Society Members' Bulletin

"RNEBS acquires 111 North Hill"

October 2015
Issue 12

Royal Naval Engineers Benevolent Society

Founded in 1872

Society Members' Bulletin

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Welcome, welcome, welcome. Here we are at issue 12, quite a special number in fact. It is the largest single-morpheme name in the English language and is known as a composite number, a highly composite number, a superior highly composite number, a sublime number, a semi-perfect number and a super-factorial. Then there are references to the 12 apostles, the 12 days of Christmas, the 12 tribes of Israel, 12 months in a year, 12 hours in the morning and of course 12 in the afternoon, 12 pence in a shilling, 12 inches in a foot and King Arthur's 12 knights.

I am still staying with the theme of the 100 year anniversary of World War1 with some articles about submarines. This year sees the 70th anniversary D–Day and VJ Day and the formation of the Royal Navy Aircraft Handlers Branch. Also it is the 75th anniversary of the Dunkirk Evacuations and the 200th anniversary of the founding of the Royal Yacht Squadron. Did you know that RYS yachts are allowed to fly the white ensign rather that the normal red ensign?

The 5th Anniversary visit to the Arboretum will be held on Sunday 2nd October 2016. Please let us know if you are interested in attending to give us an idea of numbers. The date has been chosen so that it does not coincide with the "Ride to the Wall".

Finally, hi to RNEBS member Trevor, who I met up with on a recent cruise on board the Oriana. If you have not yet tried a cruise holiday then book one up and give it a go.

Regards

Mark Stevens

Editor, Society Members' Bulletin

Distribution:

Only members and associate members of the RNEBS are entitled to a copy of the Society Members' Bulletin.

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111 North Hill

In August this year the trustees signed the documentation that completed the purchase of 111 North Hill for £350k. This is a significant investment for the society and reallocates a large proportion of our funds from savings back into property, since Holland House was sold back in 2002. The process has taken over 18 months to complete from our first enquiries. A big thank you goes to Derek Fletcher who has managed this purchase from beginning to end.

The five story building is somewhat larger than 113 and is currently split up into three sections; the basement, three floors leased out to the Plymouth Proprietary Library, and a three-bedroom self-contained flat spread over two floors. There is also a garage at the rear and two parking bays at the front of the property.

The majority of the building has recently been refurbished, including the roof, so it is in a fairly good material state. After crunching the numbers we calculated that this venture would give a better return on investment (ROI) in the medium to long term rather than leaving the money in the bank, where interest rates are at an all time low. It also shifts the balance of the Society's portfolio to approximately 57% property and 43% cash. The trustees regularly look at how the assets of the society are invested and make great efforts to obtain the best rates available. It has taken a number of years to find a suitable property to buy and although a number of buildings in the Gosport and Fareham area have been looked at over the years, none were deemed suitable or value for money.

The Plymouth Proprietary Library (PPL) is one of Plymouth's oldest historic institutions, founded in 1810. It was originally situated in a John Foulston-designed building at the centre of the City in Cornwall Street, but was bombed in 1941 during World War Two, destroying most of the stock. The library moved to its present location at 111 North Hill after the war.

The PPL is a Registered Charity run by a Committee of Trustees elected by the members (the subscribers) at each Annual General Meeting. It has a regular income from investments, lettings and the heritage Lottery Fund which supplements member subscriptions to cover the running expenses of the Library and for purchase of new fiction and non-fiction books.

The collection consists of 20,000 volumes ranging from 18th century literature to contemporary fiction and non-fiction. Also biographies, diaries and letters, travel, maps, local history and the Windham Collection of Royal Naval historical papers. The Cottonian Collection of books, prints and drawings, presented in 1853 by William Cotton, is currently housed in Plymouth Museum and administered by Trustees of Plymouth City Council, Cottonian descendants and Plymouth Proprietary Library.

General Secretary's Report

By Cliff Fiander

The year has progressed as normal with visits to HMS Sultan, one for Divisions in the rain, another to attend the Annual Charity Reception together with the Managing Secretary and several others for meetings to discuss awards. Visits to HMS Collingwood are planned for the Autumn. As described below there was a visit to Portsmouth Dockyard and 1710 NAS, attendance at the Annual Executive Council Meeting in the Shearsby Suite and, as you will read elsewhere in the Bulletin, the purchase of 111 North Hill; albeit that was managed by the Managing Secretary under the watchful eyes of the Trustees and I only contributed where I felt it might be useful.

Conscious of the great history of engineering in the Royal Navy and the part played by artificers it has been decided that, as it did in March 1968 for the 100th Anniversary of the Introduction of Artificers into the Royal Navy, the Society will take the lead in organising a celebration of the 150th Anniversary in 2018. Arrangements are very much in their infancy but we intend to work with the Fisgard Association and the Old Caledonian Artificer Apprentices' Association to put together an event that will culminate in a gala dinner-dance at a suitably impressive venue. It is unlikely there will be many ex-Artificers left to celebrate the 200th Anniversary so this once-in-a-lifetime event needs to reflect the importance of the occasion and provide the opportunity for as many as wish to attend to do so.

To ensure adequate publicity for the event I would be most grateful if any members could put me in touch with our Commonwealth brethren as the Anniversary is also theirs. We will be seeking expressions of interest in the near future to give some dimensions to the organisation of the event but in the meantime if any members have any useful suggestions I would be very happy to receive them.

Earlier this year I had the pleasure of visiting 1710 Naval Air Squadron (1710 NAS) in Portsmouth Dockyard for a tour and to present POAET Sparks with the Society's award for achievement during his course at RNAESS. 1710 has an impressive capability in the investigation of equipment failure and the repair and manufacture of aircraft components and there was ample evidence to show that the best traditions of naval engineering are in good hands.

I also had the pleasure of meeting POAET Seb Coulthard in the workshops for a most interesting tour of that facility; he is clearly of the old Artificer School – try Googling www.sebcoulthard.com.

The Repair Manager, Lieutenant Commander Simon Peck, gave a great deal of his time to make the day interesting and informative. He also provided me, most generously, with a brief on the Squadron's activities and capabilities which in that great tradition of I-can't-say-it-any-better I include as follows:

1710 NAVAL AIR SQUADRON (1710 NAS)

INTRODUCTION

1710 Naval Air Squadron (1710 NAS), under the command of a Commander Air Engineer Officer and based in HM Naval Base Portsmouth, is the Ministry of Defence's centre of expertise for helicopter structural repair, service modifications and scientific support to military aviation. Commissioned as a Naval Air Squadron on 27 May 2010, the Squadron is responsible for providing the full range of rapid aviation support to meet the exacting demands being made on UK military aviation, of all three Services, deployed anywhere in the world. The Squadron's primary role is support to current operations ensuring that UK

military aircraft operate at optimum levels of operational readiness and capability at all times. This includes the assessment and structural repair of damaged helicopters, designing and fitting modifications to enable new capabilities and Providing advice and support, across a range of scientific disciplines, to preserve aircraft airworthiness and availability. The Squadron also assists with in-depth investigations into failures and accidents.

The Royal Navy has been operating aircraft in all environments for over 100 years and Naval aviators are well known for their technical innovation. 1710 NAS consists of a formidably capable team of experts including specialists from the Royal Navy, Army, Royal Air Force and Civil Service. In addition to providing a highly effective capability in support of worldwide UK defence commitments, the Squadron is unique in that it also brings together many mutually beneficial aspects of specialist aviation support in one organisation.

SERVICE MODIFICATION

The purpose of 1710 NAS Service Modification Section is to design and manufacture urgent operational requirements, capability enhancement and safety modifications for UK military aircraft. The Modification Section aims to deliver to the front line quickly and cost effectively, providing the ingenuity and flexibility that has always been the hallmark of Naval aviation. The section comprises of Service project managers, design staff and a workshop support team of military and civilian engineers including a highly reactive contractor support team for production manufacturing.

Able to manage around 40 Service modifications at a time, projects vary from relatively simple modifications such as aircraft grab handles to far more complex projects such as integration of offensive and defensive weapons or complex communication upgrades. The Squadron has recently produced urgent operational modifications for the new Merlin Mk2 helicopter to support on-going operations, even before the aircraft has been formally handed


Photo by LA(Phot) Vicki Benwell

into Royal Navy service. The Squadron's work-shop facilities in both mechanical and aviation disciplines make it a very well equipped resource to rapidly deliver capability direct to the front line.

REPAIR

1710 NAS's Repair Section carries out repairs to structurally damaged UK military helicopters anywhere in the world at very short notice. The section comprises small teams of specialist Air Engineering personnel, who are trained to deploy with combat forces in all conditions whether in the desert, the jungle, the arctic or at sea.

The section delivers approximately 125 helicopter repairs each year and has only just returned from an 8-year enduring deployment in Afghanistan in December 2014. Whilst deployed they conducted 409 repairs on 8 aircraft types with over 152 personnel cycling through the deployment and over 50,000 maintenance man hours expended directly on aircraft repair. Beyond Afghanistan, the requirement to conduct repairs to front line aircraft results in section personnel spending the vast majority of their time deployed to aircraft operating bases in the UK, Europe and worldwide.

Repairs range in complexity from major structural rebuilds, requiring specialist jigs and support equipment, to rapid repairs in the field to avoid an aircraft falling in to enemy hands. Whilst battle damage is a significant driver of repair activity, most of the biggest challenges faced by the teams stem from incidents which occur as the result of aircraft operating in harsh conditions and at the very limit of their capability. Repair personnel are highly trained to deliver this deep specialist task, which is a critical enabler to UK military helicopter operations.

MATERIAL INTEGRITY

The Material Integrity Group sustains operational capability of military aircraft by providing direct and rapid scientific materials and monitoring support to front line units and their support organisations. The group consists of scientific and military subject matter experts, specialising in materials science, failure investigation, forensic engineering, chemistry, mechanical engineering, non destructive testing, tribology and aeronautical engineering. Military aircraft are frequently operated in demanding environments that push the airframes, engines and associated systems to the limit of their capability. Materials Integrity Group provides support, on a 24/7 basis, to enable the aircraft to continue operating in these conditions whilst reducing the danger of unexpected failures and avoiding prohibitive levels of maintenance. They do this through monitoring of aircraft vibration characteristics, structural faults, wear debris and systems' health, providing reactive and proactive diagnosis of problems. Materials and chemistry experts then provide recommendations regarding suitable recovery and prevention actions.

The knowledge, experience and comprehensive range of disciplines of this specialist group not only keeps the UK's military aircraft fleets flying, but the full capability of their collective military and scientific expertise comes sharply into focus in the event of failure or accident. This provides the UK Ministry of Defence with highly professional forensic technical support to aircraft accident investigation teams.

Furthermore the team provides direct technical and scientific advice to a broad range of customers across the Royal Navy Surface Fleet and Land component, as well as the wider Ministry of Defence. The Materials Integrity Group are currently conducting analysis to support the surface finish for the Queen Elizabeth Class carrier decks which have to withstand the future Lightning II jet blast and regularly advise ships regarding material failure and fuel contamination recovery.

Farewell to the Type 42's

HMS Gloucester, The Royals Navy's last Type 42, has finally departed these shores for the last time, bound for Turkey to be scrapped. Of the 16 ships in service between 1975 and the present day, only one remains, the Argentine *Hércules*.

Built as the replacement for the cancelled Type 82 (the original replacements for the County Class destroyers), these lighter and cheaper air defence destroyers were first laid down in 1970 and built by Vickers, Cammel Laird, Swan Hunter and Vosper Thorneycroft. This ship was designed around the GWS30 Sea Dart missile system, which was effective against high flying targets but useless against low level close range aircraft and anti-ship missiles. Further enhancements came in the form of the two CIWS Phalanx guns, four 20mm and 30mm cannon and the Type 996 surveillance and target indication radar. It was proposed that the Sea Wolf point-defence system should be fitted to the longer and heavier Batch 3's but the upgrades were never fitted.

Looking back, we can see that these ships were not well designed, cramped and required extensive modifications and changes over the years to ensure that they were fit for purpose in their role as a carrier group escort and more recently as a general escort as the numbers of frigates declined.

The relatively high numbers of Type 42's allowed for some flexibility in deployment and the numbers of operations that could be taken on even accounting for accidents and breakdowns. In 1988, Southampton collided with a merchant ship in the Gulf and in 2002, Nottingham grounded on a rock off the coast of Australia. Not sure how the RN will cope with only six Type 45's.

Of the 14 British ships built, Sheffield and Coventry were sunk during the Falklands War, Birmingham was scrapped in 2000, Glasgow, Newcastle and Cardiff were scrapped in 2008, Exeter, Southampton and Nottingham were scrapped in 2011, Liverpool and Manchester were scrapped in 2014 and York, Edinburgh and Gloucester scrapped this year.

The E-Class Submarines

The E-class attack submarines formed the primary submarine force of Britain when it committed to war in World War 1. They were a logical progression from the D-class, were larger in displacement, better armed and had a greater radius of action. They were the first British submarines to incorporate transverse watertight bulkheads, being divided into three watertight compartments to offer better survivability in case of flooding. The front section contained the crew's mess space, the centre section housed the control room, beam torpedo tubes and wireless office. The after space contained the engine and motor room.

E-1 was laid down in 1912 and E-56 was completed in 1916. The building of these boats was accelerated when Churchill instigated the November 1914 Emergency War Programme which included the construction of E-19 to E-56. Some were built in as little as 8 months. The build cost was between £101,900 to £105,700 per submarine.

During WW1, the E-class submarines were extremely successful and excelled through efficiency and outstanding reliability under the most arduous conditions. The E-class' superstructure was larger and higher than in previous boats, had a large navigating bridge fitted on top of the conning tower, and with a freeboard of 5 feet, made for much improved seagoing qualities.

One of the less successful experiments with this class, was the carrying of sea planes with the aim of intercepting Zeppelins over the North Sea (on E-22). Two Baby Sopwith Seaplanes would be secured on the casing, but if the submarines had cause to dive, the planes were left on the surface to take off and return home. The experiment did not continue.

All of the remaining E-class submarines were withdrawn from service in 1922 and were replaced by the L-class.

Diving Depth

The E-class was designed to have a diving depth of 100 ft. However, this proved to be inadequate during active service and many boats achieved far greater depths due to the ample factor of safety. For example E-12 had to go to a depth of 245 ft to free herself from anti-submarine nets whilst in the Dardanelles.

Mine-laying Submarines

During the first half of 1915, the British were considering the deployment of moored mines laid from submarine torpedo tubes. However, the narrowness of existing tubes imposed restrictions on efficient mine designs. After examining the wreck of the German submarine UC-2 in July 1915, it was decided to adapt two of the E-class submarines, E-24 and E-41 and equip them with 10 fully vertical mine tubes either side of the hull in the saddle tanks where the chutes were permanently open to the sea. The arrangement of mine chutes with a diameter of 30 inches enabled a satisfactory mine design to be achieved, with Hertz horn firing, hydrostat and pilot wire. As each chute carried only one mine, the submarine was capable of sowing a 20-mine field. Due to the wet storage, all of the setting had to be applied before the mines were loaded into the chutes, preventing any changes once the submarine was at sea.

On completing E-24 and E-41 in January 1916, a further four E-class minelayers were

ordered, E-34, E-45, E-46 and E-51. The six minelayers were allocated to the 9th Flotilla and based at Harwich, although E-46 was sent to the Mediterranean in 1918. In total they laid 2,469 mines off the enemy's harbours, at the cost of two of their own, E-24 and E-34. In comparison, British surface ships laid down some 128,00 mines doing the same period. Although these boats did the job they were designed for it was not an effective mine deployment system and it would be in the late 1920's when greater numbers of contact mines could be carried in a submarine.

Machinery

The boats were equipped with twin screws, each propeller being driven by an 800 HP eight cylinder diesel engine. The cylinders were of 14.25 ins diameter with a 15 inch stroke; the standard 100 HP per cylinder being attained at 350 rpm. Fuel consumption averaged about 0.55 lb/HP/hr. The boats were fitted with two batteries each weighing about half a ton, consisting of 112 cells and supplying current to 420 HP electric motors.

These engines proved to be very reliable. For instance, two boats built for the Royal Australian Navy, AE-1 and AE-2, were sent to Australia under their own power and AE-2 went on to cover 30,000 miles before she required a machinery refit.

Weapons

Torpedoes: These were the 18 inch Mark VIII weighing in at 3,828 lbs with a 320 lb TNT warhead, having a range of 2,500 yds at a speed of 35 kts or 4,000 yds at a speed of 29 kts. Torpedoes were relatively sophisticated self propelled weapons having been around since the invention of the Whitehead Torpedo by British engineer Robert Whitehead in 1866.

The first eight submarines were fitted with a single forward tube, one aft tube and two transverse tubes amidships. The transverse tubes never proved to be of any specific use and were largely abandoned in later builds. From E-9 onwards a second forward tube was specified.

Deck Guns: A variety of guns were fitted to a small number of E-Class boats ranging from 4 inch Quick Fire to 6 and 12 pounders. Some boats were fitted with 2 pounder pom-poms.

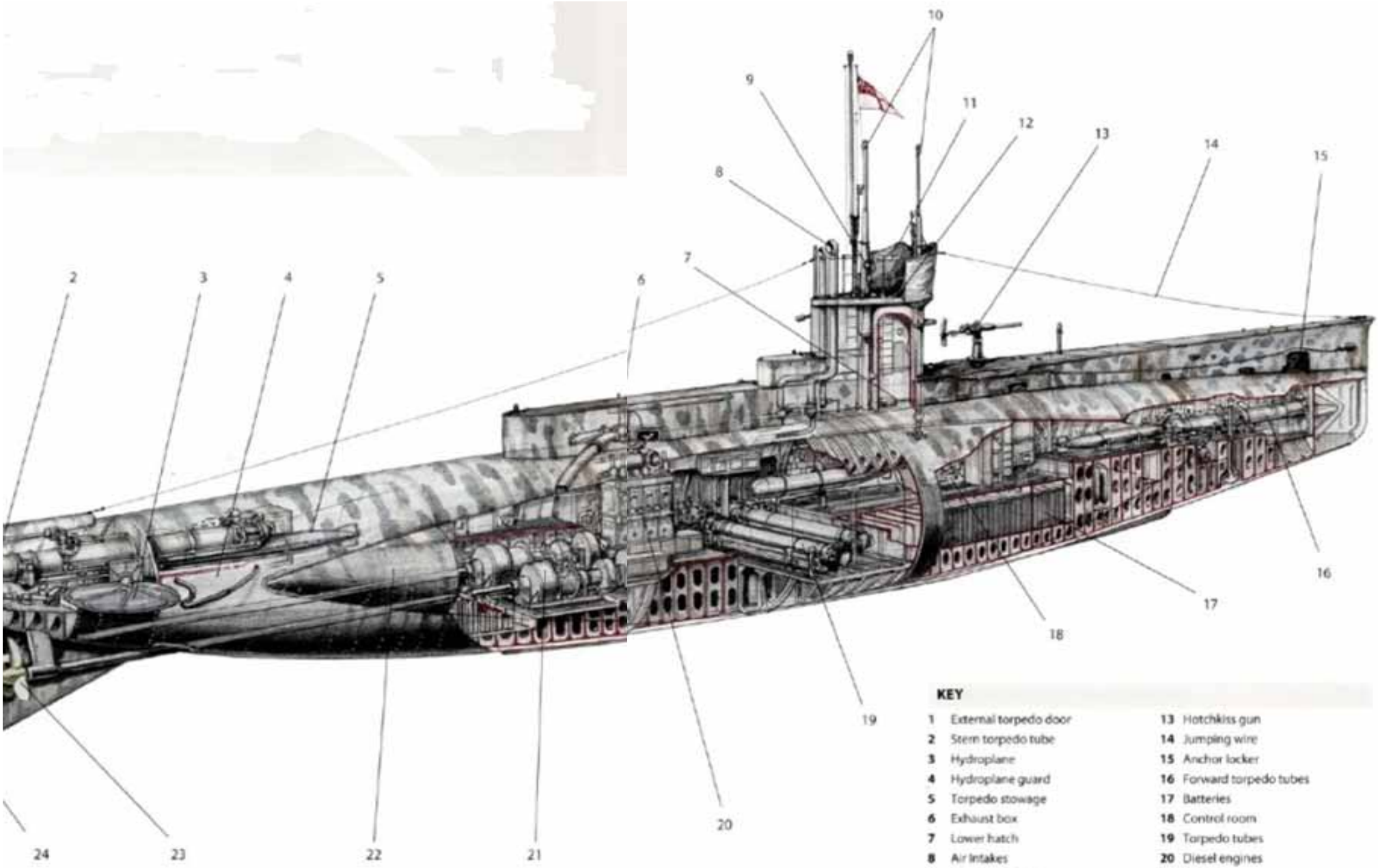
Communications

The E-class submarines were fitted with 1kW wireless installations which were later upgraded in some cases to 3kW. Some boats were also fitted with Fessenden underwater signalling gear, developed by Reginald Fessenden in 1915. It allowed submarines to send and receive messages and to also detect ships whilst submerged. A heavy diaphragm operated underwater by an electric current made it possible to send Morse code messages for up to 30 miles.

However, the Fessenden oscillators were non-directional so any ship could pick up the messages. Also the clarity of any message being received by the submarine was masked by engine noise or by the sound shadow cast by the submarine. The sound wave produced by the oscillator also varied depending on the density of the water – dense water impeded the motion of sound waves and, therefore, limited the distance they travelled.

Living Conditions

All the E-class submarines were withdrawn from service by 1922. Conditions on board theses submarines were pretty basic and extremely cramped, there was just one bunk which



KEY

1 External torpedo door
2 Stern torpedo tube
3 Hydroplane
4 Hydroplane guard
5 Torpedo stowage
6 Exhaust box
7 Lower hatch
8 Air intakes
9 Steering position
10 Periscopes
11 Bridge
12 Upper hatch
13 Hotchkiss gun
14 Jumping wire
15 Anchor locker
16 Forward torpedo tubes
17 Batteries
18 Control room
19 Torpedo tubes
20 Diesel engines
21 Motors
22 External ballast tank
23 Screws
24 Rudder

the three officers shared; the ratings slept where they could. The heads were more often than not, just a bucket. The weather in the Baltic was also extremely cold, with much of the submarine's superstructure freezing over the moment it surfaced.

Lost and Found

With just over half of the E-class boats being scrapped after WW1, the others lay where they were sunk either having been hit by enemy fire or scuttled by their crews. However some of these have now been rediscovered.

E-3 was found off the island of Schiermonnikoog in 1997.

E-8 was salvaged in August 1953 and was broken up in Finland.

E-9 was salvaged in August 1953 and was broken up in Finland.

E10 was discovered off Germany in 2002 and is now preserved as a war grave.

E14 In June 2012, after a three-year search, Turkish marine engineer Selçuk Kolay and filmmaker Savas Karakas discovered the wreck in 20 m of water about 250 m off Kum Kale. The ship is largely buried in sand with only 7m of the coral-encrusted bow, with a shell hole, remaining visible. It became the first E-class submarine ever to be discovered intact. The British government is to ask the Turkish authorities to ensure the wreck is respected as a war grave.

E15 remains off Kepez Point in 8 m of water.

E17 stayed on the bottom of the North Sea for 70 years, until a Dutch diver discovered it, the Conning Tower was Brought to HMS Dolphin on the 10th March 1988.

E18 was found in 2009 close to the Estonian island of Hiiumaa by a Swedish marine survey company.

E-23 was found by divers hunting for a WW2 U-boat. In 1973 the sections of a mined submarine wreck, including the conning tower, were raised. The boat was towed to Cuxhaven where the wreck was identified as a British E-class boat, rather than a German submarine. The German government then informed the Admiralty. Human remains found in the wreck are buried in Ohlsdorf Cemetery, Hamburg.

E-47 was found in 2002 by Divingteam Noordkaap from Vlieland, lies about 6 miles northwest of Texel. The deck gun which was torn off its mounting, probably by a trawler, was lying beside the wreck and has been salvaged. It identifies the wreck.

E-class Specifications

Length: E-1 to E-8: 176', E-9 onwards: 180'
Width: 22'
Surface displacement: 652 / 622 tons, Submerged displacement: 795 / 807 tons
Engine power: 1,600 BHP
Surface speed: 16 kts
Submerged speed: 10 kts
Range: 3,225 miles at 10 kts
Fuel: 50 tons of diesel
Submerged endurance: 14 hours at 5 kts
Complement: 31

No.	Builder	Launch Date	Comment
E 1	Chatham	09-Nov-12	Sent to the Baltic in 1914 and scuttled on 3rd Apr 1918 outside Helsinki, 1.5 miles off Harmaja Light in the Gulf of Finland.
E 2	Chatham	23-Nov-12	Sold in Malta for scrap in Mar 1921.
E 3	Vickers	29-Oct-12	Torpedoed on 18 Oct 1914 by U27.
E 4	Vickers	05-Feb-12	Sunk in a collision with E41 during exercises off Harwich on the 15th Aug 1916, and though raised it never served again. She was sold for scrap on 21 Feb 1922 to the Upnor Ship Breaking Company.
E 5	Vickers	17-May-12	Mined in the North Sea on 7th Mar 1916.
E 6	Vickers	12-Nov-12	Mined in the North Sea off Harwich on 26 Dec 1915.
E 7	Chatham	02-Oct-13	Abandoned and scuttled on 5th Sept 1915 when under attack from UB-14.
E 8	Vickers	30-Oct-13	Sent to the Baltic and scuttled on 8th Apr 1918 to avoid seizure by advancing German forces who had landed nearby.
E 9	Vickers	29-Nov-13	Scuttled on 8th Apr 1918 outside Helsinki 1.5 miles off Grohara Light in the Gulf of Finland to avoid her falling into German hands.
AE 1	Vickers	18-Jun-13	Built for the Royal Australian Navy and lost near Papua New Guinea, 14 Sept 1914.
AE 2	Vickers	22-May-13	Built for the Royal Australian Navy and scuttled on 28 Apr1915, in the Sea of Marmara during the Battle of Gallipoli
E 10	Vickers	29-Nov-13	Lost on 18th Jan 1915. Recent research having found the sunken submarine appears to show that it struck by a sea mine
E 11	Vickers	23-Apr-14	One of the most successful submarines in action during the 1915 naval operations in the Dardanelles Campaign, sinking over 80 vessels in three tours of the Sea of Marmara. Sold for scrap in Mar 1921.
E 12	Chatham	05-Sep-14	Sold in Malta for scrap in Mar 1921
E 13	Chatham	22-Sep-14	Ran aground in Baltic and disabled by shellfire. Interned by the Danes in Aug 1915 and returned Nov 1918. Sold for scrap in Dec 1921
E 14	Vickers	07-Jul-14	In 1915, Lt-Cdr Edward Courtney Boyle was decorated with the Victoria Cross after steering E14 through these heavily defended straits at the height of the Gallipoli campaign. A later captain of E14, Lt-Cdr Geoffrey Saxon White, also won the VC in the Dardanelles. Mined and sunk on 27th Jan 1918
E 15	Vickers	23-Apr-14	Lost on 15th Apr 1915 after running aground and subsequently bombed and attacked by torpedoes
E 16	Vickers	23-Sep-14	The first E-class to sink a U-boat, U-6, sunk 4 miles south-west of Karmøy island off Stavanger, Norway on 15 September 1915. Sunk by a mine in Heligoland Bight on 22nd Aug 1916.
E 17	Vickers	16-Jan-16	Wrecked off Texel in the North Sea on 6th Jan 1916.
E 18	Vickers	04-Mar-15	Sunk on 24th May 1916 by German decoy ship KE41. She was also rammed by E4.
E 19	Vickers	13-May-15	Scuttled on 8th Apr 1918 to avoid her falling into German hands.

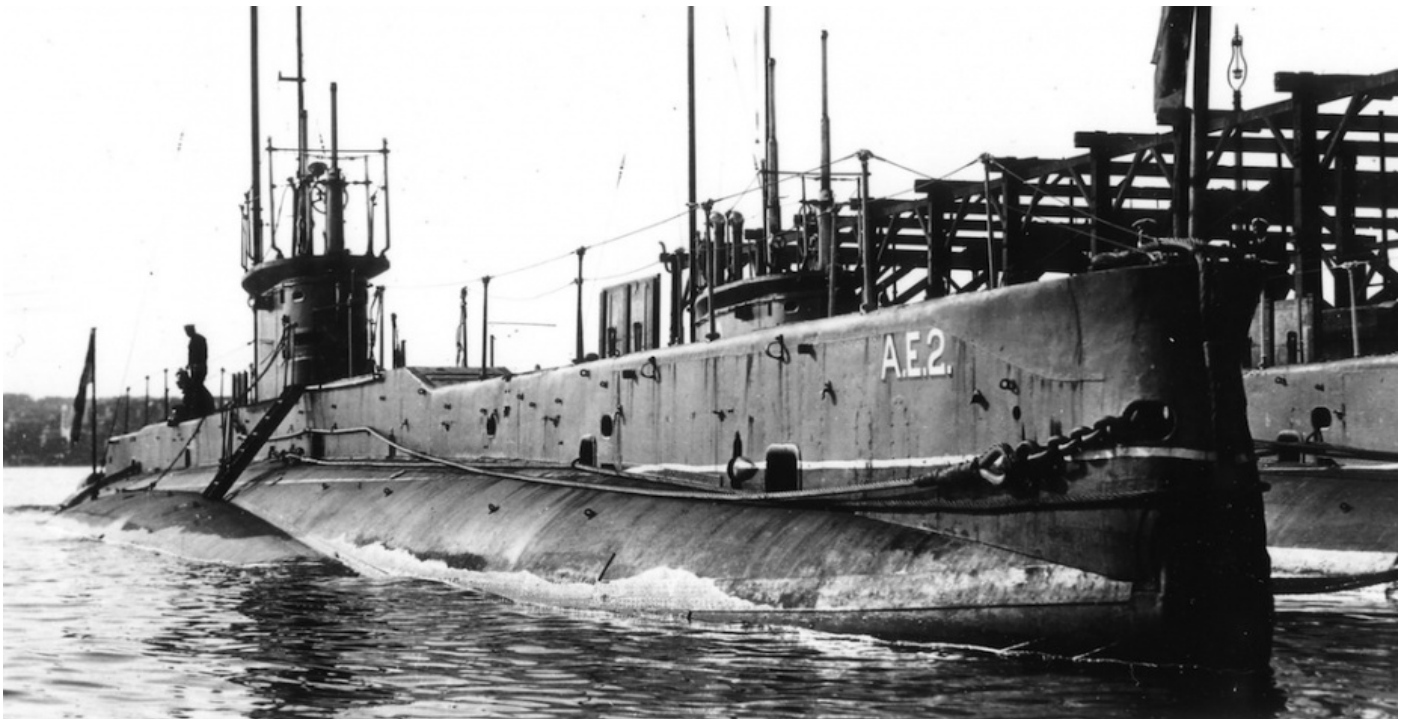
E 20	Vickers	12-Jun-16	Torpedoed and sunk on 5th Nov 1916 by UB-14.
E 21	Vickers	24-Jul-15	Sold for scrap in Dec 1921
E 22	Vickers	27-Aug-15	Torpedoed by UB-18 on 25th Apr 1916.
E 23	Vickers	28-Sep-15	Sold for scrap in Sunderland on 6th Sept 1922.
E 24	Vickers	09-Dec-15	Used as a minelayer she was mined on 24th Mar 1916
E 25	Beardmore	23-Aug-15	Sold for scrap on 14th Dec 1921.
E 26	Beardmore	11-Nov-15	Lost on 6th Jul 1916 for reasons unknown
E 27	Yarrow	09-Jun-17	Sold to John Cashmore Ltd for scrap in Sep 1922.
E 28			Cancelled before completed.
E 29	Armstrong	01-Jun-15	Sold for scrap in Feb 1922.
E 30	Armstrong	29-Jun-15	Mined off Orfordness, Suffolk in the North Sea on 22 December 1916.
E 31	Scott	23-Aug-15	Shot down Zeppelin L-7 on 4th May 1916 whilst on patrol in the North Sea. Sold for scrap in Sept 1922.
E 32	J. S. White	16-Aug-16	Sold in Sunderland for scrap in Sept 1922.
E 33	Thornycroft	18-Apr-16	Sold to John Cashmore Ltd for scrap in Sep 1922.
E 34	Thornycroft	27-Jan-17	Used as a minelayer she was mined on 20th Jul 1918
E 35	John Brown	20-May-16	Sold for scrap in Sept 1922
E 36	John Brown	16-Sep-16	She was sunk in a collision with E-43 off Harwich in the North Sea on 19th Jan 1917.
E 37	Fairfield	02-Sep-15	Lost in the North Sea on 1st Dec 1916 for reasons unknown.
E 38	Fairfield	13-Jun-16	Sold in Newport for scrap in Sept 1922.
E 39	Palmer	18-May-16	Sold for scrap in Oct 1921.
E 40	Palmer	09-Nov-16	Sold for scrap in Dec 1921.
E 41	Cammell Laird	22-Oct-15	E-41 collided with E-4 on the surface during exercises off Harwich on 15th Aug 1916. Was raised in Sept 1917 and re-commissioned and used as a minelayer. She was scrapped in Sept 1922.
E 42	Cammell Laird	22-Oct-15	Sold in Poole for scrap in Sept 1922.
E 43	Swan Hunter	11-Nov-15	Sold for scrap in Jan 1921.
E 44	Swan Hunter	21-Feb-16	Sold for scrap in Oct 1921.
E 45	Vickers	25-Jan-16	Used as a minelayer she was scrapped in Sept 1922.
E 46	Cammell Laird	04-Apr-16	Used as a minelayer she was scrapped in Sept 1923.
E 47	Fairfield	29-May-16	Lost on 20th August 1917 for reasons unknown.
E 48	Fairfield	02-Aug-16	Used for target practice in 1921 and then sold for scrap in Jul 1928.
E 49	Swan Hunter	18-Sep-16	Mined and sunk on 12th Mar 1917.
E 50	John Brown	13-Nov-16	Mined and sunk on 1st Feb 1918.
E 51	Scott	30-Nov-16	Used as a minelayer she was scrapped in Oct 1931
E 52	Denny	25-Jan-17	E-52 sank U-boat UC-63 near the Goodwin Sands on 1st Nov 1917. Sold for scrap in Jan 1921.
E 53	Beardmore	1916	Sold for scrap in Sept 1922.
E 54	Beardmore	1916	She sank UC-10 on 21st Aug 1916 and U-81 on 1 May 1917. Sold for scrap in Dec 1921.
E 55	Denny	05-Feb-16	Sold for scrap in Sep 1922
E 56	Denny	19-Jun-16	Sold for scrap in Jun 1923
E 57	Vickers	18-May-16	As sufficient changes were incorporated in the design it became the first of the new L-class submarines and designated L-1. Sold in Mar 1930 for scrap, but lies stranded at Penanwell Cove in Cornwall.
E 58	Vickers	18-May-16	Re-designated as L-2. Sold for scrap in Mar 1930

AE-2, an E-class submarine at the Dardanelles

The AE-2 was an 'E' class submarine build for the Royal Australian Navy. It had diesel engines not petrol, better batteries with a longer range submerged and twice as many torpedoes as the British version. Four 'E' class submarines had arrived to serve with the British fleet off the Dardanelles. Lieutenant-Commander Henry Stoker's AE-2 arrived from Australia in early March 1915. The question was, could an E-class vessel make the journey underwater right through the Narrows and so be able to break through and operate in the Sea of Marmara? This question became even more significant after the failure of the Allied warships to silence the Turkish shore batteries during the great attack of 18 March 1915. If there was now to be a military landing on Gallipoli, with the aim of seizing the peninsula and putting the Turkish guns out of action that way, it would be a great help to get submarines past the Narrows and operating against Turkish military transports in the Marmara. The main problem for the submarines in getting through the straits was the speed of the current at the Narrows. To make progress against it required running at full speed, which drained the battery power. Moreover, the submarine would have to negotiate two sharp bends in the coastline at the Narrows, where the unpredictability of the currents was notorious, coming to periscope depth frequently in order to stay on the right course.

The first to try, on 17 April 1915, was Lieutenant-Commander Theodore Brodie in E-15. His ship was caught in a violent eddy off Kepez Point and forced ashore. Brodie and six of his crew were killed by a Turkish shell and the remainder of the crew were captured. Later, British gunboats sunk the submarine to stop it falling into enemy hands.

After Brodie's failure, Stoker begged to be allowed to try in AE-2. The date for the great Allied invasion was fast approaching and the admirals were keen to get the submarines through to cause maximum disruption in the Turkish rear areas. The AE-2's first attempt on 23 April failed due to faulty machinery. But, on the evening of 24 April, Stoker was again given the go-ahead, being told by Admiral de Robeck that if they got through, then 'there is nothing we will not do for you'. Commodore Keys issued more dramatic instructions. Stoker was to sink any mine-laying ships he saw in the Narrows and, as the landings were due at



dawn the next day, to 'generally run amok' around Çannakale and cause maximum disruption to the Turks.

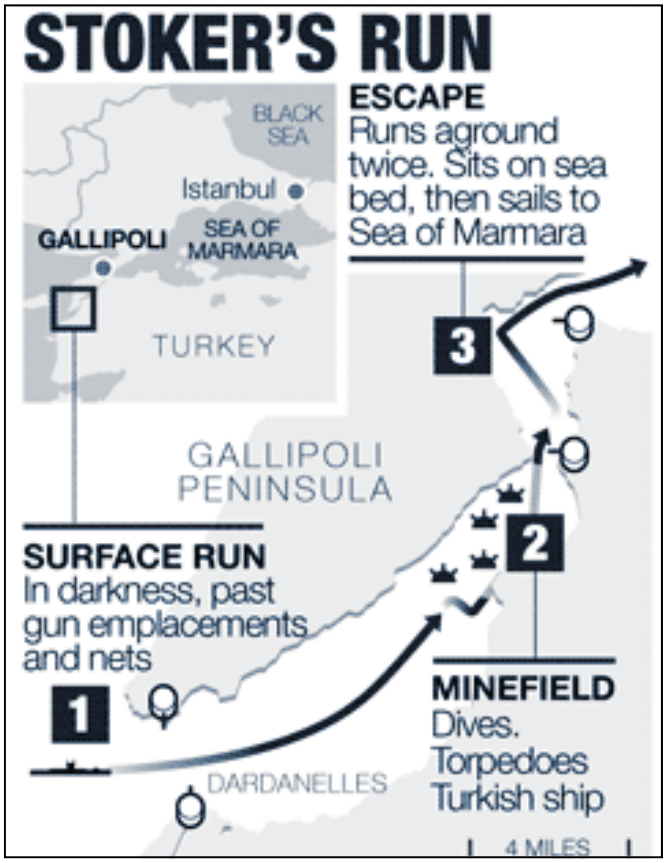
At 2.30 am on 25 April 1915, as the men of the Anzac Corps approached the west coast of Gallipoli in the ships of the invasion fleet, the AE-2 entered the Dardanelles. According to Stoker's report, the moon had just set and searchlights played across the dark waters. For half an hour the crew listened as mine cables scraped the sides of AE-2 and Stoker brought the submarine up through the minefield to check his position. He was aware that E-15 had been caught by the currents in this area and driven ashore so he took every precaution to ensure that AE-2 was well out into the channel.

At 6 am, Stoker took AE-2 up to periscope depth. By that time, Australian soldiers had been ashore on the other side of the peninsula for about an hour and a half. The submarine's periscope was spotted and heavy fire opened up from Fort Chemenlik at Çannakale and from Kilitbahir on the other side of the Narrows while gunboats and destroyers began the hunt for AE-2. Seeing a suitable target, the small Turkish cruiser Peykisevket, Stoker fired a torpedo and managed to submerge just before the AE-2 would have been rammed by an enemy destroyer. The cruiser was badly damaged and later taken to Constantinope (Istanbul) for repairs. At this point AE-2's presence became of some value to the Anzacs fighting kilometres away. A Turkish battleship, which had been firing across the peninsula at the invasion fleet causing considerable disruption, sighted the submarine's periscope and was forced to cease its shelling and move rapidly away.

By this time Stoker was north of Çannakale. He took AE-2 up again and discovered he was close inshore. Suddenly, the vessel ran aground directly under the guns of a Turkish fort. Much of AE-2's conning tower was showing above the surface. They were so close that Stoker could see the flashes from the enemy guns almost reaching his periscope. Luckily, the Turks were unable to depress their guns sufficiently to hit AE-2 and other batteries were too far away for accurate shooting. However, Stoker and the crew spent an anxious four minutes while the submarine worked itself off the shore and shells fell all around them. They had now certainly run 'amok' in the Narrows and Stoker set off to try and get away.

As AE-2 submerged and approached the opposite shore, it ran aground again. Putting his engines into reverse at full power, Stoker brought the submarine back off the bank bumping along the seabed. With a final huge thump, it broke loose. Stoker considered that this bump could have caused much damage but he was determined to fulfill his orders to break through the Dardanelles, so they pressed on. Later, Stoker reported that during these heart-stopping moments his crew had behaved with great courage.

By this stage many Turkish ships were on the lookout for AE-2. In those days the equipment did not exist for finding a submarine's position when it was submerged and it could not be attacked until it came up. On the other hand, submarines passing through the Dardanelles needed to surface frequently to take accurate course bearings from nearby landmarks, otherwise they risked running aground. Feeling he had



sufficient data for his course, Stoker now headed the AE-2 down the straits past Nara Burnu at some depth before he risked further necessary observations at periscope depth. Coming back up, he saw they were well past the point but the Turks saw them. Fire was reopened upon the submarine and the chase resumed. Diving deep once more, the AE2 headed on but when they surfaced again Stoker saw straight ahead two Turkish tug boats with a wire stretched between them to catch the submarine's conning tower. Down AE2 went yet again. Stoker took it to the bottom and settled the vessel there with the engines off. They did not have enough power left in the batteries to get right through to the Sea of Marmara and to recharge them would require running on the surface under diesel power. It was 8.30 am, 25 April 1915. As the Anzacs tried to find their way forward on Gallipoli, sailors of the Royal Australian Navy were almost through the Dardanelles.

April 25 1915 was a Sunday. As the AE-2 rested, Stoker held prayers and then gave the crew a chance to sleep. Overhead they could hear the Turks looking for them and at one point something being towed from the surface hit the side of the vessel. Leaks were bringing significant amounts of water into the bilges and this water, if pumped out and released, could reveal their position because it contained large amounts of oil. All day the crew worked carrying water to a safer place in the submarine.

At 9 pm Stoker finally brought AE2 back to the surface. They had spent more than 16 hours underwater, it was dark and no ships were in sight. So stale had the air become that in some areas of the submarine a match would not burn for more than a fraction of a second. The crew, when permitted, now hurried up top for gulps of fresh air. Stoker placed the submarine on diesel power and moved ahead charging the batteries. Again and again the AE -2's wireless operator beamed a message back to the invasion fleet to say they had made it through the Narrows and were heading for the Marmara. No answer was received and AE-2 ran on into the night.

But AE-2 had been heard and the news of its success conveyed to the top navy and army commanders. After the war Stoker was told by Admiral Roger Keys of the dramatic effect the news had had as General Sir Ian Hamilton was pondering the fate of the Anzacs on Gallipoli. The Australian war correspondent, Charles Bean, recorded in his diary that the news of AE2's breakthrough of the Dardanelles arrived at headquarters on Gallipoli at about 2.30 am on 26 April 1915.

Between 26 and 30 April AE-2 hunted for Turkish ships in the southern area of the Sea of Marmara. Stoker and his crew had little success in sinking anything but they certainly made their presence there known. A painting of the submarine that hangs in the Australian War memorial shows it cruising along on the surface, with Turkish fishing boats all around. By

displaying the presence of the AE-2, Stoker hoped to deter Turkish shipping from approaching the Dardanelles with reinforcements. At one point he took the AE-2 back below the top reaches of the Dardanelles and then traveled up through them with his periscope up trying to convince the Turks that yet another submarine had broken through the Narrows.

Actually, another submarine had got through. On the night of 27 April, Lieutenant-Commander Edward Boyle took E-14 up the Dardanelles. He got all the way through until near Nara Burnu he fired at a gunboat and missed. Now the Turkish forts opened up and Boyle fired another torpedo. All of a sudden, Boyle could see nothing through his number one periscope! Quickly raising the other scope he saw an extraordinary sight – a Turk in a small boat was clutching it in his hands and if he had brought along a heavy object he could certainly have done serious damage to E-14. Boyle dived quickly and ran successfully past Nara Burnu and by morning the submarine was running up past the town of Gelibolu (Gallipoli) at the entrance to the Sea of Marmara. Turkish patrols had sighted E-14 and all day Boyle had the vessel surfacing and submerging with the result that its batteries were nearly out of power. The enemy patrols eventually vanished for a while and E-14 was able to surface and run briefly on its diesel engines while the batteries recharged.

However, all during the night of 27–28 April and the daylight hours of 28 April, E-14 was obliged by a vigilant enemy to keep diving for cover. During the dark of 28-29 April, Boyle kept the submarine motionless on the bottom to give his crew a chance to rest. On 29 April, they fired at and sank a Turkish transport and that evening they met up by chance with the AE-2. Stoker and his men were greatly relieved to see friendly faces.

Boyle was the senior submarine captain and Stoker now reported to him how he had been getting on. His plan was to head up to Constantinople but Boyle believed that they should stay in the area while he received further orders by wireless. The two captains agreed to rendezvous next day, 30 April, at 10 am.

Next morning AE-2 was heading towards the meeting place with E-14 when it ran into trouble. As it approached, a Turkish torpedo boat appeared and it had to dive. There had been no sign of E-14. As AE-2 cruised underwater it suddenly began to rise upwards, out of control. The explanation later given for what happened was that the submarine had hit swirling patches of denser water which caused it to lose its capacity to hold balance or 'trim'. Although Stoker ordered full speed downwards, the submarine ascended and was fired on by the Turks. AE-2 now began to dive, still out of control, and headed well down below its maximum permitted depth. There was a danger that it would be crushed by the weight of water, so Stoker now ordered full speed astern and blew air into his main tanks. Slowly AE-2 responded but then it ran back up until it broke surface in full view of the Turkish torpedo boat, the Sultanhisar. Stoker was determined not to let his submarine fall into enemy hands and gave the order for it to be scuttled. The AE-2 went down at 10.45 am on 30 April 1915 and slid to the bottom of the Sea of Marmara about six kilometres north of Kara Burnu. Stoker and all his crew were captured.

The E-14 continued her patrol in the Marmara with substantial success, sinking two Turkish ships. One of them, the Guj Djemal, was a transport ship with 6,000 men on board and a battery of field guns, all bound for Gallipoli. After 13 days E-14 had only one defective torpedo left but it was ordered to continue the patrol as the presence of a British submarine in Marmara was causing great difficulties for the Turks. Boyle now rigged a false gun on deck and frightened one steamer into heading away for shore. The Turks were still hunting for

them, however, and E-14 was once nearly rammed by an enemy destroyer. On 17 May, after 20 days at sea, orders came through for them to return and on the afternoon of 18 May E-14 surfaced near a French battleship off Cape Helles. Boyle raised the flag – the White Ensign – and a British destroyer escorted them to Imroz (Imbros) Island where they were cheered round the fleet. For his daring cruise in the Marmara, Lieutenant-Commander Edward Boyle received the Victoria Cross and each member of his crew was decorated with a lesser award. Other British submarines, notably E-11 under its captain, Lieutenant-Commander Martin Nasmith, who was also awarded the VC, continued the submarine campaign against Turkish shipping in the Marmara. While Boyle and Nasmith were justifiably feted, Stoker and his crew began three and a half years of captivity in Turkish prisoner-of-war camps.

What effect did the submarine war in the Marmara have on the Gallipoli campaign? Clearly, it was not a war winner as eventually the Allies were forced to evacuate the peninsula without ever having successfully broken through the Turkish lines. But the submarines did cause some havoc. Charles Bean concluded that the activity of vessels like the AE-2, E-11 and E-14 'completely disrupted' Turkish sea communications, forcing reinforcements to be sent overland which meant they took much longer to reach the front lines on Gallipoli. Food and other stores were still brought by sea, but in small ships forced to hug the coast and move only by night. All Turkish writers, Bean wrote, agreed that because of the submarines the supply of their armies on Gallipoli was, for the whole of the campaign, an 'acutely anxious problem'.

In this Allied attack on the Turks, the AE-2 had led the way.

Captain of HMAS AE2, Lieutenant Commander Stoker with his crew

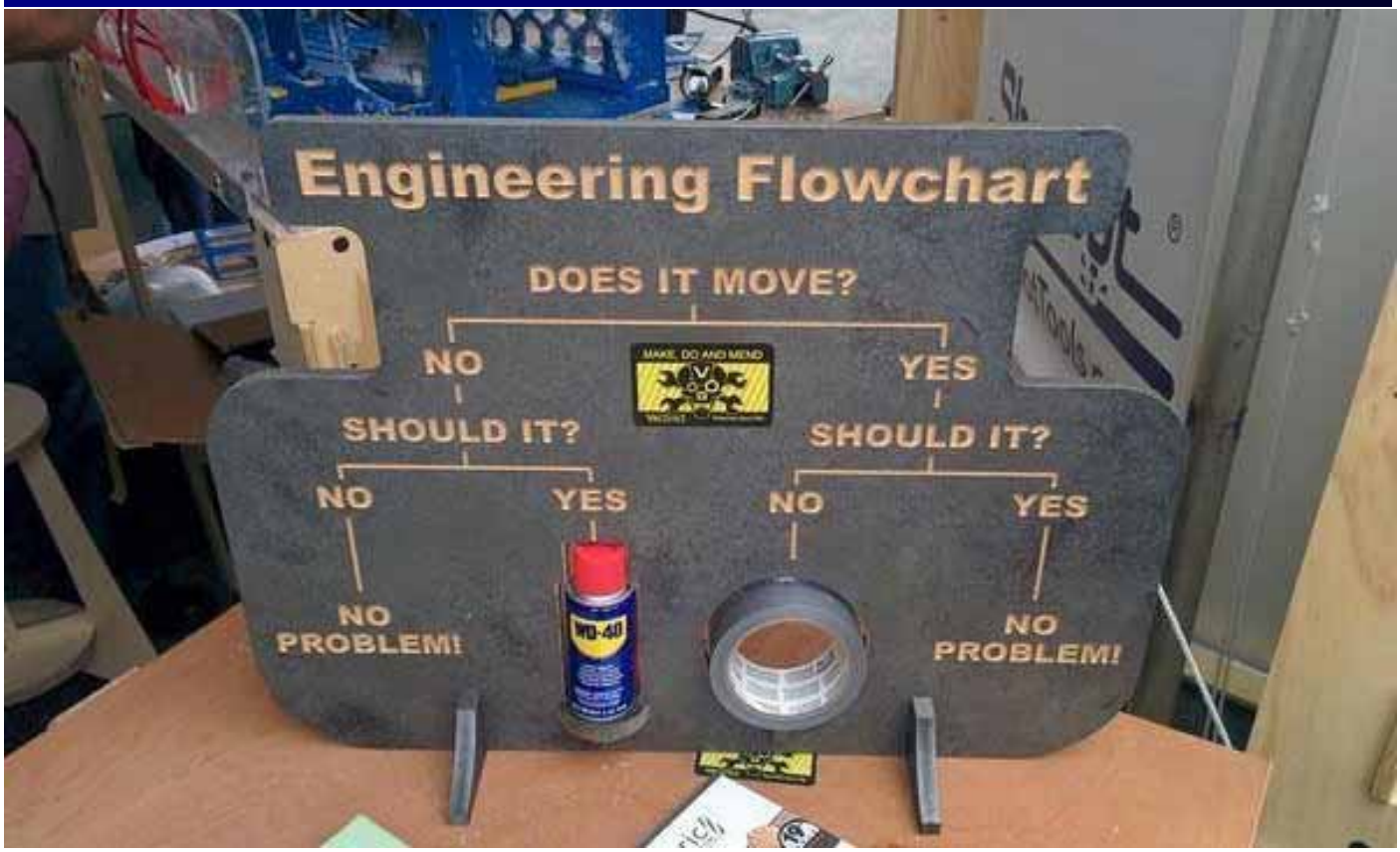
Front Row (from left to right).—L/Sea. McGregor, A.B. Naggs, P.O. Gilbert, S.P.O. Brown, P.O. Stiling, P.O. Bray, S.P.O. Kinder, L/Sea. Holderness, Sig. Thompson.

Second Row (from left to right).—Wtr. Robinson, E.R.A. Fawnes, E.R.A. Gibson, C.P.O. Vaughan, C.P.O. Abbott, Lieut. Haggard, Lt.-Comd. Stoker, Lieut. Carey, C.E.R.A. Broomhead, E.R.A. Bell, Ch. Sto. Smith, Ch. Sto. Varcoe.

Third Row (from left to right).—A.B. Gwinne, A.B. Talbot, ——, ——, A.B. McCready, A.B. Nicholls, A.B. Norris, Tel. Falconer, A.B. Wheat, L/Sto. Wishart, A.B. Cheater.

Back Row (from left to right).—Sto. Jenkins, Sto. Johnson, Sto. Walker, Sto. Broughton, Sto. Harding, L/Sto. Kerin, A.B. Naggs, Sto. Suckling, ——, Sto. Wilson.

The Australian Way...



Fuel from Water? - sounds a bit far fetched...

Researchers at the U.S. Naval Research Laboratory, Materials Science and Technology Division, say they have demonstrated proof-of-concept on the ability to draw carbon dioxide and hydrogen from seawater and turn it into forms of gasoline.

This is the first time technology of this nature has been demonstrated with the potential for transition, from the laboratory, to full-scale commercial implementation. The lab's researchers used an innovative and proprietary U.S. Navy Research Laboratory electrolytic cat-ion exchange module to remove the carbon dioxide from the water and produce hydrogen gas in the process. The gases are then converted to liquid hydrocarbons by a metal catalyst in a reactor system.

The fuel produced has so far been used to power the engine of a small model aircraft. The next stage of the project is to develop the processes that will ramp up production to provide replacement for jet fuel at a cost of $3 to $6 per gallon within a decade. Could this mean the end of refuelling at sea? Surface ships would then have the same capability as nuclear submarines—the ability to sail as long as you want as long as you have enough food and provisions.

Type 45's Propulsion Problems

Since the Type 45's were first launched in 2006, they have been subject to a number of failures in the advanced propulsion systems. These ships are fitted with an integrated electric propulsion (IEP) system comprising 2 x Rolls Royce WR-21 gas turbine alternators and 2 x Wärtsilä 12V200 diesel generators feeding 2 x 20MW GE Power Conversion induction motors. These same power generators also provide all of the ships hotel and other services.

HMS Dauntless:

In 2012 she suffered power problems off the coast of Senegal, apparently by a blown fuse and in 2014 she lost power and had to return to Portsmouth for repairs.

HMS Daring:

In 2009 she lost power in the Atlantic and had to go to a Halifax shipyard for repairs. In 2012 the ship needed emergency repairs whilst patrolling off the coast of Kuwait. It has been reported that she underwent three days of secret repairs to fix a starboard shaft bearing. It is believed that these problems are being caused by a propeller drive shaft that is misaligned.

It is thought that the Wärtsilä diesels are underpowered and that the original concept was to fit these ships with MAN (Paxman) VP185 engines.

As ever the procurement process due, presumably, to the complex and convoluted procedure the MoD is obliged to follow, never seems to deliver what the operators actually require. Perhaps a measure of realism and common sense is needed.

Navy Manpower problems continue

Manpower has been reduced through cost cutting measures to about 31,000 – the lowest in Admiralty history. However large numbers of people reporting sick is straining an already depleted Royal Navy and with 4,740 off ill, warships are struggling to find ships' companies. The crisis affects destroyers, frigates and submarines, with a 45% shortage of marine engineers.

To stop the gaps, personnel are being sent from one warship to another to keep up operational capability and the RN is struggling to find the 800 crew required to man the new aircraft carrier HMS Queen Elizabeth, which will be commissioned into service next July. As a consequence, two assault ships will be taken out of service so that QE can be manned adequately. Fleet-wide vacancies for weapons and hydrographic specialists, medical technicians and nuclear watch keepers for submarines are shown in the Ministry of Defence annual report.

In 2013 General Sir Nicholas Houghton, head of UK armed forces said: "The Royal Navy is perilously close to its critical mass in terms of manpower." A senior Navy source has reported that "The problem is that we got rid of a lot of engineers in the defence cuts and we are struggling to recruit more because not as many young people are studying engineering." So, in the future, will there be more US Coastguards and manufacturers' reps maintaining the Fleet with more reservists manning the front line?

The Sea Venom helicopter launched missile

The Royal Navy urgently needs to replace the old Sea Skua missiles carried by its Lynx naval helicopters. Also, the French could use a lighter missile than the 655 kg AM39 Exocet. The solution for both could be the planned relatively lightweight missile under development by MBDA (Matra BAE Dynamics Alenia), as part of the 2006 "Team Complex Weapons" arrangement with the UK's Ministry of Defence.

Britain needs a strike missile to equip its new AW159 Wildcat helicopters, but France can already mount longer-range AM39 Exocets on its Super Puma helicopters, and does not feel a huge sense of urgency about its new NH90-NFH medium helicopters or AS565 Panther light naval helicopters. It took until 2013, but development is now underway. The MBDA program goal is a 110 kg missile with a 30 kg warhead, one capable of sinking or disabling Fast Attack Craft in the 50 to 500 ton range, and damaging corvettes or frigates.

The choice of guidance modes should also allow it to be used for precision attack more generally. Boost and sustain rocket motors are both compliant with naval safety requirements, and steps have been taken to ease integration by minimizing changes to the ship borne handling equipment and magazines, etc. that currently handle the Sea Skua and AS.15TT missiles. Sea Venom will rely on inertial navigation as well as Imaging Infrared (IIR) guidance, creating a fire-and-forget weapon that won't alert its targets by broadcasting a radar signal. A downward facing radar altimeter keeps the missile skimming just above the waves making it harder for defensive radars to detect it. Sea Venom can be fired in either Lock-on Before Launch or Lock-on After Launch modes, and a bi-directional data link allows updates and retargeting in flight. In comparison, the semi-active radar homing AS.15 and Sea Skua are not fire and forget and the Exocet's active radar guidance will trigger a ship's ESM defensive electronics.

The Sea Venom's range is likely to be shorter than the Exocet's 70 km / 38 nm but longer than the Sea Skua's 25 km/ 13.5 nm, allowing the launching helicopter to stay beyond the reach of short range air defences expected on Fast Attack Craft, corvette, and light frigate opponents. Development leaders MBDA, has branches on both sides of the English Channel and is owned by BAE, EADS, and Finmeccanica. They also manufacture the larger helicopter-launched anti-ship missiles like the AM39 Exocet and Marte Mk2, as well as shorter-range missiles like the FASGW-L/ LMM and laser-guided 127mm Zuni rockets.

Britain had been planning to replace its Sea Skua missiles by 2012 – 2014, but that won't be possible. At best, there will be testing in late 2017 or early 2018. France's timeline is more leisurely, aiming only to equip its NH90-NFH helicopters by 2020. Those timelines will force Britain to either extend the service life of its Lynx Mk8 helicopters and Sea Skua missiles, or do without a helicopter anti-ship capability until Sea Venom is ready for use for the new AW159 Wildcats.

Origins of 'Tribe' Division

Rear-Admiral Raymond Haydn Tribe, CB, MBE, DL

He was born in Southsea on 9 April, 1908, son of Thomas and Gillian Ada Tribe.

He was a former artificer apprentice who rose to flag rank. He passed out of HMS Pembroke (Fisgard Block) in December 1927. He married Alice Mary Golby in 1938 but had no children. He served in World War II, received the MBE (Military) when a Lieutenant -Commander serving in HMS Orwell and was mentioned in despatches twice. He was promoted to Commander in 1947, Captain in 1955 and Rear-Admiral in 1962. He became the Inspector-General Fleet Maintenance, and Chief Staff Officer (Technical) to the Commander-in-Chief, Home Fleet between 1962 and 1965.

Admiral Tribe was awarded a CB in June 1964 and then retired from the Royal Navy in September 1965. He also received the Distinguished Battle Service Medal of the Soviet Union. He was a Berkshire County Councillor from 1970 to 1977 and was appointed a Deputy Lieutenant for the County of Berkshire in 1975. He died at Moulsford, Oxfordshire on 29th July, 2005, aged 97

The 'East Side' Tribe division was formed at HMS Fisgard in 1972.

The Robbins Memorial Essay Prize

"Have you a story to tell, a simple answer to an engineering problem or an amusing anecdote?" Yes, you have seen these words before in the Naval Engineering Review. If the answer is yes and you would like the chance to win a cash prize and have a few thousand well penned words together with a couple of pictures, then send what you have to the Bulletin editor and you may get your name in print. MS-Word and JPGs please. Terms and conditions apply.

From Gun Busters to Clay Busters

For those who live in the Gosport and Fareham area, have you ever considered having a go at clay pigeon shooting? Although not the cheapest of sports it is probably similar in cost to playing golf. Cartridges work out at about £20/£24 per 100 and a round of 50 clays will cost about £15.

There are two shooting grounds in your area, the first is in Lee on the Solent and the second is a couple of miles north of Fareham between Fareham and Botley. Take a look at the following websites for further details.

http://www.gosportfarehamsportingclayclub.com/

http://www.farehamctc.org.uk/

Why not go along and see what it's all about, it's probably more fun than you think.

Society Accounts

ROYAL NAVAL ENGINEERS' BENEVOLENT SOCIETY

Receipts and Payments Accounts for the Year Ended 31/03/2015

RECEIPTS.		**2014**	**2015**
Contributions, less refunds to members accounts:-		16102	£16,937.19
Rents 113 North Hill, Plymouth:- (incl Agency Fees)		20380	£18,181.38
Savings a/c interest:-	Term Investment Bonds / Building Society:-	21999	£21,995.81
	Barclays Bank, Business a/c :-	18	£55.17
	Coventry / Poppy Bond 2013	2106	£2,352.00
Insurance Premium Recovery:-		408	£438.54
Prize Funds from Marrack &			£45,503.00
Donations, Sales income.		380	£179.00
	Total Income:-	61393	£105,642.09
PAYMENTS.			
Bulletin and Newsletters Production, Printing and Postage		5576	£3,950.16
Managing Secretary's Expenses:-		529	£385.20
Managing Secretary's Salary:-		5250	£5,400.00
Assistant Man Sec's Expenses:-		379	£60.00
Assistant Man Sec's Salary:-		1250	£300.00
Executive Council Expenses:-		530	£696.52
General Secretary's Honorarium & Expenses:-		3290	£3,593.20
Data Base Manager's Honorarium & Expenses			
Property Repair, Maintain & Furnish:- 113 North Hill Plymouth:-		3558	£6,698.40
Agents Fees, New Lets & Inspections:- (Incl VAT).		1156	£1,339.75
Insurance Premiums:-		1020	£1,096.34
Rates: Business & Water (& Elec):-		984	£1,165.08
Death / Invaliding Benefits / Retiring Bonus:-		3024	£5,499.60
Accountants / Auditors:-		944	£944.00
Income Tax:-		-1265	£952.52
Recruiting Expenses (Note Books) and presentations		1988	
Capital Expenditure			£260.00
Office Eqpt, Hardware / Software / Maintenance:		1282	£1,451.81
Donations (& Prizes):-		-300	
Bank Charges:-		-50	
Social Event (New Year Lunch)		148	£190.00
Solicitors Fees:- (lease renewal, land search, member services, etc.) & Surveyors fees.		1300	£1,962.00
Loan to PPL		-1	£25,000.00
	Total Expenditure: -	30592	£60,944.58
	Income brought down: -	61393	£105,642.09
	Profit / Loss: -	**30801**	**£44,697.51**
Principality B.Soc. Bond, 5yrs @ 3.75% (to Nov 2016)		199814	£199,813.54
Principality B.Soc. Bond, 5yrs @ 5.00% (to Jan 2015)		400000	£0.00
Coventry B.Soc. Poppy Bond (bought 2011, matures 30 September2014):-		140000	£170,000.00
9th Issue Index Linked National Savings Certificate:-		10000	£10,000.00
Barclays Bank, Business Saver Account:-		41518	£460,073.32
Barclays Bank, Current Account (Subs):-		2622	£1,436.85
Barclays Bank, Current Account (Rent):-		3908	£1,224.67
Cash In Hand:-		0	£5.00
	Total Accumulated Funds: -	£797,862	£842,553.38
	Creditor/Debitor		£0.00
	Profit / Loss: -		**£44,691.38**
Property: 113 North Hill (as Valued July 2014):-		240000	£295,000.00

Accountant: Sheppards, Plymouth. Auditors: Mr T Worsfold & Mr R Lampen

President: Mr C. Heaver, Devonport Section. Managing Secretary: Mr D. Fletcher

Australia's Biggest Warship

The Canberra Class Amphibious Assault Ship (LHD), also known as a Landing Helicopter Dock, will provide the Australian Defence Force with one of the most capable and sophisticated air-land-sea amphibious deployment systems in the world.

These 27,000 tonne ships being built as a collaboration between Navantia and BAE Systems will be able to land a force of over 1,000 personnel by helicopter and water craft, along with all their weapons, ammunition, vehicles and stores.

Construction of the hull to the level of the flight deck, including the majority of fitting out will be undertaken at Navantia's Ferrol-Fene shipyard in north-west Spain. The hull will then be shipped to BAEs' Williamstown shipyard in Victoria for the installation of the island structure. The island modules will be constructed at a number of sites around Australian before being moved to Williamstown for final installation on the flight deck.

The ship's roles are to embark, transport and deploy an embarked force along with their equipment and aviation units, and carry out/support humanitarian missions. The first LHD, named HMAS Canberra, was commissioned in 2014 and the second ship, HMAS Adelaide, is planned to commission in 2016.

The ship is a conventional steel mono hull design with the superstructure located on the starboard side of the flight deck. There are four main decks: the Well Dock and Heavy Vehicle Deck for heavy vehicles and/or cargo; Main Accommodation Deck, including the Primary Casualty Reception Facility (PCRF); Hangar and Light Vehicle Deck for light weight vehicles and cargo; and the Flight Deck.

The LHD has been designed with the shallowest possible draft to allow her to operate in secondary ports and harbours as well as manoeuvre tactically in the shallow waters common in the littoral regions. Maximum speed is in excess of 20kts with a range of 6,000 miles, a sustained maximum speed of 19kts under full-load conditions and an economic cruising speed of 15kts with a range of 9,000 miles. She can also reverse with full directional control at up to 8kts.

The LHD has a stern ramp that provides access to the well dock for landing craft and

vehicles along with a fixed ramp between the well dock and the heavy vehicle/cargo deck. Additionally two lateral ramp doors are located on the starboard side and provide wharf access to the heavy vehicle/cargo deck for vehicles up to 65 tonnes.

The well dock is 69.3m long and 16.8m wide and the LHD will normally carry four amphibious mechanized landing craft—LCM 1E and four RHIBs, however this will be mission dependant rather than a normal load out. The well dock has been designed to handle water craft of allied nations, including landing craft, amphibious vehicles and hovercraft.

The LHD will be jointly crewed with personnel from Navy, Army and the Air Force. The main accommodation deck is located above the well dock and heavy vehicle/cargo deck and includes crew accommodation, mess decks, medical spaces, galley facilities, office spaces, and recreation rooms. Accommodation is provided for 1400 personnel; some 400 ship's company, watercraft and flight deck crews and 1000 embarked force personnel. The LHD's flight deck is 202.3m long and 32m wide allowing the ship to operate a range of ADF rotary wing aircraft including:

- MRH90 helicopter
- CH-47 Chinook helicopter
- Blackhawk helicopter
- S-70B-2 Seahawk
- Armed Reconnaisance Helicopter
- Romeo Seahawk

The flight deck has been configured with six spots on the port side for medium sized aircraft such as the NRH90 or Blackhawk, which allows for simultaneous take off and landing operations; alternatively it can support simultaneous take off and landing operations of four CH-47 Chinooks.

There are two aircraft lifts that service the hangar and light vehicle/cargo deck and the forward lift is also used for stores and personnel. Between the flight deck and the accommodation deck is a contiguous hangar and light vehicle deck; the hanger occupying the after section of the deck whilst the light vehicle deck is located on the forward section of the deck. The hanger can accommodate up to 8 medium sized helicopters with 18 medium sized helicopters able to be accommodated if

the light vehicle deck is also used.

In addition there is a cargo lift used to transfer 20-foot containers and vehicles between the heavy and light vehicle decks. There are also lifts for ammunition, provisions and casualties. Up to 110 vehicles, depending on the size and configuration, can be loaded across the two vehicles decks.

The Command and Control (C2) and Combat Systems will consist of:

- Combat Management System
- Extensive ICT infrastructure to support the ADF's Command Support Systems and provide C2 capability for the embarked force
- 3D Air Search Radar
- Helicopter Control and Surface Radar
- Navigation Radar
- IFF capability, including Mode S
- ESM/ECM Suite
- Integrated communications system (internal and external), including a Message Handling System, Link 11 and 16, civil and military Satellite Communications
- Electro Optical and IR surveillance systems
- Integrated Navigation System, including an integrated bridge, navigation sensors, AIS and WECDIS.

The LHD will be fitted with a number of defensive systems including:

- Anti-Torpedo Towed Defence System (Nixie)
- Four 20 mm automated guns
- 6 x 12.7 mm machine guns
- Active missile decoy system – Nulka (weight and space reserve)

Major Statistics

- Length Overall 230.82m
- Moulded Beam 32.00m, Waterline Beam 29.50m
- Flight Deck height 27.50m
- Draft at Full Load Displacement 7.08m
- Full Load Displacement 27,500 tonnes

Although it looks a big ship, it is quite a bit smaller that the new HMS Queen Elizabeth at some 50m shorter in length, 7m shorter in beam and one third of the displaced weight less.

The LHD utilises an electric drive system similar to that used by major cruise companies such as Cunard. The propulsion/generating plant includes the following main elements:

- One gas turbine (LM 2500) turbo generator of 19,160kW
- Two MAN 16V32/40 diesel generators of 7,448 kW each
- Two Siemens azimuth POD units of 11.0 MW each fitted with two propellers of approx 4.5m diameter
- Two bow thrusters of 1,500kW each
- One Progener-Mitsubishi S16MPTA emergency diesel generator of 1,350kW

UAV "printed" for the Royal Navy

In July 2015, the River Class patrol vessel, HMS Mersey, launched something unusual from its gun deck off England's southern coast—a cheap drone made using a 3-D printer. The 3-Kg craft with an airplane-style design was launched by a three meter catapult and flew between a number of pre-programmed waypoints for about five minutes before being piloted to a safe belly landing on a nearby beach.

The cheap drone had been printed on shore and then assembled on the ship. The test was meant to demonstrate how more or less disposable drones, that could be printed on-board, might cut costs and let a crew adapt quickly to a new mission; for example, after a natural disaster.

Making plastic drones for using conventional mass production techniques doesn't offer such flexibility and is also more expensive because the numbers required are not large enough to offset the setup costs. The technology was developed in partnership with researchers at Southampton University and a 3-D printing company, and could find its way into civilian and commercial use. The 1.5-meter-wingspan, propeller-driven drone known as "Sulsa" was printed on an EOS EOSINT P730 nylon laser sintering machine, which can fabricate either plastic or metal objects, layer by layer. Even the control structures and wings were printed. Once the four component parts are clipped together, the plane's battery, control electronics, motor and propeller are added separately. If required, sensors like cameras and radar can also be added. The consumable cost of printing the Sulsa and adding in the other components is approx. £5,000.

The finished drone can fly at up to 100 miles per hour. Ship-launched drones already exist but are typically much larger and cost millions of dollars. At present the UAV can fly for only 40 minutes, but that should be enough for missions such as responding to reports of piracy, where being able to easily check out a vessel from a distance of 10 miles or so is a great advantage .

It is thought that ships could put to sea carrying the 3-D printer and powder feedstock needed to make printed parts for up to 50 drones or for bespoke vehicles to be used on different missions that might require different sensors However, work remains to be done to prove that printing planes at sea makes sense. Printing the parts for a Sulsa takes hours, and existing printers would need to be modified so they could stay level at sea.

The EOS P730 printer, made in Germany, is one of the largest selective double-laser sintering devices available and has an effective building volume of 700 mm x 380 mm x 580 mm. This is no lightweight machine either at 2300 Kg and has dimensions of 2.25m x 1.55m x 2.1m. The machine costs in the region of several hundred thousands of pounds.

Recent recipients of RNEBS prizes for 2014/2015

WE Prize winners at HMS Collingwood are:

Winner of the SEMC Chatham Memorial Prize - Sub Lt David Savin

Winners of the POET Chatham Memorial - Prize POET Chris Burke; POET Chris Clements and LET Andrew Pick

Winner of the Captain Marrack Prize - LET Carl Brazier

POAET Luke Thomas being congratulated by the General Secretary on receiving the RNEBS Air Engineering Avionics award during a rather wet Divisions at HMS Sultan.

LAET Andrew Sparks being congratulated by the General Secretary on receiving the RNEBS Air Engineering Mechanical Trade Prize during a visit to The Royal Naval Club and Royal Albert Yacht Club.

Crossing the Bar

Members whose Crossing of the Bar has been notified since the last Bulletin was published.

Michael O'Hara, 09333, joined the Society 1966, passed away 28 May 2013.

Richard (Jan) Mead, 12811, joined the Society 1998, passed away 05 December 2014.

Thomas (Tom) Lunn, 07927, joined the Society 1962, passed away 27 January 2015.

Update Your Details

Please ensure you keep the Society updated with any changes of postal address and email addresses. We currently have a number of members for whom we have no contact details, therefore they cannot be contacted or able to receive the *Bulletin* or receive notification of events and functions that are being planned. If you know of any colleagues who are not receiving the *Bulletin*, then please let us know and we will endeavour to sent a copy to them. The Bulletins will always be posted on the RNEBS website http://www.rnebs.co.uk/