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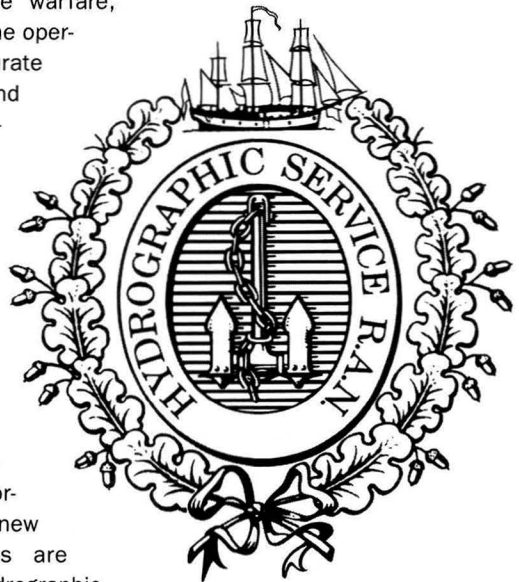
The *Leeuwin* Class Hydrographic Ships

Enhancing the Royal Australian Navy's Knowledge of Its Operating Environment

Captain Bruce Kafer
RAN, Hydrographer of Australia

A detailed understanding of Australia's maritime environment is an essential component of safe and effective maritime operations, particularly for navigation, mine warfare, and submarine and anti-submarine operations. The provision of accurate hydrographic, oceanographic and meteorological data is fundamental to the optimum performance of the Royal Australian Navy's (RAN's) ships, submarines and aircraft in the defence of Australia.

The Australian Hydrographic Service, Royal Australian Navy, is responsible for gathering such information. In fact, hydrographic data is a key element of military geospatial information, and many of the RAN's new combat systems and sensors are reliant upon accurate digital hydrographic, oceanographic and topographic data. Two new Hydrographic Ships significantly enhance the RAN's ability to acquire this crucial data. The *Leeuwin*-class Hydrographic ships, HMAS *Leeuwin* and HMAS *Melville*, commenced operational service in May 2000; they are the product of over 12 years of planning and construction that has established the RAN's Hydrographic Force as one of the most capable and modern in the world.



Hydrographic Ships' Primary Roles

The primary peacetime role of the new hydrographic ships is to undertake survey missions to meet defence and commercial requirements. This is a formidable task: Australia's area of charting responsibility covers more than 10 percent of

the earth's surface, but only approximately 20 percent of the waters within our 200 mile Exclusive Economic Zone have been surveyed to modern standards (by echo-sounder and sonar). To address the urgent need for more accurate and up-to-date information, *Leeuwin* and *Melville* are required to survey a combined area of 10,000 square nautical miles per year.

The ships are normally employed in Australia's remote northern maritime approaches. These waters are strategically important, as are the coastal waters of Papua New Guinea (PNG), where the Hydrographic Ships will also carry out regular surveys. The RAN is committed to conducting hydrographic surveys within the PNG Exclusive Economic Zone, in accordance with an agreement made between the Australian and PNG governments.

Leeuwin and *Melville*, named after Cape Leeuwin and Melville Island respectively, are based at Cairns (northern Queensland) together with the four existing Survey Motor Launches and the Laser Airborne Depth Sounder aircraft (in an F-27 airframe) from the Hydrographic Survey Force. Cairns is close to Australia's priority areas for hydrographic surveys, and the city contains the necessary industrial infrastructure to support the two new ships. *Melville* and *Leeuwin*, and their six embarked Survey Motor Boats, are equipped to conduct survey missions from coastal to offshore waters, in depths from 0 to 6,000 metres.

The hydrographic ships do not have a combat capability, however during periods of tension or conflict they might be required to conduct hydrographic surveys in support of naval forces. Such tasks could include route surveys in poorly charted waters, to permit safe passage of a Task Group, or precursor surveys for amphibious operations. *Melville* and *Leeuwin* are fully equipped for precise navigation, so they could also be tasked with providing navigation support for Mine Countermeasures (MCM) vessels. This capability has been trialled during a recent combined naval exercise with the United States Navy.

Hydrographic Ships' Secondary Roles

The hydrographic ships are able to perform a variety of roles other than surveying. Because of their employment in remote northern waters they must be able to undertake surveillance, both in peacetime and during periods of tension. They are also required to contribute to disaster relief operations and provide Search and Rescue (SAR) support, particularly in submarine SAR situations. Moreover, the ships have to be able to provide emergency medical assistance and casualty care.

The size of the *Leeuwin* class Hydrographic Ships also enables them to act as command ships for Mine Countermeasures operations. The ships have sufficient space to embark military personnel and equipment to perform this role. The Hydrographic Ships could also be tasked with providing logistics support for small military forces operating in remote areas, particularly during periods of low threat.

Features of the Hydrographic Ships

The roles and functions of the *Leeuwin*-class hydrographic ships have determined their design, construction and operational capabilities. Paramount is the requirement to survey, in a cost-effective manner, over 10,000 square nautical miles per annum in coastal and offshore waters. This necessitates each ship being available for operations for 300 days per year, throughout their projected 20-year life span. The ships are multi-crewed in order to maximise productivity - three crews rotate through both vessels.

Leeuwin and *Melville* are minimally manned: each mixed-gender crew comprises just 48 people (9 officers, 8 Senior Sailors and 31 Junior Sailors). The ships' systems have been designed with minimal-manning as a key criterion. For example, an integrated control system, operated from the ship's bridge, manages all power generation, propulsion and manoeuvring, and some navigation and survey system functions. A closed-circuit television system also enables the propulsion plant and upper decks to be under constant observation.



HMAS LEEUWIN and HMAS MELVILLE off Cairns during trials early 2000

Melville and *Leeuwin* have essentially been built to commercial standards, by Cairns shipbuilder NQEA Australia Pty Ltd. However the ships' communications systems and damage control and safety equipment meet military specifications, to allow the ships to operate as RAN units. In the interests of minimising through-life costs, a commercial maintenance support philosophy has been adopted.

Other capabilities essential to the ships' primary survey role, have also determined their size and layout. These include requirements to:

- operate continuously in Sea State 4;
- support three 9-tonne Survey Motor Boats, and deploy these boats to remote camps;
- operate, support and house in a hangar, an intermediate size helicopter, and conduct in-flight refuelling of a medium size helicopter; and
- detect a one cubic metre obstacle on the seabed in water depths of 70 metres.

To meet these requirements, the hydrographic ships displace 2,200 tonnes, are 71 metres in length with a 15-metre beam and maximum draught of 5.5 metres. They have a maximum speed of 14.5 knots, and a range of 8,000 nautical miles at 12 knots. Each ship is fitted with a flight deck and hangar, an omnidirectional bowthruster, a single-tank passive stabilisation system, electronic navigation system, naval communications and the GMDSS safety radio system. The state-of-the-art hydrographic survey system is designed to meet today's stringent accuracy requirements for hydrographic data. It comprises multibeam and singlebeam echo-sounders, towed and hull-mounted sonars, oceanographic and meteorological sensors, input from three GPS/DGPS units, a motion sensor and a seabed sampler.

The ships' secondary roles have also been factored into their design and construction. *Leeuwin* and *Melville* are equipped to embark 10 metre containers on their quarterdecks, and their survey holds and storerooms have extensive space for embarkation of military stores and other cargoes. The ships' medical facilities are also capable of supporting their contingency roles, and they can accommodate large groups of evacuees for short periods. Their aviation facilities enable vertical replenishment, airborne casualty evacuation, and support/refuelling of other ships' helicopters.

The ships' detailed specifications are listed as follows:

Displacement: 2200 tonnes
Length: 71.1 metres
Beam: 15.2 metres
Range: 8000 nautical miles at 12 knots
Speed: in excess of 14 knots

Complement: 9 Officers, 8 Senior Sailors and 31 Junior Sailors

Propulsion: Four 810 kW Ruston diesels driving two Variable Speed Drive motors, connected to twin shafts. One 400 kW bow thruster.

Boats: Three 9 tonne Survey Motor Boats with full surveying capability.
Two Light Utility Boats.
One 4.7 metre rigid hull inflatable boat.

Helicopter: Ability to support up to a 9 tonne helicopter with a complete electronic approach guidance system, deck landing area and hangar.



HMAS Melville off Cairns, north Queensland, Australia

Sensors:

Hydrographic	One STN Atlas Fansweep 20 echosounder and one AD25 singlebeam echosounder feeding depth data into the Hydrographic Survey System. One Klein 2000 towed side scan sonar providing seabed texture data.
Oceanographic	Towed and fixed conductivity, temperature, probes. Portable external bathythermographs for temperature. Fixed and deployable acoustic doppler current profilers. Portable tide gauges.
Meteorology	One weather facsimile and a full suite of sensors.
Navigation	One CMAS forward looking sonar. One STN Atlas X-ray band ARPA navigation radar. A fully automatic pilot system. A range of GPS satellite receivers. Two Navigat X gyro compasses. A magnetic compass.
Communications:	Global Maritime Distress and Safety System radio suite. Two HF transceivers. Three HF receivers. One satellite receiver. Two V/UHF transceivers. Satellite telephone and facsimile. Internal LAN system.

Summary

The introduction into service of *Leeuwin* and *Melville* is a major milestone in the 81-year history of the Royal Australian Navy's Hydrographic Service. These two new ships provide a modern offshore surveying capability and enhanced productivity in a more cost-effective manner than their predecessors *Moresby* and *Flinders*. They make a major contribution to the defence of Australia, by providing accurate military geospatial information in the form of hydrographic and oceanographic data. This data enhances our understanding of the maritime environment in which the RAN operates.

Whilst hydrographic surveying is their primary role, *Melville* and *Leeuwin* are versatile and durable ships, which can undertake a variety of roles in peacetime and times of conflict, from disaster relief to command and control of MCM forces. The ships are undergoing operational evaluation, and beginning to demonstrate their potential as essential elements of the Royal Australian Navy.

Biography

Captain Bruce Kafer, RAN was appointed as Hydrographer of Australia and Commander of the Australian Navy's Hydrographic Force Element Group in December 2000.

Captain Kafer joined the RAN in 1977 and specialised in hydrographic surveying in 1982. Highlights of his early appointments as a hydrographic surveyor include service in HMA Ships *FLINDERS* and *MORESBY*, and an exchange posting with the Royal Navy from 1986 to 1989. During this exchange he served in HM Ships *FAWN* and *HERALD*, conducting surveys in the Irish and North Seas and operating with British Mine Countermeasures Forces in the Persian Gulf during the Iran-Iraq war.

His next posting was as Staff Officer (Quality Control) within the Australian Hydrographic Office, where he was responsible for the checking of all surveys produced by the ships of the Hydrographic Survey Force. This was followed by command of HMAS *FLINDERS*, undertaking surveys in the Coral and Arafura Seas and the Gulf of Papua. He then held two staff appointments, including a stint as Manager Hydrographic Development in the Hydrographic Office.

Captain Kafer's last sea posting was command of HMAS *LEEWIN*, from 1997 through its commissioning in May 2000 to trials and small proving surveys off the coast of Queensland.