# Ocean and Maritime
# **Science and Engineering**

**Scientific and technical expertise and innovative technologies to enhance the operational performance and survivability of defence platforms in the maritime domain, particularly in and around the Indian Ocean.**

UWA has 170 experts from disciplines including marine science, oceanography, ocean engineering, hydrodynamics, geotechnics, environmental management, economics, commerce, law and policy, communications, history and archaeology. In many areas within the marine domain UWA's expertise is unique within Australia.

# DEFENCE RESEARCH CAPABILITY CATEGORY: **OCEAN AND MARITIME SCIENCE AND ENGINEERING**

**UWA's experts provide a competitive advantage in areas related to:**

- Reliable prediction of currents, waves and temperature from the deep ocean to the shoreline via data ingestion and sophisticated modelling.
- Development of novel techniques for the measurement of ocean currents, waves, and nearshore bathymetry from remotely sensed observations.
- Capability in observing, modelling and understanding the fine-scale ocean variability that affects underwater navigation and sound propagation, including realistic non-linear internal wave modelling tools relevant to submarine navigation and communication.
- Statistical tools for quantifying uncertainty from ocean observations and numerical models that allow the development of operational decision-making tools.
- Detailed observational, modelling and prediction capabilities in nearshore and littoral areas relevant to defence operations.
- Application of novel distributed sensors, data-driven engineering and machine learning approaches to interpret and predict the dynamic response of marine craft and floating systems.
- Optimisation of the design of marine craft based on improved understanding of fluid-structure interaction and the development of novel non-linear models of dynamic systems.
- Expertise in quantifying the hydrodynamic forces on subsea vehicles in a range of environmental flow conditions using model scale testing and/or Computational Fluid Dynamics.
- Understanding and predicting extreme responses, as is applicable to survivability of offshore systems and marine craft in extreme conditions.
- Expertise in offshore soil structure interaction and offshore anchoring dynamics.
- Ocean renewable energy (wind, tidal, wave), including resource assessment, energy capture optimisation and distribution.

**Outcomes and Impact**

- Development of tools to maximise operability in the ocean across a range of environments from the deeps to beaches and estuaries
- Development of sensor packages, algorithms, and the underlying knowledge to rapidly assess and predict environmental conditions, understand and predict vessel behaviour and fatigue, and exploit ocean energy sources to power offshore and remote assets.
- Development of subsea technologies for instrument deployment at depths of 10,000m.

**Capabilities and facilities**

- Ocean Glider Facility operates a fleet of autonomous, underwater ocean gliders to make oceanographic measurements across the continental shelf.
- HF Radar Facility measuring surface currents around Australia.
- A large pool of state-of-the-art field oceanographic and bioacoustic equipment.
- Minderoo-UWA Deep-Sea Research Centre operates deep sea benthic landers, full ocean depth rated cameras, oceanographic sensors and sampling equipment.
- Remote sensing platforms, sensors, and algorithms to measure ocean properties from the seabed to surface.
- The Coastal and Offshore Engineering Laboratory, which includes a 54 m long wave flume and the UWA 'O-tube' facility, which is a unique large-scale recirculating flume test facility capable of simulating underwater wave and current conditions.
- Centre for Offshore Foundation Systems provides solutions to worldwide offshore foundation needs through sophisticated modelling and experimental facilities.
- National Geotechnical Centrifuge Facility is a world leading facility working on a wide range of onshore and offshore geotechnical solutions.
- Watermans Bay Facility: laboratory for marine research with state-of-the-art laboratories and pumped seawater.
- Woodside OceanWorks is an innovative space to bring industry and academia together
- Marine Energy Research Australia supports the development of ocean renewable energy in Australia and worldwide.

**Contact Details**

Jeff Hansen and Nicole Jones
Assoc/Prof Nicole Jones, Associate Professor, Ocean Graduate School
Phone: 6488 3074
Email: nicole.jones@uwa.edu.au

Dr Jeff Hansen, Senior Lecturer, School of Earth Science
Phone: 6488 3724
Email: jeff.hansen@uwa.edu.au