Australian Government
Department of Defence
Science and Technology

Science and Technology Capability Portfolio

DST | Science and Technology for Safeguarding Australia


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October 2017

AAMOST	Anglo Australian Memorandum on Science and Technology
AAS	Australian Academy of Science
ABCANZ	America, Britain, Canada, Australia, New Zealand information exchange MOU
ADF	Australian Defence Force
ADFA	Australian Defence Force Academy
AFP	Australian Federal Police
AFRL	US Air Force Research Laboratory
AFSEO	US Air Force SEEK EAGLE Office
AISC	Australian Industry Skills Committee
AOSM	Australian Operational Service Medal
ANSTO	Australian Nuclear Science and Technology Organisation
ANZPAA	Australia New Zealand Policing Advisory Group
ARDEC	US Army Armament Research, Development and Engineering Centre
ASC	Australian Submarine Corporation
ASD	Australian Signals Directorate
AUMICE	Australia and the United Kingdom Memorandum of Understanding on Military Capability Harmonisation and Equipment Cooperation
BoM	Bureau of Meteorology
CBRN	Chemical, Biological, Radiological, Nuclear
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTTSO	Combating Terrorism Technical Support Office (US)
CUESC	Contested Urban Environment Strategic Challenge
CWALN	The Chemical Warfare Agent Laboratory Network
DMTC	Defence Materials Technology Centre
EM	Electro-magnetic
FGAN	Research Institute for Applied Sciences (Germany)
FPDA	Five Power Defence Arrangements (UK, Australia, NZ, Singapore, Malaysia)
ICSSP	International Conference on Sport Psychology and Performance
IEEE	Institute of Electrical and Electronics Engineers
IIE	Institute of International Education
INCOSE	International Council on Systems Engineering
MORS	Military Operations Research Society
MOU	Memorandum of Understanding
MSSANZ	Modelling and Simulation Society of Australia and New Zealand
NATO	North Atlantic Treaty Organisation
NATO STO	NATO Science and Technology Organisation, within which there are the following panels:
	AVT Applied Vehicle Technology
	HFM Human Factors and Medicine
	IST Information Systems Technology
	SAS Systems Analysis and Studies
	SCI Systems Concepts and Integration
	SET Sensors and Electronics Technology
	plus the:
	MSG NATO Modelling and Simulation Group
	CMRE Centre for Maritime Research and Experimentation
NAVAIR	Naval Air Systems Command (USN)
NSRDEC	U.S. Army Natick Soldier Research, Development and Engineering Center
NSWS	Naval Surface Warfare Centre (USN)
NUWC	Naval Undersea Warfare Centre (USN)
OPCW	Organisation for the Prohibition of Chemical Weapons
ONR	Office of Naval Research (US)
RAeS	Royal Aeronautical Society
RINA	Royal Institution of Naval Architects
R&D	Research and Development
RMIT	Royal Melbourne Institute of Technology
SIGINT	Signals Intelligence
SPAWAR	US Navy Space and Naval Warfare Systems Command
SPIE	International Society for Optics and Photonics
T&E	Test and Evaluation
TTCP	The Technical Cooperation Program, within which are the following 10 Groups:
	AER Aerospace Systems Group
	C3I Command, Control, Communications and Information Systems Group
	EWS Electronic Warfare Group
	HUM Human Resources and Performance Group
	ISTAR Intelligence, Surveillance, Target Acquisition and Reconnaissance Group
	JSA Joint Systems and Analysis Group
	LND Land Systems Group
	MAR Maritime Systems Group
	MAT Materials and Processing Technology Group
	WPN Conventional Weapons Technology Group
UGV	Unmanned Ground Vehicle
US DHS	United States Department of Homeland Security

Contents


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Message from the Chief Defence Scientist

Excellence in science and technology is fundamental to an agile, innovative, capable and modern Australian Defence Force. For this purpose Defence maintains a strong portfolio of science and technology capabilities across a wide spectrum of military domains and operations.

This publication captures Defence's Major Science and Technology Capabilities which should serve as a valuable resource for our partners and external stakeholders.

Our Major Science and Technology Capabilities are independently reviewed by international experts and many of them have been rated as world benchmarks.

Achieving and maintaining excellence in science underpins the quality of the independent advice that we provide to Government. Defence values science excellence for its contribution to saving lives, enhancing effectiveness, reducing and mitigating strategic and operational risks and maintaining a capability edge.

Partnerships with industry, academia and government agencies, national and international, are essential to strengthen and supplement Defence's capability and technology base.

We trust that you can make good use of the information in this publication.

We also hope that this will inspire industry and academia to continue contributing to the growth of Defence capabilities for the future.

Dr Alex Zelinsky
Chief Defence Scientist


DST
Science and Technology for Safeguarding Australia

Introduction

Science and Technology (S&T) plays a critical role in safeguarding Australia's defence and national security.

Defence Science and Technology (DST) has been supporting the Australian Defence Force for more than 100 years with innovative technology solutions that deliver a capability edge.

Today, Defence Science and Technology is managed in terms of Major Science and Technology Capabilities. A **Major Science and Technology Capability (MSTC)** consists of people with S&T knowledge, infrastructure, and partner relationships within an area of science and a defence domain. This document provides a snapshot of Defence's MSTCs. It is a summary of how an MSTC, working with its partners, has delivered outcomes for Defence together with examples of how **DST** measures its science and technology excellence.

The scientists, engineers and technical specialists working in the 37 MSTCs described in this document are supported by the skills of staff in the three corporate divisions who deliver the science policy and strategy, the frameworks for science partnerships and external engagement, associated enabling research services such as computing, safety and security as well as staff from areas such as finance and human services which are shared across the rest of Defence.

DST's distinctive value is derived from the combination of its unique world-class sovereign capabilities, its deep knowledge and responsiveness to the Australian defence environment, its active collaboration with the best partners nationally and internationally and its ability to combine these to deliver soundly based independent advice.

DST has several roles, of which one is to ensure that Defence can both prevent and create strategic surprise as a result of the application of innovative technologies. In order to achieve this **DST** aims to continue to build and foster a national science and technology base. A second aim in delivering this role successfully is to generate and transfer technology into ADF capability through collaboration with industry.

The contents of this document are intended to help build an understanding of DST's science and technology skill base as a starting point to further our external engagement.


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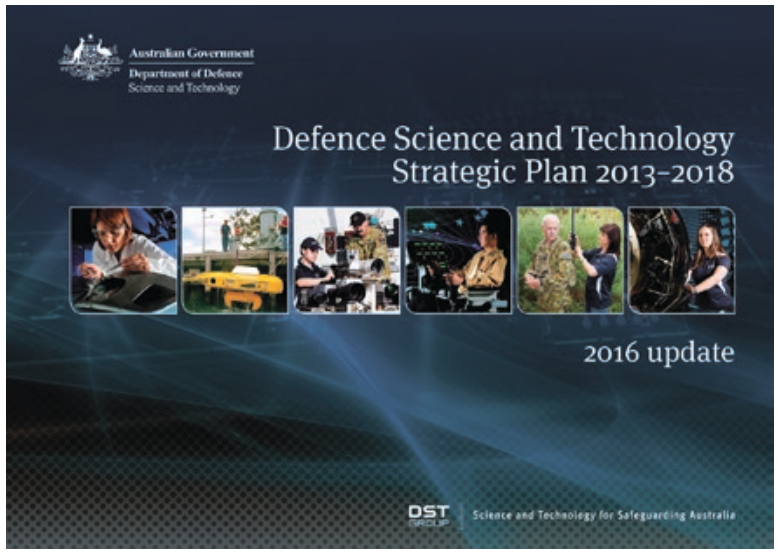
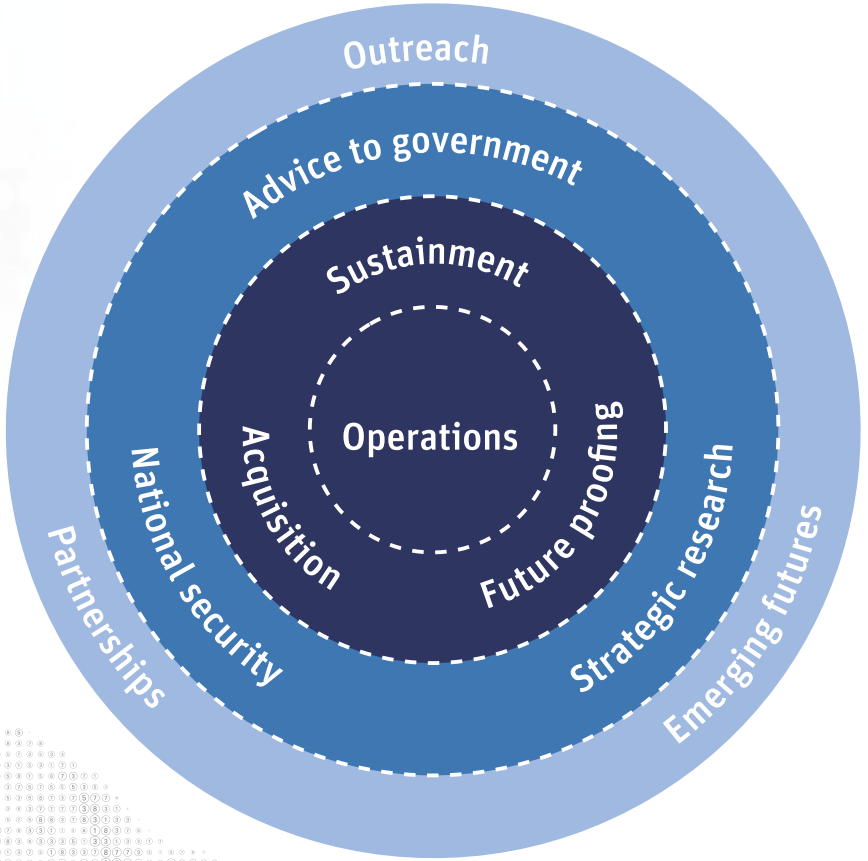
Science and Technology: Purpose and Roles in Defence



DST is a national leader in safeguarding Australia by delivering valued scientific advice and innovative technology solutions for Defence and national security.




DST
Science and Technology for Safeguarding Australia

Australian Government
Department of Defence
Science and Technology

Maritime Division

DST | Science and Technology for Safeguarding Australia

Sonar Technology and Systems

Goal

Develop and apply sovereign undersea acoustic sensing, processing and analysis expertise to provide the current and future ADF with an acoustic undersea warfare capability edge.

Impact

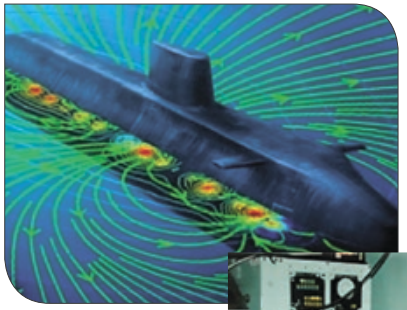
Sovereign USW S&T Capability: Targeted industry and academia partnerships in critical undersea warfare technologies to ensure ADF maintains its capability edge against current and future undersea threats.

Next-generation sensor technologies: Our patented fibreoptic technology turns a single optical fibre into 32 hydrophones. Industry is using this technology in prototype towed and seabed acoustic sensor systems.

Collins and Future Submarine Sonar: Pivotal advice and design partner for enduring regional undersea acoustic superiority.

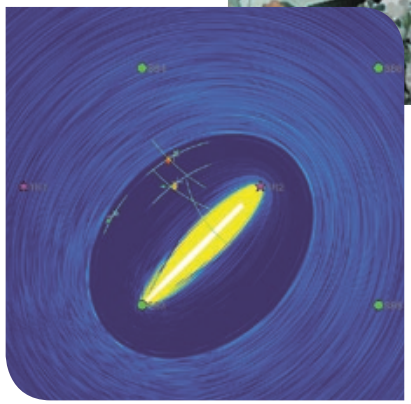
Airborne ASW: National and international collaborative R&D program focused on future wide-area, airborne ASW capability for theatre and task group scale ASW.

Sonar Processing and Visualization: Our technology has been transitioned via Australian Industry to improve operational sonars on RAN ships and submarines.



Passive Sonar

Active Sonar



Multi-Sensor Anti-Submarine Warfare

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 8 DST Technical Reports
- 11 DST Client Reports
- 7 Journal Publications
- 41 Conference Papers
- 1 Patent

PEER RECOGNITION

- Adjunct Positions: UWA, Curtin University
- PhD Supervision: UWA, Curtin University
- National Lead TTCP MAR TP9

AWARDS

- TTCP Achievement Awards 2014, 2016
- Clunies Ross Awards 2015
- DST Awards 2012, 2013, 2015 (multiple)
- Australian Acoustical Society – WA Tertiary Prizes 2014 and 2015

Partnerships and Outreach

UNIVERSITIES

Sydney University
RMIT University
Adelaide University
Flinders University
University of WA (UWA)
Curtin University

INDUSTRY

Thales (Aus)
Ultra
Raytheon
Sonartech Atlas
L-3 Oceania
Boeing
In-Situ Pacific

GOVERNMENT

CSIRO
Bureau of Meteorology

INTERNATIONAL

TTCP MAR Group
NATO/CMRE
USN ONR, NUWC, NAVAIR
DTA (NZ)
Thales UK and France
Dstl (UK)
University of Washington

Acoustic Signature Management

Goal

To control and manage the acoustic signature of RAN platforms providing increased operational effectiveness and improved survivability.

Impact

Anechoic Tiles: New anechoic tiles have been developed to reduce submarine susceptibility to detection by active sonar threats, increasing the survivability and operational effectiveness of the platforms.

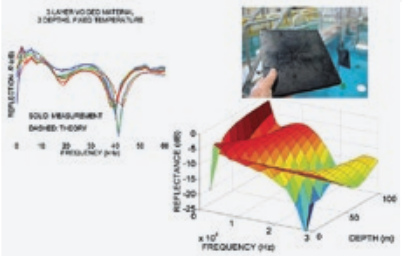
Acoustic Signature Monitoring: Partnering with industry a command decision aid has been developed to provide 'realtime' signature and susceptibility estimates providing greater situational awareness to the command team.

Platform Acquisition: The provision of S&T advice on acoustic signatures and signature reduction to the new surface platform and submarine acquisition projects ensuring the new capabilities have regional superiority.

Submarine Training: The development of new maneuvering and control models for the training simulator at Fleet Base West, improving the fidelity of operator training and reducing the onboard training requirement for new operators.

Acoustic Signature Control

Hydro-acoustics



Acoustic Material Systems

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 52 DST Technical Reports
- 79 DST Client Reports
- 38 Journal Publications
- 76 Conference Papers

PEER RECOGNITION

- 4 ARC Grant Reviewers
- Adjunct Professors: UNSW, QUT, Australian Maritime College
- PhD Supervisor: UNSW, QUT, UQ
- National Lead TTCP MAR Group TP4

AWARDS

- Minister's Award for Defence Science 2014 (S Burke)
- Defence Commendation 2012
- SA Engineering Excellence Award 2013
- DST Awards: Outstanding Contribution to Collaborative Partnerships 2013, Outstanding Communication of S&T 2014, Science and Engineering Excellence 2016.
- Best Papers: AAS 2012, 2015 IEEE 2012; IIE 2015; AE 2014; MSSANZ 2011; RINA 2016

Partnerships and Outreach

UNIVERSITIES

University of Melbourne
University of Tasmania
University of Adelaide
Queensland University of Technology (QUT)
University of WA
University of NSW (UNSW)
RMIT University

INDUSTRY

Frazer Nash
Mackay Industries
ASC
QinetiQ
L3

GOVERNMENT

CSIRO

INTERNATIONAL

TTCP MAR Group
ATLA (Japan)
NSWC (US)
DE&S (UK)
Dstl (UK)
CSSM (Europe)
FOI (Sweden)
MARIN (NL)

Non Acoustic Signature Management

Goal

To enhance the survivability and operational warfighting capability and to reduce the cost of ownership of ADF platforms through the use of materials science and technology.

Impact

Platform Survivability: Partnering with industry to design, manufacture and install radar absorbing material on ships, submarines and aircraft to reduce the RCS of platforms to radar detection.

Safety: Leading the evaluation of chromate free primers for aircraft, including F35, and new isocyanate free navy topcoat has led to a safer workplace for platform sustainment.

Operational Capability: Design and application of Radar Absorbing Materials to the "surfboard" on 4 FFH's to significantly improve communication performance.

Platform Acquisition: The provision of S&T advice on signatures and management technologies for SEA 1000, SEA 5000, LAND 400, LAND 121, AIR 6000 ensures enhanced survivability and regional superiority.

Cost of Ownership: New anti-foul and durable coatings on ship hull, superstructure and propellers has reduced RAN fuel consumption, in water cleaning and maintenance costs.

Electromagnetic Signature Control

Specialised Coating Technology

Environmental Signatures and Protective Systems

Corrosion Sciences

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 52 DST Technical Reports
- 39 DST Client Reports
- 24 Journal Publications
- 61 Conference Papers

PEER RECOGNITION

- 2 ARC reviewers
- TTCP MAT Group National Lead
- Editor J. Computer Networks
- ONR Coatings Program reviewer

AWARDS

- Minister's Award for Defence Science 2013 (A Amiet)
- NATO STO Excellence award 2014
- Surface Coatings Association of Australia Lou Cash Memorial award 2016
- Engineers Australia Excellence Award for Innovative R&D 2016
- DST Awards: Outstanding early career achievement 2014, 2016, Outstanding contribution to defence 2015, Technical Excellence Award 2014, 2016
- CDS Gold Level Commendation 2011
- CN Silver level Commendation 2012
- TTCP MAT Group Personal Achievement Award 2012

Partnerships and Outreach

UNIVERSITIES

Swinburne University of Technology
Deakin University
University of Wollongong
La Trobe University
University of South Australia
RMIT University
University of Melbourne
Flinders University

INDUSTRY

Mackay Industries
BAE Systems
ASC
PPG, Akzo Nobel, Jotun, DEFT, Protec, Axalta, RUAG
MacTaggart Scott
Dow Chemicals

GOVERNMENT

National Marine Science Committee
NT & WA Departments of Fisheries
Australian Institute of Marine Science

INTERNATIONAL

TTCP MAT, AER and MAR Groups
NATO SET Panel
NRL, ARL (US)
Dstl (UK)
TNO, MARI, Phillips Lighting (NL)
WTD 52 (Germany)
Atlas Elektroniks (UK)
Lockheed Martin (US)

Maritime Autonomy

Goal

To enhance the ADF's maritime capability edge with smart sensors and unmanned systems for undersea warfare and littoral operations.

Impact

Sovereign Mine Warfare Capability: Unique scientific and technical knowledge of sea mine threats and platform signatures to help ensure safe passage in contested waters.

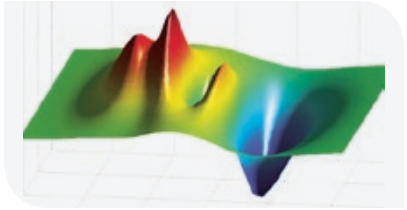
Concepts for unmanned undersea operations: Focused industry and academic partnerships that enable the ADF to explore and evaluate new paradigms in off-board mine countermeasure technology – to 'take the man out of the mine field'.

Persistent Surveillance: Exploiting unique Australian industry and academic skills to significantly augment current ADF ocean surveillance capability.

Advanced Autonomy: Exploiting advances in machine intelligence to demonstrate distributed, automated decision making in undersea warfare.

Unmanned Systems and Autonomy

Magnetics and Payload Sensors



S&T Excellence

THREE YEAR PUBLICATION RECORD

- 21 DST Technical Reports
- 28 DST Client Reports
- 12 Journal Publications
- 11 Conference Papers

PEER RECOGNITION

- Adjunct Professor – Sydney University
- Adjunct professor – UNSW
- TTCP MAR TP13 National Leader

AWARDS

- Minister's Award for Defence Science 2016 (B Ferguson)
- Minister's Award for Defence Science 2012 (D Cato)
- TTCP Awards 2014, 2016

Partnerships and Outreach

UNIVERSITIES

Australian Maritime College
Curtin University
Queensland University of Technology
University of Technology Sydney
Sydney University
University of NSW (UNSW)

INDUSTRY

AADI
Boeing
InSitu Pacific
Kraken Systems
Ocius, Ron Allum
SAAB
SfS
Thales

GOVERNMENT

CSIRO
Bureau of Meteorology

INTERNATIONAL

TTCP MAR Group
USN ONR and NRL
US Army
Rochester Institute of Technology (US)
MIT (US)
Atlas Elektronik UK
ADD (Korea)
DSTA (Singapore)

Undersea Command and Control

Goal

To improve the RAN undersea warfare effectiveness through improving the collection, processing and exploitation of undersea tactical information by undersea platforms and systems.

Impact

Joint Development: Improved the performance of the MK 48 Heavy Weight Torpedo and the AN/BYG-1 Combat Management system by the insertion of Australian algorithms.

Collins Class Submarines: Improved weapon control displays, periscope photography practice and operator training to increase submarine effectiveness.

Torpedo Countermeasures: Developed and delivered improved signal libraries for RAN torpedo countermeasures.

Human Systems Integration: Provided HSI technical leadership for SEA1000 – Endurance, Control Room and Habitability and Anthropometry

Optronics Research: Increased understanding of detectability and performance of optronic systems through collaborative PA and experimentation with the USA.

Signature and Stealth: Environment and sensor modelling to inform signature and stealth requirements for SEA1000.

Undersea Combat Systems

Human Systems and Information Integration

Undersea Weapon Systems

Undersea Environment and Warfare Assessment

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 3 DST Technical Reports
- 31 DST Client Reports
- 20 Journal Articles
- 17 Conference Papers

PEER RECOGNITION

- 2 adjunct positions; Curtin University and University of Adelaide
- 1 PhD examiner
- 3 PhD Co-Supervisors

AWARDS

- USN NAVSEA Excellence Award 2014
- US Enterprise Integration Award 2015
- Curtin University Award 2016
- DST Award finalist 2014
- Human Factors and Ergonomics Society Conference Best paper 2014

Partnerships and Outreach

UNIVERSITIES

Australian Maritime College
University of Melbourne
RMIT University
University of Adelaide
University of South Australia
Curtin University
University of Western Australia
Edith Cowan University

INDUSTRY

BAE Systems
Lockheed Martin
Raytheon
Thales
Ultra
Atlas Elektronik UK

GOVERNMENT

CSIRO
Bureau of Meteorology

INTERNATIONAL

TTCP HUM and MAR Groups
USN NUWC, NSWC, NAVSEA, PEOSUBS, ONR and SPAWAR
DSTA (Singapore)
DRDC (CA)
Dstl (UK)

Maritime Platform Performance

Goal

To ensure the Royal Australian Navy have surface ships and submarines that are safe, efficient, sustainable and survivable for their desired operational envelope.

Impact

Sustainment: Partnering closely with Defence and industry has led to a substantial improvement in the structural integrity of the Armadale Class Patrol Boats.

Safety: Leading the technical investigation into the fire onboard HMAS Bundaberg has lead to improvements in fire protection for the Armidale Class Patrol Boat fleet.

Platform Acquisition: The development of performance and requirements analysis has shaped future acquisition projects such as SEA1000, SEA1180 and SEA3033 programs.

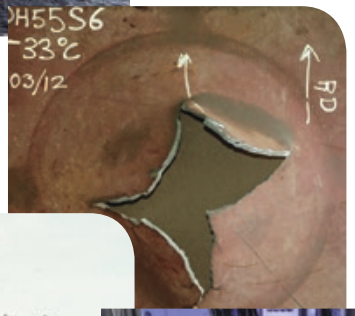
Reducing cost of ownership: Improvements in understanding the life of type issues for submarine hull valves has resulted in significant savings in maintenance costs.

Sustainment: Mechanical and Electrical failure investigations for return to service of RAN submarines and surface ships.

Naval Architecture and Platform System Analysis

Naval Platform Survivability

Dynamic Military Loads



Materials Performance and Structural Integrity

Power and Energy Systems

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 69 DST Technical Reports
- 118 DST Client Reports
- 27 Journal Publications
- 73 Conference Papers
- 2 Book chapters

PEER RECOGNITION

- Adjunct Professor and 2 senior lecturer positions at University of Tasmania – Australian Maritime College and Monash University.
- Advisory board members for University of Tasmania and Victoria University
- TTCP MAR Group National Lead

AWARDS

- Public Service Medal 2016 (Z Mathys)
- Fellow of the Academy of Technological Science and Engineering, 2016
- TTCP Award 2015
- 14 DST Awards over the last 5 years

Partnerships and Outreach

UNIVERSITIES

University of Tasmania – Australian Maritime College
University of Wollongong
Flinders University
Monash University
University of Melbourne
Queensland University of Technology

INDUSTRY

ASC
DMTC
Babcock
Siemens
Austal

GOVERNMENT

ANSTO
Customs
AFP

INTERNATIONAL

TTCP MAR and MAT Groups
Cooperative Research Navies
Dstl (UK)
ARL, ONR, NSWC (US)
ABCANZ
MARIN (NL)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Australian Government
Department of Defence
Science and Technology

Land Division

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Land Human Systems

Goal

To enhance the warfighter and the human systems that select, prepare, equip, protect and sustain them to prevail in their mission and reset for the next.

Impact

Cognitively Prepared: Research to meaningfully measure and practically enhance the selection and training of warfighters to cognitively outperform and resiliently outlast their adversaries.

Physically Prepared: Research building on the MSTCs design and delivery of the world leading physical employment standards for all ADF trades to effectively select and efficiently train warfighters to achieve peak performance across diverse roles, under extreme conditions.

Nutritionally Sustained: Driving innovation and quality in the design and provision of combat rations and fresh food, as the ADFs trusted experts on food and nutrition in a military context.

Augmented Close Combatant: Working closely with Army and CASG through the Diggerworks partnership has delivered a world class Soldier Combat System that continues to evolve to meet the emerging threats and opportunities for close combatant superiority.

Augmented Vehicle Occupant: Field and Lab experimentation that reduce injury vulnerability and raise the human-system performance of Army's new combat vehicle acquisitions.

Cognition and Behaviour

Physical Ergonomics

Food and Nutrition

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 68 DSTO Technical Reports
- 94 DSTO Client Reports
- 52 Journal Publications
- 108 Conference Papers

PEER RECOGNITION

- Chair TTCP HUM Group
- Chair TTCP HUM JP1 Land Human System Performance
- National Lead TTCP LND TP5 Warfighter Survivability
- ICSPP Conference Chair
- Over ten university appointments
- Professional memberships held by the majority of staff

AWARDS

- Minister's Award for Defence Science 2015 (M Patterson)
- Comcare Work Health and Safety Award 2016
- College of Sport and Exercise Psychologists Award of Distinction 2016
- Traffic and Transport Psychology Young Scientist Award 2016
- APS College of Organisational Psychologists (SA) Award 2016

Partnerships and Outreach

UNIVERSITIES

Human Performance Research Network (HPRnet)
University of Wollongong
University of Tasmania
Griffith University

INDUSTRY

Rheinmetall SA
Cobalt
Alertness CRC

GOVERNMENT

Australian Institute of Sport
CSIRO
AFP

INTERNATIONAL

TTCP HUM and LND Groups
NATO STO
DSTA (Singapore)
NSRDEC (US)

Land Vehicles and Systems

Goal

To enhance the Land Force's ability to survive and win in challenging environments by delivering novel land systems concepts and solutions

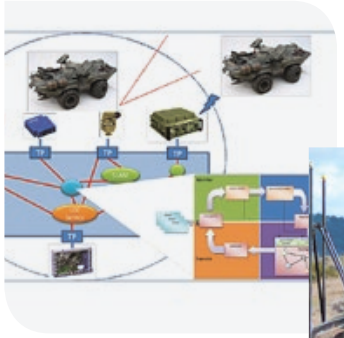
Impact

Vehicle Survivability: Increased ballistic and blast survivability of land vehicles and their crews through R&D in multi-role armour systems, predictive modelling, protective appliqués, improved materials and cabin survival systems.

Resilient Mission Systems: Developing resilient vehicle hosted mission systems that adapt dynamically in demanding situations, thus reducing the cognitive burden of operators and making Australia's land vehicles more potent.

Enhanced and Survivable Combat Service Support: Developing, exploring and exploiting CSS concepts and technologies, such as autonomous logistics, to enhance CSS efficiency and survivability in complex environments.

Resilient Tactical C2 Information Networks: Collaborating with academia and the Army Research Labs to research and develop information management solutions with greater autonomy, resilience, trust and quality of service of the tactical information network in complex environments.



Advanced Vehicle Systems

Vehicle Survivability

Systems Integration and Tactical Networking

Land Logistics

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 54 DST Technical Reports
- 68 DST Client Reports
- 21 Journal Publications
- 27 Conference Papers
- 3 Book chapters

PEER RECOGNITION

- 5 PhD Supervisors
- 2 University adjuncts
- 1 Principal Scientist
- 1 Defence Science Fellowship
- 3 Journal reviewers
- 1 Chair of International Symposia
- TTCP LND Group
- Chair of the International Council of Systems Engineering's Model-based Conceptual Design Working Group

AWARDS

- Land Defence Australia Young Innovator Scholarship 2016
- DMTC Early Career Award 2016
- INCOSE Award for Leadership 2013
- Commander CDG Gold Commendation 2014
- DST Achievement Awards 2016

Partnerships and Outreach

UNIVERSITIES

University of NSW
RMIT University
Deakin University
Melbourne University
Adelaide University

INDUSTRY

BAE Systems
Defence Materials Technology Centre
Thales Australia
Ambrose
Myriota

INTERNATIONAL

TTCP LND Group
Dstl (UK)
DRDC (CA)
Tank Automotive Research, Development and Engineering Center (US)
DSTA (Singapore)
NATO STO
EMI Germany

Chemical and Biological Defence

Goal

Lead the application of Biology, Chemistry and related disciplines to inform, safeguard and mitigate the risk posed by chemical and biological threats to personnel and missions of Defence and National Security organisations.

Impact

Hazard Management and Individual Protective Equipment: Develop and assess CBRN protective equipment, detectors and decontamination systems that provide ADF with more effective capability to survive and operate within CBRN environments.

Agent Chemistry and Verification: Application of R&D to assess the hazards posed by chemical agents and toxins and verify their alleged use. This will enable Defence to better prepare for the challenges posed by chemicals of concern and allow attribution of chemicals to sources and/or individuals, assisting law enforcement agencies and the Organisation for the Prohibition of Chemical Weapons (OPCW).

Bio-agent Identification and Characterisation: Application of R&D in virology and development and evaluation of detection and diagnostics platforms for biosurveillance and health monitoring. The work has resulted in international and national collaboration to evaluate platforms, the development of a potential in-field assay for bio-warfare agents and informed advice to CASG projects, Special Operations Engineering Regiment and Joint Health Command.

Hazard Management and Individual Protection

Agent Chemistry and Verification

Bio-agent Identification and Characterisation

Agent-based Genomics and Cell Biology

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 37 DSTO Technical Reports
- 7 DSTO Client Reports
- 26 Journal Publications
- 27 Conference Papers

PEER RECOGNITION

- 1 ARC assessor
- 2 PhD thesis assessors
- 1 PhD supervisor
- 4 DSF and 3 CDS Fellows
- 5 Journal reviewers
- Chair of the International CBR MOU
- 2 S&T advisors to the Australia Group
- Executive Committee members for CWALN
- National S&T lead for Medical Counter Measures Consortium
- 2 Chairs of International Symposia
- ISO and Australian Standard panels

AWARDS

- SP&I Award for Client Support 2016
- OPCW Hague award 2016
- DST Achievement Award 2015
- DST Best Client Support 2011
- ANZSMS Bowie Medal 2013

Partnerships and Outreach

UNIVERSITIES

LaTrobe University
University of Technology Sydney
Monash University / Bio21
Macquarie University
Garvan Institute of Medical Research
RMIT University
University of NSW
Swinburne University
Flinders University

INDUSTRY

Catapult
Ideation
Defence Materials Technology Centre

GOVERNMENT

CSIRO
Defence Science Institute
Army Malaria Institute
Victorian Infectious Disease Research Laboratory
Berrimah Veterinary Labs

INTERNATIONAL

Chemical and Biological Memorandum of Understanding (CBR MOU)
Australia Group (forum for control of CBR weapons)
Organisation for the Prohibition of chemical weapons (OPCW)
Chemical and Biological Weapons Conventions
CTTSO and Department of Homeland Security (US)
DRDC (CA), DSTA (Singapore), DTA (NZ)

Land Personnel Protection

Goal

Inform, protect and enable defence and national security personnel through advances in CBRN hazard analysis, physical protection systems, EM signature reduction and the use of autonomous systems.

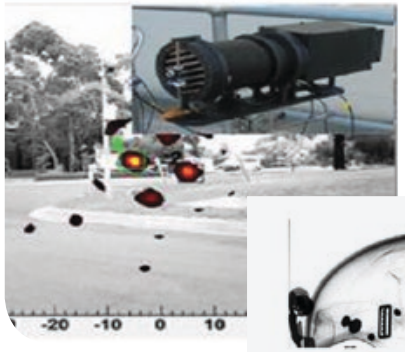
Impact

Support to Operations: CBRN hazard modelling to optimise personnel protection and mission effectiveness for deployed ADF at threat from hazardous materials.

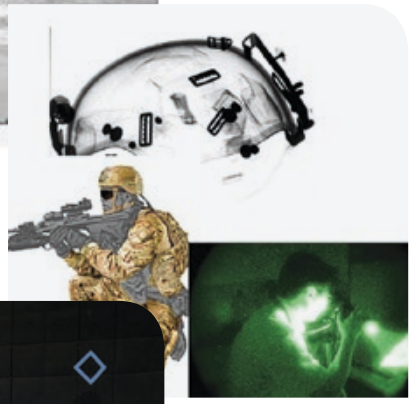
Force survivability: Improved camouflage and signature management for Army and advice on current combatant ballistic protection to enhance survivability of the individual combatant.

Support to Acquisition: Advice, R&D and T&E provided in the areas of signature management, power and energy and radiological science has enhanced the outcomes of acquisition projects such as LAND 3025, 121, 200, 400, 2110, JP199, 500, 8045.

Research and Development: Development of improved fragmentation and stab and spike protection for dismounted combatants and the development of standoff radiological imaging detection systems providing the ADF with capability advantage over potential adversaries.



CBRN Hazard Assessment



Integrated Personnel Protection

Enabling Systems and Concepts

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 96 DST Technical Reports
- 10 DST Client Reports
- 41 Journal Publications
- 29 Conference Papers
- 1 Book
- 2 Book chapters

PEER RECOGNITION

- 2 ARC Experts
- 1 PhD Examiner
- 1 Defence Science Fellowship 2011–2014
- 3 International Associate Academics
- 2 Keynote Speaker Invitations

AWARDS

- DST Achievement Award for Science and Engineering Excellence 2016
- RAAF Commendation Medal 2014
- 2 Divisional Awards for Excellence 2014, 2015
- 3 Industry Innovation Awards 2014, 2015
- Fusion 2016, Best Paper Award – 2nd runner-up

Partnerships and Outreach

UNIVERSITIES

University of Melbourne
RMIT University
University of NSW

INDUSTRY

Bruck Textiles
Wax Converter Textiles
Bartlett Industrial Textiles
ADA
Tectonica
A.C.E Body Armour

GOVERNMENT

ANSTO
Bureau of Meteorology
CSIRO
Geosciences Australia
Victorian Department of Health

INTERNATIONAL

CBR R&D Forum (AU/US/UK/CA)
DRDC (CA)
Dstl (UK)
US Army CERDEC, Naval Research Lab (US)
TTCP MAT and LND Groups
NATO STO
FTSD (Singapore)

DST | Science and Technology for Safeguarding Australia

Australian Government
Department of Defence
Science and Technology

Aerospace Division

DST | Science and Technology for Safeguarding Australia

Aerospace Systems Effectiveness

Goal

To support Defence outcomes in capability, efficiency and safety by providing advice and solutions where humans and air platforms or systems interact

Impact

Training for the Future Battlespace: Developing tools, techniques and metrics which are transforming ADF aerospace collective training to enable 5th generation operations. Shaping future Live, Virtual and Constructive training through the RAAF Joint Air Warfare Battle Lab.

Human Autonomy Teaming: Researching fundamental techniques to ensure the ADF fully harnesses the capabilities of current and future autonomous systems.

Human Performance: Providing advice on human cognition, human system interfaces and crewing concepts that impact the design and usage of ADF aerospace capabilities and the selection and training of aircrew.

Rotary Wing Systems Effectiveness: Providing advice that enables reduced risk and increased capability for rotary wing platforms operating in challenging environments. S&T analysis provides critical information for rotary wing accident investigations such as the 2011 CH-47D accident in Afghanistan.

Human Factors

Air Operations Simulation Centre

Helicopter Systems Effectiveness

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 33 DST Technical reports
- 14 DST Client reports
- 7 Journal papers
- 35 Conference papers

PEER RECOGNITION

- 3 PhD supervisors
- 2 Defence Science Fellowships
- 1 TTCP Group National Representative
- 3 TTCP Panel National Leads
- 1 TTCP Panel Chair
- 6 Professional memberships
- 1 Editorial Board membership

AWARDS

- Royal Aeronautical Society Award 2015
- CAF commendation 2014
- TTCP Award 2015
- Australia Day Medallion 2013
- DST Silver Award 2015
- Best Paper Award SimTecT 2013, 2014, 2015

Partnerships and Outreach

UNIVERSITIES

University of Western Australia
Western Sydney University
RMIT University
Deakin University
University of Sydney
Queensland University of Technology
University of Tasmania

INDUSTRY

AOS
Boeing
Elmtek
Simsol
AVT
Airbus Australia Group

GOVERNMENT

Bureau of Meteorology

INTERNATIONAL

TTCP AER, HUM and JSA Groups
NATO STO HFM-247 Panel
AFRL AFOSR, ONRG, AMRDEC (US)
University of Liverpool (UK)
DSO (Singapore)

Aircraft Performance and Survivability

Goal

To ensure the operational effectiveness and survivability of the war-fighter by characterising and controlling ADF air signatures and systems performance, and by providing expert technical input to Intelligence assessment.

Impact

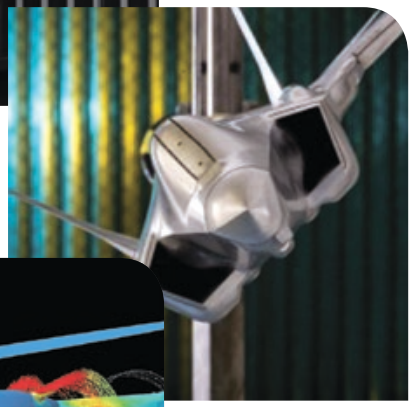
Operations: Enhanced Battle-worthiness of deployed ADF aircraft through validated Airborne Electronic Warfare Self-Protection systems; Validated safe carriage of weapons for deployed aircraft through vibration assessment advice.

Sustainment: Enhanced capability of JDAM weapon by range extension (JDAM-ER) through aerodynamic design, development, test and evaluation.

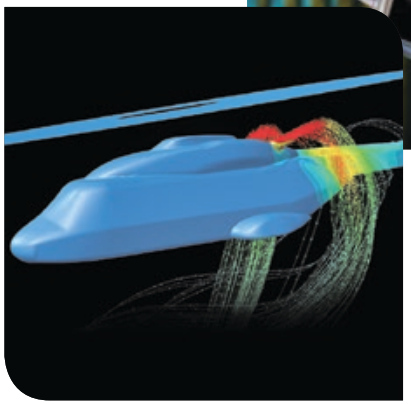
Platform Acquisition: Aerodynamics research conducted through an AUS/US Partnership on Weapons Integration under Project AIR 6000 has reduced the acquisition risk of the F-35. Demonstrated enhanced aircraft performance through aerodynamic and performance assessment of aircraft such as P-8 and UAVs.

Future Proofing: Undertaking S&T in autonomous UAV operations, multi-system teaming and IR signature control to support enhanced future ADF maritime capabilities.

Unmanned Aerial Systems



Aerodynamics and Aeroelasticity



Infra-Red Signatures and Aerothermodynamics

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 44 DST technical Reports
- 39 DST Client Reports
- 17 Journal Publications
- 91 Conference Papers
- 3 Chapters in NATO STO Report

PEER RECOGNITION

- 1 University Advisory Committee
- 4 PhD Supervisors
- 1 NATO STO AVT Technical Panel Chair
- 2 TTCP AER Group National Leads
- Chair of the Supersonic Tunnel Association International (STAI)
- AIAA Membership

AWARDS

- 2 Prime Ministers Awards for Excellence in Public Sector Management 2013
- AFP Commendation for MH17 support 2015
- RAAF (DGSP) Commendation 2013
- 1 NATO STO SET Panel Achievement Award 2014
- DST Bronze Commendation 2015
- 2 Best Papers at 16th AIAC Conference 2015

Partnerships and Outreach

UNIVERSITIES

Sydney University
RMIT University
Defence Science Institute
Monash University
University of South Australia
Melbourne University
University Queensland
Australian National University
Deakin University
University of NSW

INDUSTRY

Boeing (US)
AVTOL
ASE, DMTC
CAE Pty Ltd
Hardchrome
QinetiQ
Grollo Aerospace
Lockheed Martin

GOVERNMENT

Australian Federal Police
Bureau of Meteorology

INTERNATIONAL

ATLA (Japan)
DSTA (Singapore)
TTCP AER Group
NATO STO AER Panel
Cranfield University
Dstl (UK)
DLR (Germany)
Sandia Labs, NASA, USN, USAF AFRL (US)
RCAF (CA)
Arnold Engineering Development Complex (US)
USAF Seek Eagle Office (US AFSEO)

Aircraft Health and Sustainment

Goal

Enable safe, supportable and affordable operation of ADF air vehicle fleets over their life-cycle through a focus on asset and health management technologies.

Impact

Safety: The ADF's trusted experts for support of accident/ incident investigations. Delivery of enduring and enhanced aircraft system health management capability for on-going support to airworthiness.

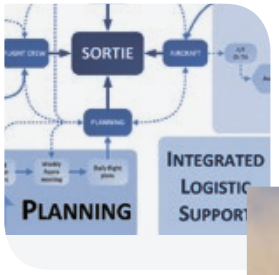
Supportability/affordability: Enhanced availability via aero-materiel state awareness technologies. Improved affordability and maintenance efficiency through analysis of LOT cost drivers.

Support to Operations: Measuring aircraft aural signatures for enhanced covert mission planning and survivability.

Future Force Experimentation: War gaming logistics con-ops and Air Force Plan Jericho Theme 11; Development of non-intrusive flight testing instrumentation (NIFTI) for on-demand flight trials.

Platform Acquisition: S&T advice to Defence projects: AIR 7000 (fleet size determination); AIR 9000 (HUMS technologies); AIR 6000 (propulsion system, vibration diagnostics and wear debris analysis).

Strategic Research: Autonomous material state awareness systems for enhanced availability; development of novel IR signature coatings for improved survivability.



Aerospace Systems Sustainment Analysis

Vehicle Dynamics and Diagnostics

Engines and Fuels Integrity

Airframe Diagnostic Systems

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 40 DST Technical Reports
- 24 DST Client Reports
- 42 Journal Publications
- 34 Conference Papers
- 2 Book chapters
- 6 Patents

PEER RECOGNITION

- 2 ARC Reviewers
- 1 CSIRO Endowment Fund Reviewer
- 4 PhD supervisors
- 3 Journal Associate Editors and Internal Scientific Boards
- 2 TTCP National Leads
- 1 External Course Advisory Committee
- 2 Conference Chairpersons

AWARDS

- US Office of Secretary of Defense Medal for Exceptional Public Service 2014
- RAeS Aviation Safety Award 2016
- TTCP Achievement Awards 2009, 2013
- Combined Joint Task Force 633 Silver Commendation 2013
- DST Bronze Commendation 2012, 2016
- Australia Day Medallion 2016
- 9 DST awards since 2010
- DST Solvelt award 2015
- Best Conference Paper 2015

Partnerships and Outreach

UNIVERSITIES

Monash University
RMIT University
Melbourne University
Swinburne University
Deakin University
Adelaide University
Sydney University

INDUSTRY

Defence Innovations
Northrop Grumman
Van Gelder and Monk
Honeywell
LRM Technologies
Lockheed Martin

GOVERNMENT

Bureau of Meteorology
Australian Synchrotron

INTERNATIONAL

TTCP AER and MAT Groups
F-35 JSF S&T Advisory Board
ABCANZ
University of South Carolina (US)
NRL, NSWC (US)

Airframe Technology and Safety

Goal

To maximise aircraft capability and safety through the development and application of leading edge computational modelling and materials systems research.

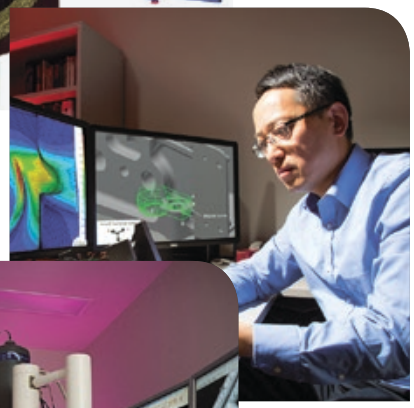
Impact

Operational capability: The operational capability of the F/A-18 fleet was restored in time for their deployment to operation OKRA achieved through the application of advanced metallographic assessment, computational modelling and biologically inspired shape optimisation of the SUU-62 centreline pylon.

Acquisition and safety: The safety of flight of the JSF fleet has been increased through the appropriate lifing of anodised components undertaken due to AT&S research into the effect of the anodising process on fatigue initiation.

Operational capability: The simultaneous operation of the satellite communications antenna and the ESM systems fitted to ANZAC Class ships was restored through the design, manufacture and installation of a low observable technology electromagnetic shield.

Aerospace Composite Technologies



Structural and Damage Mechanics

Aircraft Forensic and Metallic Technologies

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 24 DST Technical Reports
- 401 DST Client Reports
- 50 Journal Publications
- 46 Conference Papers
- 4 Book chapters

PEER RECOGNITION

- 5 PhD supervisors
- 3 PhD Examiners
- 12 Journal reviewers
- 1 International Journal Editorial Board
- ESDU Committee Panel member
- 1 CDS Fellowship
- 1 Adjunct Senior Research Fellow
- TTCP MAT Group National Leads for TP12 and TP13
- TTCP AER Group Panel Chair

AWARDS

- Jaap Schijve Award for young aeronautical engineers 2013
- TTCP AER Group Award 2014
- CDF Gold Commendation 2008, 2011
- RAN Silver Group Commendation 2012
- DST Achievement Awards for; Technical Excellence 2016, Outstanding Corporate Contribution 2015, Outstanding Early Career Achievement 2014
- Best Paper Intl. Workshop on Antenna Technology 2016

Partnerships and Outreach

UNIVERSITIES

Swinburne University
University of Queensland
Melbourne University
Macquarie University
La Trobe University
Deakin University
Australian Synchrotron
Monash University
University of Sydney
RMIT University

INDUSTRY

Qinetiq
RUAG Australia
BAE Systems Australia
Airbus Group Asia Pacific
Boeing Defence Australia
DMTC
Altair

GOVERNMENT

ANSTO
AFP
ATSB
CASA
CSIRO

INTERNATIONAL

NRC (CA)
University of Delaware
Norwegian Technology University
Franhofer ILT; dstl (UK);
Renishaw Corp
Texas University; Mississippi State University
TTCP AER and MAT Groups
Lawrence Livermore National Laboratory (US)
International Accident Agencies: AAIB, NTSB, BEA, BFU, TSB
NAVAIR, NAWC (USN)
AFRL; FractureLab (US)
IMP (CA)
University of California, Davis (US)
Delft University (NL)

Aircraft Structures

Goal

To provide safety-critical aircraft structural integrity and airworthiness advice and solutions to the ADF through targeted partnerships, research and application of innovative science and technology.

Impact

Safety: The provision of critical test results and analyses as the evidence base required for airworthiness qualification under Australian configuration, usage and environment for aircraft such as the BAE Systems Hawk LIF & C-27J.

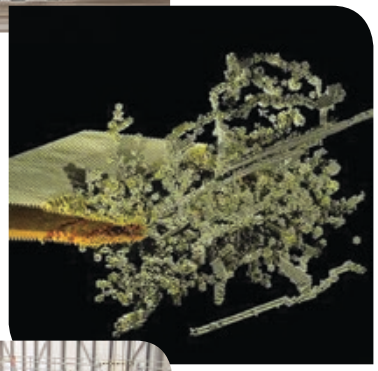
Costs: Advanced testing and analysis has provided Defence with significant cost avoidance or life extensions for aircraft such as F/A-18 Hornet ($400M saved) and AP-3C ($388M saved).

Capability: Ensuring full capability through maximising availability and readiness of air assets, eg, F/A-18 Hornet, PC- 9 and AP-3C. Contributing to a sovereign industry capability for aircraft sustainment via industry alliances, eg, QinetiQ.

Acquisition: Contributing to ADF's smart-buyer status through rigorous technical risk assessments. Our science has influenced development programs that will lead to significant long term future benefits eg, F-35 structural durability.

Future: World leading science has contributed to the advancement of aircraft structural integrity testing and analysis resulting in enhanced capability for ADF aircraft.

Airworthiness and Life Evaluation



Emerging Aircraft Structural Integrity

Structural Experimentation

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 25 DST Technical Reports
- 4 DST Client Reports
- 35 Journal articles
- 24 Conference papers
- 1 Book Chapter

PEER RECOGNITION

- ARC Expert College member
- 2 PhD examiners
- Editorial Board member
- TTCP AER Group National Lead
- National Delegate – International Committee on Aeronautical Fatigue and Structural Integrity

AWARDS

- Order of Australia AM 2016 (L Molent)
- Public Service Medal 2015 (S Barter)
- Minister's Award for Defence Science 2010 (L Molent)
- 2 TTCP AER Group Awards 2012, 2014
- Operational Service Medal (AOSM) – Civilian 2013
- Client Commendations: DCAF 2014, PM NACC 2013, CASA 2012, Dir AEPM 2011, DMO Engineering Award 2011
- Australia Day Medallions 2011, 2012
- DST Achievement Awards; Outstanding Contribution to Defence Outcomes 2011, Best Corporate Contribution 2012
- British Society for Strain Measurement, Best Paper Award 2015
- Best Paper in J. Expt Mech 2016

Partnerships and Outreach

UNIVERSITIES

RMIT University
Monash University
University of NSW Canberra
Swinburne University
Melbourne University

INDUSTRY

QinetiQ
Boeing
BAE Systems
AGAP
RUAG
Northrop Grumman
Lockheed Martin

GOVERNMENT

CASA

INTERNATIONAL

TTCP AER Group
NATO STO
RAF, Dstl (UK)
RCAF, NRC, Bombardier (CA)
USN NAVAIR, USAF AFRL & LMLC (US)
RNZAF, DTA (NZ)
Armasuisse (Switzerland)
Finnish Air Force
Leonardo – Finmechanica (Italy)
Delft University (NL)
Southampton University (UK)


DST
Science and Technology for Safeguarding Australia

Australian Government
Department of Defence
Science and Technology

Joint and Operations Analysis Division

DST Science and Technology for Safeguarding Australia

Aerospace Capability Analysis

Goal

To enhance ADF aerospace capability by providing expert, impartial, scientific advice informing acquisition decisions, supporting operations, and future-proofing Defence capability.

Impact

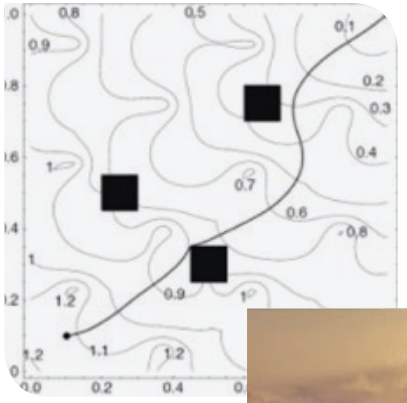
Aerospace Project Support: Supporting introduction into service of aerospace platforms such as F-35A, EA-18G, P-8A and MH-60R. Analysis is focused on integration into the wider force, informing CONOPS/tactics development and informing upgrade decisions.

Air Force Experimentation: Tested concepts of operations against planned force structure to inform Air Force about its future roles in delivering joint operational effects.

Plan Jericho: S&T research and advice has enabled broadening of capability options and developed innovative applications of new technology (HoloLens).

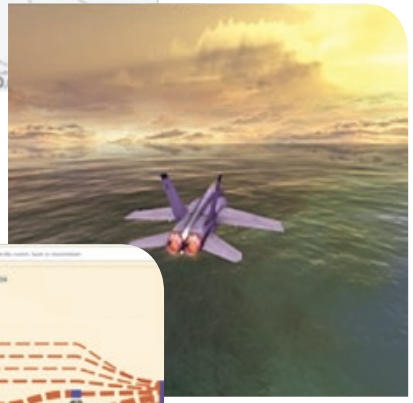
Air Warfare Centre: Established OA capability to allow Air Force to develop integrated air warfighting tactics (e.g. USAF Red Flag, RAAF Pitch Black).

Training Pipeline Analysis: Working with ADF aircrew training establishments to optimise training pipelines, including automation of course scheduling, improved data visualisation and resource use.

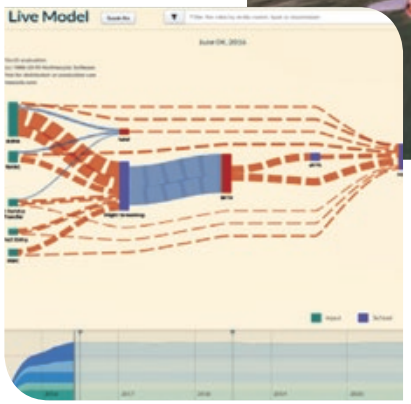


Aerospace Mathematical Sciences

Aerospace Organisation and Management Science



Aerospace Simulation, Experimentation and Wargaming



Aerospace Systems Analysis

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 15 DST Technical Reports
- 30 DST Client Reports
- 24 Journal Publications
- 51 Conference Papers

PEER RECOGNITION

- ARC Partner Investigator
- Adjunct Professor University of Melbourne
- Scientific Editor J. App. Econ.
- Journal reviewers: IEEE, Defence Technology and Electronics Letters

AWARDS

- AFP Commissioner's Certificate 2016 for MH17 investigation support
- ADF Gold 2011, Silver 2016, and Bronze 2016 Commendations for Rotary Wing work program
- Defence Operations Research Symposium best paper awards 2014, 2015

Partnerships and Outreach

UNIVERSITIES

RMIT University
University of Melbourne
University of South Australia
University of Tasmania
University of Queensland
University of Western Australia
University of NSW Canberra

INDUSTRY

Boeing
Northrop Grumman
SAAB Australia
RAND

GOVERNMENT

AFP

INTERNATIONAL

TTCP AER Group
Dstl, UK Air Warfare Centre, (UK)
USAF HQ AFRL
USN NAVAIR, OPNAV, NPS, NLR
University of Utah
Glasgow University
Georgia Tech Research Institute

Land Capability Analysis

Goal

To provide evidence and analysis to support decisions on Land force structure and capabilities, focussing on operational effectiveness through applying and developing operations research methods, tools and techniques.

Impact

Close combat: Evaluation of contributions made by elements of the Combined Arms Teams to close combat effectiveness is ensuring that Army has the required mix of capabilities to succeed at close combat into the future.

Ground combat enablers: Assessment and advice of the impact of various land combat enablers including situational understanding, C3 and combat support, as well as joint enablers, on the operational effectiveness of the reinforced combat brigade engaged in joint land manoeuvre.

Shape future Army: Providing whole of force evidence to support Army in the design and development of a robust and adaptive force for joint interagency land operations.

Analytical Wargaming: Developing a wargaming capability that fosters the application of wargaming analytical models and techniques for joint and land force design.

Land Simulation, Experimentation and Wargaming

Land Mathematical Sciences

Land Organisational and Management Sciences

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 15 DST Technical Reports
- 47 DST Client Reports
- 11 Journal Publications
- 27 Conference Papers
- 1 Book Chapter

PEER RECOGNITION

- TTCP LND Group National Lead for TP1 Soldier Combat Systems
- TTCP Contested Urban Environment Strategic Challenge Group, National Lead
- Military Operations Research Society, Board representative for Australia
- Australian Society for Operations Research (ASOR) member
- Australasian Bayesian Network Society; President-Elect

AWARDS

- Australian Army commendations 2012
- DST Bronze Commendation 2013
- Australia Day Award 2014
- 85th Barchi Prize Nomination
- Morry Frost Operations Research Award 2014

Partnerships and Outreach

UNIVERSITIES

University of South Australia
Deakin University
Monash University
University of NSW Canberra
Curtin University
Monash University

INDUSTRY

YTEK
Averill M. Law & Associates, Inc.
RAND
Ground Effects
Elmtek
Blue Swimmer
Consilium

INTERNATIONAL

TTCP LND Group
Naval Postgraduate School
US Army Training and Doctrine Command Analysis Center (TRAC)
US Center of Army Analysis (CAA)
Dstl, Cranfield University (UK)

Maritime Capability Analysis

Goal

To support evidence-based decisions on Navy's Force structure, concepts, acquisition of systems, operational effectiveness and capability management

Impact

Future Force: Conducting experimentation and analysis for Navy Strategic Command to support future warfighting concepts and force design. Established the needs case for Future Frigate.

Acquisition Projects: Combining operational knowledge with performance modelling to provide evidence informing decisions on requirements and options for maritime projects including Future Submarine and Future Frigate.

Current Fleet operations: Conducted research to support Fleet Command in transitioning from single-ship to Task Group level operations. Assessing the effectiveness of the surface and subsurface fleet informs major projects and Navy's Maritime Warfare Program.

Fleet Data: The Navy's assessment of operational performance, fleet optimisation, gap identification and exercise analysis has been enhanced through the development of a big data repository and an agile and comprehensive data analytics capability.

Maritime Mathematical Science

Maritime Simulation Experimentation and Wargaming

Maritime Systems Analysis

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 17 DST Technical Reports
- 28 DST Client Reports
- 10 Journal Publications
- 19 Conference Papers
- 1 Book Chapter

PEER RECOGNITION

- 1 Academic board membership – University of NSW
- 1 ARC Assessor
- Journal reviewers for; Ergonomics, SysEng, Ethics and IT
- ASOR National Conference secretary
- Professional Memberships of AustMS, IEEE, MORS, MSSANZ

AWARDS

- TTCP award 2014
- RAN Fleet Commander Bronze Commendation 2015
- DST Achievement Award for Outstanding Communication of S&T 2015, 2016
- Australia Day Medallion 2012
- Best Papers Defence Operations Research Symposium 2014, 2016

Partnerships and Outreach

UNIVERSITIES

Australian National University
Macquarie University
University of NSW
RMIT University
University of Adelaide

INDUSTRY

RAND
Defence Science Institute

INTERNATIONAL

TTCP MAR Group
Maritime Warfare Centre (UK)
UK, NZ & Netherlands Navies
US Navy/US Marine Corps
Indian Navy
Pakistan Navy
University of Bristol
University of Cambridge
UK Royal Society

Joint Capability Analysis

Goal

Support and enhance current and future Joint Force operations through the application of systems engineering, mathematical models, organisation and social science techniques, simulations, experimentation and operations research.

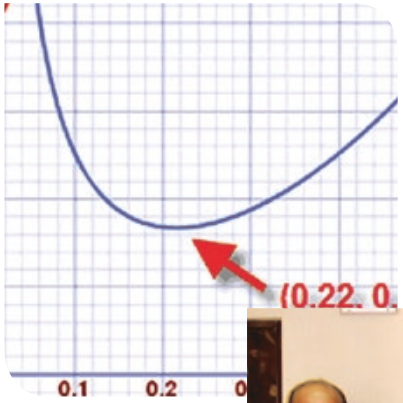
Impact

Integration by Design: Influence the development and adoption within the ADO of System of Systems engineering to achieve integration by design.

Project interdependencies: Analyse and evaluate system interdependencies to inform VCDF of Project interdependencies within the Integrated Investment Program (IIP).

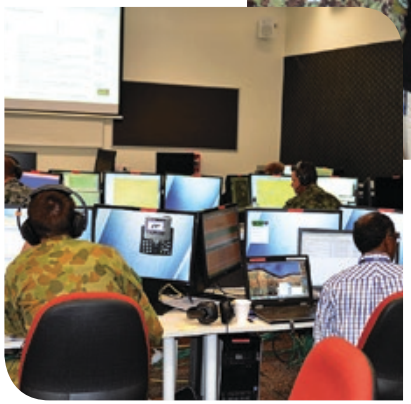
Joint Concepts Experimentation: Through undertaking testing and evaluation of concepts such as Joint Fires the ADF is better prepared and has an enhanced understanding of how to operate in complex joint operations.

Support to Operations: Enhanced mission effectiveness and reduced operational risk to the deployed force has resulted from the coordinated DST support to operations program. Research into improved methods to understand the human and cultural environment has provided key inputs into operational planning and conduct.



Joint Warfare Mathematical Science

Joint Organisation and Social Science



Joint Simulation, Experimentation and Wargaming

Defence Systems Integration

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 40 DST Technical Reports
- 21 DST Client Reports
- 50 Conference Papers
- 6 Journal Publications

PEER RECOGNITION

- Honorary Senior Research Fellow Oxford University
- Vice President Australian Society for Operations Research (ASOR)
- TTCP JSA Group Technical Panel 4 National Lead

AWARDS

- Australasian Evaluation Society Prize: Best Public Sector Evaluation 2013
- TTCP award (Systems of Systems Engineering) 2015
- Defence Gold Commendation 2013
- Defence Silver Commendation 2011

Partnerships and Outreach

UNIVERSITIES

University of Adelaide
University of Wollongong
Deakin University
Flinders University
University of NSW Canberra

GOVERNMENT

AFP
DFAT
Australian Civil Military Centre (ACMC)

INTERNATIONAL

TTCP JSA Group
DSTA (Singapore)
Dstl (UK)
Foreign and Commonwealth Office (UK)
Stabilisation Unit (UK)
University of Oxford
Kings College London

Strategic Capability Analysis

Goal

Aims to shape Defence and National security policy, strategy and capability by being DST's lead analytical capability for: Horizon scanning and technology foresight; Strategic context, risks and mitigation approaches; and, future whole-of-force design, force level capability trade-off analysis and prioritisation.

Impact

Defence strategic planning is informed by: Technology Foresighting: Impact of future environments and emerging technologies through Emerging and Disruptive Technology Assessment Symposia (EDTAS) and S&T Strategic Outlook.

Force Design: Analytical support to Defence's strong strategic centre is integral to VCDF's new Force Design approach and has a strong client embed model.

Strategic Analysis: Supporting identification and assessment of risks to Defence strategic policy, developing methods for, and supporting the analysis of strategic investment priorities to enhance Defence resilience, notably Defence's energy security.

Technology Forecasting and Futures

Force Design

Strategic Security Risk Assesment

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 19 DST Technical Reports
- 6 DST Client Reports
- 13 Journal Publications
- 45 Conference Papers

PEER RECOGNITION

- ANU Honorary Associate Professor
- ARC Grant Assessor
- ADFA Defence Grants Board
- Secretary of Defence Fellowship 2012, 2014
- CDS Fellowship 2016
- Defence International Fellowship 2015
- ADFJ Editorial Board
- TTCP JSA Group technical panel leads for TP-3 and TP-9
- Fellow of Dr. Schöller Research Center for Business and Society, Germany
- Members of; Australian Society of Operations Research, Institute for Regional Security, IEEE

AWARDS

- Defence Gold Awards 2011, 2014, 2016
- Australian Operational Service Medal 2015
- Best Paper InSITE 2014

Partnerships and Outreach

UNIVERSITIES

Australian Academy of Science
Australian National University
Flinders University

INDUSTRY

Noetic
Australian Strategic Policy Institute

GOVERNMENT

Attorney General's Department

INTERNATIONAL

TTCP JSA Group, Technical Panels 3 and 9
Dstl (UK)

Decision Sciences

Goal

Decision Sciences enables Defence and National Security to achieve a capability edge in decision making at the strategic and operational levels.

Impact

Fuel Network Review: Provision of advice and tools that assists Joint Logistics Command in understanding the Defence fuel network and its critical weaknesses and limitations.

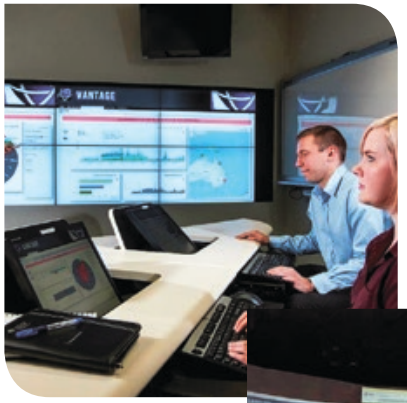
Directorate of Strategic Fuels: Advice on logistics estimate of surge requirements and supply options for marine and aviation fuels informing defence storage and supply contracts.

Commander: Decision instrument used by Australian Defence College to improve Joint Professional Military Education.

Situation Awareness Tools: Development of tools to enhance situation awareness in operations and exercises which were used by HQJOC in Op Fiji Assist.

HQJOC and HQ 1Div Modernisation: Data collection, analysis, modelling and simulation contributing to organisational enhancement.

5th Gen HQ Conceptualisation: Informing the development of next generation HQ structures and functions.



Command Intent

Situation Assessment

Planning and Logistics

Behaviour and Control

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 16 DST Technical Reports
- 9 DST Client Reports
- 34 Journal Publications
- 33 Conference Papers
- 1 Book

PEER RECOGNITION

- 2 Academic Board Memberships
- 2 Academic Fellows
- One CDS fellowship
- One Principal Scientist

AWARDS

- Defence Fellowship 2013–2016
- Secretary of Defence Fellowship 2014–2015
- ADF Journal Best Paper 2015
- Alphonse Chapanis Best Student Paper Award 2016

Partnerships and Outreach

UNIVERSITIES

University of South Australia
Melbourne University
Australian National University
University of Adelaide

INDUSTRY

Consunet Pty Ltd.
Elmtek Pty ltd.
KIAH Consulting
Data to Decisions CRC

GOVERNMENT

Bureau of Meteorology

INTERNATIONAL

TTCP C3I Group
SPAWAR (US)
University of Southampton
CTTSO (US)

DST | Science and Technology for Safeguarding Australia

Australian Government
Department of Defence
Science and Technology

Cyber and Electronic Warfare Division

DST | Science and Technology for Safeguarding Australia

Cyber Assurance and Operations

Goal

Enable autonomous, resilient and effective cyber capabilities with an operational edge in the face of ubiquitous encryption, untrustworthy ICT and a highly dynamic, sophisticated and perimeter-less threat environment.

Impact

Cryptologic capability: Application of expertise in cryptology and information assurance has ensured the safety and security of ADF troops and Australian government communications.

Trustworthy Systems: Increasing cyber resilience with the development and trials of prototype computer security devices in Defence and other government agencies.

Cyber Defensive Capabilities: Delivery of new cyber defensive capabilities to the Australian Cyber Security Centre (ACSC) and the Defence Security Operations Centre (DSOC)

Supporting Cyber Operational Capabilities: Provision of critical support to Defence and Australian Government agencies in cyber operations.

Providing Cyber Subject Matter Experts (SMEs): Integrees and secondees have provided highly valued contributions to clients, resulting in greatly improved effectiveness and innovative solutions, improved data visualisation and resource use.

Cyber- and Crypto-Mathematics Research

Cyber Defence Analytics

Active Security Technologies

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 30 DST Technical Reports
- 7 DST Client Reports
- 4 Journal Publications
- 11 Conference Papers
- 10 joint publications

PEER RECOGNITION

- Adjunct position & three visiting fellows at Australian National University (ANU)
- Advisory board – Australian Centre for Cyber Security (ACCS)
- Journal reviewers – Microprocessors and Microsystems, ACM Computing Surveys
- Conference Program Committees – Australasian Information Security Conference, Australian Cyber Security Centre Conference, Australasian Web Conference

AWARDS

- Prime Minister's letter of appreciation 2014
- Commendation from US Department of Homeland Security 2015
- ASD Merit Award 2016
- 2 ASD Exceptional Achievement Awards 2016
- ASD Australia Day Awards 2014, 2016
- 2 ASD Certificates of Appreciation 2015
- AISC Best Paper 2015
- South Australian iAward 2014

Partnerships and Outreach

UNIVERSITIES

University of NSW
Australian National University
University of South Australia
Defence Science Institute
University of Wollongong
Edith Cowan University
Deakin University
Macquarie University

INDUSTRY

Northrop Grumman
Cyber Security Growth Centre

GOVERNMENT

Data61/CSIRO

INTERNATIONAL

TTCP Cyber Security Challenge
US Department of Homeland Security
Dstl (UK)
University of Waikato (NZ)

Cyber Sensing and Shaping

Goal

Delivery of concepts techniques and technologies for sensing and shaping modern communication networks to address challenges in cyber and related areas of signals intelligence.

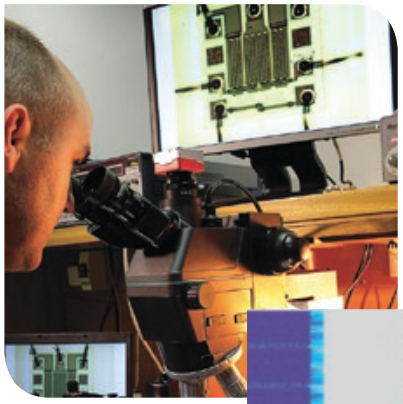
Impact

Operational Support: To the Australian Intelligence Community and ADF through provisioning of unique S&T capability and SME advice; enduring presence at the Joint Defence Facility Pine Gap (JDFPG).

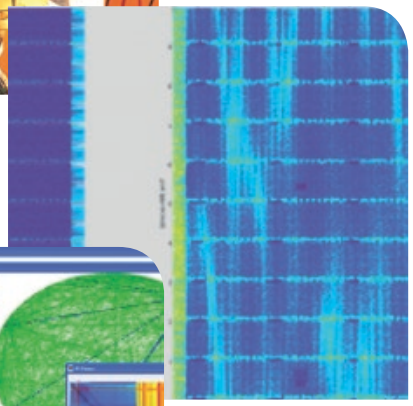
Facilitate Cyber Operations across the EM spectrum: Development and operational deployment in 2016 of physical and cross-layer signal processing with innovative physical-to-network layer technologies for the security and exploitation of fixed and wireless telecommunications and free space optical networks.

Support to Cyber Network Situational Awareness: Develop operational solutions to enhance network knowledge through characterisation, modelling and analysis of telecommunication core networks.

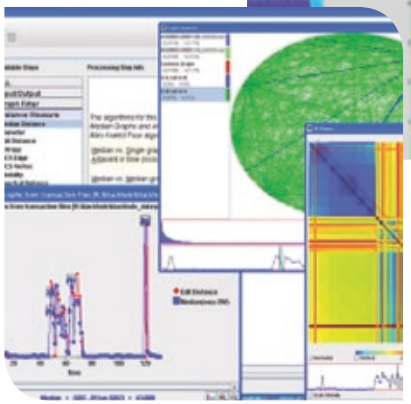
Advanced technologies: Development and delivery of specialised body worn antennas and SDR-based waveforms for cyber access and tailored wireless links.



Access Technologies



Communications Signal Processing



Communications Networks Research

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 36 DST Technical Reports
- 5 Journal articles
- 23 Conference Papers

PEER RECOGNITION

- 2 adjunct academics
- TTCP Cyber Strategic Challenge National Lead
- TTCP Cyber Strategic Challenge EM Cyber Lead
- Joint Chair of SIGINT Applications of Network Analysis Research (SANAR) organising committee

AWARDS

- Australia day medallion 2013
- Five Eyes SIGINT awards 2014, 2017
- CEWD award for client impact 2015

Partnerships and Outreach

UNIVERSITIES

University of Adelaide
University of South Australia
Australian National University
Swinburne University
University of New South Wales

INDUSTRY

Ebor
Data to Decisions (D2D) CRC
Quintessence Labs

GOVERNMENT

National Security Agencies
CSIRO / Data 61

INTERNATIONAL

Five Eyes
International Joint Program at JDFPG
NATO STO
NRL (US)
TTCP Cyber Strategic Challenge
US DHS

Assured Communications

Goal

Develop survivable tactical communications and electronic warfare solutions for contested and denied cyber electromagnetic environments.

Impact

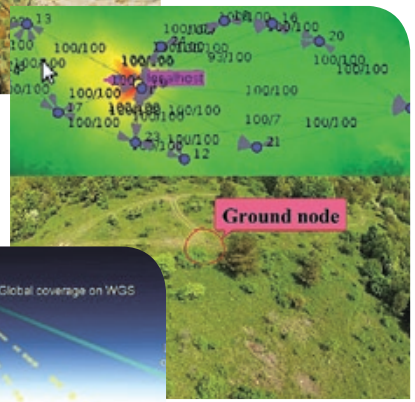
Saving Lives: Prevent battlefield casualties of ADF and coalition soldiers by developing practical systems that defeat improvised explosive devices for production on an industrial scale. 160,000 units delivered and hundreds of lives saved in the last few years.

Protected Satellite Communications: Delivered specialised satellite communications for submarines and land vehicles on the move. Built customised communications monitoring and management systems for ADF network operations centre.

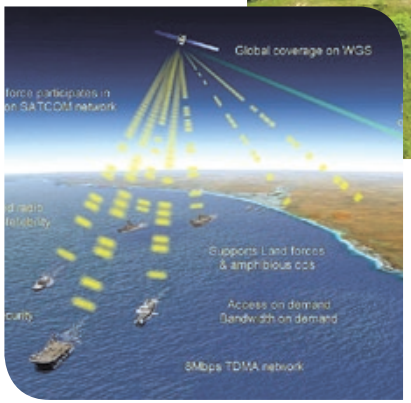
Survivable Network Research: Developed autonomous UAV systems that can maintain radio communications networks that are under electronic warfare attack.

Protocol Exploitation: Developing machine learning systems that can respond to novel cyber and electronic warfare attacks in real time. Developing solutions to mitigate radio interference.

Communications Electronic Warfare



Survivable Networks



Protected Satellite Comms

Protocol Exploitation

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 39 DST Technical Reports
- 58 DST Client Reports
- 5 Journal Publications
- 23 Conference Papers

PEER RECOGNITION

- Adjunct professor University of South Australia
- PhD co-supervisor
- TTCP C3I Group Technical Panel lead

AWARDS

- Public Service Innovation Award – REDWING Team 2016
- Chief of Army Commendation for Counter IED 2014
- Chief of Navy Commendation 2015
- DST Award – MH370 Aircraft investigation 2015
- Best Paper Land Forces Conference 2016

Partnerships and Outreach

UNIVERSITIES

University of Adelaide
University of South Australia
Monash University
University of New South Wales

INDUSTRY

Micreo
Ultra Avalon
Lintek
Diemould
AES
IMP

GOVERNMENT

Attorney General's Department
ANZ Counter-terrorism Centre
State and Federal Police
Air Transport Safety Bureau

INTERNATIONAL

TTCP EWS and C3I Groups
TTCP Cyber Challenge
USN Postgraduate School, SPAWAR
US Army CERDEC
Five-Eyes Working Group

Systemic Protection and Effects

DST

Goal

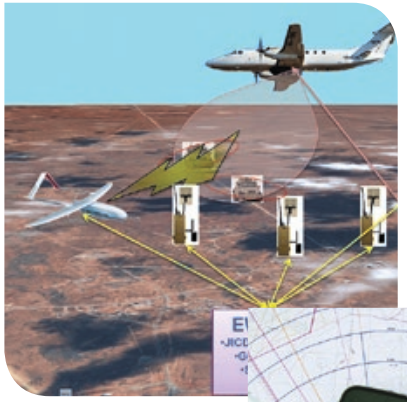
Maximise Australian Defence and National Security capability through the development and delivery of solutions for the integration of force-level Cyber and Electronic Warfare (EW) with effective command and control.

Impact

Joint Force Level Electronic Warfare (JFLEW): Supporting the implementation of JFLEW through close engagement with Airborne Electronic Attack and Joint Intelligence, Surveillance, Reconnaissance and EW (ISR&EW) Defence programs as well as experimentation with user groups, international exercises and engagement with overseas partners developing C2 tools for this application.

F/A-18 threat geolocation: Working closely with the US Navy to jointly develop significant improvements to USN and Defence's emitter location and classification capability that is in the process of being fitted to Australian Air Force and US Navy aircraft.

Position Navigation and Timing (PNT) resilience: Contributing to the assured access of PNT for the ADF. Enabling training and OT&E opportunities in GPS degraded environments. Development and application of advanced PNT threat concepts.



Distributed Electronic Warfare Experimentation and Simulation

Position Navigation and Timing Technology and Systems

Automated Analytics and Decision Support

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 14 DST Technical Reports
- 15 DST Client Reports
- 7 Journal Publications
- 17 Conference Papers
- 1 Book Chapter

PEER RECOGNITION

- Two adjunct professorships – Adelaide University and University of South Australia
- TTCP EWS Group and Panel national leads

AWARDS

- USN Commendation 2016
- TTCP Award 2016
- 3 DST Commendations

Partnerships and Outreach

UNIVERSITIES

Australian National University
Adelaide University
University of NSW

INDUSTRY

Aerosonde (AAI)
Consunet
Swordfish
Simbiant
SAAB
GPSat Systems

GOVERNMENT

National Positioning Infrastructure

INTERNATIONAL

TTCP EWS Group
USAF
USN NRL
US Geo-spatial Agency
DRDC (CA)
Five-Eyes. 11-Eyes

Spectrum Sensing and Shaping

Goal

To develop and transition RF technologies, techniques and systems that sense and shape the EM Battlespace to support EW, SIGINT and Cyber operations, in complex, contested and congested EM environments.

Impact

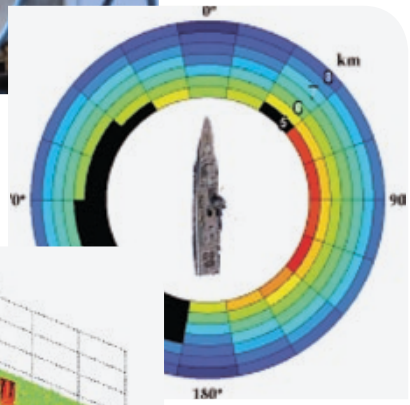
Nulka: Ongoing support to multiple phases of SEA 1397, ensuring the protection of RAN major combatants against current and future anti-ship missile threats. Development of RF technologies and low size weight and power electronic warfare payloads to support the future force.

Wideband and Multi-channel Digital Electronic Support Systems: Development and transition of world leading wideband and multi-channel digital electronic support systems for improved ADF electronic support and signals intelligence capabilities. Prototype wideband system used in cooperative program with US Navy.

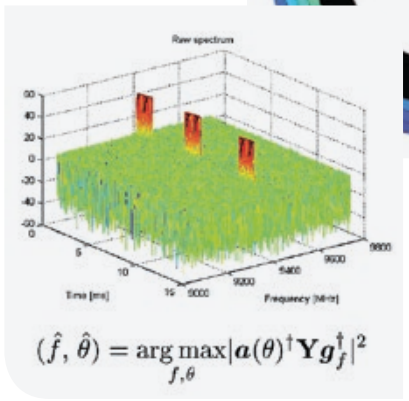
Electronic Support and Signals Intelligence Data Deluge: Development and transition of algorithms and applications to enhance ADF electronic support and signals intelligence capabilities in future EM operating environments.

Enhanced Situational Awareness: Development and transition of algorithms and applications to enhance ADF situational awareness, including environmental effects, in future EM operating environments.

Radio Frequency Systems



Radio Frequency Technologies



$$(\hat{f}, \hat{\theta}) = \arg\max_{f,\theta} |\boldsymbol{a}(\theta)^{\dagger} \mathbf{Y} \boldsymbol{g}_f^{\dagger}|^2$$

Radio Frequency Techniques and Exploitation

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 8 DST Technical Reports
- 6 DST Client Reports
- 19 Journal articles
- 43 Conference Papers

PEER RECOGNITION

- 4 Adjunct Senior Lecturers
- 3 PhD Co-supervisors
- Advisory committee – Adelaide University
- TTCP EWS Group TP6 National Leader

AWARDS

- DST Achievement Award 2015, 2016
- DST Team Bronze Commendation 2015 (2), 2016
- First prize student paper 2015
- Top 3 most downloaded papers in IEEE Transactions on Antennas and Propagation, 2015

Partnerships and Outreach

UNIVERSITIES

Macquarie University
Adelaide University
University of Sydney
Flinders University

INDUSTRY

Micreo
BAE Systems
Ultra Electronics
Jenkins Engineering Defence Systems
Solinov, Macom, Lintech
Puzzle Precision, Curtiss-Wright

GOVERNMENT

CSIRO
Bureau of Meteorology
Australian Institute of Marine Science

INTERNATIONAL

TTCP EWS Group
US Navy; ONR, NAVAIR, NAVSEA, SPAWAR
Dstl (UK)
Arizona State University
Air & Space Interoperability Council (Five Eyes)

Electronic Warfare Operations

Goal

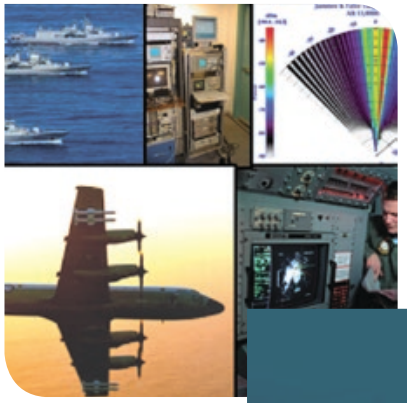
To enhance the survivability of the ADF by understanding, detecting and defeating threats using the electromagnetic spectrum.

Impact

Countermeasure Development & Validation: Initiation and delivery of a RAAF/DST process that has reached final operating capability which enhances airborne platform battle-worthiness through the development and validation of electronic countermeasures of 13 ADF aircraft types.

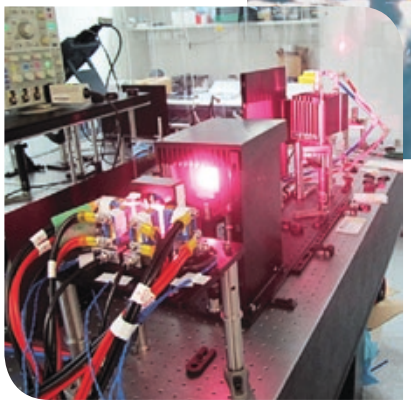
Laser Technology Development and Licensing: World leading mid-infrared fibre laser technology enabling future 'game changing' battlespace capabilities with a strong record in S&T excellence, innovation, and a growing IP portfolio. Technology transfer of a Directed Infrared Counter Measure (DIRCM) laser to Defence Industry through a licensing agreement.

Current and Future ADF Platform Protection: Theoretical research, hardware-in-the-loop testing and field experimentation demonstrating the survivability of current and future ADF platforms. Survivability can be enhanced through advanced Radio Frequency Electronic Attack techniques in a layered defence.



Radio Frequency Electronic Attack

Electro-Optic Counter Measures



Laser Technologies

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 54 DST Technical Reports
- 44 DST Client Reports
- 87 External Publications
- 21 Joint Publications

PEER RECOGNITION

- 1 ARC assessor
- 1 University board member
- Adjunct Senior Lecturer (USA)
- Australian Institute of Physics National Executive member
- PhD co-supervisor
- TTCP EWS National lead

AWARDS

- Public Service Medal 2012 (M Pitt)
- PM's Award for Excellence in Public Sector Management 2013
- PM's Award for Innovation 2013
- Australia Day Medallion 2012, 2016
- UK MoD CSA Commendation Award 2013
- 2 NATO STO Awards 2013, 2014
- TTCP Achievement Award 2012
- Defence Support Services Commendation Gold and Bronze Awards 2015
- 4 DST Awards 2012, 2013, 2014, 2015
- SPIE best paper award 2015

WORLD RECORDS

- 400 W 2.1um CW fibre laser
- 99 W MWIR DIRCM laser source

Partnerships and Outreach

UNIVERSITIES

Adelaide University
University of South Australia
Macquarie University
University of Sydney
Flinders University

INDUSTRY

BAE Systems
Airbus Group Australia Pacific
Chemring
Thales
elmTek
SysTech
Sub-Micron
Aether Photonics

GOVERNMENT

AFP

INTERNATIONAL

TTCP EWS Group
NATO STO
Dstl (UK)
DRDC (CA)
MELCO, Shinkosha (JPN)
Airbus DS, DESY (GER)
AFRL, NRL, ONR (US)
NAVSEA, NAVAIR, NSWC (US)
MSIC/ NASIC, ASE/CTE (US)
Nufern (US)
ADD-ROK (Korea)
University of Southampton
Rochester Institute

DST | Science and Technology for Safeguarding Australia

Australian Government
Department of Defence
Science and Technology

Weapons and Combat Systems Division

DST Science and Technology for Safeguarding Australia

Tactical Systems Integration

Goal

To enable the ADF to conduct joint and coalition tactical operations with seamless integration and interoperability of current, planned and next generation platforms and systems with tactical decision superiority and high degrees of automation and autonomy.

Impact

Interoperability: Enhanced interoperability through intrinsically interoperable tactical battlespace architectures for advanced joint tactical systems.

Open Architectures: Intrinsically secure and adaptable systems through open, modular, distributed and scalable tactical systems architectures.

Decision Superiority: Timely and effective tactical force-level response decisions through increased use of automation/ autonomy and operator decision aids.

Human teaming: Enhanced tactical mission effectiveness through improved team composition, operations room design, and human-human, human-machine and autonomous/automated teaming.

Human and Autonomous Decision Superiority

(TI3) Tactical Information Integration and Interoperability

Adaptive Information Architectures

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 3 DSTO Technical Reports
- 9 DSTO Client Reports
- 2 Journal Publications
- 10 Conference Papers
- 2 Book Chapters

PEER RECOGNITION

- 4 Society Memberships
- 1 ARC Examiner
- 1 Adjunct Position
- 5 Journal Reviewers

AWARDS

- Australia Day Council Award 2016
- 2 TTCP Awards 2016
- DST award 2016

Partnerships and Outreach

UNIVERSITIES

University of Adelaide
University of South Australia
University of Western Sydney

INDUSTRY

Boeing Defence Australia
SAAB Australia
Lockheed Martin Aerospace
BAE Systems

INTERNATIONAL

TTCP AER, MAR, LND and HUM Groups
NATO STO
US Navy
Dstl (UK)
DRDC (CA)
Object Management Group

Tactical System Performance Assessment

Goal

To enable a tactical performance advantage for the ADF in complex contested environments, underpinned by innovation in modelling, simulation, analysis and experimentation.

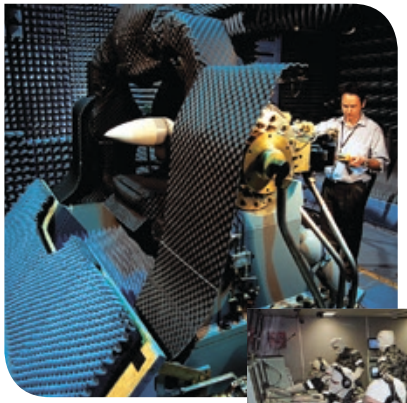
Impact

Weapons Technical Intelligence: Applying modelling and simulation of threat weapon systems to the MH17 incident has lead to a better understanding of what really happened.

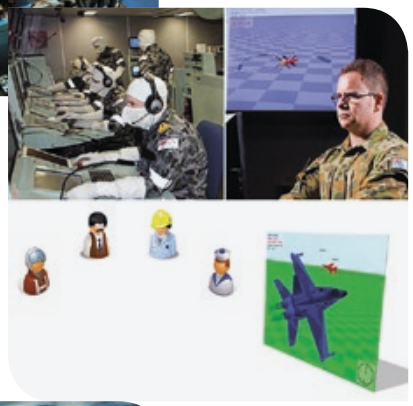
Integrated Air and Missile Defence: An integrated, closed loop simulation of a real threat scenario resulted in development of optimised tactics for Naval survival.

Integrated Air and Missile Defence: Conducting a virtual experiment of the Frigate ops room layout has reduced the risk of a sub-optimal ops room design for SEA5000.

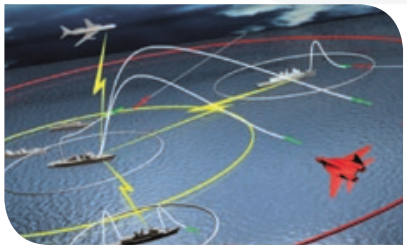
Land Active Protection Systems: Constructive modelling and simulation of Active Protection System concepts is enabling the evaluation and integration of future technologies for LAND400.



Weapons Systems Evaluation



Tactical Systems Modelling and Simulation



Tactical Systems Assessment

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 13 DST Technical Reports
- 45 DST Client Reports
- 7 Conference Papers

PEER RECOGNITION

- 2 ARC examiners
- 3 journal reviewers
- 6 Society memberships
- TTCP WPN Group TP8 National Lead

AWARDS

- Australian Intelligence Community Award 2016
- DST Achievement Award 2016
- 2 x CDS Gold Commendations 2016

Partnerships and Outreach

UNIVERSITIES

Adelaide UniversityIndustry
Saab Australia
Shoal
Consilium

INTERNATIONAL

TTCP WPN Group
Dstl, MBDA (UK)
TNO (Netherlands)
NATO STO
DRDC (CA)
Intelligence Community (5-eyes)
USN NAVSEA

Weapon Systems Technologies

Goal

To apply the science and technology of sensors, intelligent processing and electromagnetic interactions to weapons and tactical systems to enhance war fighting capability in a complex contested battlespace.

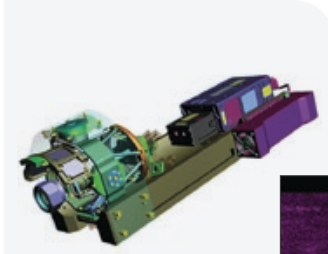
Impact

Advanced Weapon Technologies: Development of novel photon detector and ladar technology is leveraging access to international co-developments.

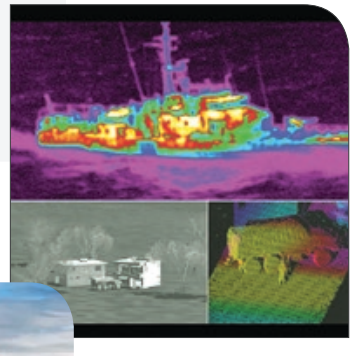
Technical Intelligence: DST VIRSuite scene generation software has been adopted by our international partners as an integral part of joint threat assessments.

Future War Fighting Concepts: Collaborative weapon concepts and autonomous tactical response options are being developed for future complex and high-tech conflicts.

Interoperability and EM Protection: Accurate Target Location Error analysis has been undertaken for RAAF precision guided weapons, enabling F/A-18A integration with coalition forces. EM studies have ensured safe and non-degraded operation of JDAM-ER, ASRAAM and RF systems being procured under projects AIR6000, SEA1448, AIR7000 and SEA 4000 and contributed to high power microwave directed energy capability development under project JP154.



Weapon Seekers and Tactical Sensors



Sensor Processing and Algorithms

Collaborative Weapons and Autonomous Response

Electromagnetic Effects Characterisation and Control

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 39 DST Technical Reports
- 19 DST Client Reports
- 21 Journal Papers
- 16 Conference Papers
- 3 Patents

PEER RECOGNITION

- ARC Reviewer
- Adjunct Professor
- 4 PhD Examiners
- 5 Journal Reviewers
- Chair TTCP WPN Group
- 3 Intl. Conference Committee Members

AWARDS

- 2 MBDA (UK) Innovation Awards 2013, 2015
- UK MOD Chief S&T Advisor Commendation 2014
- TTCP Award 2014
- 2 DST Achievement Awards 2015
- 2 Chief of Air Force Commendations 2016
- 2 Civilian Operation Service medals 2013, 2015
- Australia Day Medallion 2016, 2017
- DST Award for Outstanding Communication of S&T 2016
- CDS Gold Commendation 2015

Partnerships and Outreach

UNIVERSITIES

University of Adelaide
University of Western Sydney
University of NSW
Monash University
RMIT University
Australian National University
Deakin University

INDUSTRY

Fraunhofer IZM
BAE Systems
Teledyne Defence Australia

GOVERNMENT

ANSTO
Government of South Australia

INTERNATIONAL

TTTCP WPN Group
USN NAVAIR
DRDC (CA)
MoD E3, Dstl (UK)
USAF AFRL, AFSEO
BAE Systems, MBDA, AWC (UK)
Kongsberg
Milan Politechnic
JAEA (Japan)
FSTD (Singapore)

Energetic Systems and Effects

Goal

To conduct fundamental and applied scientific research in Energetics (materials, systems, effects) in collaboration with academia, industry and international partners to deliver high-impact outcomes for Defence and National Security.

Impact

Enabling Future Weapons: Advanced research and development of next-generation propulsion, explosives and warhead technologies in collaboration with international partners is enabling game-changing Defence capabilities.

Countering Current and Emerging Threats: As Australia's primary source of deep expertise in energetic systems (including IEDs and flares), the MSTC is responsive to time critical Defence and National Security requirements.

Operational and Intel Advice: Specialist research and analysis provided to Defence and Intelligence agencies enables informed decisions on explosive ordnance to protect the warfighter from current and evolving threats.

Safe and Effective Explosive Ordnance: In-house knowledge and research is ensuring the safety and effectiveness of frontline ADF weapon systems and has saved Defence over $50m in acquisitions and averted fatal risks to personnel.

Explosives and Pyrotechnics

Weapons Propulsion

Warheads and Effects

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 29 DST Research Reports
- 62 DST Client Reports
- 17 Journal Publications
- 62 Conference Papers
- 2 Book Chapters

PEER RECOGNITION

- 3 Associate Professor and Lecturer Positions at Flinders University
- Adjunct Professor at University of SA
- 3 PhD Supervisors
- 6 Journal Reviewers
- TTCP WPN Group 2 TP National Leads
- Fellow Royal Australian Chemical Institute
- Membership of American Chemical Society, Royal Society of Chemistry and International Pyrotechnics Society

AWARDS

- PM's Award for Excellence 2013
- CTTSO 10 Years Outstanding Service 2016
- TTCP Awards 2012, 2016
- Chief of Air Force Commendation 2016
- AFP Commissioner Award 2016
- CDS Gold Commendation 2015
- Australia Day Medallion 2013
- DST Achievement Award in Technical Excellence and Outstanding Corporate Contribution 2016

Partnerships and Outreach

UNIVERSITIES

Flinders University
University of Victoria
Australian National University,
University of NSW Canberra
University of Queensland
University of Adelaide

INDUSTRY

Thales Australia
Chemring
DefendTex
Frazer-Nash

GOVERNMENT

AFP
Attorney General's Department

INTERNATIONAL

TTCP WPN Group
USAF AFRL
ARDEC (US)
MBDA and DOSG (UK)
CTTSO (US)
University of Manchester

DST | Science and Technology for Safeguarding Australia

Australian Government
Department of Defence
Science and Technology

National Security and ISR Division

DST | Science and Technology for Safeguarding Australia

Intelligence Analytics

Goal

Intelligence Analytics adds value to Australia's defence and national security by improving the situational awareness of Australian intelligence analysts.

Impact

Biometrics: Biometrics has informed the procurement strategy for the Australian Passports Office through studies into Facial Recognition Algorithms, developed eFace technology, and assisted with the National Biometrics Matching Capability with the Australian Intelligence Community.

Information Fusion: Information fusion capabilities are sought after by allied nations. The MSTC is engaged in Five Eye collaboration through various international programs (TTCP and Squaredance).

Visual Analytics: Development of analytic software to mitigate procurement risk of DEF100 by refining requirements for GEOINT analysts.

Social Media Exploitation: Providing intelligence value from Open Source INT for Army Situational Understanding and NS clients - includes human domain understanding, information dissemination and influential actors.

Analytic Interaction

Language Technology and Fusion

Human and Social Modelling and Analysis

Biometrics

Multi-Intelligence Analytics

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 14 DST Technical Reports
- 24 DST Client Reports
- 10 Journal Publications
- 20 Conference Papers
- 3 Book Chapters

PEER RECOGNITION

- Executive Chair TTCP C3I Group
- TTCP CUESC Australian Event Lead
- 11 Adjunct University Appointments
- 2 ARC Assessors
- 4 PhD Supervisors
- 13 Professional Memberships

AWARDS

- 3 Australian Operational Service Medals with 4 clasps 2014
- NATO Medal with clasp 2009, 2012
- AIC Team Award 2016
- DST SRI Fellowship (2015-18)
- IEEE Harry Rowe Mimno Paper Award 2015

Partnerships and Outreach

UNIVERSITIES

Flinders University
University of South Australia
University of NSW
University of Adelaide
University of Melbourne
Swinburne University
Queensland University of Technology
Victoria University

INDUSTRY

Swordfish
Cognitec
NEC
SAFRAN
3M
Aware
Westbourne
Raytheon
CSRA
Appen
LDC
Data to Decisions CRC
Consilium
Source Forge

GOVERNMENT

Australian Intelligence Community
CSIRO, DATA 61
Government of South Australia

INTERNATIONAL

TTCP C3I Group
TTCP Contested Urban Environment Strategic Challenge (CUESC)
Squaredance
DARPA, ONR, ARL (US)
US Intelligence Community

Information Integration

Goal

To develop and demonstrate advanced integrated intelligence, surveillance and reconnaissance (ISR) capabilities supporting Defence decision superiority.

Impact

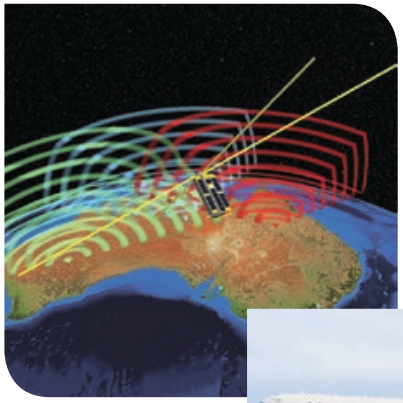
Strategic ISR Systems Analysis: Informing the integration of new AIR 7000 ISR capabilities into the Defence enterprise.

ELIIXAR: The Evolutionary Layered Integrated ISR eXemplar ARchitecture is guiding the DGS-AUS(I) ISR exploitation environment for Air Force, and informing the acquisition methodology for JP 2096 for CIO Group.

SERVAL: A DST pilot project providing cost-effective, high quality geospatial imagery from commercial satellites to users across Defence.

Multi-sensor Tracking: DST advanced algorithms underpin the ISR capabilities of the Jindalee Operational Radar Network and the Wedgetail airborne early warning and control aircraft.

Small Satellite Missions: Biarri and Buccaneer are positioning Defence to exploit responsive, low-cost spacebased capabilities.



Strategic Systems Analysis

Data and Information Fusion

Information Architectures

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 4 DST Technical reports
- 25 DST client reports
- 23 Journal publications
- 32 Conference Papers

PEER RECOGNITION

- 3 Adjunct university appointments
- 2 ARC assessors
- 3 PhD supervisors
- 2 PhD examiners
- 5 journal reviewers
- 2 IEEE Journal Associate Editors
- 1 IEEE AES Board of Governors member
- TTCP ISTAR Group TP1 chair

AWARDS

- DST awards for outstanding contribution to Defence outcomes 2014 and 2015
- DST awards for science excellence 2013 and 2015
- TTCP award for multi-Sensor Integration 2011
- 5 Best Paper awards at recent Fusion conferences

Partnerships and Outreach

UNIVERSITIES

University of Queensland
University of South Australia
RMIT University
University of Melbourne
Monash University
University of New South Wales (Sydney and Canberra)
Sydney University, Western Sydney University
Australian National University

INDUSTRY

Boeing Defence Australia
BAE Systems
Price Waterhouse Coopers
Agent Oriented Software
Bayesian Intel
Lockheed Martin
Northrop-Grumman
Airbus Defence and Space
General Dynamics (NZ)
Pumpkin
Tyvak
Cal Poly
Shoa

INTERNATIONAL

TTCP ISTAR Group
Dstl (UK)
FGAN (Germany)
Square Dance
Responsive Space MOU (10 Nations)
US Naval Postgraduate School

Intelligence Systems

Goal

Research, develop and transition advanced Geospatial Intelligence (GEOINT), imagery Measurement and Signatures Intelligence (MASINT), and automated GEOINT processing to enhance Australia's Intelligence, Surveillance and Reconnaissance (ISR) capabilities

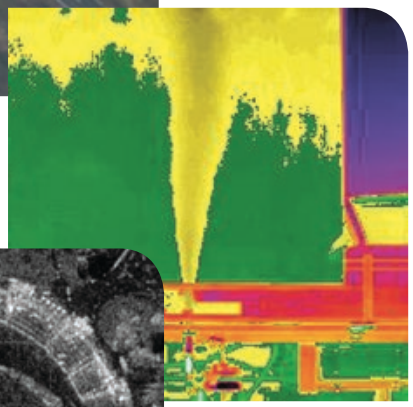
Impact

Advanced Sensing: Development of advanced sensing techniques for difficult environments using hyper-spectral and imaging radar. Demonstrated capabilities in airborne trials, provided advice to ADF for ISR and equipment signatures.

MASINT Techniques: New persistent techniques demonstrated leading to operational evaluation, new temporal techniques trialed and demonstrated with international partners.

Automated GEOINT Processing: New techniques and processing capabilities transitioned to limited operations, demonstrated new real-time target detection capabilities for video and radar maritime ship classifier, investigated new automated GEOINT processing architectures for technical risk reduction.

Advanced Geospatial-Intelligence Exploitation



Electro-Optic Processing and Exploitation

Radar Processing and Exploitation

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 7 DST Technical Reports
- 2 Journal Publications
- 39 Conference Papers

PEER RECOGNITION

- 1 ARC and 1 NASA reviewer
- 4 PhD examiners, 4 PhD Supervisors
- 2 PhD Awards, 2 Visiting Research Fellows
- 10 journal reviewers
- TTCP Contested Urban Environment (CUE) Lead
- TTCP ISTAR Group Australian Lead

AWARDS

- 3 Square Dance Arnold Awards 2011, 2013, 2014
- Square Dance Pranke Award 2012
- 2 TTCP Awards
- 1 Defence Meritorious Unit Citation Award
- 1 Defence Support Services Silver Commendation 2011
- 1 NATO Award 2014
- US Defence National Intelligence Citation 2012
- DST Awards 2011, 2012, 2014, 2015

Partnerships and Outreach

UNIVERSITIES

University of Adelaide
University of NSW
University of Technology Sydney
Swinburne University
Data to Decisions (D2D) CRC

INDUSTRY

Rheinmetall
BAE Systems
Hawker Pacific
Lockheed Martin
Swordfish
SAAB Systems
VCorp

GOVERNMENT

Bureau Of Meteorology
Department of Foreign Affairs and Trade

INTERNATIONAL

Square Dance
TTCP ISTAR Group
Dstl (UK)
NATO STO
US Air Force, Navy and Army research laboratories

Surveillance and Reconnaissance Systems

Goal

To provide Australia with a surveillance and reconnaissance edge by exploiting active and passive radar technologies, advanced signal processing, and radar signature prediction, measurement and exploitation.

Impact

Wedgetail: Provided critical technical advice and solutions to enable the Wedgetail system to provide the world's best AEW&C capability. Providing ongoing advice on capability edge sustainment.

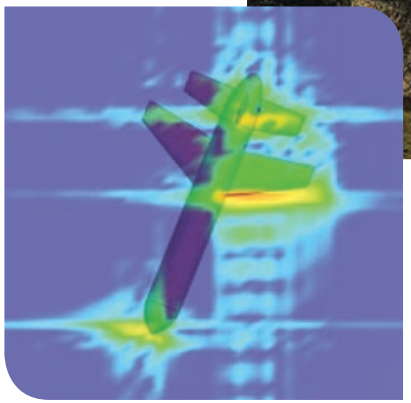
Signature Management: Provided critical advice on the control and management of the radar signatures of ADF weapon systems, including time critical advice to support specific operational objectives.

Radar System Evaluation: Conducted research and provided advice to enable the ADF to make appropriate decisions regarding selection, use and expected performance of radar systems.

Passive Coherent Location: Demonstrated the operational effectiveness of passive coherent location technology to the ADO.

Surveillance Modelling and Analysis

Microwave Radar Systems



Radar Signatures and Phenomenology

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 25 DST Technical Reports
- 22 DST Client Reports
- 60 Journal Publications
- 138 Conference Papers

PEER RECOGNITION

- 1 Adjunct university appointment
- 3 PhD supervisors
- 1 IEEE AES Board of Governors member
- 4 journal reviewers
- TTCP ISTAR Group Technical Panel Australian Lead
- NATO SET Panel Australian Lead

AWARDS

- Ministers Award for Defence Science 2011 (C Anderson)
- Gold award for excellence in public sector management 2013
- DST Award for Outstanding Contribution to Defence Outcomes 2014
- DST Award for Science and Engineering Excellence 2016
- Best Paper Awards at International Radar Conference 2014, 2015

Partnerships and Outreach

UNIVERSITIES

University of Adelaide
University of South Australia
University of Melbourne
RMIT University
University of Queensland
Curtin University
Macquarie University
University of NSW Canberra

INDUSTRY

Northrop Grumman
Boeing Defence Systems
CEA Technologies
Daintree Systems
Rheinmetall Defence
Solinnov
Raytheon Teledyne Australia

INTERNATIONAL

TTCP ISTAR Group
NATO SET Panel
USN NAVAIR, ONR, NRL
Fraunhofer FHR (Germany)
Dstl, RAF (UK)
University College London
Arizona State University
University of Dayton
University of Pennsylvania,
University of Pisa
Colorado State University

High Frequency Radar

Goal

Conduct R&D into high-frequency over-the-horizon radar to enhance and sustain Australia's wide-area air and surface vessel surveillance capability.

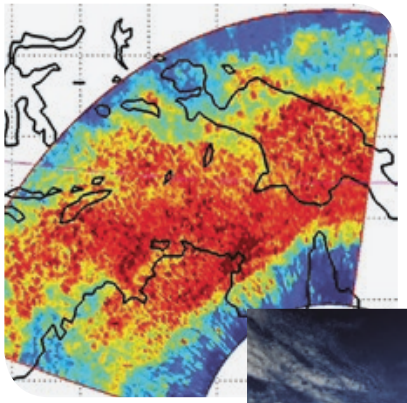
Impact

Operations: JORN daily support; R&D transitioned to capability with extended coverage, improved detection sensitivity, clutter and interference rejection, EW suite.

Sustainment: JORN component replacement integrity; development of specialised equipment design options.

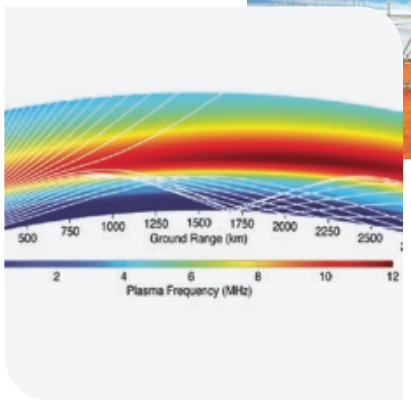
Acquisition: Capability options; technical and industry workforce risk reduction through the JORN Priority Industry Capability (PIC) Program; system design and assessment; modelling; experimentation and demonstration.

Future Proofing: New radar design and high-fidelity instrumentation aiming for significant detection sensitivity and persistence improvement.



Signal Processing and Propagation

Radar Technology and Systems



Geophysical Phenomenology and Performance Assessments

S&T Excellence

THREE YEAR PUBLICATION RECORD

- 4 DST Technical Reports
- 12 Journal Publications
- 20 Conference Papers

PEER RECOGNITION

- 1 ARC Assessor
- 3 Adjunct Lecturers University of Adelaide
- 1 Adjunct Research Fellow University of Adelaide
- 1 IEEE Fellow
- 1 IEEE Senior Member
- 1 IEEE Associate Editor

AWARDS

- US INT Community Awards 2009, 2016
- 2 DST S&T Excellence Awards 2014
- DST Jindalee Pioneer Award 2011

Partnerships and Outreach

UNIVERSITIES

University of Adelaide

INDUSTRY

Lockheed Martin (Aust)
BAE Systems

GOVERNMENT

Bureau of Meteorology

INTERNATIONAL

US ROTHR Program Office
US Intelligence Community
US Naval Research Laboratory
US Air Force Research Laboratory
MIT Lincoln Laboratory

Australian Government
Department of Defence
Science and Technology

Major Science and Technology Capabilities (MSTCs)

Each MSTC comprises people, infrastructure, S&T know-how and partner relationships in a combination of a science and defence domain. The science component comprises the specialist knowledge, skills and experience of staff in the domain, as well as infrastructure and partnering. The defence component is the context in which our specialist knowledge, skills and experience have impact, including the particular physical aspect or operational context.

Responsible for corporate duties in order to shape strategic direction and enhance engagement with Defence and external partners.

Science Strategy and Program Division Develops science policy, formulates Defence S&T and strategic research programs, and oversees resource investment into S&T capabilities.

Science Partnerships and Engagement Division Coordinates and develops interactions with industry, academia, overseas agencies and other Australian government agencies. Promotes defence science in the education and wider Australian communities.

Research Services Division Delivers enabling services including science information management and technology, research infrastructure, scientific engineering and support, laboratory emergency management, safety and security.

Maritime Division (MD)
Provides support and solutions to enhance the operational performance and survivability of defence platforms in the maritime domain.

Sonar Technology and Systems
Conducts leading research and development in undersea acoustic sensors and systems to grow the ADF's undersea warfare capability.

Acoustic Signature Management
Delivers S&T solutions to manage the acoustic signature of defence platforms; and the hydrodynamic and manoeuvring performance of ships and submarines.

Non Acoustic Signature Management
Undertake research in materials science and technology to enhance the survivability, operational capability, seakeeping and cost of ownership of ADF platforms.

Maritime Autonomy
Leads research into autonomous and unmanned systems to enhance ADF capability in maritime surveillance, mine countermeasures and rapid environmental assessment.

Undersea Command and Control
Provides the ADO with scientific and technical expertise to enhance the RAN's undersea warfare capability and decision making.

Maritime Platform Performance
Undertakes research in platform performance of materials, structures and systems to enhance the capability, survivability and safety of RAN vessels.

Land Division (LD) Provides support and solutions for ADF personnel by applying expertise in human sciences, personnel protection, vehicle and systems sciences, and chemical, biological and radiological warfare.

Land Human Systems
Develops, sustains and applies the broad cross-section of human science skills in support of ADF land operations.

Land Vehicles and Systems
Conducts research in vehicle systems management, armour and protection, logistics and integrated support systems.

Chemical and Biological Defence
Research and development of defence against chemical, biological and radiation (CBR) threats.

Land Personnel Protection
Supports soldier combat system development, and analysis of threats affecting the soldier.

Aerospace Division (AD)
Provides support and solutions to enhance the operational effectiveness, performance, survivability, availability and safety of ADF aerospace capabilities.

Aerospace Systems Effectiveness
Supports Defence outcomes in capability, efficiency and safety by providing advice and solutions where humans and air platforms or systems interact.

Aircraft Performance and Survivability Conducts performance and survivability modelling and experimentation for flight, propulsion, signatures and stores carriage and clearances.

Aircraft Health and Sustainment
Supports aircraft health management systems and technologies, engine and fuel integrity, and aerospace systems sustainment analysis.

Airframe Technology and Safety
Works to ensure aircraft safety and availability, reduce fleet cost of ownership and advises on acquisition projects.

Aircraft Structures
Provides safety-critical aircraft structural integrity and airworthiness advice and solutions to the ADO.

Joint and Operations Analysis Division (JOAD) Analyses Defence operations and capability to provide independent, impartial and timely advice.

Three JOAD MSTCs develop and apply analytical methods, techniques and tools to inform decisions impacting: **1. Aerospace Capability, 2. Land Capability and 3. Maritime Capability**. This encompasses specification, procurement, command and control, underpinning technologies, force structure and training, and their contribution to operational effectiveness.

Joint Capability Analysis
Supports joint capability issues, including through the DST Group operations support centre by immersion and experimentation with warfighters.

Decision Sciences
Enhances military decision-making at individual, team and organisational levels in terms of intent, capabilities, awareness and control including human and machine perspectives, and their integration.

Strategic Capability Analysis
Informs strategic policy and capability decisions by applying analysis, concept development, risk assessment and technology forecasting.

Cyber and Electronic Warfare Division (CEWD) Provides expert advice and technology solutions in the cyber domain and electronic warfare environment.

Cyber Assurance and Operations
Supports enhanced performance in the presence of threats and unauthorised activities on computer resources.

Cyber Sensing and Shaping
Develops techniques for accessing, characterising and shaping communication networks to enable cyber operations.

Assured Communications
Provides solutions for robust communications in contested, complex and dynamic environments.

Systemic Protection and Effects
Analyses and supports critical cyber physical systems, with respect to systemic electronic attack.

Spectrum Sensing and Shaping
Supports enhanced situational awareness in complex radio frequency environments, and defeating the future networked EW, cyber and kinetic threats.

EW Operations
Conceives, develops and validates countermeasures to defend ADF assets, and conducts fundamental research in laser technologies and systems.

Weapons and Combat Systems Division (WCSD) Applies science and technology to the development and operation of highly effective weapon and combat systems for Defence.

Tactical Systems Integration
Conducts research into tactical-information: architectures; integration and interoperability; automation; and processing, to achieve distributed tactical decision superiority for the ADF.

Tactical Systems Performance Assessment Conducts analysis of weapon system performance and end-to-end tactical system effectiveness.

Weapon Systems Technologies
Applies S&T of sensors, processing and electromagnetic interactions to weapons and tactical systems to enhance the ADF's warfighting capability.

Energetic Systems and Effects
Enhances Defence and national security capabilities, and the safety of ADF assets through research into energetic materials, explosive ordnance, propulsion technologies and high speed systems.

National Security Intelligence Surveillance & Reconnaissance Division (NSID) Enhances the national capability for accurate, relevant and timely actionable intelligence for Defence and Government decision makers.

Intelligence Analytics
Develops situational awareness capabilities for intelligence analysts and conducts domain-specific research into human, open-source and all-source analysis techniques.

Information Integration
Supports the integration and application of intelligence, surveillance and reconnaissance systems.

Intelligence Systems
Develops intelligence systems for geospatial intelligence and measurement and signature intelligence, and imagery-based capabilities.

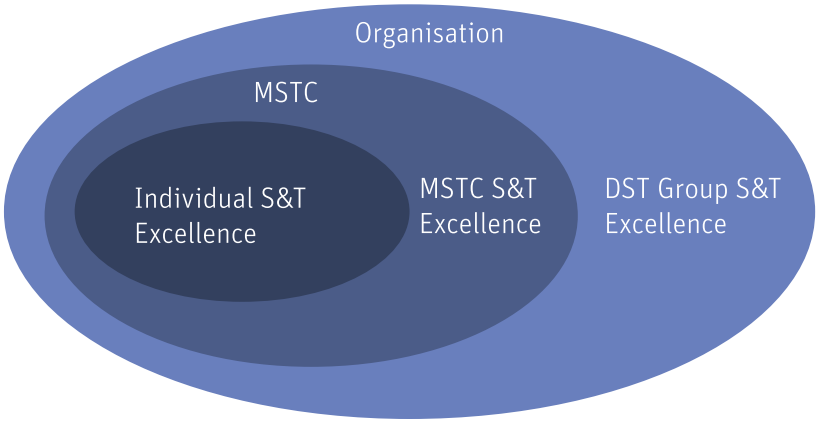
Surveillance and Reconnaissance Systems Conducts research into surveillance and reconnaissance systems and assesses their application to defence and national security needs.

High Frequency Radar
Enhances long-range over-the-horizon radar as part of the national intelligence, surveillance and reconnaissance system.

National Security
Provides a whole-of-government coordination program for science and technology needs relating to national security.

DSC 1812 August/17

Science Excellence



Defence has defined Science Excellence in these terms

"Science and technology excellence within Defence is demonstrated by the highest international standards for scientific and technological innovation, rigour, original contribution and influence, whilst solving the most challenging and valued problems."

The principles and characteristics of science and technology excellence have been defined to incorporate three nested layers, representing the individual researcher, the MSTC and the organisation as a whole.

Success in achieving science and technology excellence will be governed by eight practical activities:

- MSTCs have external quality review once every 4 years
- Every person in an MSTC will have a learning and development plan
- MSTC staff actively collaborate with internationally recognised research institutions
- The MSTC will be actively involved with defence R&D organisations
- MSTC staff members will present and test ideas with peers – through conferences, publications, colloquia and symposiums
- Every STC in an MSTC will have peer reviewed publications in high quality journals or conference proceedings
- The MSTC delivers value through its transition path from S&T to a defence capability
- The MSTC will shape and develop defence S&T capability and build the talent pool for the future through engagement with academia.

Principles and Characteristics of Science and Technology excellence

Principles	Characteristics
We achieve our goals and they have impact	Our S&T achieves high quality, high value Defence and national security outcomes
We test our quality against world benchmark standards	We undergo external quality reviews by independent experts at regular intervals. Staff contribute to symposia, colloquium, conferences, teaching/lecturing
We share and test our ideas with peers	We actively collaborate with internationally recognised research institutions, defence R&D organisations, and actively contribute to conferences, publications and symposia
We have ongoing professional development	Every person has a learning and development plan
We publish our work at the highest level	Staff publish unclassified work in leading refereed journals. Staff publish classified work in client or technical reports
We shape and develop defence S&T capability and build the talent pool for the future through engagement with academia	Staff are active members of collaborations with universities
We deliver value through transition of S&T from the laboratory to a defence capability	Staff are active members of collaborations with industry
We employ continuous improvement practices	We undertake reviews of our capability and outcomes

Partnerships

DST accesses and leverages world-leading science, technology, knowledge and innovation by collaborating with industry, academia and international agencies. Working closely with these partners ensures quality advice and innovative solutions for Defence and national security.

Science and technology partnerships also provide pathways for Defence innovations to be transferred to industry for commercialisation and the development of future capability.

DST has long-term Strategic Alliances with 14 defence primes and publicly-funded research agencies. These alliances are in addition to a number of individual collaboration agreements with technology companies and small business enterprises.

The Defence Science Partnerships framework has been developed for universities and Defence to conduct joint research under a standard agreement which provides cost efficiencies and time savings. More than 30 Australian universities are now partnering with **DST** under this framework, providing a larger research network to support Defence outcomes.

DST forms partnerships with defence research organisations overseas to access international capabilities that would otherwise not be available to the Australian Defence Force. The principal multi-lateral science and technology relationship is with the United States, United Kingdom, Canada and New Zealand under the Technical Cooperation Program. Joint research in niche capabilities is also undertaken with the Netherlands, Sweden, France, Japan, South Korea and Singapore.

DST is leading the $730 million Next Generation Technologies Fund which focuses on developing future game-changing capabilities in collaboration with industry and academia.

Australian Government
Department of Defence
Science and Technology

Doing business with DST

Download the free DST App

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GET IT ON Google Play

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CCEWD@dst.defence.gov.au

Chief Weapons and Combat Systems Division
Phone: +61 8 7389 5138
CWCSD@dst.defence.gov.au

For further information on DST
Visit: www.dst.defence.gov.au

DST Science and Technology for Safeguarding Australia

DSC 1844


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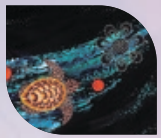
Australian Government

Department of Defence
Science and Technology

DST

Science and Technology for Safeguarding Australia

Defence values cultural diversity



Stars guiding turtles to their breeding site, signifying creativity and innovation.
From the Song of the Seven Sisters by the Gurreng Gurreng people.
Artist: Anthony Walker.