

MARITIME DIVISION

Dr David Kershaw
Chief



Maritime Division

Maritime
Platform
Sciences

Undersea
Warfare System
Sciences

Surface
Ship
Platforms
Program

Submarine
Platform
Program

Air and
Land
Platform
Programs

ASW
Program

Littoral
Warfare
Program

Submarine
Warfare
Program



Maritime Division's 7 S&T Capability areas

Acoustic Signature Management

Sonar Technology and Systems

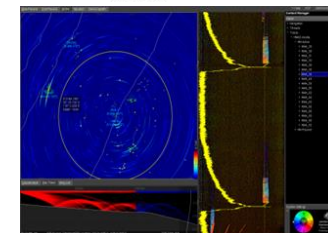
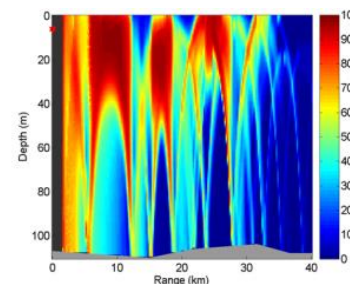
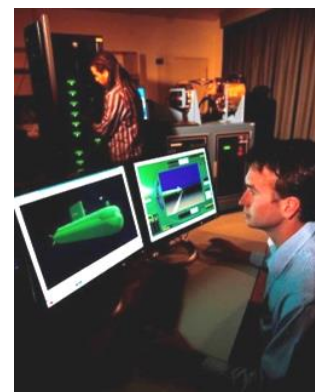
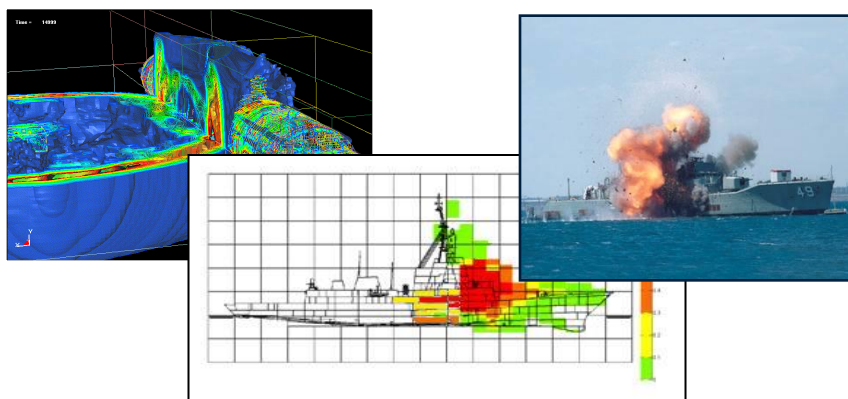
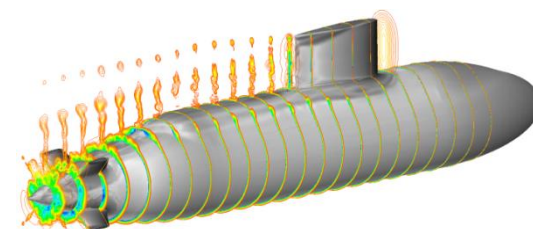
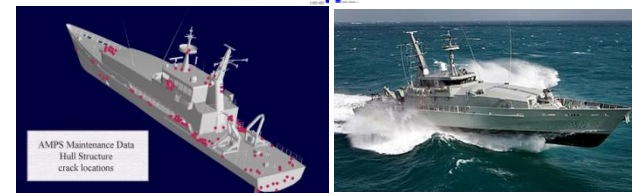
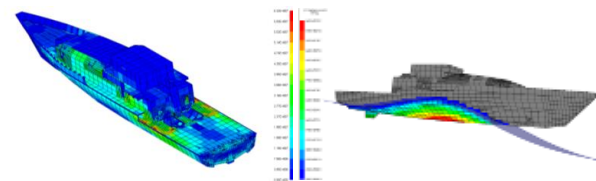
Maritime Platform Performance

Undersea Command and Control

Platform Survivability

Non-acoustic Signature Management

Maritime Autonomy



Maritime Division MSTC: Sonar Technology and Systems

Passive Sonar



Research Leader Dr David Liebing

Aim:

Raise train and sustain a capability in undersea acoustic sensing and analysis that can be applied to assessing and improving current, enhanced and future ADF ASW requirements.

Successes

World-first fiber-laser hydrophone towed array demonstration (DSTO-Thales)

BSAPS/PANORAMA hull-mounted sonar processing system

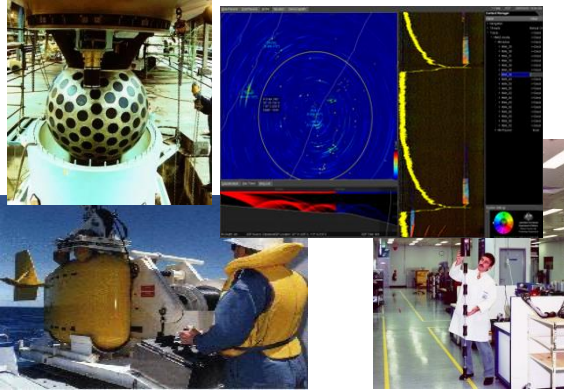
- Licensed to Thales Australia
- Fitted to RAN FFG class
- SEA 1408 (SSTD) candidate

SENTINEL/AUSSnet undersea sensor network (DSTO & L3-Oceania)

Collins Class Onboard Demonstrator

- CCSM Sonar health monitoring
- CCSM Custom sonar processing

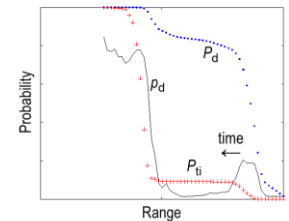
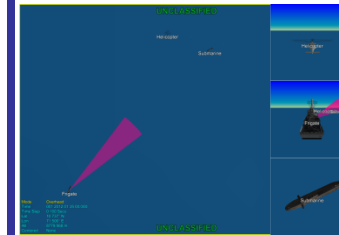
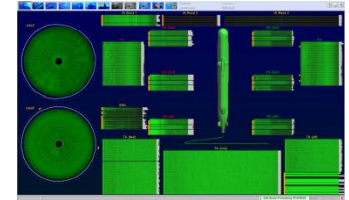
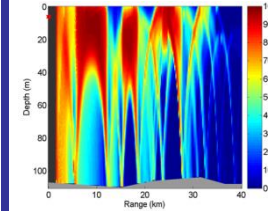
Active Sonar



Industry & Government

Thales Australia
Raytheon Australia
Ultra (UK, CA, AS)
STN-Atlas
L3-Oceania
Boeing & In-Situ Pacific
CSIRO & Bureau Of Meteorology

Sonar Processing & Performance Analysis



Universities

Sydney University
University of Melbourne
Adelaide University
Flinders University
University of Western Australia
Curtin University (CMST)

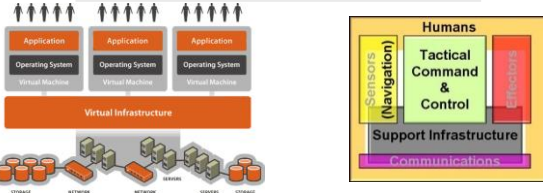
International

TTCP MAR TP-9 (ASW Systems & Technology)
Office of Naval Research (ONR) - PA
NUWC/NAVSEA - PA
DRDC- A (Canada)
DTA (NZ)



Maritime Division MSTC: Undersea Command and Control

Combat System Architectures



A/Research Leader Dr David Gamble

Aims:

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

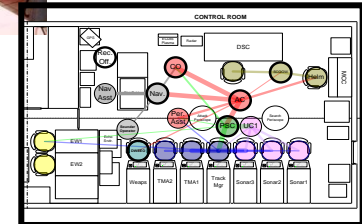
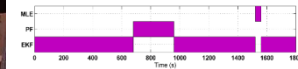
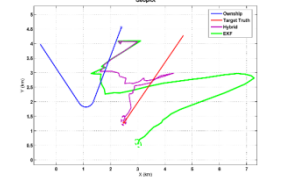
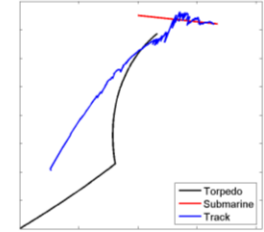
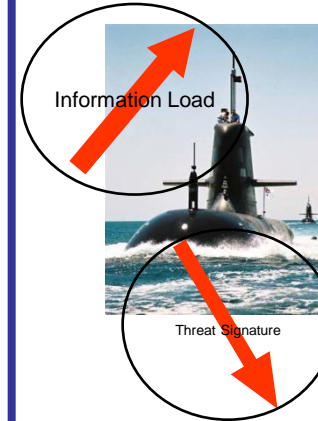
Successes

Insertion of Australian algorithms into the MK 48 HWT and the AN/BYG Combat system

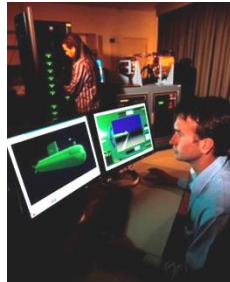
Improved weapon control displays for Collins Class submarines

Improved signal libraries for RAN torpedo countermeasures

Human Systems & Information Integration



Underwater Weapon Systems



Universities

Australian Maritime College
University of Melbourne
University of Adelaide
Curtin University
University of Western Australia

Industry

Thales

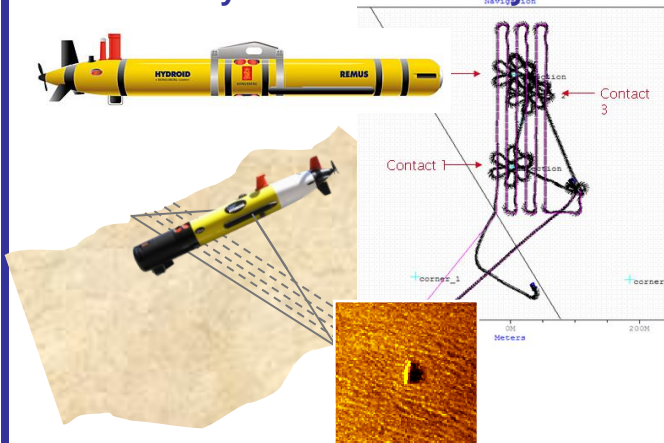
International

TTCP MAR
NUWC (USA)
ONR (USA)

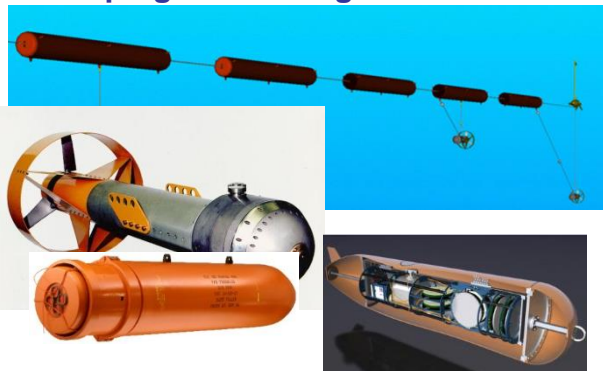


Maritime Division MSTC: Maritime Autonomy

Unmanned Systems & Autonomy



Underwater Influences, Naval Mine Sweeping & Jamming



A/Research Leader Dr David Battle

Aims:

To advance Navy's capabilities through the use of modular portable unmanned systems with a focus on the littoral operating environment through the provision of technical advice and niche system development.

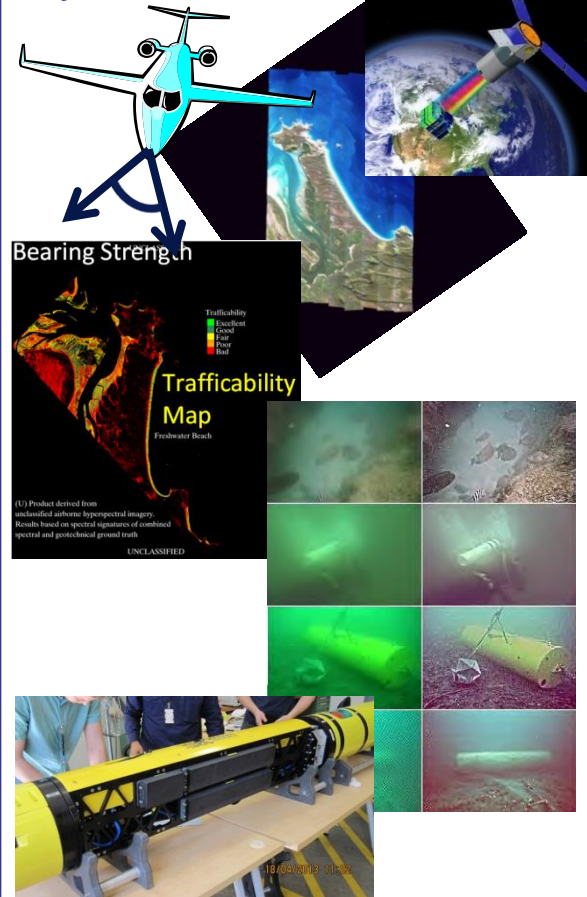
Successes:

Achieving autonomous operation of a REMUS 100 through on-board decision making supporting adaptive search, detection and classification capabilities.

Characterization of the littoral environment from hyperspectral data analysis.

The development of naval mine sweeping and jamming systems.

Payload Sensors



Universities

Sydney University
UNSW
Newcastle University
CUDOS

Industry

THALES
Resonance Technology
Kraken Sonar Systems
Ron Allum Deep Sea Services

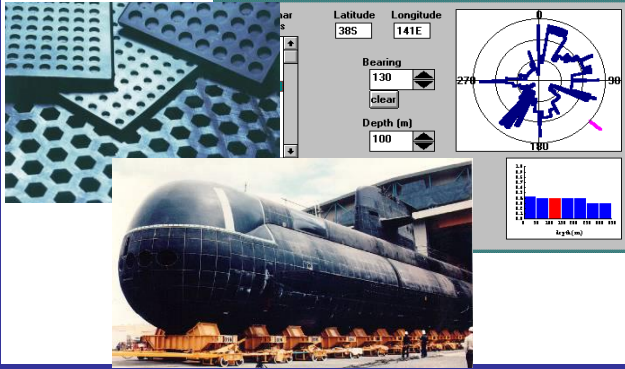
International

TTCP MAT & MAR
NATO MCG3
ABCANZ



Maritime Division MSTC: Acoustic Signature Management

Acoustic Systems



Research Leader Dr Chris Norwood

Aims:

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

Successes

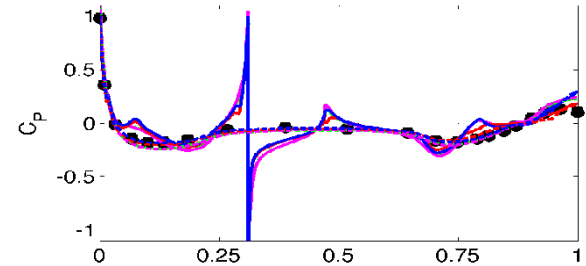
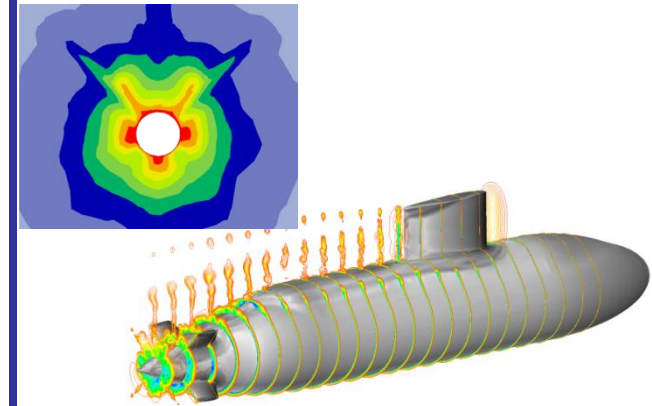
Anechoic tiles for Collins class submarine

Collins class noise reduction program

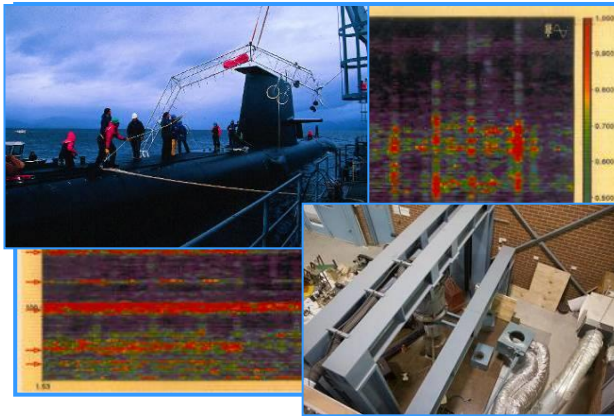
FFG 7 rudder noise treatment

Acoustic signature monitoring system for Collins class

Hydroacoustics



Acoustic Signature Control



Universities

University of New South Wales
Australian Maritime College
Adelaide University
University of Melbourne
UWA

Industry

Frazer Nash
ASC
McKay Rubber
QinetiQ

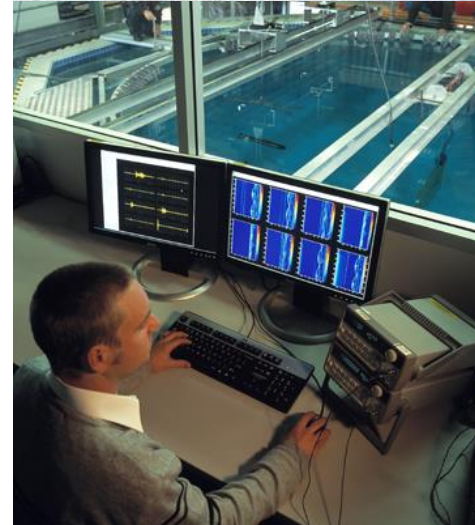
International

TTCP MAR
MARIN (Holland)
NSWC (USA)
DE&S (UK)
FOI (Sweden)



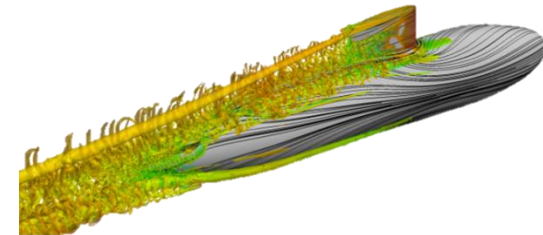
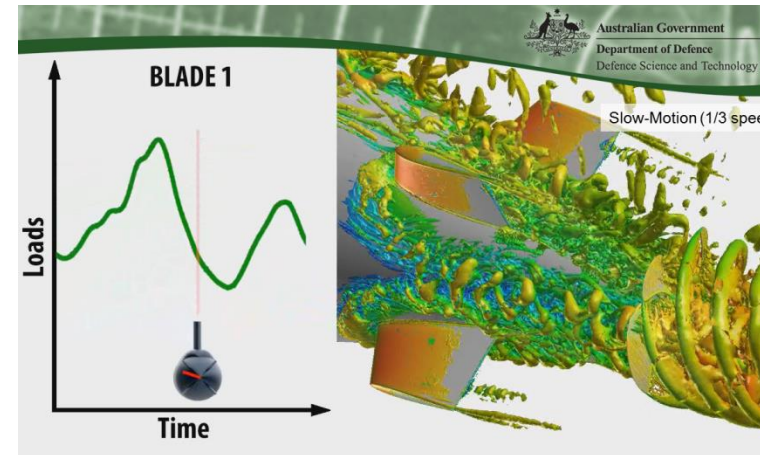
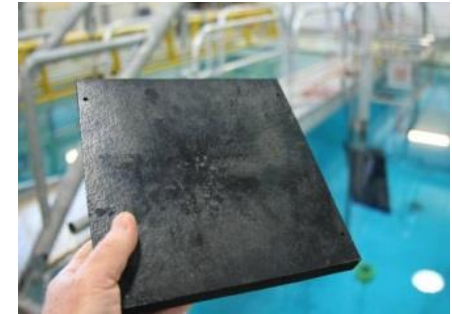
Research Facilities

- Elastomers Laboratory for the production of prototype coatings
- Anechoic measurement facility
- AUSRAT signature modelling framework
- High performance computing facility
- Towing tank and cavitation tunnel
- Materials characterisation, modelling and design capability
- Mechanical testing
- Composite materials fabrication
- Diesel engine test facility



Key Research Areas

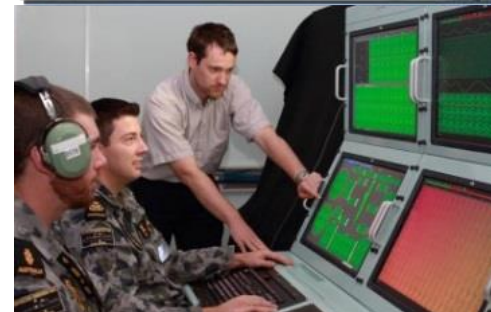
- Materials for acoustic signature reduction – anechoics, decoupling coatings, vibration isolators
- Acoustic signature modelling and measurement
- Hydrodynamic modelling
- Flow noise and hydroacoustics



Areas of Potential Partnership Interest

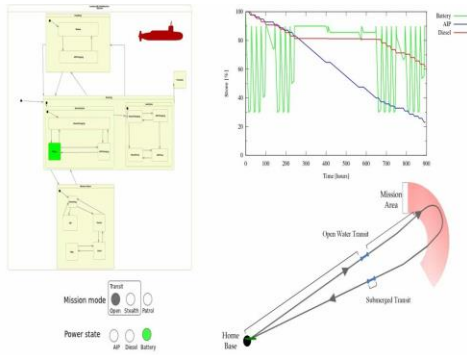
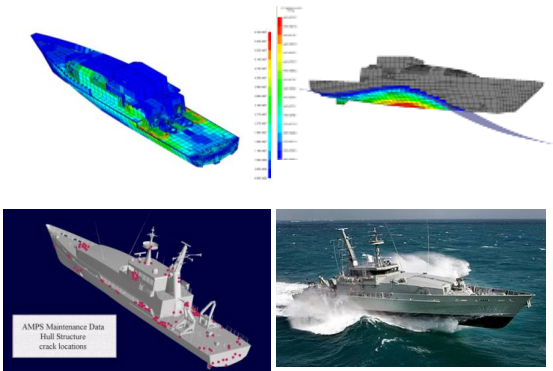
Start small and grow...

- Computational fluid dynamics modelling and validation
- Vibro-acoustic modelling and measurement capability
- Acoustic meta-material design and production



Maritime Division MSTC: Maritime Platform Performance

Naval Architecture and Platform System Analysis



Research Leader Dr Stuart Cannon

Aims:

To ensure the RAN have platforms that are safe, efficient and sustainable for their desired operational envelope

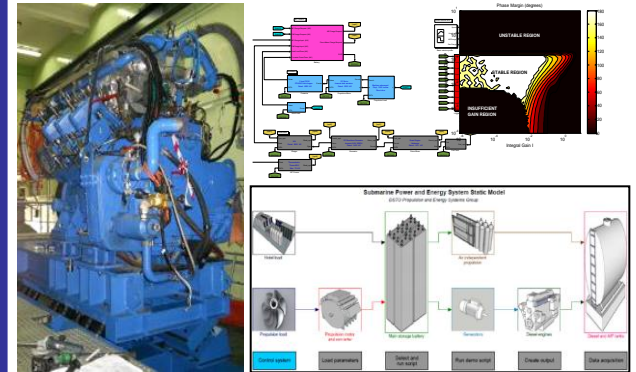
Successes

HMAS Choules transformer investigation and analysis.

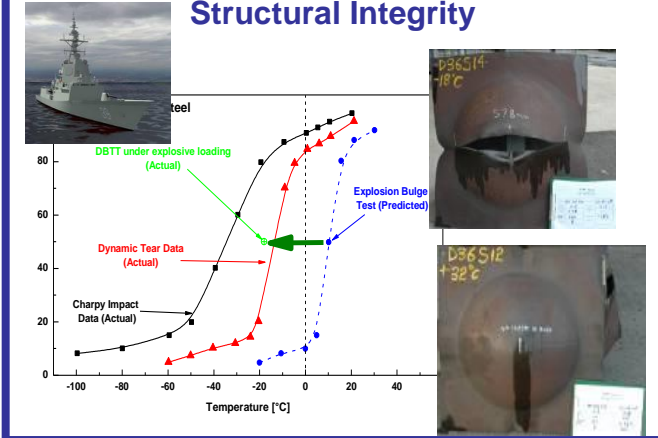
Selection of D Grade Steel for AWD

Improved structural reliability for the Armidale class Patrol Boats

Power and Energy Systems



Materials Performance & Structural Integrity



Universities

Australian Maritime College
University of Melbourne
University of Wollongong
DMTC

Industry

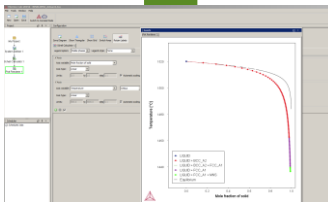
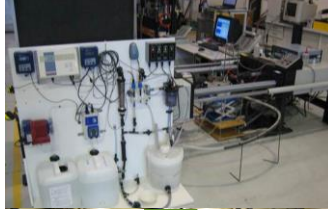
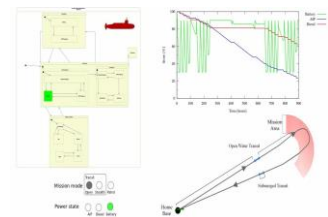
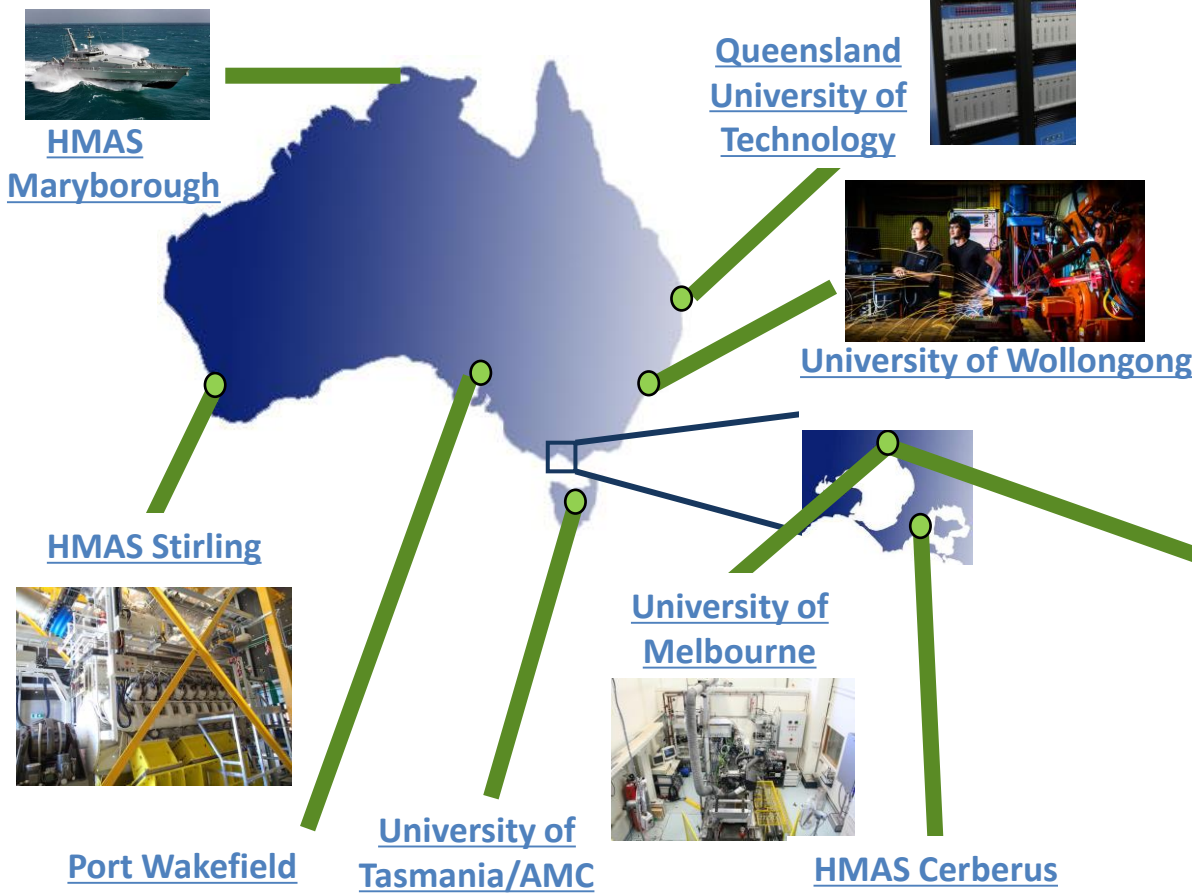
Defence Maritime Services
Qinetiq / GRC
Bluescope Steel
ASC

International

TTCP MAT & MAR
MARIN (Holland)
ABCANZ

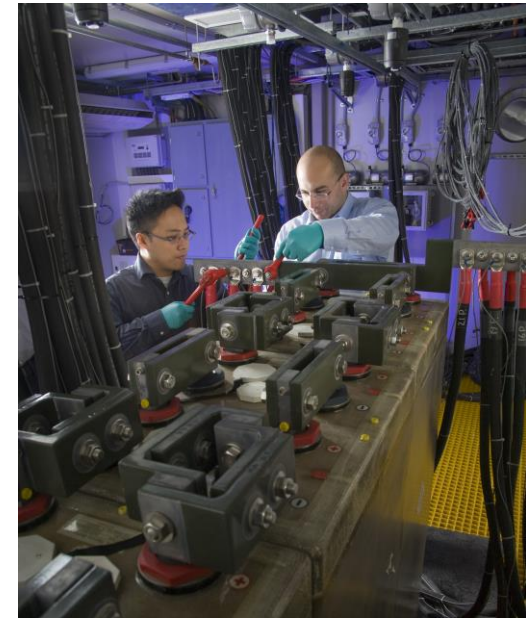


Research Facilities



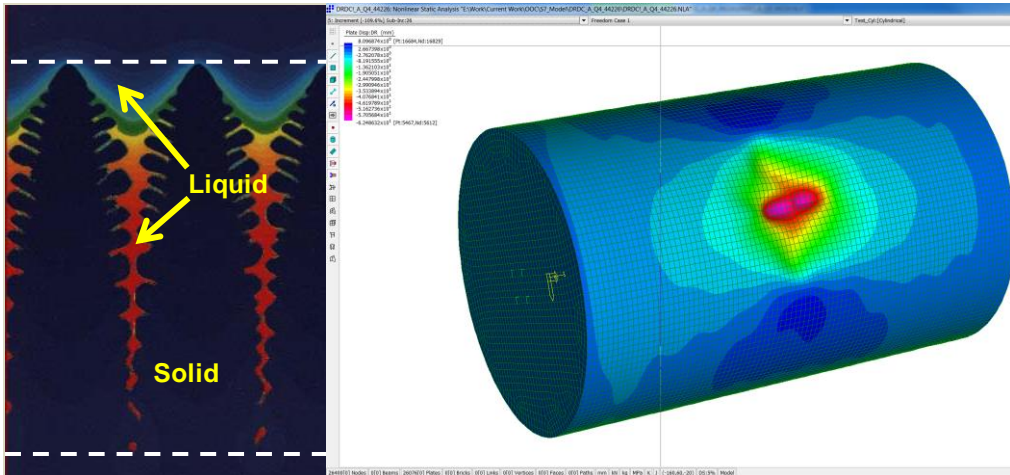
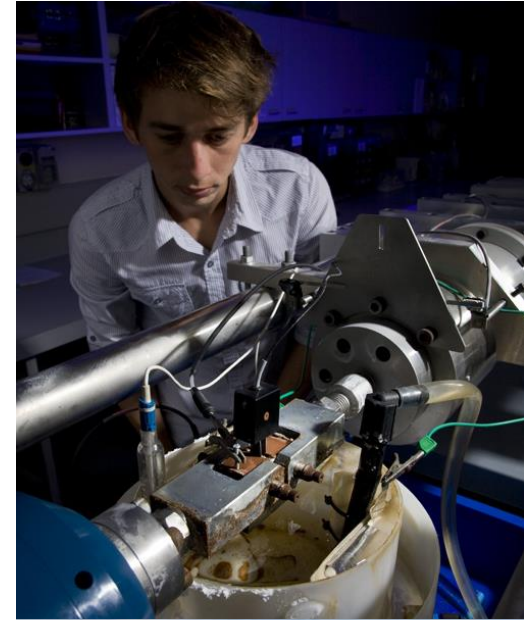
Research Areas – Power & Energy Systems

- Naval battery energy storage systems
- Reliability and performance of naval diesel engines
- Naval energy usage optimisation
- Naval P&E system modelling and advanced land based testing technologies
- CO2 air purification technology
- Advanced naval electric machine technologies



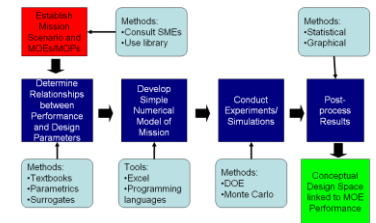
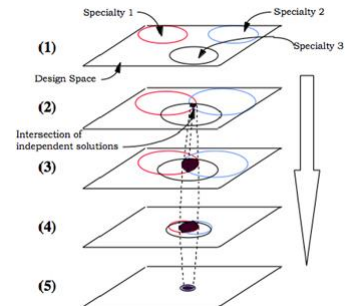
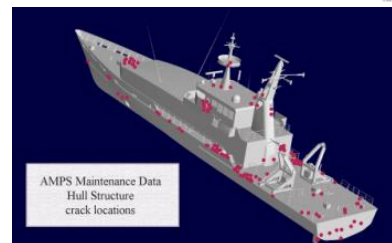
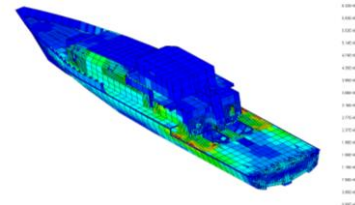
Research Areas – Materials Performance and Structural Integrity

- Material design, evaluation and selection for surface and undersea maritime platforms
- Fatigue, corrosion-fatigue and stress-corrosion cracking for submarine pressure hull integrity
- Computation modelling and physical simulations of welding processes and welded structures
- Validated assessment tools and guidelines for through-life evaluation of submarine structures



Research Areas – Naval Architecture and Platform Systems Analysis

- Seaway / Slamming loads – prediction capability and full scale trials
- Integrated Platform Systems Analysis – mission modelling
- Life of Type Assessment – Ultimate and Residual Strength
- Naval Platform Concept and Requirements Exploration



Potential Engagement

Naval platforms Energy
Recovery Systems

Potential new hull materials



Materials fabrication
technologies

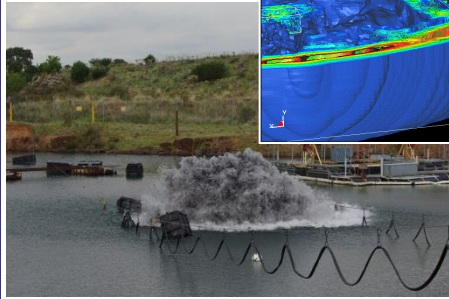
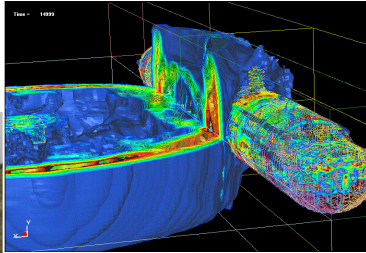
Life of type prediction and
Assessment methodologies

Structural analysis methodologies



Maritime Division MSTC: Platform Survivability

Dynamic Military Loads



A/Research Leader Mr David Cox

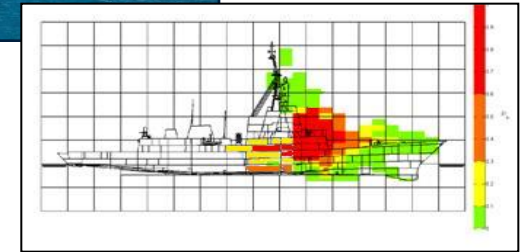
Aims:

To ensure the operational survivability and capability of RAN platforms.

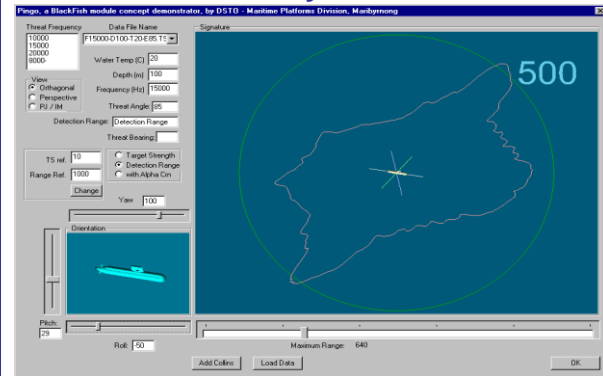
Successes

- Collins class hull valve
- Collins class shock trial
- MHC shock testing
- Warramunga crew fatigue study
- AWD fire modelling and fire protection
- JASSM vulnerability modelling and missile damage prediction

Vulnerability, Damage Control and Recoverability



Susceptibility and Signature Threat Analysis



Universities

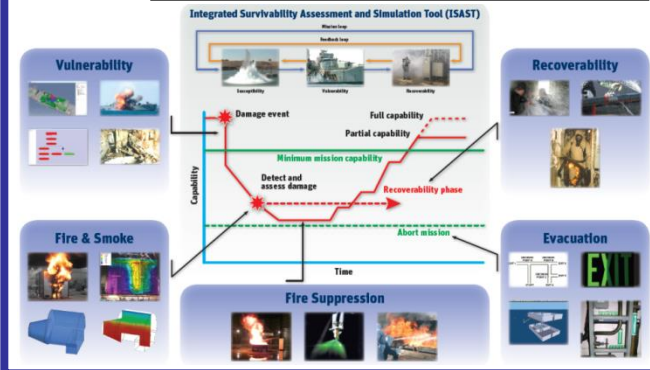
- Australian Maritime College
- Victoria University
- RMIT University
- University of Greenwich

Industry

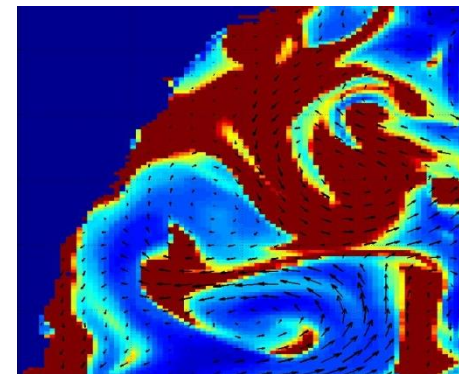
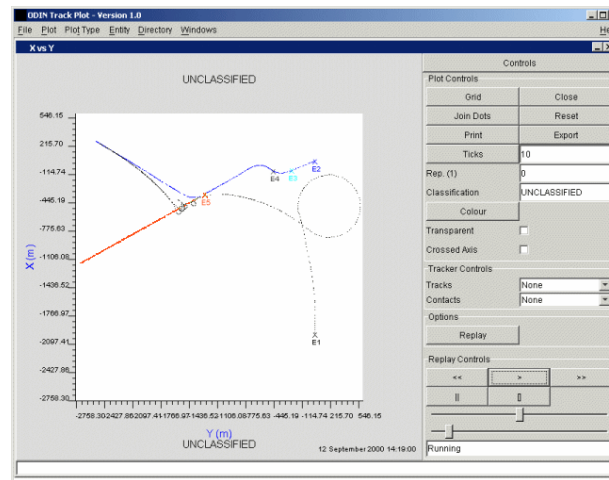
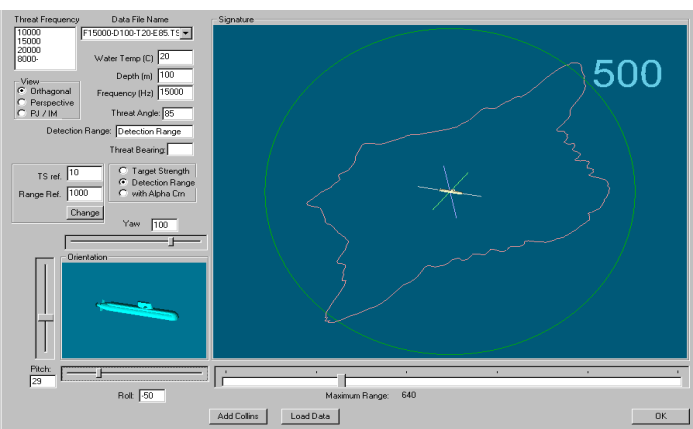
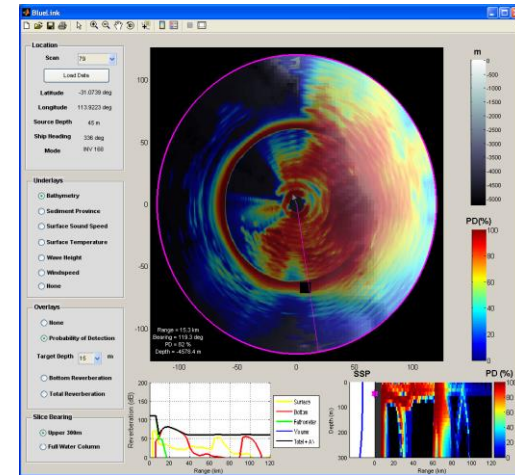
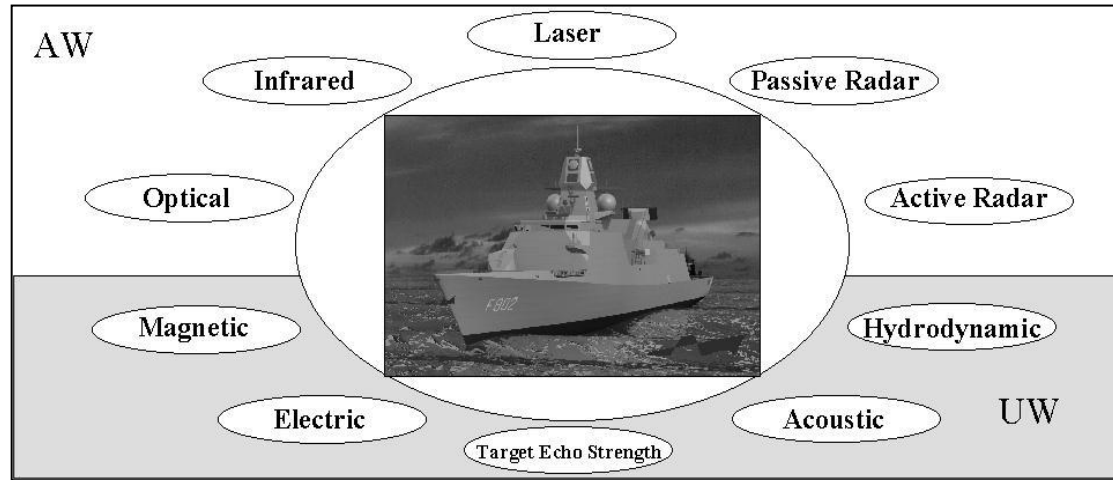
- Widelinger UK
- ASC
- L3
- QinetiQ

International

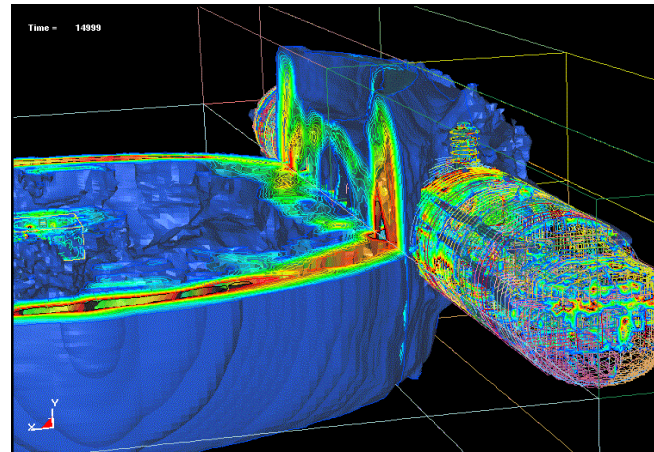
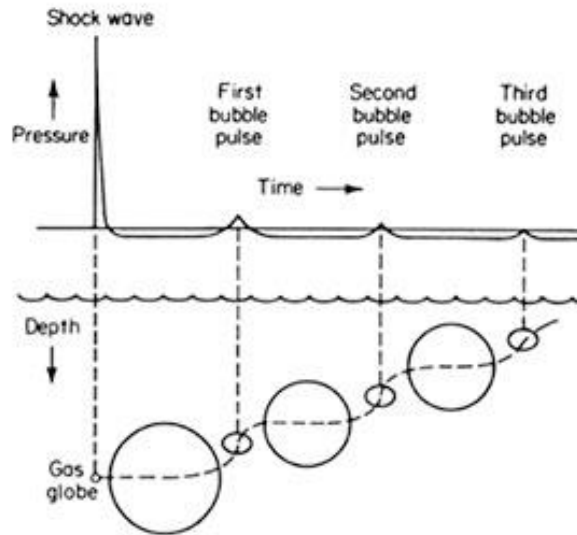
- TTCP MAR and Weapons
- NSWC (USA)
- Dstl (UK)
- ONR (USA)
- DRDC (Canada)



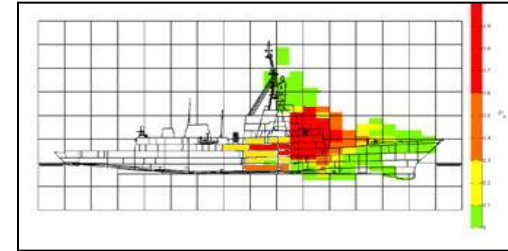
Susceptibility & Signature Threat Analysis (SSTA) informs platform signature reduction and management requirements and operating tactics to reduce the likelihood of being detected and engaged by threat sensors, platforms, and weapons.



Dynamic Military Loads (DML) determines the immediate structural, equipment and systems damage from weapon attack that enables a higher level of confidence in the survivability of a platform.



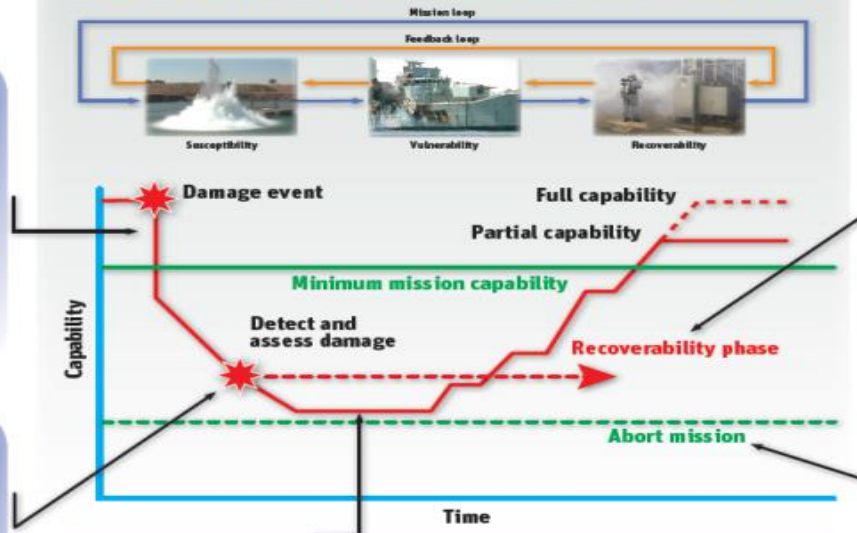
Vulnerability, Damage Control and Recoverability (VDC&R) undertakes analysis of damage consequences and optimisation of recoverability processes to enhance the safety and survivability of personnel and platform.



Vulnerability

Fire & Smoke

Integrated Survivability Assessment and Simulation Tool (ISAST)



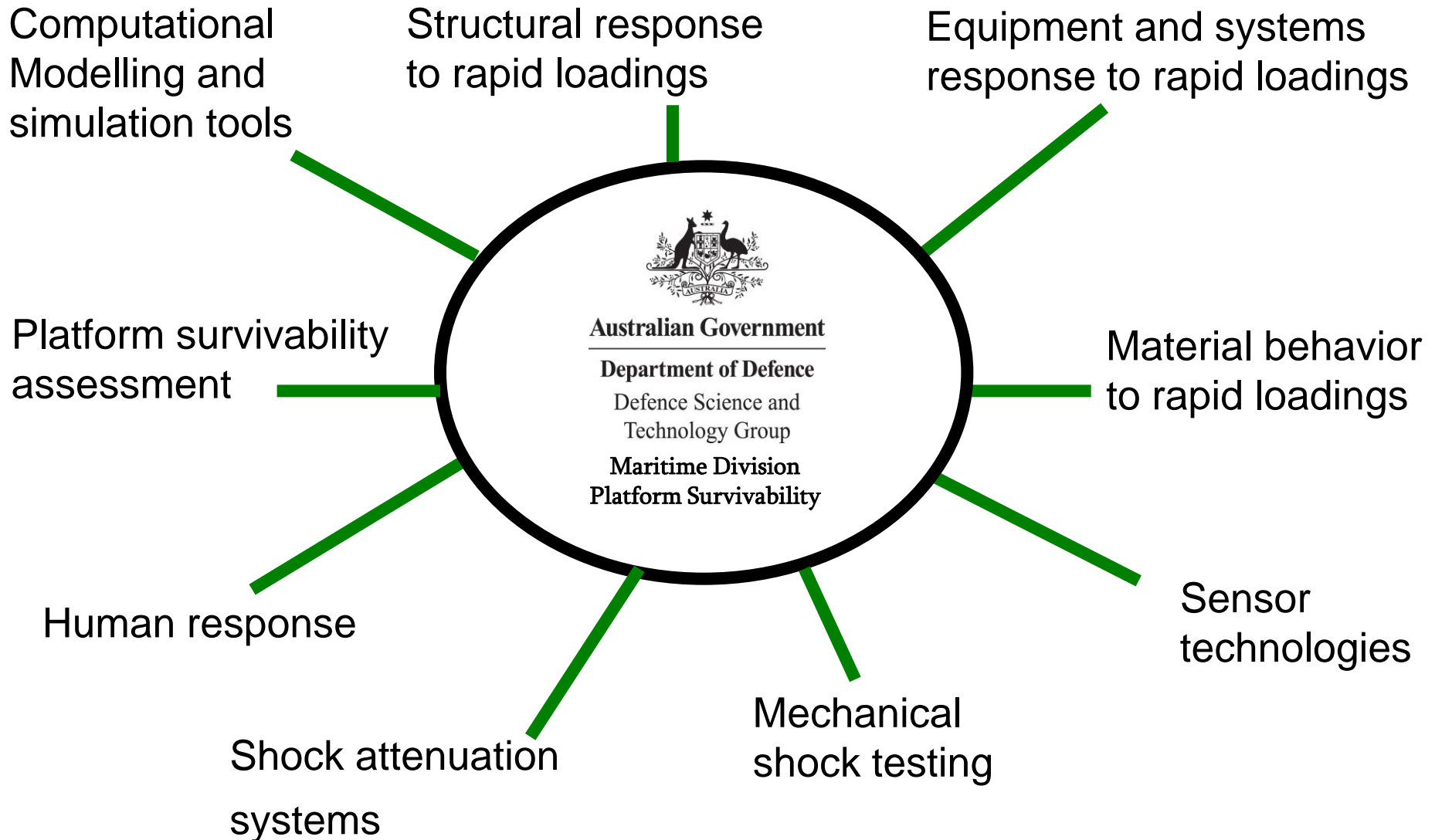
Recoverability

Evacuation

Fire Suppression

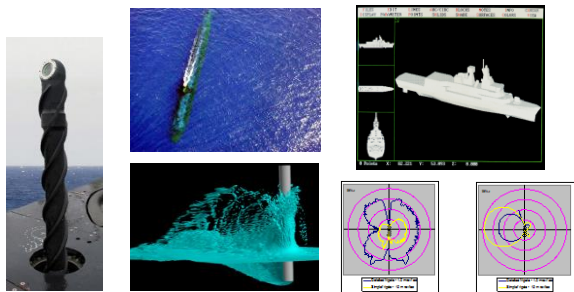


Potential Engagement



Maritime Division MSTC: Non-Acoustic Signature Management

Electromagnetic Signature Control



Specialised Coatings



Research Leader Mr Leo de Yong

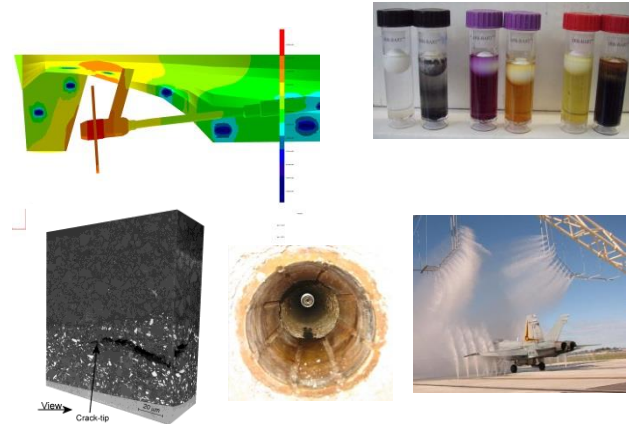
Aims:

To ensure the RAN have platforms that have improved operational performance and increased survivability as well as reduced cost of ownership.

Successes:

- Radar absorbing materials for Collins class submarines and surface ships
- RF interference shield for Anzac class
- New generation foul release coatings on ACPBs with quantified fuel savings
- Haze Grey colour for RAN ships

Corrosion Science



Environmental Signatures



Universities

University of Adelaide
Swinburne University
University of Melbourne
DMTC

Industry

Mackay Consolidated
PPG, Akzo Nobel
ASC
BAE

International

TTCP MAT & MAR
NATO SET
ABCANZ



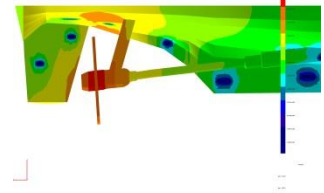
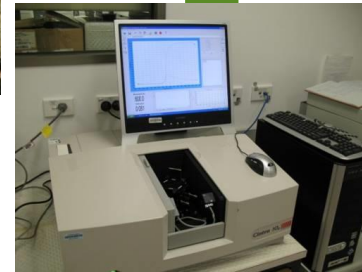
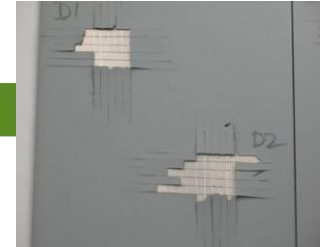
Research Facilities



HMAS Maryborough



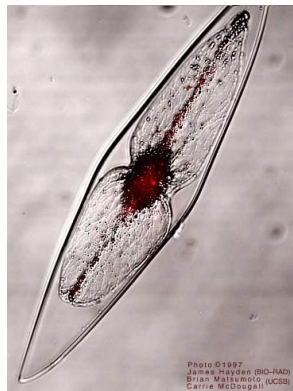
Innisfail



University of Tasmania



RMIT University



Fishermans Bend



HMAS Cerberus



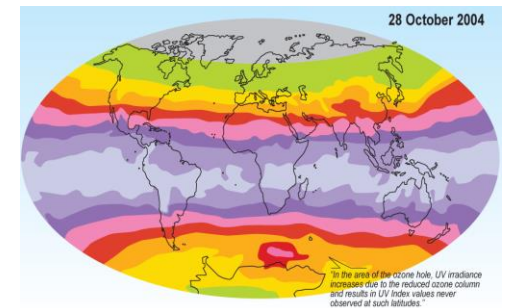
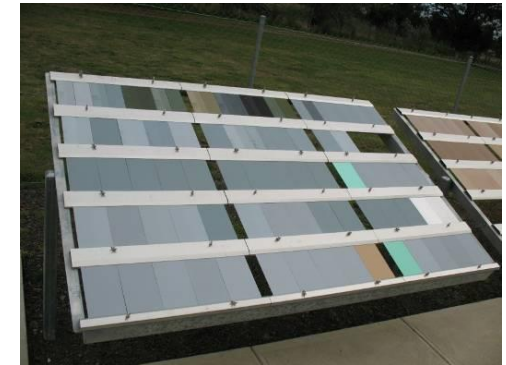
Research Areas – Electromagnetic Signature Control

- Design and manufacture of Radar Absorbing Material, with installation to RAN ships and submarines
- Infrared signature modelling and control; thermal analysis for validation; screens; coatings
- Visible signature measurement and prediction; synthetic imagery; emphasis on Army and Navy
- Periscope wake signature modelling; suppression technologies; multiple mast states



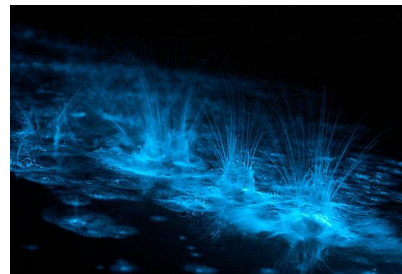
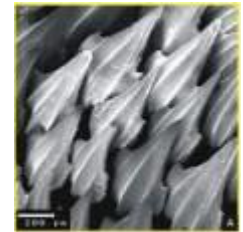
Research Areas – Specialised Coatings Technology

- Pretreatments, primers, top coats, paint removers
- Evaluation of conventional coatings for Navy, Air and Land platforms; higher performance; durability; health and safety requirements; flexibility; colour stability
- Non-conventional coatings for signature management: ultra violet; visible; near infrared; thermal infrared; and radar
- Formulation, performance measurement; durability
- Exposure test facilities for Defence materiel



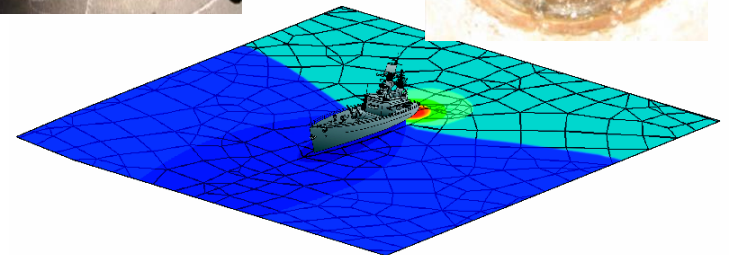
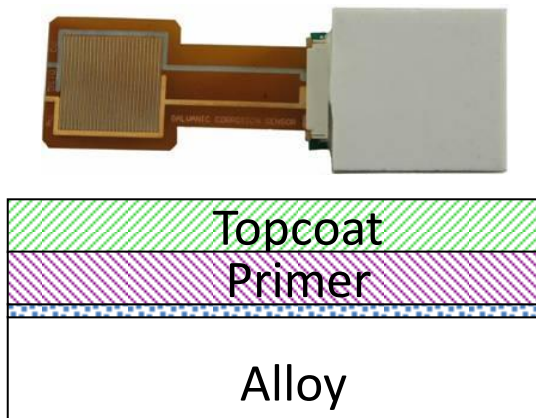
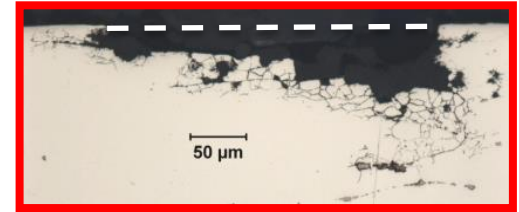
Research Areas – Environmental Signature Control

- Environmental signatures: underwater thermal; chemical; bioluminescence
- Underwater coatings test and performance; biofouling control technologies; ship hulls; niche areas and piping systems; fuel efficiency; bio inspired surfaces
- Pollution control and marine biosecurity; international regulations
- Tropical environment materials performance



Research Areas – Corrosion Science

- Corrosion protection: paints; pre-treatments – non chromate systems; location; cleaning; storage
- Corrosion prediction/modelling and sensor development; health monitoring
- Corrosion repair methods: cold spray technology
- Alloy corrosion susceptibility: AUS environment
- Corrosion related underwater electromagnetic signatures



Potential Engagement

Treatments to reduce/prevent microbiologically influenced corrosion

Development of PiSTOL Database

Next generation materials for signature reduction



Australian Government
Department of Defence
Defence Science and
Technology Group
Maritime Division
**Non Acoustic Signature
Management**

Advanced coatings

Sensor technologies for corrosion prediction

Thermo-conductive pigments

Chromate-free primers



Questions?

