

Jump TO Article



The article on the pages below is reprinted by permission from *United Service* (the journal of the Royal United Services Institute of New South Wales), which seeks to inform the defence and security debate in Australia and to bring an Australian perspective to that debate internationally.

The Royal United Services Institute of New South Wales (RUSI NSW) has been promoting informed debate on defence and security issues since 1888. To receive quarterly copies of *United Service* and to obtain other significant benefits of RUSI NSW membership, please see our online Membership page:

www.rusinsw.org.au/Membership



Jump TO Article

HMAS AE2

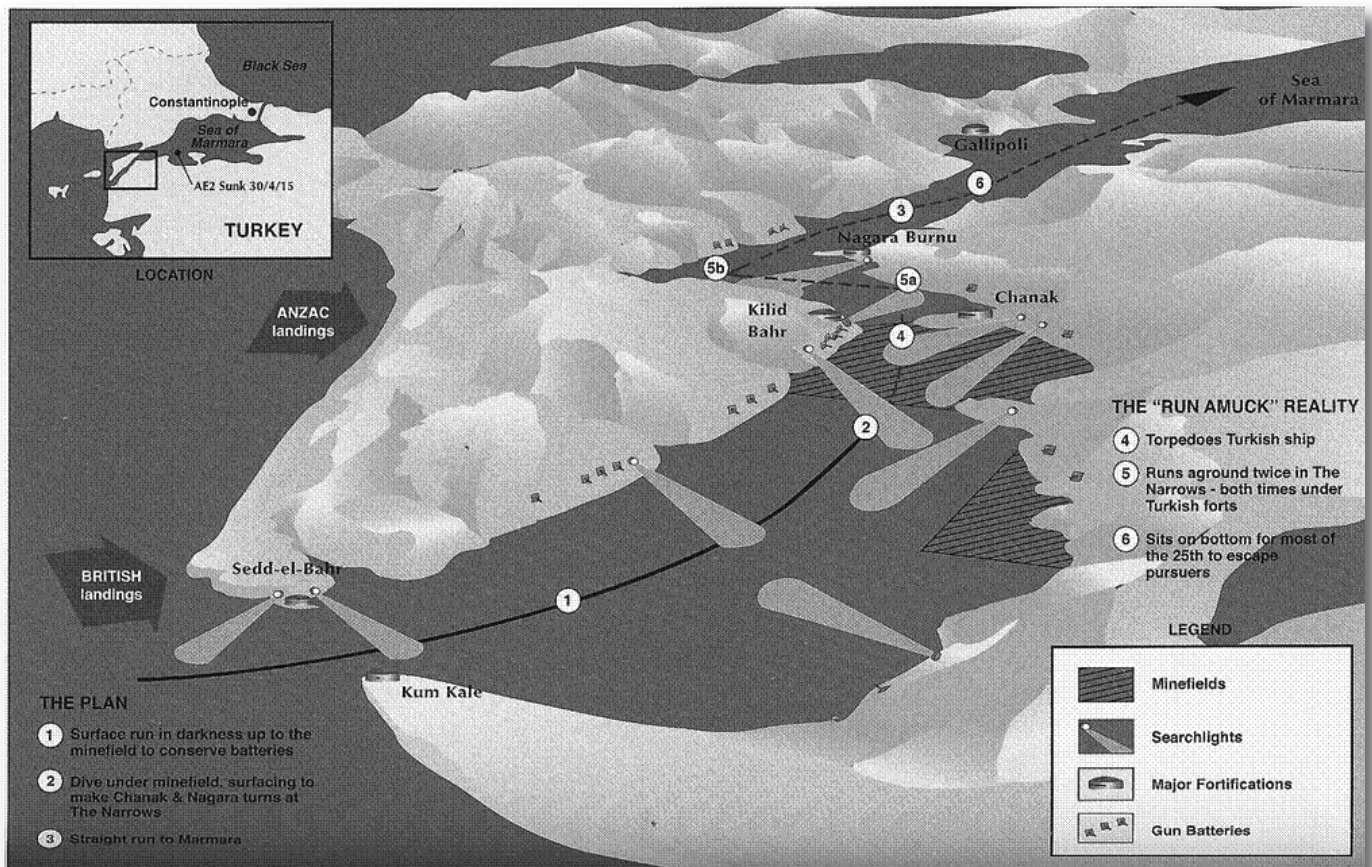
an address¹ to the Institute on 29 April 2009 by
Commodore T. A. Roach, AM, RAN (Retd)²



On 25 April each year, Australians focus on the heroic exploits of the Australian Army as it forged the ethos of ANZAC³ at Gallipoli. As the soldiers landed on the beaches, however, some 80 kilometres away in the Dardanelles Strait, Australian sailors in the submarine, HMAS AE2, were on a hazardous mission to support their brothers-in-arms ashore. In this paper, Terry Roach tells their story and then outlines recent steps to commemorate their deeds and secure the wreck of the AE2.

The Exploits of HMAS AE2 in April 1915

HMAS AE2 was the second of two E-class submarines that were built in Britain in 1913 for the Royal Australian Navy⁴. In April 1915, AE2 was ordered to penetrate the Dardanelles, to create a diversion for the Allied landings at Gallipoli by 'running amok' in the Narrows and then, subsequently, to disrupt Turkish supply lines through the Sea of Marmara to the battlefields (see map below).



The Dardanelles, showing the Turkish defences in April 1915, HMAS AE2's plan and the 'run amok' outcome [Source: Brenchley and Brenchley (2003), illustration by Simon Dance opposite p. 80]

¹Attended by 95 members and guests

²terry.roach@bigpond.com

³Australian and New Zealand Army Corps

⁴The other, AE1, was lost without trace in New Guinea waters early in the Great War.

AE2 was to battle her way through the enemy defences of the straits – the five minefields that had defeated British and French warships; the ever-vigilant coastal batteries and searchlights; and the many patrolling gunboats and destroyers. The limited battery technology of the time meant that AE2 would have to

surface to recharge at least once during the transit of the straits. The crew also would have to struggle with the navigational hazards. The unpredictable current which flowed out down the strait was never less than 1½ knots and in the narrowest part could be up to 4 knots against them. The normally calm sea meant that the wake of a periscope would be easily visible whenever it was raised for navigation or to observe enemy activity. There were many reefs and shoals to avoid; which was difficult when the use of the periscope had to be severely constrained to reduce the risk of detection. Further, the seawater density fluctuated wildly in the confined waters of the straits as less-dense fresh water from snow-melt in Russia, which flowed into the Black Sea then through the Sea of Marmara and out through the straits, mixed with the saltier Aegean waters. These fluctuations had a severe impact on the ability of a submarine to maintain neutral buoyancy and a consequent effect on depth keeping.

Penetrating the Narrows and causing a diversion

In calm and clear weather, *AE2*, under command of Lieutenant-Commander Henry Stoker and with her crew of 32 men, entered the straits at 0230 hours on 25 April 1915. She ran on the surface until 0430 hours when, just as the troops were commencing the landing at Anzac Cove, gunfire from a coastal battery forced her to dive and begin penetration of the first minefield. Numerous mine-mooring wires scraped against the hull as the submarine approached the narrows to create a diversion. There, the periscope was seen and the forts opened fire. Despite the hail of shells, she attacked and hit a gunboat with a torpedo; then ducked under a Turkish destroyer as it tried to ram her. A Turkish battleship, which had been bombarding the troops on the landing beaches over the peninsula, had to break off the bombardment and move as a precautionary measure against the threat posed by the submarine.

In eluding the pursuit, *AE2* ran aground, with much of her conning tower exposed, right under the guns of one of the forts – so close that the guns could not be depressed sufficiently to fire at the submarine. Desperate measures freed the submarine and she slid off the sand bank into deeper water, still pursued by the Turkish destroyers and gunboats. Shortly after, she grounded again and was again exposed and subjected to enemy gunfire, before managing to reach the comparative safety of deeper water.

The Turkish warships prosecuted the hunt with great vigour, but eventually *AE2* managed to evade them and sat on the bottom at 0830 hours. The crew listened for more than ten hours in the hot humid atmosphere, nerves taugth, to the sounds of the searching ships overhead. It was a long day!

Hours after the sound of the ships faded, the submarine surfaced to recharge batteries. The air was foul and thick with diesel and the stench of men too long confined. The crew took turns to stand on deck and

breathe in the fresh night air, relieved at having survived the dangerous hours beneath the surface.

At the same time, the ANZAC troops were in a parlous position with very heavy casualties on a very small beachhead. The commanders ashore were in favour of immediate evacuation. At 2300 hours in the flagship, the Commander-in-Chief, General Sir Ian Hamilton, was considering this recommendation when he received a wireless message from *AE2* reporting that she had penetrated the Narrows, sunk a Turkish warship and was now in the Sea of Marmara. Having demonstrated that the straits could be penetrated by a submarine and having caused a diversion, *AE2* had largely accomplished its mission. We do not know whether Hamilton's decision to stay put was influenced by *AE2*'s message, but, in his message to the troops ashore, he told them of *AE2*'s success.

Severing Turkish supply lines

The submarine continued on into the Sea of Marmara to disrupt Turkish supply lines, seeking out Turkish ships to destroy and fighting the Turkish gunboats and destroyers which were sent to destroy her. *AE2* had no deck gun with which to fire on Turkish shipping and only six torpedoes left. But the threat posed by the submarine was substantial. The Turkish supply lines to Gallipoli were hampered by very poor roads, there was no railway and shipping was the only practical method. The Turks would simply have to deal with the submarine and expend considerable effort in the process. So, within two hours of the receipt of *AE2*'s message, a second submarine, *E14*, was ordered to follow *AE2*'s example and penetrate the Dardanelles Strait.

AE2 attacked several ships over the next two days, causing consternation to Turkish authorities, and had to evade vigorous counter attacks from Turkish patrol craft. On 29 April, she returned to the straits, dived and then turned back into the Sea of Marmara, with the periscope breaking the surface to give the impression of a second submarine entering the area. She was seen and pursued, but she shook off her pursuers yet again, firing at, and narrowly missing, a Turkish gunboat.

Later that day, with *AE2* was down to her last torpedo, the captain was planning to sail for Constantinople to attack shipping there when the lookout sighted the British submarine *E14*, which had made the same dangerous passage through the Dardanelles two days after *AE2*. The two captains agreed to rendezvous the next morning, but the planned meeting never happened.

Loss of the AE2

On 30 April, as she approached the rendezvous, *AE2* dived to avoid being seen by a Turkish gunboat. The science of oceanography was in its infancy and little was known about the effect of fluctuations of seawater density caused by the mixing of salt and fresh water. As in the straits, these effects are present in the

Sea of Marmara and *AE2* encountered this phenomenon when, half-an-hour after sighting the Turkish gunboat *Sultanhisar*, *AE2* lost control of her buoyancy at a depth of 16 metres.

AE2 went bow-up and broke the surface just 90 metres from the Turkish vessel. Under heavy gunfire, the forward tanks were flooded and the submarine plunged back into the depths, down to 30 metres before rising again, breaking the surface at speed and out-of-control. The captain ordered the ballast tanks flooded, again sending his submarine on a wild, almost vertical dive, deeper and deeper until she passed 30 metres, beyond the safe diving depth. All eyes were on the boat's hull, waiting for it to collapse. Instead, *AE2* shot back up again, surfacing quickly, stern first, and almost immediately was hit three times by gunfire from the gunboat. The gunfire penetrated the hull in the engine room and control room. With the pressure hull ruptured in three places, *AE2* was doomed and the captain ordered the crew to scuttle the submarine and abandon ship. The captain was the last to leave and only when the rest of the crew were safely in the water.

The entire crew was picked up and became prisoners of war. Four of the crew died of disease during the subsequent three years of captivity. In 1922, the Imperial War Graves Commission exhumed and re-interred the bodies of three of these sailors in the North Gate Cemetery in Baghdad – the grave of the fourth sailor was never found. The Australian Army elements stationed in Baghdad conducted their Anzac Day commemorations there this year.

A successful campaign

AE2 had demonstrated that the Narrows could be penetrated by submarines. Many British and French submarines followed her into the Sea of Marmara. They destroyed some 230 Turkish ships and denied Turkey the use of the sea to support her forces on the Gallipoli peninsula. For the remainder of the Gallipoli campaign, virtually all Turkish supplies and reinforcements had to be laboriously brought in overland. It was arguably the first successful submarine campaign in history and is a classic example of a strategy of sea denial. Australian sailors had led the way and their feat showed the potential value of a capable submarine force to Australia's defence.

Operation Silent Anzac

In 1998, the wreck of HMAS *AE2* was discovered in the Sea of Marmara by a Turkish diver, Mr. Selçuk Kolay, and an Australian archaeological team led by Dr Mark Spencer and including maritime archaeologist Mr. Tim Smith, subsequently confirmed the identification.

The Submarine Institute of Australia established the *AE2* Commemorative Foundation (AE2CF) to investigate the discovery. In collaboration with the Turkish Institute of Nautical Archaeology (TINA), AE2CF brought together a multi-disciplinary team of volunteers in 2007 to conduct a maritime

archaeological assessment of *AE2*. Matching funding was provided by the Australian Government and the major sponsor ASC Pty Ltd – in total almost \$900,000. The project became known as Operation Silent ANZAC.

The expedition team consisted of ten divers and a supervisor; two Defence Science and Technology Organisation (DSTO) personnel with a remotely-operated vehicle; experts in corrosion science, maritime archaeology and naval architecture; a Turkish cultural advisor; and project management personnel.

The survey of the wreck

The survey tasks were coordinated by a maritime archaeologist in accordance with a Turkish Government permit and the UNESCO⁵ *Convention for the Protection of the Underwater Cultural Heritage 2001*. From a base in the fishing village of Karabiga, diving activities were conducted from a chartered diving support vessel, *Detek Salvor*, moored in close proximity to *AE2*.

Divers surveyed the wreck and video-recorded it, generating high-definition digital footage with good depth-of-vision, due to exceptional water clarity in the early stages. Still photography provided good images of the bow and forward casing section as well as extensive coverage of the torpedo tubes, stern and propeller. Initially, the current, weather and visibility were favourable, but deteriorated as the week progressed and activities had to be curtailed. One day, a diver experienced equipment difficulties, but was recovered, resuscitated and stabilized. The Turkish Navy arranged for the rapid transport of the patient to a hospital intensive care unit and the diver made a full recovery.

A video camera (the 'drop camera'), specially developed by DSTO, proved to be very successful when it was inserted through the partially-open, upper hatch⁶ of the conning tower. It provided images of the conning tower and control room interior, as well as a steering wheel, engine repeater and what appeared to be a voice pipe. There was only minor evidence of marine growth or corrosion on the internal hull and fittings; and, critically, unlike many other submarine wrecks, there was no appreciable sediment inside the hull, in which the water appeared very still and clear. No isolated archaeological relics were observed on the floor of the control room and most of the major items of machinery, piping and equipment could be quite clearly seen and identified.

A remotely-operated vehicle also proved to be an excellent data collector, enabling the surface research team to focus in on areas of interest, free of any in-water dive-time constraints. It provided the major dataset available for methodical analysis – a comprehensive

⁵United Nations Educational, Scientific and Cultural Organisation.

⁶Lieutenant-Commander Stoker left it this way when he abandoned ship.

video-survey of the submarine's entire visible external area, including clear images of marine flora growing on the hull and corrosion effects; and a series of ultrasonic thickness measurements on a clean portion of the submarine's ballast tanks. The level of sediment around the hull was little changed since the 1998 expedition.

Sedimentation: A sample of original *AE2* ballast tank plating concretion was recovered along with a dislodged ring bolt bracket. Preliminary analysis showed a number of layers of sediment indicating that there may have been a number of sedimentation events which have resulted in the submarine becoming buried in a fine layer of silt that now covers the vessel up to the base of the fin. Indeed, the hull would appear to have been buried by sediment on four occasions since the submarine was sunk.

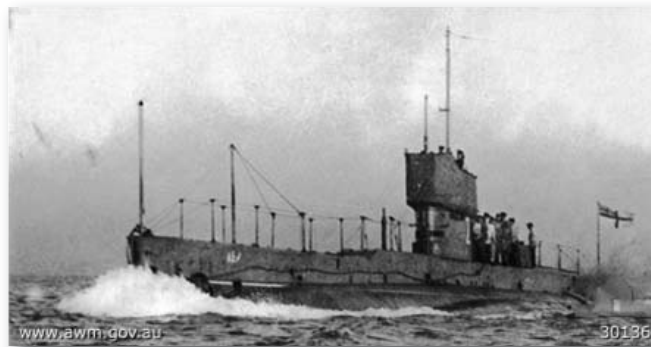
Corrosion: A corrosion survey of the hull started after the completion of still and video recordings of the site. Divers removed concretion from a small area with a pneumatic drill and then used a corrosion meter to measure the corrosion potential at the site. Enough data were collected to confirm the corrosion rate predicted by the corrosion scientist, so extrapolations across the hull can be made with confidence. An *in situ* measurement of corrosion potential and pH confirmed that the observed degree of corrosion is consistent with the vessel having corroded for long periods in an essentially anaerobic to very low oxygen microenvironment.

Water quality: The seawater in the immediate vicinity of the wreck was sampled for salinity, dissolved oxygen and temperature at one metre intervals. The most striking characteristic was a strong halocline (change in salinity) at 14 to 22 metres, which coincided with a marked thermocline (change in temperature) – the water temperature fell from 26°C to 18°C. Above the halocline, the salinity was 21 parts per thousand (ppt), reflecting the influx of relatively fresh water from the Black Sea (an average of 18 ± 0.5 ppt). Below the halocline, the water was hyper-saline (42 ppt), reflecting that which floods through the Dardanelles from the Aegean Sea. The site is a relatively benign corrosion environment, dissolved oxygen levels being approximately 50 per cent of the saturated values at the surface.

Battle damage: No conclusive evidence of battle damage was found. It is likely that concretion, corrosion products or marine flora have obscured the 37 mm shell holes which caused uncontrollable flooding when the holes were submerged. It was this battle damage which compelled the captain to abandon ship and to scuttle the submarine to prevent its capture by Ottoman forces.

Structural analysis of the hull was critical to determine if the hull girder was strong enough to withstand lifting. A three-dimensional computer-based surface model of the submarine was developed and validated by a 'grounding' analysis to simulate lifting of the hull with two sets of slings. This identified the

maximum stress points where hull thickness needed to be measured. This analysis combined with the corrosion data then enabled assessment of the ability of the hull to withstand lifting. It indicated that the pressure hull is in a remarkably good state of preservation. Overall, the submarine appears strong enough to be lifted and moved to shallow-water, though a more detailed survey would be required to confirm this before considering either moving it or full-scale recovery.



HMAS AE2 [Australian War Memorial negative 301364]

Summary of archaeological findings

The major finding of the 2007 expedition is the significant increase in the amount of damage sustained to the upper exposed portions (the casing and fin) of *AE2* since its discovery in 1998. At that time the casing was largely intact, except for some isolated damage from contact with fishing nets. The bow now is almost totally torn apart, with the extreme ends bent up, to port and aft, with many plates dislodged, forming a localised debris field on the seabed to the port side of the submarine.

The survey revealed a relatively sound and obviously intact lower hull. As the corrosion, ultrasonic and water quality data confirmed, the main hull elements of *AE2* have survived in remarkably sound condition; and the permanently buried portions of the *AE2* hull are likely to be in a better state of preservation. Equally, the interior of the *AE2* hull has a benign environment, which drop-camera images showed has resulted in minimal deterioration of the structural elements, fixtures and fittings.

The relatively benign macro and micro-environments – anaerobic sediment; relatively passive water column, with low levels of dissolved oxygen – in which *AE2* sits has been instrumental in determining its current state of preservation and integrity. The drop camera showed the water inside the submarine to be very clear and still, indicating that, except for the partially-open upper hatch, there are few openings into the hull to allow water movement. Of equal interest was the absence of significant corrosion products or marine growth on the internal features; many internal fittings and fixtures could be identified; and there was little sedimentation inside the hull.

Management options

The starting point for developing options for future management of *AE2* is that the hull is remarkably well preserved and appears in good enough condition to be lifted clear of the sea bed for relocation to a shallow water site. There is an unexploded torpedo, probably in the after tube, however, which would have to be rendered safe as a pre-condition for recovery or moving *AE2*.

AE2 has suffered some additional deterioration and damage since initial discovery – some caused naturally by ongoing fabric corrosion and destabilisation; and some by fishing nets and a lifting force applied to the port towing pendant, possibly by an anchor fouling it. That this damage occurred within a short 9-year period shows that *AE2* is vulnerable to such activity if unchecked. One immediate option, therefore, could be to deploy a defensive barrier around the site, to reduce the possibility of nets, anchors or trawls fouling the submarine.

The natural deterioration of the superstructure could be further limited by the attachment of sacrificial anodes to the hull. An array of zinc or aluminium anodes could lower the active corrosion rates significantly.

Options for the future management of *AE2*, therefore, include whether to:

- implement a least-impact approach to site management;
- undertake activities to prolong site retention and management in situ; or
- more extensive interventionist approaches to seek effective protection, management and interpretation, such as
 - o recovery to shallow water for preservation and display, or
 - o recovery, preservation and display in an interpretive centre ashore in Turkey.

Advice to government

The findings of the 2007 survey informed a joint *AE2*CF and TINA workshop held in April 2008 in Istanbul, Turkey. There was virtually unanimous agreement to preserve and protect *AE2 in situ*. The following recommendations were made to the Turkish and Australian governments:

- there should be ongoing archaeological and environmental monitoring of the wreck, including an internal maritime archaeological assessment using remotely-operated vehicles;
- a site surveillance system should be installed and linked to the Turkish Coastguard system to prevent unauthorised diving on the submarine;
- site protective measures should be installed;
- cathodic protection should be installed on the submarine as a priority;
- site-specific Turkish legislation to provide cultural heritage controls and fishing moratoria should be implemented effectively; and

- educational programmes should be delivered including:
 - o a television documentary – *Gallipoli Submarine* was broadcast by the ABC on the eve of ANZAC Day 2008,
 - o a website with suitable historical content – this was established in March 2009,
 - o the placing of commemorative plaques at significant locations in Turkey and Australia⁷, and
 - o the provision of all Australian primary and secondary schools with teaching and learning resources kits that tell the story of *AE2* – this is being discussed with the Curriculum Corporation.

Since the workshop, the *AE2* Commemorative Foundation has approached the Australian government offering to prepare an implementation plan for the future management of the submarine. Discussions have been held with the responsible minister and the inter-departmental working group that oversees such activities will be briefed shortly on the latest proposals.

Conclusion

The Royal Australian Navy's participation in the Gallipoli campaign has been overshadowed by the exploits of the Australian Army – it should not be overlooked. *AE2* is the 'Silent Anzac' and deserves recognition as an important part of Australia's naval heritage, its wreck preserved appropriately by the Turkish and Australian governments. As well as the stories of the ANZAC soldiers, the story of the heroism of the sailors of *AE2* should be told as well.

Reference

Brenchley, F., and Brenchley, E. (2003). *Stoker's submarine* (HarperCollins: Sydney).

The Author: Commodore Terence Roach, with his wife, presently produces beef on the southern tablelands of New South Wales. During a career as a submarine specialist officer in the Royal Australian Navy, he commanded two submarines, HMA Ships *Otway* and *Ovens*, before retiring after serving as the Australian Naval Attaché in Washington DC, United States. He was the Director of Operations of the 2007 expedition which surveyed the sunken World War I submarine, HMAS *AE2*, and participated in the subsequent joint workshop in Istanbul which formulated recommendations to the Turkish and Australian governments for the submarine's future management [Photo of Commodore Roach: Colonel J M Hutcheson MC].

⁷The first plaque by well known sculptor Dr Ross Bastiaan was unveiled on 22 April 2009 by Minister Snowdon and the Turkish Consul General at Garden Island from whence the submarine sailed to her fate on 19 December 1914. A second plaque was unveiled on 5 June at the West Australian Maritime Museum [the only Museum with a significant display depicting *AE2*]. Two more are planned for installation – one at the Turkish Naval Museum, Çanakkale; and the other at the Gaba Tepe Battlefield Museum.