the technology may also lend itself to development of low cost personnel armour. Once fully characterised for manufacturability and optimum configuration, this technology has the potential to form the basis of at least two new product streams for ADA.

The work undertaken in Project 3.6 resulted in a pilot ceramic protective equipment plant that can achieve production quantities of components being officially opened this year. These components have been provided to DMO for first article testing and the focus is now on full scale production of protective articles and facilitation of a follow-on research program which promises to yield further process optimisation and increases in technology performance.

PROJECT HIGHLIGHTS

RESEARCH, DEVELOPMENT, DESIGN AND MANUFACTURE OF A NEW COMBAT HELMET

Since the adoption of military ballistic helmets made from consolidated fabrics (e.g. Kevlar) Australia has lacked a domestic capacity to design and manufacture this crucial component of soldier armour. DMTC has undertaken to address this with a new project focused on the prototyping of an indigenously designed and manufactured ballistic combat helmet that is lighter and more protective than other global alternatives.

By leveraging existing technology and interest from DSTO, ADA and VCAMM, DMTC has established a team with the expertise to develop a manufacturing technique, a product and a path to market. Building on the manufacturing technology known as Double Diaphragm Deep Drawing (D4) which arose as the result of the Land 149 Capability and Technology Demonstration (CTD) program, DMTC raised the TRL from 3 to 6.

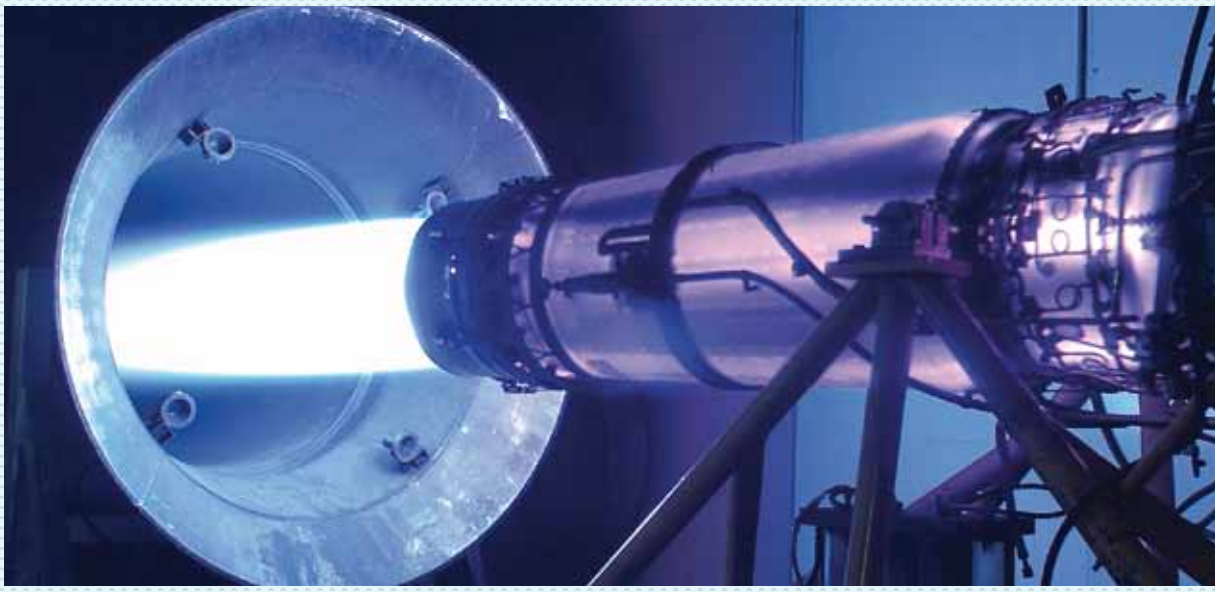
The D4 technique eliminates much of the requirement for touch labour and fabric splicing associated with traditional ballistic helmet manufacture. The result is a product with fewer flaws that can be manufactured less labour intensively. Prototype articles have undergone ballistic testing and early results indicate that significant improvements in both weight and performance over contemporary helmets are likely.

During the year this new project delivered five functional prototype helmets, of unique design, made from the latest ballistic materials and using the new D4 process.

The project has also leveraged the expertise of SMEs where their capability is relevant and complementary to the project. Pacific ESI Pty Ltd has been simulating the helmet manufacturing technique and the finished articles, suggesting design improvements and establishing a platform for ongoing technology development.

Research Program
Propulsion Systems

Delivering engine repair technologies and world-class hypersonics capabilities



PLANNED OUTCOMES

Development of new technologies for repair of aircraft structures and engine components, including advanced surface engineering and repair technologies capable of enhancing or restoring structural and component performance.

Development of new materials capable of withstanding extended exposure to the extreme conditions associated with hyper and supersonic flight, including applications such as scramjet combustors, vehicle leading edges and thrust vectoring flight control systems.

OVERVIEW

DMTC's Propulsion Systems Program is helping Australian companies develop, prove and certify new repair technologies to reduce the cost of repairing damage to the airframe and power train components of ADF aircraft, and cost-effectively extending their service lives. These will help grow an efficient, competitive industry base which can help the ADF maintain its current high operational tempo while helping meet the goals of the SRP by reducing the through-life cost of operating and sustaining the ADF's helicopters and fixed-wing aircraft.

ACHIEVEMENTS

Within Program 4, Rosebank Engineering Pty Ltd, is working with RMIT, DSTO the DMO and the ADF's Directorate-General of Technical Airworthiness (DGTA) to develop a greatly improved indigenous capability to restore components to service.

This year Project 4.1 focused on the development and certification of repair technologies for current and next generation aircraft using direct metal deposition technologies. A major breakthrough has been in the area of laser cladding of Al 7075 powder onto Al 7075 substrates. This work has led to a better understanding of factors causing the early failure of tensile and fatigue specimens and identified the approach required to overcome these so that the mechanical properties of repaired specimens are similar to the original. The technology has now reached a certification stage which when approved, will significantly reduce the cost of maintaining aircraft platforms. Project 4.1 has also delivered optimised process parameters for the laser cladding of stainless steel powder composition and cladding parameters for the repair of an FA18 anti-rotation bracket which has been implemented by Rosebank Engineering. The project team has also developed a new model for laser cladding of Al and Ti powders on Al and Ti substrates and conducted detailed residual stress measurements on Al and Ti clad deposits. These components can be returned to service in a safe, timely and cost effective manner.

Targets for the next year include the repair and testing of a damaged FA18 landing gear, rudder anti-rotation bracket and the engine mount.

Significant progress has also been made on the development of high temperature materials to enable hyper and supersonic flight. This has included the development of a hybrid ultrahigh temperature cladding process and a Hot Gas

Torch (HGT) to perform ablation testing for application in the development and assessment of the next generation of thrust vectoring control materials. The work has focused on the development of thrust vector vanes with increased performance, reduced mass and/or reduced cost for supersonic/hypersonic flight. The project team has continued to develop and evaluate both Tungsten Copper (W/Cu) and Ultra High Temperature Ceramic (UHTC) clad C/C materials systems. Ultra High Temperature Ceramic (UHTC) coupons have been fabricated in the refurbished ANSTO hot press. C/C-SiC sample materials have been supplied by BAE Systems and site preparation for rocket plume testing is near completion. Prototype jet vanes were evaluated in small-scale tests using live rocket motors, courtesy of Teakle Composites in Brisbane.

Progress has also been made towards the development of a supersonic/hypersonic ground based environment test facility which incorporates the hot gas generator testing facility.

Activities have concurrently focused on the development of advanced material systems for hypersonic vehicle leading edges and scramjet combustors for preliminary testing in this hot gas generator test facility. The first three years of this work has resulted in the development of a number of advanced material systems which may have applications in hypersonic vehicle leading edges and scramjet combustors. These options include a split case Inconel/ Zirconia sprayed combustor and C/C, Zr02/ Mullite solutions through to C/C-Ultra High Temperature Ceramic options.

4.1
Repair technologies for current and next generation propulsion systems

4.2
High temperature materials for hyper and supersonic flight

2011 HIGHLIGHTS

Demonstrated capability to repair components to original performance and dimensions through laser cladding.

Certification requirements identified for the adoption of laser cladding technology.

Research Program
Propulsion Systems

PROJECT HIGHLIGHTS

REPAIR TECHNOLOGIES TO SAVE TIME AND MONEY

Commercialisation of research being undertaken in Project 4.1: 'Repair technologies for current and next generation propulsion systems' will soon enable Rosebank Engineering to repair damaged titanium components from ADF aircraft that would have previously been scrapped. Surface damage to mechanical components through corrosion, impact and wear can lead to significant sustainment costs throughout the life of aircraft and impact operational availability.

The emergence of powder deposition technologies provides the opportunity to restore damaged metallic components to both the original design geometry and structural configurations cost effectively and efficiently. Rosebank Engineering has successfully employed Supersonic Powder Deposition (also known as cold spray) for recovery of Seahawk magnesium transmission components. As a result of their involvement in this DMTC project, they are soon to certify the recovery of worn 17-4PH steel F/A-18 components through the utilisation of laser powder deposition technology at Hardchrome Engineering. This particular component is an integral part of the flight control system on the F/A-18's, however the long lead time for acquiring a replacement component means that aircraft availability can be affected. By creating a domestic capability to repair these components, the cost to the ADF and aircraft time out of service have been reduced.

PROJECT HIGHLIGHTS

HIGH TEMPERATURE MATERIALS FOR HYPER AND SUPER-SONIC FLIGHT

Advanced materials being developed in Project 4.2 will be used on the HiFIRE 8 hypersonic vehicle. They will also improve the competitiveness of BAE Systems Australia in global supply chain opportunities for new supersonic missiles. The success of HiFIRE 8, demonstrated by sustained and controlled hypersonic flight, will help determine the continuing role for “Team Australia” on future collaborative hypersonic programs. The importance of HiFIRE 8 is akin to the successful demonstration of hovering rocket technology by DSTO and the Government Aircraft Factory in the 1980’s. This spawned the collaborative Nulka Active Missile Decoy Program with the US and became Australia’s most successful defence export program.

Targets for the next year include commissioning the University of Queensland Hot Gas Generator for testing of advanced combustor material configurations in the DSTO combustion test facility. This is a critical assessment capability required to determine and down-select materials on scramjets for HiFIRE and future hypersonic programs.

Research Program
Personnel Survivability

Creating better solutions to protect our Diggers

In June 2011, the Minister for Defence Stephen Smith and Minister for Defence Materiel Jason Clare announced that the Government would contribute more than $9 million towards research for the protection of soldiers of the Australian Defence Force. The Defence Materiel Organisation has committed $7.5 million to the program through Land 125 Phase 4 funding and the Defence Science and Technology Organisation (DSTO) is committing an additional $1.7 million. Industry and the research sector have committed additional support in excess of $11 million, which is expected to grow throughout the program.

Personnel Survivability will run for 5 years, and deliver a range of improved materials, manufacturing processes and technology solutions. The program aims to reduce the burden to personnel by decreasing the weight, bulk and cognitive awareness of the equipment being worn while maintaining or increasing the level of protection enabling them to perform their duties with minimal hindrance.

Focusing on improving the mobility, survivability and sustainability factors that affect personnel, Personnel Survivability will contribute to saving lives and increasing operational effectiveness of Australian Defence personnel. This research will further enhance the work being undertaken by the Integrated Solider Systems group (also known as Diggerworks) within the Defence Materiel Organisation. In addition to the benefits to Defence personnel, this Program will contribute to the further development of Australia's defence industry and the enhancing of indigenous industrial, commercial and academic defence capabilities.

SME and Special Projects

SME ENGAGEMENT

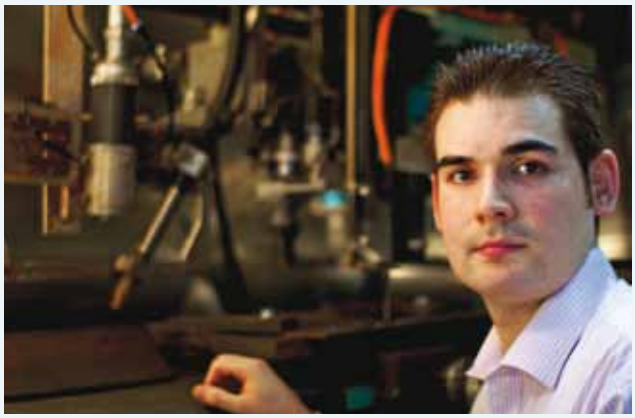
DMTC encourages the participation of SMEs as a core part of our activities, supporting the development of an integrated and highly capable supply chain. SMEs are involved in all DMTC technology themes through core research and special funding projects. In 2009, DMTC created the 'Associate' level of membership to further increase the engagement of SMEs in DMTC activities. The Associate Membership Program provides a more flexible avenue for SMEs to participate in DMTC activities. To complement this, a series of 'SME Projects' have been created to leverage significant research and IP knowledge already well-established in core projects. The success of SME engagement activities is apparent from the growing involvement of SMEs in DMTC. Eleven additional SMEs joined DMTC during the 2010-2011 financial year and 9 SME projects have commenced.

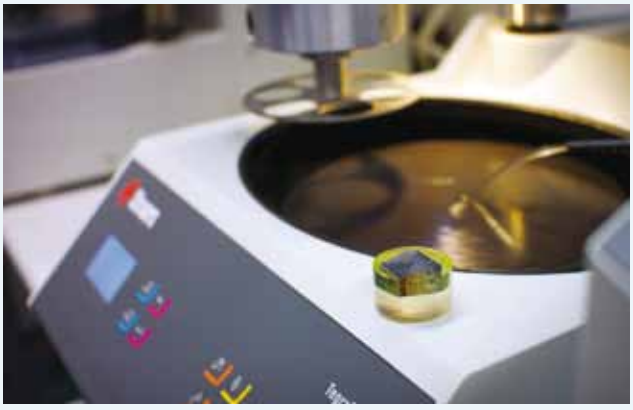
SPECIAL PROJECTS

The Special Project initiative was established this year to enable targeted research to be undertaken over and above our core research activities. This initiative has attracted significant additional participation and contribution from industry and research sectors. Four projects have commenced under this program, augmenting DMTC's research effort in the areas of titanium machining, aircraft corrosion, next generation ceramics and next generation composite materials. Three more projects are expected to commence early in the coming year. Associate Members were actively involved in four Special Funding Projects during the year which allowed them to collaborate with Universities, primes and other SMEs in the defence industry supply chain.

SME PROJECTS

- Advanced Titanium Alloys
- Numerical Simulation of the Protection of Vehicles from IEDs
- Protective Fabrics to Mitigate Blast Impact for use in Military Uniforms
- Flame Retardant Treatment of Nylon/Spandex Lightweight Fabric with Boron Acid and Ammonium Polyphosphate
- HVOF Coatings Capabilities
- Vibration Isolation Mechanism on Seats in Rigid Hull Inflatable Boats
- Supersonic Particle Deposition (SPD) for Thin Panel Repair
- Disruptive Pattern Camouflage Uniform (DPCU) Fragmentation
- Numerical Simulation of the Manufacture and Structural Response of a Composite Military Helmet





1. LOBES CREATING LIMITED TORQUE ANGLES
2. ELASTOMER SUBSTRATE
3. BOND INTEGRITY AT CORE AND HOUSING

PROJECT HIGHLIGHTS

RIAS TECHNOLOGIES (INTERNATIONAL) LTD

RIAS Technologies from Perth WA engaged in a project aimed at demonstrating the shock and vibration attenuation capability of their RIASORB® rotational suspension within a Defence environment, more specifically around enhancing the comfort and protection of personnel in transit. This technology, which applies torsional shear to specially designed elastomers within a patented configuration, was incorporated into a prototype seat suspension mechanism and subjected to a series of military standard tests performed at an accredited testing facility. The test piece displayed a minimum 95% absorption of repeated shock impulses over a range of loads with a recovery time of 0.35 seconds. Following the success of this demonstration, the company intends to target a range of critical defence applications, including incorporation into blast and marine seat designs; suspension units for army vehicles to improve under vehicle blast protection and engine mountings for submarines.

> Connecting with the right area within Defence and evaluation of our technology by a Defence accredited laboratory against a military specification were crucial to our efforts in customising the RIASORB® technology for Defence applications. This would not have been possible without the assistance provided by DMTC. We look forward to continuing to work with DMTC.

TROY KEENAN,
GENERAL MANAGER RIAS TECHNOLOGIES.

Education and Training

2010–2011 COURSES

Nanostructures via Thermal Spray: Processing, Properties and Modeling
Structural Health Monitoring by means of elastic wave propagation
Research in Titanium Manufacturing
Materials for Hypersonic Flight (2 seminars)
Additive Manufacturing Workshop Series (4 workshops)

DMTC SHORT COURSES AND SEMINARS

DMTC has continued to coordinate and deliver a number of short courses and seminars during this year. DMTC structures these courses around the delivery of high quality educational content to assist in building defence industry knowledge. A total of 9 seminars and workshops by international and local experts were coordinated by DMTC.

DMTC held its annual Participant Workshop and annual Technical Conference in Melbourne on 10 and 11 February, with 120 people in attendance over the two days. Both days provided an ideal opportunity for the sharing of ideas between industry participants and researchers. Speed networking sessions were held during the conference to give new SME participants the opportunity to network with other Participants. Feedback solicited by DMTC from attendees indicates that both days were extremely well received and highly valued.

At the conclusion of the Participants Workshop DMTC presented Awards for Excellence. The Awards for Excellence recognise individuals and project teams whose efforts have significantly contributed to the execution of DMTC's vision and mission. The awards and recipients were as follows:

Industry Partnership Award
Michael Saleh of ANSTO, for his contribution to the Armour Applications Program.

Early Career Award
Mark Callaghan of the University of Wollongong; and Tim Barry of Swinburne University of Technology.

Research Collaboration Award
Ian Crouch of Australian Defence Apparel, for the collaborative spirit in which he undertakes his work in the Armour Applications Program.

Capability Improvement Award
This award recognises a project team that achieves a significant improvement in technical capability. This award was presented to the project team working on the Manufacturing Benchmarking Special Project, consisting of individuals from BAE Systems, CAST CRC, SECO Tools, the University of Queensland, Millatec, Goodrich, Avoca Engineering and the University of Melbourne.

Presentation Award
Neil Matthews of Rosebank Engineering.

EDUCATION

DMTC's 'grow our own timber' initiative has provided 12 scholarships for undergraduate students to undertake vacation internships with a view to exposing undergraduates to the defence industry and DMTC project activities.

This year DMTC awarded 10 scholarships to PhD candidates in five participating universities bringing the total number of DMTC PhD students to 25. These candidates undertake their research directly within the framework of an appropriate DMTC project ensuring that through interaction with industry participants and by being exposed to the industry-driven research environment, their research findings contribute towards achieving the milestones and outputs of these projects. Such an approach also contributes to providing practical training outcomes and generating graduates with more industry-relevant qualifications. Cameron Barr from the University of Melbourne has been involved with DMTC's Education Program since inception, and continues to contribute significantly to the pool of knowledge being generated through the program. Cameron started his involvement in DMTC projects when he was an undergraduate student, and with the support of DMTC, has continued through to undertake a PhD. He is an outstanding example of how ongoing support can lead to the development of new expertise.

Cameron Barr was awarded the Best Presentation Award at the DMTC Students Conference for his presentation on 'Severe Plastic Deformation of Aluminium Bronzes for Marine Applications'.

"My interaction with DMTC started when I was offered a summer internship position at the Melbourne University material labs. I have always had a keen interest in the manufacturing industry- to me it is very hands on, a little dirty but seriously good fun. Under the careful eyes of my mentors I learned the basic research skills and professionalism required of a true materials scientist (and played with some very sophisticated equipment too). I was approached for the PhD position sponsored by DMTC, which for me was the opportunity of a lifetime and without hesitation I accepted the challenge. The collaboration and networking opportunities provided by DMTC means I am never short of ideas or input. I am truly grateful to the DMTC Education Program for providing this opportunity."

CAMERON BARR,
THE UNIVERSITY OF MELBOURNE AND DMTC PHD STUDENT

PhD Candidates and Topics

PHD CANDIDATES	TOPIC	COMPLETION DATE
Peng Luo	Recycling of Ti Machining Chips	2012
Lenka Kuzmikova	An Investigation of the Weldability of High Hardness Armour Steel	2012
Joseph Polden	Automated Welding in Armour Applications	2012
Rajneesh Jaitlee	Textiles for Armour Applications	2012
Nicholas Orchovski	Performance of Ti-6Al-4V After the Occurrence of FOD	2012
Toby Joel Seidel	Phase Compensation Methods for Load Bearing Antenna Array	2012
Kelvin Nicholson	Broadband Tuneable Metamaterials	2012
Rizwan Abdul Rahman Rashid	Hybrid Machining of Beta Titanium Alloys	2012
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Mike Wang	Modelling Two Phase Material Properties (Primarily Thermal) Using Monte Carlo Approach	2013
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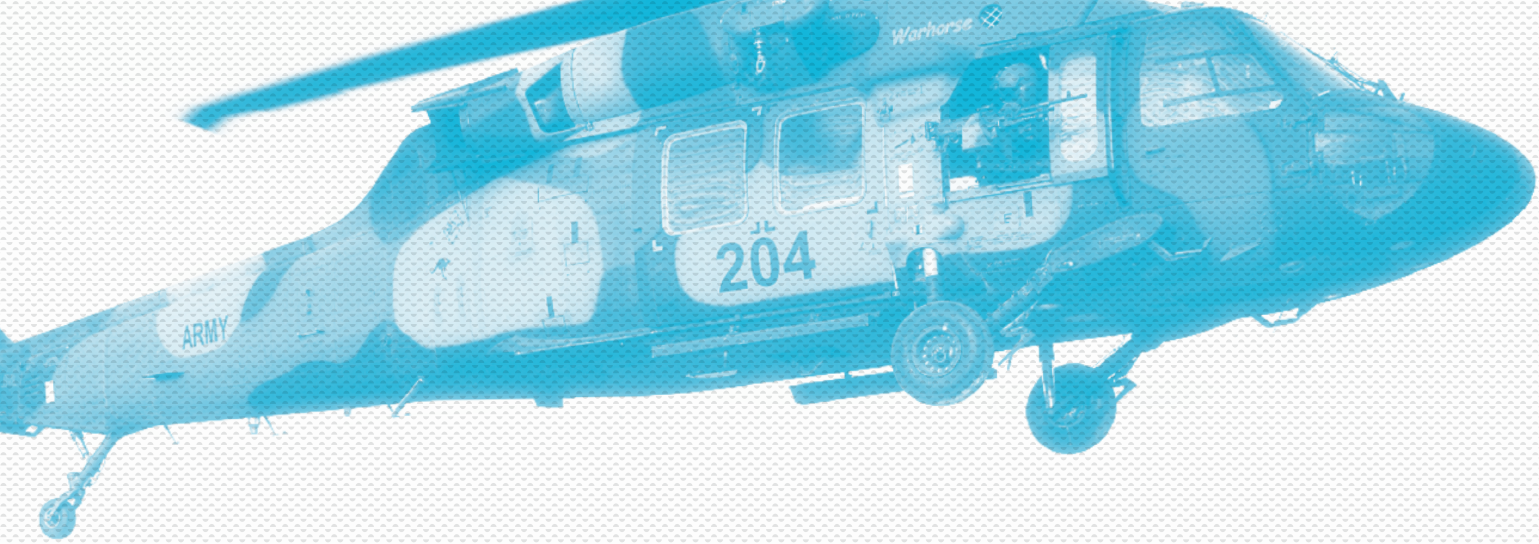
Eric Yang	Modelling of welded and Mechanical Joints Under Blast Loading	2014


CAPABILITY THROUGH COLLABORATION



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@dmtc.com.au