MARITIME DIVISION

Dr David Kershaw
Chief
Maritime Division

Maritime Platform Sciences
- Surface Ship Platforms Program
- Submarine Platform Program
- Air and Land Platform Programs

Undersea Warfare System Sciences
- 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**

![Image of Passive Sonar]

**Active Sonar**

![Image of Active 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

**Universities**

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

**Industry & Government**

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

**International**

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

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**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)
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.
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

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
**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

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**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

- HMAS Maryborough
- HMAS Stirling
- Port Wakefield
- University of Tasmania/AMC
- University of Melbourne
- Queensland University of Technology
- University of Wollongong
- Fishermans Bend
- HMAS Cerberus
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
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
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.
Potential Engagement

- Computational Modelling and simulation tools
- Platform survivability assessment
- Human response
- Shock attenuation systems
- Structural response to rapid loadings
- Equipment and systems response to rapid loadings
- Material behavior to rapid loadings
- Sensor technologies
- Mechanical shock testing
Electromagnetic Signature Control

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

Specialised Coatings

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
- University of Tasmania
- RMIT University
- Innisfail
- 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

Advanced coatings

Sensor technologies for corrosion prediction

Thermo-conductive pigments

Chromate-free primers

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

Development of PiSTOL Database

Next generation materials for signature reduction

Advanced coatings

Sensor technologies for corrosion prediction

Thermo-conductive pigments

Chromate-free primers
Questions?