SEMAPHORE

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WHY DOES THE NAVY NEED ENGINEERS?

> *The Navy, perhaps more than any other of the Services is dependent on a high quality of engineering skill and practice. All our ships and planes, the establishment which designs and builds them and the equipment which operates and arms them could not exist without the engineer and technical expert.*[1]
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> Fleet Admiral Ernest J King, USN

Throughout history naval forces have been quick to adopt improved technology, thereby gaining a capability advantage and allowing their parent nations to better pursue their national maritime aims. The exploitation of steam power, the internal combustion engine, controlled nuclear fission, the electromagnetic spectrum, solid state electronics and information processing, have each in turn led to a revolution in the capabilities that enable sea power, and thereby the means by which maritime strategy may be executed.

Central to the introduction and maintenance of changes to technology is the Naval Engineering service. All naval personnel are trained in the specific aspects of technology that allow them to do their job, but it is the engineering professional who lays the foundation, allowing technological advances to be incorporated and sustained. This *Semaphore* will examine how technology enables sea power and how engineering enables maritime strategic concepts.

Naval Engineering and *Australian Maritime Doctrine*

At the heart of *Australian Maritime Doctrine* (AMD) is the concept of sea power:

> The sum of all physical, demographic, geographic, economic, and military resources that are derived from or related to the sea and that are used by a nation to advance its national interests. More specifically sea power expresses a nation's ability to defend, by means of a navy and its adjuncts, its maritime interests.[2]

As a maritime nation, it is Australia's sea power which will frequently be the most efficient and effective means of applying force in times of conflict. In addition, by consistent involvement in a range of maritime patrol, engagement and cooperative security measures, it is our sea power which will often prevent and deter conflict from arising in the first place.

Naval forces have unique characteristics which, through their judicious use, provide many options to strategic decision makers. AMD lists these characteristics as Mobility in Mass, Readiness, Access, Flexibility, Adaptability, Sustained Reach, Poise and Persistence, and Resilience. Technology plays a central part in many of these characteristics, and it is the role of the naval engineer to provide commanders with assurance that the required capabilities will be available on demand.

Mobility in Mass. The advent of steam power in the 19th century freed naval units once and for all from the vagaries of the wind. Warships could thereafter travel the seas as their mission required and at a sustained and predictable speed. Furthermore the development of maritime propulsion allowed for larger vessels to be constructed, in consequence allowing for a greater ability to carry combat power in the form of troops, sensors and weapons systems. The responsibility for maintaining a ship's mobility belongs to the Engineering Department. Indeed, it was the advent of steam and later diesel propulsion that lead to the creation and formalisation of the engineering branch.

Readiness. Warships normally operate at a level which means they are ready for any contingency. Ships which are not in maintenance and have completed normal training can be very rapidly deployed. The technical regulation and maintenance of all systems carried by a ship, regardless of whether they are used daily or only in extreme conditions, is the responsibility of the engineering branch. It is a constant function of the engineering branch to maintain the material aspects of readiness.

Adaptability. The ability of a naval force to rapidly transition from being in a peacetime state to a high degree of battle readiness and with little or no external indication of change gives considerable flexibility and a range of strategic options to decision makers. Adaptability is entirely reliant on the continuous readiness of weapons systems, sensors and communications equipment, and the maintenance of a high level of proficiency in those that operate and maintain them.

Resilience. Warships are designed to control and withstand the effects of damage while maintaining mission readiness. Resilience relies on a good measure of redundancy in design and the ability of both sensors and weapons to achieve a variety of tasks. The engineering branch has a significant role in managing damage control and ensuring capability during operations.

Staff at the Centre for Maritime Engineering, one of the deep technical specialist organisations currently providing critical support to Navy capability

Naval Engineering and Combat Power

Technological change has affected every facet of naval life. The advent of refrigeration, air conditioning and electronic media have changed the habitability of warships and improved the health and living standards of a ship's company immeasurably.

However its greatest effect has been in the Navy's ability to fight and win at sea through the maintenance of a high level of modern and effective combat power. It has been the role of the naval engineer to assimilate this change and turn scientific ideas into a mature and reliable capability enhancement. During the Navy's 110 years the naval engineering branch has overseen the introduction of sonar, radar, satellite communications, gas turbine propulsion, combat data systems, guided weapons, as well as numerous other enhancements. All of which have fundamentally enhanced the combat power available to a commander.

The Human Factor

Despite the RAN being essentially a technical service, Chapter Two of *Australian Maritime Doctrine* is quite clear about the source of Navy's capability 'It is not simply technology … but rather the way that this technology is employed. It is therefore Navy people who generate the real capabilities'. This is as fundamentally true for the technical and engineering categories of the Australian Navy as it is for all others. The inherent dangers of life at sea, the requirement for a disciplined force, the need for ethical leadership at all levels of naval service are common requirements for all Navy people. In particular, a high level of collective and individual training to prepare all members of the Navy for maritime combat allows technical and engineering sailors and officers to fully contribute to the fighting effectiveness of both individual units and joint maritime forces.

The formation of the Commonwealth Naval Forces in 1901 came at a time of substantial technological revolution in naval forces. A naval arms race was underway between the major powers, and submarines and later aircraft were also being introduced into naval service. Thus, the importance of Naval Engineering was recognised early in the history of the RAN. When the Australian Naval Board was reconstituted in 1911 following the Henderson reforms, the Third Naval Member of the Board was responsible for 'the repair and construction of ships'. The first officer appointed to this position was Captain (later Vice-Admiral Sir) William Clarkson.[3] Clarkson was a marine engineer who had served under the then Captain WR Creswell as the staff engineer of HMCS *Protector* during the Boxer Rebellion of 1900-01. Although steaming 16,000 miles *Protector's* machinery and systems suffered no defects during that operational deployment – even by today's standards a remarkable engineering achievement.

Clarkson shared Creswell's enthusiasm for the development of an Australian Naval Force and his performance as Third Naval Member was exemplary. By the end of World War I Australia had developed a considerable naval shipbuilding capability which allowed the RAN to develop a modernisation program which included the construction of cruisers, destroyers and support equipment. On promotion to Vice Admiral on retirement in 1921 he became the first and still the only Engineering Officer to achieve that rank in the RAN and he was considered 'without peer in Australian maritime affairs'.[4]

No finer example of the broader contribution technical sailors make through demonstrating the Navy's values can be found than Chief Stoker Alfred Wrench. Not only an outstanding technical sailor, Wrench was also Mentioned in Despatches for the courage he displayed while serving in HMAS *Vampire* (I) during the Greece and Crete evacuations, the Malta Convoys and the evacuation of Tobruk in World War II. He was again Mentioned in Despatches for his actions as gun crew during the action that led to the sinking of *Vampire* in 1942. Later in the war he was awarded the British Empire Medal, in part for his actions during the Battle of Leyte Gulf aboard HMAS *Gascoyne* (I).

Conclusion

As Professor Geoffrey Till has noted 'to be operationally significant, high grade technology needs to be maintained and operated effectively … simply having it is not enough'.[5] Within a naval platform – a ship, a submarine or a squadron – the role of the engineering department is therefore well defined. It is responsible for having all the platform's systems maintained in a state of efficient working order and in readiness for immediate use.

The RAN is a technocracy and engineering underpins every aspect of capability. There is a need to scan through doctrine and concentrate on where engineering contributes most – the enablers of maritime capability for instance.

The Strategic Review of Naval Engineering (SRNE) conducted a comprehensive strategic analysis of the current issues facing the Naval Engineering community and highlighted the considerable challenges it faces in the next decade. It was accepted by the Chief of Navy in June, 2010 and he advised his acceptance of most of its findings. One of its recommendations was that the contribution of naval engineering be given greater prominence in Australia's naval doctrine. With a rewrite of RAN Doctrine 2 imminent it is worth asking ourselves how does engineering contribute to our maritime capability, and what is its role in the balanced maritime force that underpins the fundamental concepts of *Australian Maritime Doctrine*? The Chief of Navy, in accepting and ensuring implementation of the SRNE recommendations hopes to ensure that the Navy continues to value all members of the technical community for the essential contribution they make to maritime capability.

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1 Quoted in Louis Le Bailly, *From Fisher to the Falklands*, The Institute of Marine Engineers, London, 1991, p. xi.

2 Royal Australian Navy, *Australian Maritime Doctrine*, Sea Power Centre - Australia, Canberra, 2010, p. 206.

3 Chris Coulthard-Clark, *Without Peer: Sir William Clarkson KBE CMG (1859-1943) Engineer Vice-Admiral, Royal Australian Navy*, The Warren Centre for Advanced Engineering, Universty of Sydney, 2002.

4 BN Primrose, 'Clarkson, Sir William (1859-1934)', *Australian Dictionary of Biography*, Volume 8, Melbourne University Press, 1981, pp. 18-19.

5 Geoffrey Till, *Seapower: A Guide for the 21st Century*, 2nd ed, Routledge, London, 2009, p.117.