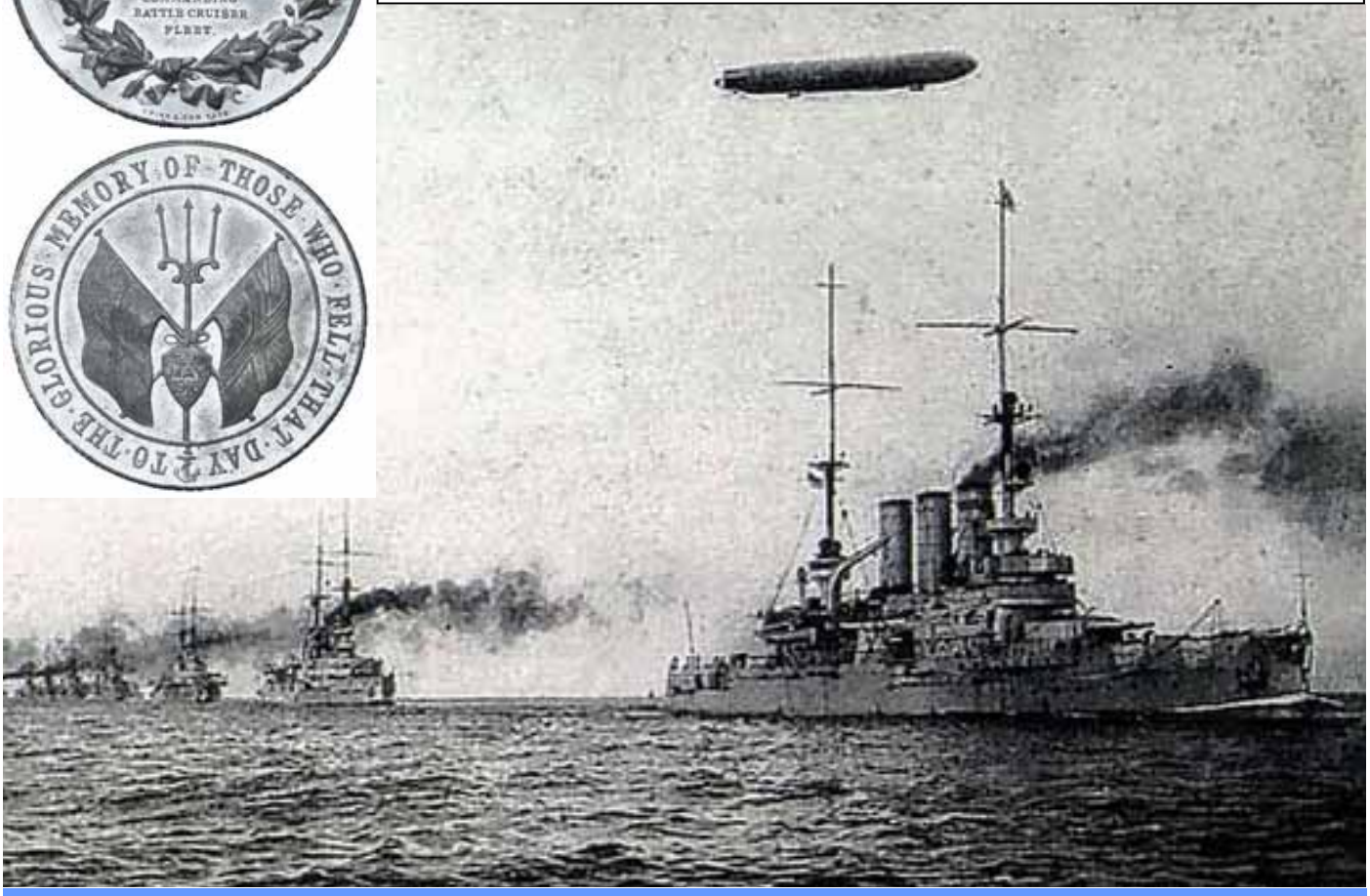
Society Members' Bulletin

100th anniversary of the Battle of Jutland

Showing left: The medal commemorating the Battle of Jutland, 1916. Designed by the Marquis of Milford Haven and created by Spink & Son. It was sold for the benefit of Naval Orphanages. This 45 mm medal was struck immediately after the battle had been fought and before it had received its official title. It was issued in gold, silver, bronze and white metal.



March 2016
Issue 13

Royal Naval Engineers Benevolent Society

Founded in 1872

Society Members' Bulletin

March 2016

Dear members,

It is with great regret that I have to announce the passing of the Managing Secretary, Derek Fletcher on Friday 29th January. A well attended funeral was held at the Glyn Valley Crematorium at 1130 on Tuesday 16 February and thereafter at The Liscawn Inn, Crafthole, Cornwall.

At last year's Executive Council meeting, Derek indicated that he would be standing down as Managing Secretary and to that end he was preparing to hand over the reins to George Else, who was to be confirmed in the post at the next EC meeting. Having worked closely with Derek over the last six months, George has accepted the position of acting Managing Secretary.

In other news, the British Legions' Mesothelioma Campaign has been successful and that legislation will be amended in April 2016 to enable all veterans diagnosed with Mesothelioma as a result of Service the choice of compensation between receiving a traditional War Pension or a £140,000 lump sum, regardless of age at diagnosis.

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.

Articles and correspondence submitted for publication and communications relating to advertising etc., should be addressed to:

Members' Bulletin, 113 North Hill Plymouth PL4 8JY

Useful RNEBS Contacts

www.rnebs.co.uk

The RNEBS Offices
The Shearsby Suite
113 North Hill
Plymouth PL4 8JY

The Society President
Mark Stevens
The Shearsby Suite
113 North Hill
Plymouth PL4 8JY

General Secretary
Cliff Fiander
The Shearsby Suite
113 North Hill
Plymouth PL4 8JY

Managing Secretary
George Else
The Shearsby Suite
113 North Hill
Plymouth PL4 8JY
man.sec@rnebs.co.uk

Editor
Society Members' Bulletin
Mark Stevens
contrabyte@gmail.com

Website Manager
George Else
The Shearsby Suite
113 North Hill
Plymouth PL4 8JY

Derek Fletcher 1946—2016

Derek

Derek was born on the 9th September 1946 in Leeds where his sister Barbara still lives. Caroline is pleased that his niece Jane has travelled from Guernsey to be here today.

Derek joined HMS Fisgard as an Artificer Apprentice in 1964 and specialised in Weapon Control Systems. He met Caroline who was at teachers training college in Southampton while completing his apprenticeship at HMS Collingwood and they married in 1969. They moved to Crafthole in 1973 and formed close and lasting friendships with their immediate neighbours.

Throughout their RN married life, Derek was invariably at sea serving aboard a variety of frigates. A most memorable time was when he was involved with the Cod Wars.

However, throughout this period of time he was planning for the future and was one of the early students with the Open University. He studied at sea over a period of 7 years in very cramped conditions finding study spaces wherever he could. He was reliant on mail being dropped by helicopter to receive his booklets of study and assignments. He overcame all these difficulties to be awarded a First Class Honours degree prior to retiring from the RN.

Caroline understanding his thirst for knowledge felt he deserved the opportunity of studying at a university full-time. Derek was granted a place at Imperial College London to undertake a MSc degree in Control Systems. At the age of 40 this challenge was taken up and he thrived in the academic environment. As a full time student he was entitled to a Young Persons railcard and he would often recall how ticket inspectors checking his train ticket would give him a quizzical look to which Derek would say ‘ I have had a tough newspaper round!’

His Masters Degree coupled with his excellent RN Apprenticeship enabled him to take up a post with Sauer Sundstrand where as a Control Systems engineer he was the English member of a European team.

As former colleagues recount, within the industry of mobile hydraulics and controls, Derek was widely admired for his comprehensive technical knowledge and competence in

overcoming problems.

Caroline has been so pleased to receive letters and emails from former colleagues in the USA, Italy and Denmark.

On retiring, Derek adapted quickly to being at home and enjoyed membership of the Probus Club in Crafthole, where he gave a presentation entitled 'Tonka Toys' about the large machines for which he had provided and adapted Control Systems.

He was also an enthusiastic member of the Plymouth U3A Italian Conversation Group and would studiously prepare his assignment each fortnight. His love of the Italian language and culture, also coffee and food led to Derek and Caroline having annual holidays in Bologna.

Derek was an inspirational member of the Liskeard Model Society for over 20years and fellow members say his knowledge of matters electrical and mechanical was unsurpassed in the Society. He was a regular presenter of talks on a variety of subjects and exhibitor at the annual exhibitions, often displaying the automata presented to the Society which he had repaired and updated. He kept the trains running at the Morval Rally and was often in the driver's seat. Derek's gruff manner at times hid his impish humour and his kindness towards and consideration of, others in the Society. As Treasurer, he provided an extremely reliable service to the Society for many years. Derek was undoubtedly a pillar of the Liskeard Model Society and his passing has come as a great shock to those who have lost a fine man, a good friend and a man of knowledge on multiple matters.

Throughout retirement, Derek remained a member of the Royal Naval Engineers' Benevolent Society. His colleagues say that as President and latterly as Managing Secretary, Derek was a leading member of the Executive Council of the Society and a cornerstone of its organisation.

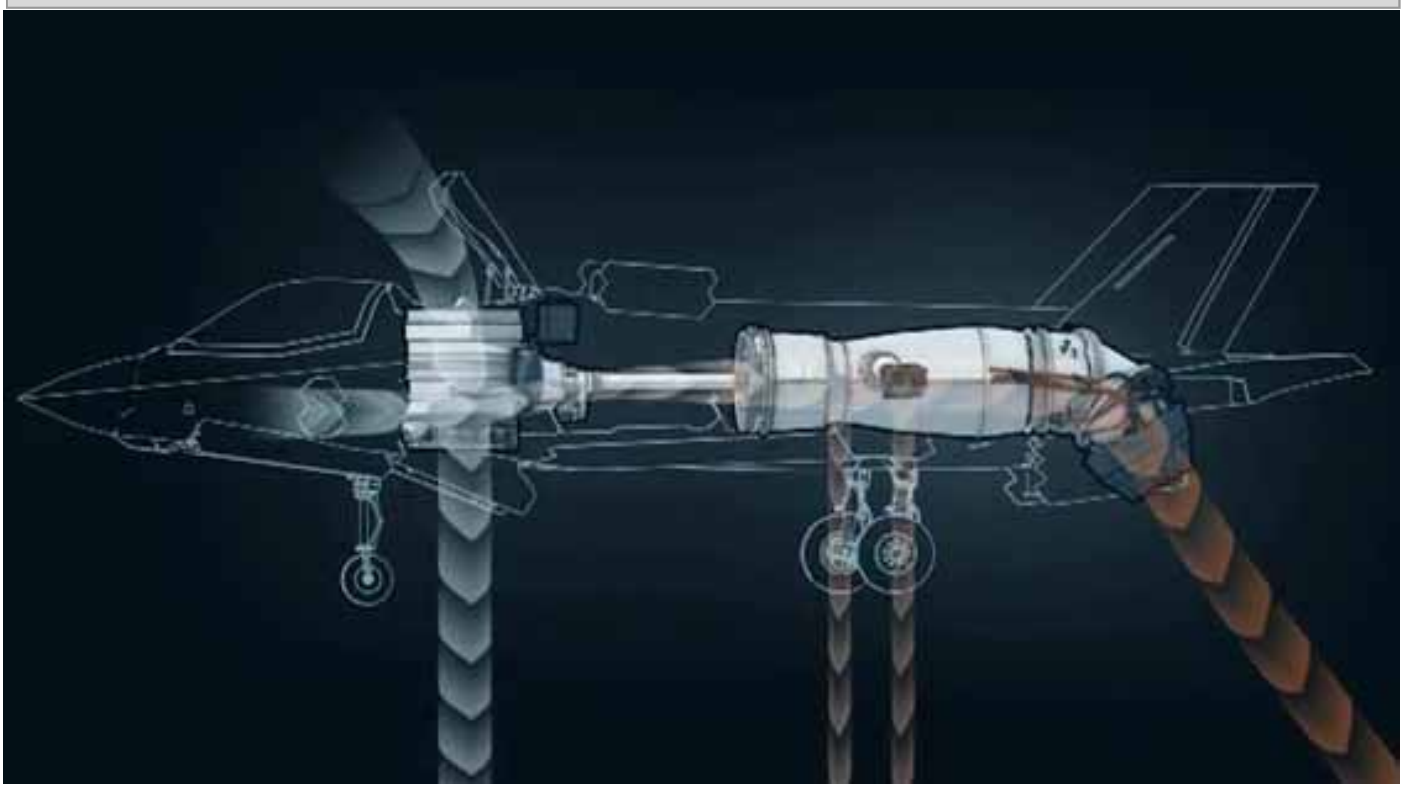
It was as Managing Secretary that he made a significant contribution to the Society and enhanced its future viability. Building on the work of former Secretaries, he oversaw the refurbishment of the Society's Head Offices building, managed its investments and lettings portfolio, catalogued its historical records, memorabilia and assets and most notably, identified, through his own endeavours, a unique opportunity for the Society to increase its property holdings with the purchase of a fine historic building at 111. North Hill, Plymouth. Having navigated his way successfully through the lengthy buying process Derek then set about managing a major internal renovation to provide a well appointed apartment that will generate a further revenue stream for the Society's investment. Having successfully completed the renovation, one of his last acts was to begin negotiations with a corporate tenant.

Derek was a first-class exponent of all that the Society stands for, he was a good engineer in the finest sense of the word, he had the skill and the talent to do the job and he accepted the responsibility for doing it right and doing it well with great pride and dignity. His sense of humour was a most useful gift, not only helping him to remain focussed on the task while the problems whirled maddeningly around him but also enriching his conversation with just the right amount of light-heartedness, such as his description of his wife Caroline as 'Commander in Chief Crafthole'.

Derek was reliable, intuitive, effective and a good friend and colleague, indeed he was many things to many people but enduringly he was what every man should strive to be, a perfect Gentleman.

Joint Strike Fighter Updates

- The former head of the Royal Navy, Lord West, has asked the MoD to consider renaming the F-35B the 'Sea Lightning' to keep the tradition of adding the 'Sea' prefix to the aircraft's name.
- The F-35 programme is the US's most expensive defence contract ever, at a cost of £620 billion over a 55 year lifespan, that includes support and development costs.
- In June 2015, the F-35B successfully completed another major milestone as the fifth generation stealth fighter was launched into the skies from a ski-jump at the US Naval Air Station in Patuxent River, Maryland.
- In August 2015, Northdrop Grumman started work on the centre fuselage for BK-10, the 10th F-35B variant for the Royal Navy. The company also designs and produces the aircraft's radar, key electro-optical and communications subsystems.
- The United Kingdom has a requirement for 138 F-35Bs for the RAF and RN, with this final numbers over the life of the programme announced in the Strategic Defence and Security Review published on 23rd November 2015. Parliament has authorised the procurement of the first 14 F-35Bs as part of the overall programme of record.
- Lockheed Martin has been contracted for $311m to deliver Block 3F software for the US and UK (7% of the cost) forces. The F-35's software and capability blocks are broken down into Block 1A - initial training, Block 1B - advanced training 1, Block 2A - advanced training 2, Block 2B (initial combat capability), Block 3i (initial full capability), and Block 3F (full combat capability).
- UK F-35B pilots will begin operating the next generation stealth fighter from bases in England starting in 2018, and are on track to fly from the Queen Elizabeth Class aircraft carriers in 2020.



General Secretary's Report

By Cliff Fiander

Society Awards

Continuing work with the 3 Engineering Schools has led to the rationalisation of the prizes awarded by the Society for those achieving excellence in their training courses. Now, all prize winners receive an engraved decanter or tankard depending on their achievement and these are presented at Divisions or at award ceremonies in the individual schools. These prizes provide recognition of an achievement, a lasting memento of a successful step in the recipient's career and tangible evidence of the Society's support of Engineering Excellence.

Examples of the prizes awarded are shown below. Each is engraved with the Society's crest the name of the award and the wording "Presented to A N Other by The Royal Naval Engineers' Benevolent Society".

SEMC SUY Prize

POAET Academic Prize

150th Anniversary

Apologies for the lack of detail on the arrangements for the 150th Anniversary of the Introduction of Artificers into the Royal Navy but the organisation continues with the choice of the venue and date to be finalised in the near future. Work can then begin on a supporting programme of events. There is considerable interest in the event both from home and abroad and members will be advised of details as soon as they become available.

Managing Secretary

Members will have read elsewhere of the untimely passing of Derek Fletcher, the Society's Managing Secretary. All I would like to add is that Derek conducted his business for the Society in the best traditions of the Royal Naval Artificer. He instinctively knew how things should be and worked hard to make them so, meeting every challenge head–on, devising a solution and then acting in the most efficient and effective manner. He was a pleasure to work with, a great guy to have in the team and he would, undoubtedly, have scoffed at the foregoing.

From the Past

Members may be interested in the following:

London Gazette 4 September 1917:

'The KING is pleased to confer the Decoration of the Albert Medal on Artificer Engineer (now Acting Mate (E)) Edmund John Pysden, R.N.'

The following is the account of the services in respect of which the Decoration has been conferred:

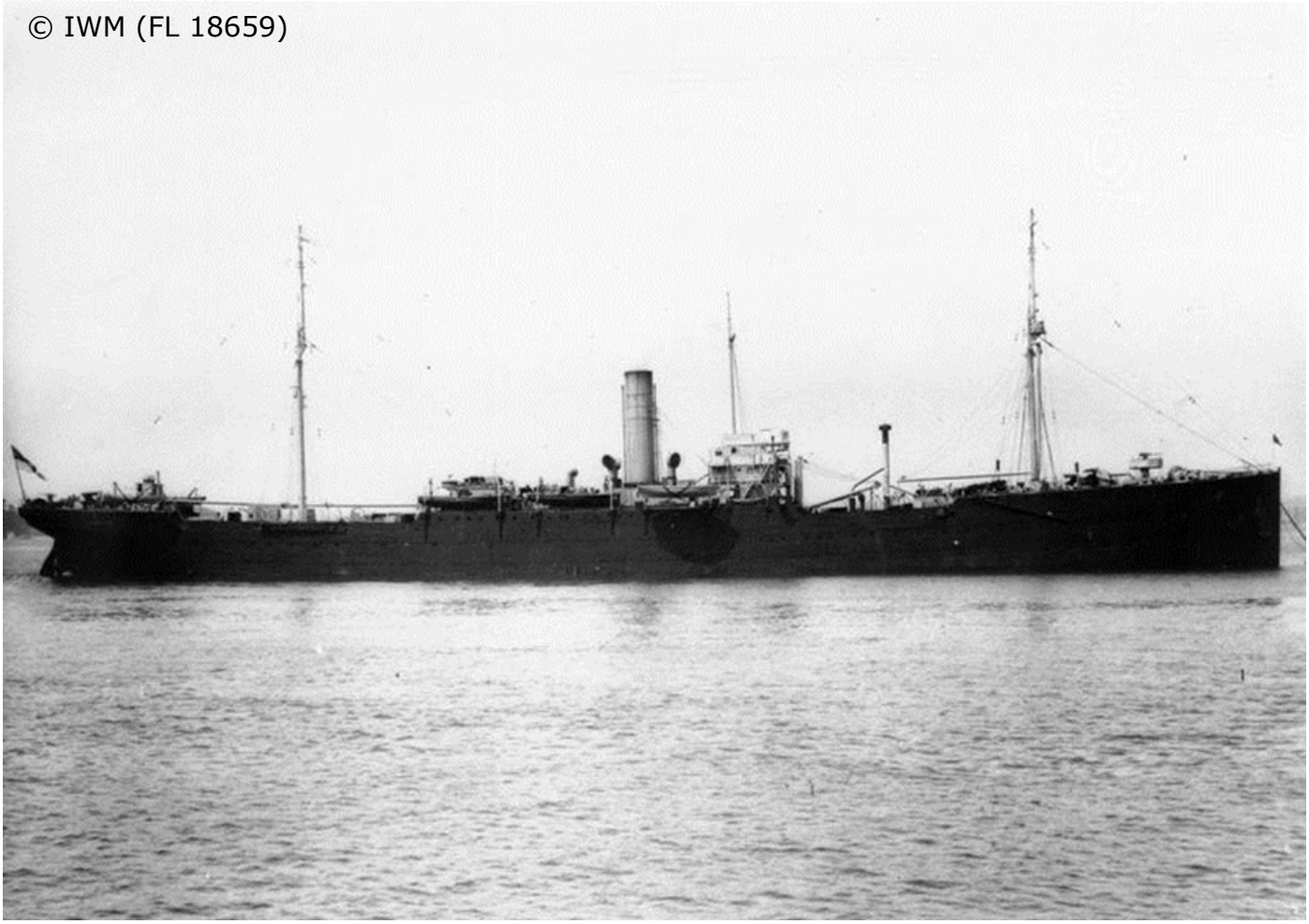
'On the morning of the 27th February, 1917, one of the auxiliary stop valves in one of H.M. Ships accidentally burst, the boiler room immediately becoming filled with dense steam. In spite of the danger of burning and suffocation from steam, and of the fact that it was impossible to draw fires or at once to lift the safety valves, which rendered the possibility of a second and even worse accident highly probable, Mr. Edmund John Pysden, Artificer Engineer, R.N., made several gallant attempts to enter the stokehold, and succeeded in bringing out two men who were lying insensible on the stokehold plates, and helped to bring out others.

Several of the survivors would undoubtedly have lost their lives but for the rescues effected by this officer and others. Mr. Pysden also eventually succeeded in opening the safety valve, which relieved the immediate danger of a further accident. Although he had a wet rag tied over his mouth, he swallowed a considerable quantity of live steam, and was partially incapacitated by its effects. Notwithstanding the gallant efforts of Mr. Pysden and other members of the ship's company, three men lost their lives owing to the accident and nine were seriously injured.'

The Albert Medal presented by His Majesty King George V to Artificer Engineer Edmund John Psyden, R.N. for gallantry in saving life after an explosion in the engine room of H.M.S. Sandhurst at Scapa Flow on 27 February 1917.

Edmund John Psyden was born at Sheerness, Kent, on 28 October 1881, and was a coppersmith by trade when he entered the Navy as an Acting Engine Room Artificer 4th Class on 15 October 1903. He was promoted to Warrant rank as Acting Artificer Engineer on 1 September 1913, and confirmed in the rank on 23 September 1914.

He joined H.M.S. Manipur in January 1916, the ship being renamed Sandhurst in July of that same year. At the time of the above incident Sandhurst was in Gutter Sound, Scapa Flow, Orkney Islands. Psyden was promoted to Acting Mate (E) on 7 June 1917 and retired in the rank of Engineer Lieutenant Commander on 28 October 1926.



H.M.S. Sandhurst

Formerly the merchant ship Manipur, was built by Harland and Wolf, Belfast, and requisitioned by the Royal Navy in 1916, first as a dummy of H.M.S. Indomitable and later as a Fleet repair ship.

I wonder what Edmund Psyden, his contemporaries and others "who go down to the sea in ships and do business in great waters" would make of the Channel 4 programme "Royal Navy School"; probably like me, not much.

HMS Warrior

On a far more encouraging note, I had the pleasure of meeting Tony Ford, XO of HMS Warrior and an ex Artificer, during a recent tour of the ship. I have to say the ship itself is really interesting and Tony is doing an excellent job of preserving it for the future. Launched in 1860, 8 years before the introduction of Artificers into the RN, HMS Warrior is a testament to the ingenuity of Victorian engineering and shipbuilding skill. So if you can overcome the natural reluctance to pay money to enter Portsmouth Dockyard (many of us would have gladly done the reverse) HMS Warrior is well worth a visit. More on HMS Warrior in a later edition.

If there are any shipwrights out there, or if you know any, who want to keep their shipbuilding and ship repair talents finely honed Tony could do with some of your unique help and assistance. If you feel inclined to lend a hand to a great project please contact Tony either through me or the HMS Warrior desk in the Portsmouth Historic Dockyard Visitor Centre on 023 9283 9766.

Finally

As we witness the RN's endeavours to restore the skill levels, career satisfaction and retention levels so sadly lost with the abandonment of proper Artificer Training I am conscious that we, the RNEBS, should have done more to warn their Lordships that, regardless of the satisfaction of finally crushing the Artificer under the heel of economic necessity, there would be a downside to such actions.

Possibly, if we had been more engaged with the serving Navy and more aware of what was planned we could have counselled against the abandonment of a system that had served the RN so very well since it was first introduced by Jackie Fisher in 1910.

Hopefully Program Faraday will re-establish much of what has been lost but if we are to stop another such move in the future (how long before the Fast Track candidates become savings targets?) then we must be more aware of what is happening to engineering support in the RN than is presently available from the pages of Navy News.

To that end I would like to ask our serving members to contact the Society with their views and concerns about the profession, obviously without compromising MOD rules and guidance, or suggest a forum or meeting format where we could enjoy a frank discussion.

It would be a great pity if the Fast Track Engineering Technicians, soon to be endowed with much of the knowledge and skills of the Artificer that so elegantly filled the gap between what the university educated Engineer Officer knew and what the mechanic was trained to do, are, in their turn, sacrificed in the name of cost savings.

Jutland: The Greatest Naval Battle of WW1

The Battle of Jutland took place on the 31st May 1916 between the British Grand Fleet and the German High Seas Fleet, in the North Sea off the mainland of Denmark.

The Battle of Jutland is considered to be the only major naval battle of World War One. It became the largest sea battle in naval warfare history in terms of the numbers of battleships and battle cruisers engaged, bringing together the two most powerful naval forces in existence at that time. Jutland witnessed the British Navy losing more men and ships but the verdict of the Battle of Jutland was that the German Navy lost and was never in a position again to put to sea during the war. Admiral John Jellicoe's tactics were criticised by some, but after this battle the British Navy remained a powerful fighting force whereas the German High Seas Fleet did not.

The recently appointed commander of the German High Seas Fleet, Vice Admiral Reinhard Scheer, had returned to the policy of making sorties against the British coastline. He was confident that his coded messages were secure, and that the main British battle fleet, at Scapa Flow in the north of Scotland could not intervene. However, the British were able to read German coded messages, and were aware of Scheer's plan. The British Grand Fleet also enjoyed a numerical advantage over the German High Sea Fleet of 37 to 27 in heavy units and 113 to 72 in light support craft.

At the end of May, Scheer sortied with the entire High Seas Fleet, expected that the only serious threat he would meet was Vice Admiral Beatty's battle cruiser squadron based on the Forth. Unfortunately for his plan, the Royal Navy knew he was coming, and the Grand Fleet sailed only minutes after the High Seas Fleet had departed.

Both fleets sailed in a similar formation, with a scouting squadron of battle cruisers sailing ahead of the main battle fleets. The battle falls into five main phases:

1. The first came when Beatty's battle cruisers encountered their weaker German equivalent under Rear Admiral Hipper and chased them south towards the main German fleet.
2. The second phase saw Beatty flee north, pursued by the German Dreadnoughts. So far, both sides thought the battle was going to plan, although a design flaw led to the destruction of two British battle cruisers.
3. In the third phase the Germans got a nasty surprise. Thinking themselves involved in a chase that would end with the destruction of the British battle cruisers, they found themselves under bombardment from Jellicoe's battle fleet, which they had assumed to be too far north to intervene. The heavy British guns quickly forced Scheer to order a

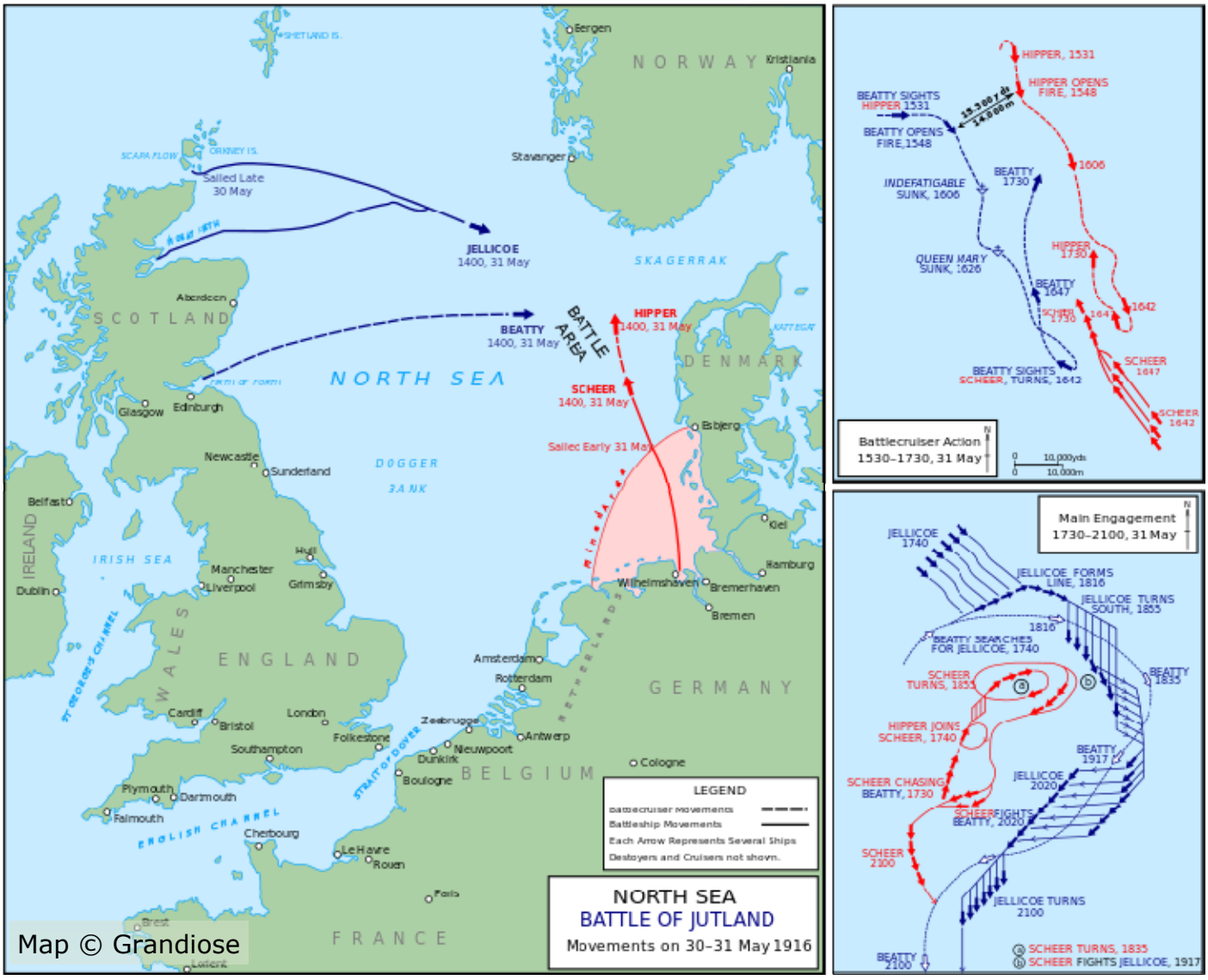
retreat, but then Scheer made what could have turned into a grievous error, turning back, possibly hoping to pass behind Jellicoe, and escape into the Baltic.

4. In fact, Jellicoe had slowed down, and the German fleet found themselves crossing in front of the British fleet, and in ten minutes of gunfire suffered 27 heavy hits while only inflicting 2 on the British. Once again, Scheer ordered a retreat.

5. Finally, in the fifth and last phase of the battle, in a night of intense fighting, the retreat of the German battleships was covered by their lighter ships, while Jellicoe lost time after turning to avoid a potential torpedo attack.

The Germans lost one battle cruiser, one pre-Dreadnought, four light cruisers and five destroyers totalling 3,058 men and 62,000 tons. The British lost three battle cruisers, four armoured cruisers, and eight destroyers amounting to 6,784 men and 111,000 tons. Many of the surviving German heavy ships had suffered serious damage, and one consequence of the battle was to increase the British dominance in heavy ships.

Despite plans on both sides neither submarines or aircraft played any part in this battle of the great battleships. Never again did battle fleets meet again in such numbers. While the British suffered more loses, the battle effectively ended any threat from the German High Seas Fleet, which knew it could not contest control of the North Sea with the Royal Navy. The Germans' solution was to commence raiding with U-boats against merchant trade vessels to try and defeat the British economic life.



HMS Brave Borderer

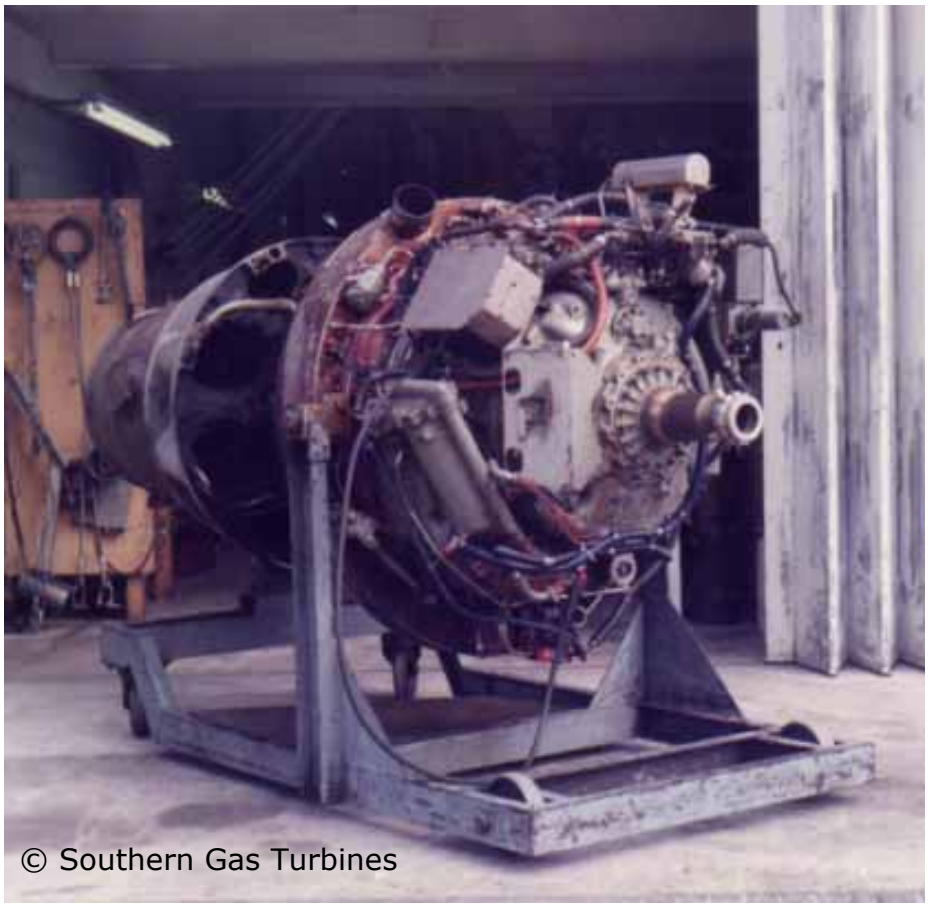
Built in the late 1950's, HMS Brave Borderer (P1011) was one of the very first naval vessels to be fitted with gas turbine engines. Even the 40kW generators were driven by Rover gas turbine engines. The Brave Class consisted of only two boats, The Brave Borderer and Brave Swordsman (P1012). Together with a single Dark Class vessel, they formed the Costal Forces Trials and Special Services Squadron based in Gosport and were used to maintain proficiency in costal operations during the 1960's.

In June 1954 a contract was placed with Vosper Ltd. to produce a series of studies of fast patrol boats that were able to exist in several formats such as minelayer, torpedo boat and gunboat, incorporate alternative machinery arrangements, able to travel at a minimum of 44 knots and have a range of some 400 miles at maximum speed. The design brief also included that the boat should be able to convert from one role to another within six hours, including the replacement of major components such as the main engine or gearbox.

Built as a fast patrol boat by Vosper in 1958, the three Bristol Siddley Proteus engines driving super cavitating propellers pushed the 116 ton fully loaded ship to a top speed of 52 knots (60 mph). It could also maintain a continuous speed of 46 knots (53 mph). The 96ft long hull had an aluminium framework that was clad in a double mahogany skin. It was armed with one Bofors 40mm gun and four 21" torpedo tubes or alternatively two Bofors and two tubes.

In 1957 the Royal Navy abandoned large scale costal forces and, together with their high build costs (£880,000 and £640,000), the Brave Class was decommissioned and removed from service in 1970. Brave Borderer was sold off to the Haydon-Baillie Aircraft Museum for spares in April 1985, the Brave Swordsman having been bought previously by the same company in 1980 for preservation.

© IWM (A 34261)



© Southern Gas Turbines

The Proteus Gas Turbine

Design work on this engine, manufactured by Bristol Aero-Engines Ltd., started in 1944 and was intended for use in aeroplanes. The original Mk 600 had an output of 3,780 hp. The Proteus was a two spool, reverse flow gas turbine and because the inner spool did not drive a compressor, it was known as a free turbine. The marine version was originally trialled and tested on the frigate HMS Exmouth.

Another variant, the Proteus Mk 705, was used in Donald Campbell's land speed record breaking car, Bluebird. This engine delivered 4,450 shaft horse power through drive shafts at each end of the engine to separate fixed ratio gearboxes on each axle, i.e. 4 wheel drive.

Supercavitating Propellers

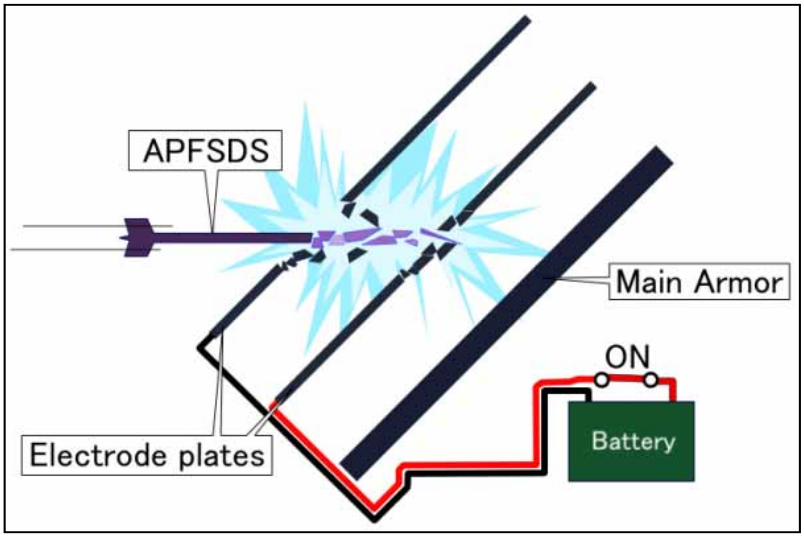
Submarine propulsion is designed to reduce the effects of cavitation as much as possible as it can cause damage to the blade surfaces and create unwanted noise. Cavitation in water is the formation of vapour cavities (bubbles) when the pressure is lowered below water's vapour pressure and occurs when water is subjected to rapid changes in pressure. When the voids implode under high pressures (the bubbles collapse) they can cause intense shockwaves and can cause cyclic stresses (pitting) on metal surfaces. However, if you can create a bubble of gas that completely envelopes the object travelling through water, skin friction drag is reduced and higher speeds can be achieved. The supercavitating propeller has wedge shaped blades that force cavitation along the whole length of the leading edge.

The Challenges of Dynamic Armour

By Mark Stevens

Also known as Electric Armour, this new proposed system uses a strong electric field to disrupt the jet of ionised gas produced by an exploding warhead. Electrically charged armour is a recent development in the United Kingdom by the Defence Science and Technology Laboratory (DSTL).

In this example, a vehicle is fitted with two thin shells, separated by insulating material. The outer shell holds an enormous electric charge, while the inner shell is at ground; this creates a basic form of a high power capacitor. If an incoming High Explosive Anti-Tank (HEAT) shaped charge jet penetrates the outer shell and forms a bridge between the shells, the electrical energy discharges through the jet, disrupting it. This is done by the sudden influx of dumped energy from the 'capacitor' vaporising the metal component in the jet or even turning it into a plasma. An inner shell of armour would then stop the impact of vaporised metal instead of trying to prevent the penetration of solid or liquid metal. Dramatically increasing the volume of a projectile reduces the effective mass on the surface area of the vehicle, thus reducing the force per unit area; i.e. spreading the load.



Trials have so far been extremely promising and it is hoped that improved systems could protect against Kinetic Energy (KE) penetrators.

However there are still many questions that need to be answered before this system can be considered to be effective and fit for purpose:

1. What is the power requirement that will allow the outer shell to remain charged up for a long period of time?
2. As the temperature of the vaporised metal is likely to be in the region of several thousands of degrees (possibly higher if turned to plasma), will the inner armour shell prevent deformation or melting? Possible answer would be to utilise ceramic armour, composite laminated armour or some type of smart metal that can return to its original shape after being subjected to a large deformation, i.e. self healing surfaces.
3. How quickly can the system react to an incoming projectile? This may determine the thickness of the two outer shells and the type of filler materiel. Is there an upper speed limit where the system can provide adequate protection?
4. How will the system protect with a secondary impact in the same location?

Now for the physics:

The three variables which affect how the initial voltage discharges is time, t; the resistance of the resistor, R; and the capacitance of the capacitor, C.

$$V_C = V_0 e^{-t/RC}$$

1. The greater the amount of time that has elapsed, the more the capacitor will discharge. The less time that has elapsed, the less time the capacitor has to discharge. Thus, the larger the t value, the smaller Vc.
2. The greater the resistance, R, of the resistor, the slower the discharge process will be. This is because resistance slows down the amount of current that passes through. Thus, if the resistance is large, the capacitor discharges more slowly. Therefore, the larger the resistance value, the greater Vc is. The smaller the resistance, the smaller Vc will be.
3. The greater the capacitance of the capacitor, the slower the discharge process will be. This is because the greater the capacitance, the more charge the capacitor has. If it has more charge, then it will take longer to discharge all of that charge. If the capacitance is smaller, it holds less charge. Therefore, it takes a shorter time to discharge that charge. Therefore, the higher the capacitance value, the greater Vc will be. The smaller the capacitance, the smaller Vc will be.

If the distance between the two outer armour shells is say 100mm and a projectile is travelling at Mach 1, that is 343 metres per second, it would take only 0.29 mille-seconds to bridge the gap and trigger the electrical discharge. Assuming that the materiel from the projectile has the same inertia, the system must discharge and vaporise the metal components in less than 0.29ms, before it reaches the inner armour shell.

Now it takes over 300kj/mol to evaporate copper, that is to say 300 kilo joules of energy to evaporate 63.55 grams (0.0655kg). So if the warhead contains approximately 8kg of copper, the amount of energy required to evaporate this would be about 37 mega joules.

So we have a requirement for this type of amour system;

1. A very fast discharge time, probably in the order of 0.2 mille-seconds
2. A large amount of electrical energy released of between 40 to 50 mega joules
3. A low resistance to ensure a fast discharge
4. A large capacitance to hold a large charge

The inherent problem here is that a large capacitor discharges slowly and a small capacitor will not hold the required charge. The energy stored by a capacitor is given by the formula

$$E = \tfrac{1}{2}CV^2$$

(where C is measured in Farads and μF = 1 x 10^{-6}F)

To get the required 50 mega joules we would need a capacitor in the region of 100,000 μF with a corresponding voltage of 1,0000 V or 10,000 μF and 100,000 V or 100 μF and 1,000,000 V. None of these values looks to be practical to achieve as we have to contend with large capacitors or large voltages.

There is not much information in the public domain concerning this new technology and therefore this article is subject to conjecture and speculation. The U.S. Navy are looking to incorporate this technology into their new Ford-class aircraft carriers at some time in the future.

If anyone out there has any facts and figures on this or any other interesting topics, then please let me know via the usual methods.

Using New Technology in Watches

Take a good look at any technology blog and all the innovation in the world of timekeeping seems to be portrayed by two words: *smart watches*. Almost every week new designs emerge from electronics giants such as Samsung and Sony, smaller producers such as Pebble and Martian, and even the odd pop star in the form of will.i.am. However, mechanical watches are leaving their digital cousins in the dust with new high-tech materials and innovative designs.

Wind back a few years to when the Swatch Group transformed dull digital watches into must-have fashion accessories in 1983, thus saving Switzerland's watch industry from financial disaster.

Now, Smart watches tend not to be very innovative and most are a amalgamation of phone, activity-tracker and music-player. Although almost 2 million of them were sold worldwide in 2014, it seems that many buyers lose interest soon afterwards as they are after the next latest gadget. Commonplace digital quartz watches, too, have seen few real technological advances. Some now sport GPS, solar power and a variety of fancy screens, but commoditisation has pushed down average prices to only a few pounds and has largely squeezed out innovation.

That leaves traditional mechanical watches, where innovation is being driven by two factors. The first is the vast profits still made in and around Switzerland's "watch valley", near Lake Neuchâtel. In 2013 the country exported 28.1 million timepieces at a reported average price of £550. This value was skewed down by Swatch, which sold a vast but undisclosed number of its quirky quartz watches at £33 to £145 each. The second is a series of technological breakthroughs, spurred by unexpected uses of untraditional materials, that may in time transform the industry.

Swatch has now launched a self-winding mechanical watch called Sistem51.

Sistem51 seeks to do for old-style watches what Swatch did for digital timepieces three decades ago. At that time Swatch used innovative design and automation to cut the number of parts in a quartz watch from about 90 to 51. Sistem51 takes the 200 or more parts in a mechanical watch and cuts that down to 51 components as well.

To do this, Swatch built a minimalist movement out of ARCAP, an alloy of copper, nickel and zinc which happens to be anti-magnetic. Magnets are the perpetual enemy of accuracy in mechanical watches. Because ARCAP resists magnetism there is no need for certain components such as a regulator mechanism and because the movement cannot be serviced it must be set properly by machine. The special escapement is set by a laser during production and never needs to be touched again. The movement is then sealed at the factory, where assembly is fully automated, a first for mechanical watches.

One of Sistem51's greatest innovations is the movement architecture itself. All 51 components link to a central screw, meaning fewer components require lubrication and wear over time will be much less than it would be with more conventional architecture.

The Sistem51 also winds automatically, has a 90 hour power reserve, and features a peripheral bi-directional rotor. This allows you to see some of the movement components through the case back. These components are also printable during production, so designs and colours can be customized over time. This first design is inspired by the Copernican revolution, to which Swatch compares this revolution in watchmaking. Sistem51 may be 100% Swiss-made, but its makers are Swiss robots and these watches can be bought from a large variety of retailers sporting many different designs for about £100 each.

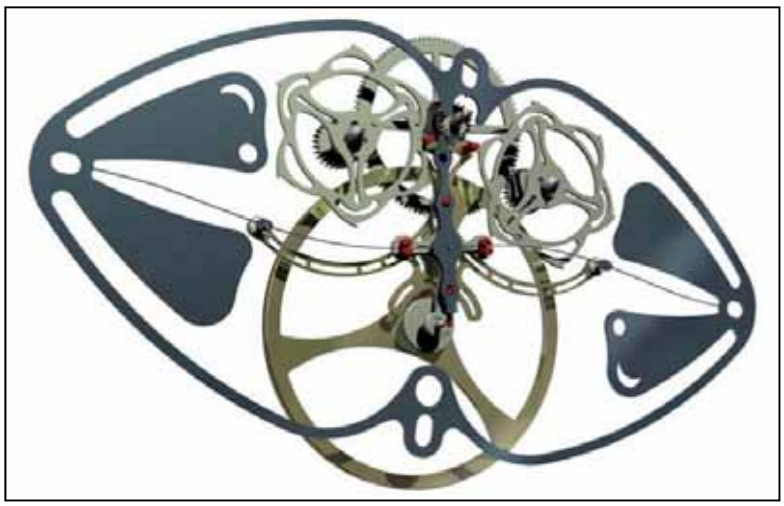
But it is silicon that is truly revolutionising traditional watches, many of which now contain more of the material than any smart watch. At the heart of a mechanical watch is the delicate hairspring, balance-wheel, escapement-wheel and pallet mechanism. In simple terms these are the elements of the watch that count each second and ensure accuracy. Traditionally, like the rest of a watch's powertrain, they are made of metal. This means that they need lubrication, are impaired by magnetism, shock, heat and cold, and wear out.

Silicon avoids these problems. A number of watch firms, using a technique known as deep reactive-ion etching, are now shaping silicon wafers into hairsprings, escapement wheels and pallets and sometimes even balance-wheels. Silicon is lighter, harder and stronger than metal. Etched into tiny skeletal structures that would be impossible to form with metal, it becomes the featherweight heart of a mechanism that can run at a far higher frequency (speed), which means greater accuracy. The silicon parts are virtually frictionless, so need no lubrication, and are immune to most external forces and when bonded with a synthetic diamond or carbon coating brittleness (silicon's only real drawback) can also be overcome.

But watchmakers are not simply using silicon as a metal substitute. One problem with all mechanical watches is that their accuracy changes with their position because it is affected by gravity. In the late 18th century Abraham-Louis Breguet, a legendary Franco-Swiss watchmaker, tried to combat this by enclosing the entire balance-wheel and escapement mechanism in a rotating cage, an invention known as a tourbillon. These are still to be found in some timepieces, but only partly counter the effects of gravity, and make the watch both complex and costly.

The Breguet watch company still exists (as part of Swatch's empire), and has now come up with a different way to defy gravity. Having made its new watch with anti-magnetic silicon components, Breguet was able to insert powerful micro-magnets at each end of the carbon steel balance-staff that spins the watch's balance-wheel. The magnets stabilise the staff in a strong magnetic field, so strong that its lower tip floats freely, reducing friction on that end to zero. The field is also powerful enough to resist the effects of gravity and shocks. Breguet's timepiece rivals digital watches for accuracy (-1 to +3 seconds a day), regardless of its position. And because it can run at a very high frequency, it measures to 1/20th of a second, but at £27,000 it is hardly cheap.

Another drawback of a traditional watch is that as the mainspring uncoils, the power that the escapement transfers to the balance-wheel declines, making the watch run slower. To fix this, watchmakers have long tried to design a "constant force" escapement to transfer precisely the same amount of energy regardless of how fully the watch is wound. Few have made much headway. But Girard-Perregaux, a watchmaker working with the Swiss Centre for Electronics and Microtechnology, seems to have made a breakthrough.



The firm's "constant escapement" uses a strip of silicon 14 microns wide, six times thinner than a human hair anchored at both ends and in its centre (just visible in the picture above) . When compressed from each end it causes each half of the strip to "buckle", the left half in one direction, the right half in the other direction. When a force is applied to the buckle on one half of the strip—via one of two escapement wheels that draw power from the mainspring, it instantly snaps to being buckled in the other direction. Because of how silicon buckles, this delivers a precise, unvarying pulse of energy to the balance-wheel. The same then happens to the other half's buckle, and so on, back and forth, tick by tock. The mechanism loses so little energy that the watch will run for a week without winding.

Fitted in this Girard-Perregaux Constant Escapement (seen on the left), the finalized form of this escapement is no longer set for high frequency, even though it has been successfully tested at speeds up to 7 Hz. It is now set to 21,600 vph (3 Hz) so that it is just slow enough to see in action. And this is not something any true aficionado of high watchmaking would want to miss: the view of the two escape wheels performing their ballet along with the buckling of the blade keeps the eye mesmerized.

At £82,000 it is quite expensive and all have been pre-sold. But as with Breguet's magnetic pivot and other innovations likely to emerge from the Swiss watchmakers, expect prices of such mechanical marvels to start ticking down.

What’s in a Crest?

During the Age of Sail, ships were identified by figureheads and gilded carvings. However, the extravagance of these decorations began to reach the point of flamboyance and an Admiralty directive in the early 18th century restricted the amount that could be spent, and eventually banned it outright.

Ships' badges first appeared in the 1850s, as identification markings on the stationery used by some Royal Navy ships. These marks were quickly used to identify the boats assigned to a ship and to aid the crew in finding their boat at a dark or crowded wharf. The creation of badges was somewhat haphazard and in 1918, Charles Ffoulkes, the curator of the newly established Imperial War Museum was asked by the commanding officer of HMS Tower to design a badge for his ship. He quickly received requests to create badges for other Royal Navy vessels, and on 10 December 1918, Ffoulkes was appointed the Admiralty advisor on heraldry. Shortly prior to this, a Ships' Badge Committee had been established to regulate the creation and use of ships' badges. It was decided to use different shapes to identify different types of vessel:

- Circles for battleships
- Pentagons for cruisers
- 'U'-shaped shields for destroyers
- Diamonds for auxiliary units, including depot ships, small war vessels, and aircraft carriers.

In 1940, the designs for all ships were standardised to a circular design. This was primarily due to wartime shortages, although another factor was to eliminate difficulties caused when a ship was commissioned with a previously-used name but was a different type of vessel, requiring the badge to be redesigned for the new shape. At the same time, the use of scaled-down badges for a ship's boats was suspended, and as of 2000 has not been resumed. After the war, the pentagonal badge shape was assigned to Royal Fleet Auxiliary vessels, and the diamond to commissioned shore bases. Before World War II, the design of badges for ships in other Commonwealth navies was the responsibility of the Royal Navy Ships' Badge Committee, but this responsibility was assigned to the relevant nations after the war.

Ships' badges are reused along with the ship name. When the Queen approves the name of a new ship she will also approve the new ship's badge, which may have changed if the shape needs to change. HMS *Chatham* is the only ship currently serving in the Royal Navy with an original badge, since none of the previous *Chatham*'s bore a badge.

Working in Maritime Security

Maritime security jobs offer a great variety of placements across the world as well as closer to home. The well publicised recent issues around piracy and protecting shipping one of many opportunities for trained security personnel overseas. Protecting shipping and maritime assets has never been more important, and you'll find well paid, rewarding roles in this sector if you've got the right skills and experience.

To be considered for these roles you will need to have been in the UK military for at least 4 years, have evidence of working at sea and be able to demonstrate the ability to be level headed, disciplined and self-motivated.

The following headings describe what most of the maritime security organisations and job providers require as basic qualifications from prospective candidates before they are considered.

Valid CRB within 12 months

Now called Disclosure and Barring Service (DBS) checks. This is a process used to check someone's criminal record. Only employers and licensing bodies can request a DBS check. Job applicants can't do a criminal records check on themselves so they would need to go through an intermediary called an umbrella body. The standard DBS check costs £26 and the umbrella company will charge a handling fee in the region of £12 to £40. County Councils usually offer the cheapest rates.

https://www.gov.uk/disclosure-barring-service-check/overview

ENG1 Medical

The Maritime and Coastguard Agency (MCA) states that every seafarer must have a valid medical certificate recognised by the administration before they can start work at sea. The ENG1 is a basic medical examination, carried out by an MCA certified doctor, confirming that you are in a fit condition to work onboard. The maximum fee for an ENG 1 medical examination is £80.

https://www.gov.uk/government/publications/mca-approved-doctors-uk-based

SSO or PDSD Qualification

The Ship Security Officer (SSO) is responsible for the security of the ship, as well as maintaining the Ship Security Plan as set out by the company. He or she must have knowledge of, and have received associated training in a range of competencies such as detailed in the ISPS Code, Part B, Article 13.1, and the guidance laid out in the SOLAS Regulations 1974 as amended Chapter XI-2. Costs for this 3 days course would be in the region of £600 and would include the following;

- Duties & responsibilities
- Code background
- Ship Security Assessment
- Security verification & certification
- Training, drills & exercises
- Weapons and Explosives
- Contingency planning
- Communications

The Proficiency in Designated Security Duties (PDSD) Course has been designed to give delegates with designated security duties an understanding of their various security responsibilities and understanding of the Ship Maritime Security Levels 1 to 3. The PDSD Course can often incorporate Anti-Piracy Awareness Training (APAT) modules. Costs for this one day course are in the region of £260. The training would include the following topics;

- Recognising Security Risks & Threats
- International Ship and Port Facility Security (ISPS) Code Overview
- Security Inspections
- Security Equipment & Systems
- Circumvention of Security
- Relevant International Codes & Conventions
- The Ship Security Plan
- Maritime Security Levels
- Security Contingency & Response
- Handling of Stowaways & Refugees

The Anti-Piracy Awareness Training Modules would include;

- Introduction to Maritime Piracy
- Maritime Security Anti-Piracy Countermeasures
- Maritime Terrorism - An Emerging Threat
- Introduction to Improvised Explosive Devices
- The Use of the Citadel Technique

Maritime Security Officer (MSO) Qualification

Maritime Security Operators play a pivotal role in the maritime counter piracy and terrorism arena, and as such play an important part in the protection of International Ship & Port Facility Security (ISPS) certified vessels. A typical 4 day course can cost from £440 and covers the following modules;

- The Maritime Security Industry
- Maritime Security pre-deployment planning and procedures
- Maritime Security operating procedures
- Incident management and post operational procedure

STCW 95 Certificate (4 Modules)

This is normally a five day course and costs in the region of £650 to £700.

- Personal Survival Techniques: Sometimes described as 'Sea Survival' – Survival Suits, hypothermia, life rafts, basic actions in emergency etc.
- Elementary First Aid: Basic, immediate, and emergency response to the most common shipboard injury emergencies, including CPR, shock, bleeds etc.
- Fire Prevention & Fire Fighting: Types and classes of fire, prevention, hazard awareness, methods of fire extinguishment, structure of incident response team, appropriate equipment, personal safety, team support, and live exercises.

- Personal Safety & Social Responsibilities: Types of shipboard emergencies, alarms, signals, initial action, personal/protective safety equipment, effects of pollution, pollution prevention, safe working practices, enclosed spaces, accident prevention, sexual harassment, individual rights, drug and alcohol awareness and prevention of abuse.

First Person on Scene Intermediate (FPOSi)

FPOS-i is currently the minimum medical requirement for employees working within the security sector, but also would benefit anybody who expects to work in a Hazardous Environment. A typical 4 or 5 day course would cost you about £475. The content would cover the following subject matter;

- The Pre-Hospital Environment
- Patient Assessment
- Management of catastrophic haemorrhage
- Airway Management (OPA, NPA, I Gel and BVM)
- Suction
- Oxygen delivery
- Basic Life Support
- Respiratory problems (Medical and trauma related problems)
- Traumatic brain injury
- Spinal injuries and immobilisation
- Vehicle extrication
- Triage
- Patient handover and communication with other facilities
- Medical Emergencies (Angina, Heart Attack, Diabetes, Stroke, Epilepsy)
- Anaphylaxis
- BLS (Adult, paediatric and drowning)
- Choking
- AED (normal and abnormal heart rhythms)
- Trauma Related Emergencies
- Bleeding and Shock
- Assisting the Paramedic
- Industry specific sessions

Maritime Firearms Certificate

This course is designed so that you can be deployed on protection duties safe in the knowledge that you have the correct safe weapon handling skills in all scenarios. You will require a good knowledge of the capability of different firearms, different calibres, and different types of ammunition you may come across. Firearms safety and good marksmanship are essential to firearms competency. A one day course can cost between £280 to £350 and the areas covered would include;

- Introduction to weapons systems and ammunition natures

- Bore sighting and zeroing
- A revision of Normal Safety Precautions (NSP), dry drills, safe weapon handling and carriage in a maritime environment
- Multi position shooting
- Multi target acquisition and snap shoots
- Water signature scenario shoots out to 400m
- Stripping/assembling, maintenance cleaning regime

Live firing training up to 400m is carried out by some course providers using a selection of the following weapons:

- M4 Carbine (5.56mm)
- AK Variants (including .22)
- Semi-auto/pump action shotgun; Mossberg, Benelli
- L1A1 SLR, Heckler & Koch G3, Browning FNAR Long Track (all 7.62mm)
- Bolt action rifles with telescopic sights

Team Medic Basic Trauma Course

The basic trauma team medic course is vital to any forward Security Operational teams in this field. This is normally a one day course, costs in the region of £140 and includes the following topics.

- Care Under Fire Module: Drivers and Constraints, Treats, SAFE approach, Interventions, Triage & Sortie.
- Airway Management: Jaw Thrust & Chin Lift, Guedel Airway & LMA
- Casualty Report & Communication Skills: AMIST Report & Medic Hand Over, METHANE Report Comms RX & TX.
- Tactical Field Care: Catastrophic Injuries, Emergency Resus CRP & AED, Cat C Tourniquet, Hemcon & Celox Dressings, Emergency Elastic Care Bandage.
- Breathing Management: Bag & Mask Skills, Asherman & Bolin Chest Seal.
- Mechanisms of Injury: Blast & Fragmentation, Gunshot Wounds, Stab & Burn Wounds, Fall & Crush Injury.

Conclusion

By adding up all of the separate courses costs you can see that it exceeds £2,700. So there is a significant investment to be made if this is the sort of career you wish to pursue. In comparison, a 3 day ITIL V3 Foundation (IT service management) course will set you back £600. A 5 day MSP (project management) course will be over £1,200 and a Six Sigma (process management) training course will be about £1,295 for just 3 days. So it would appear that completing all of the necessary courses to become a maritime security operative is relatively cheap. However, there would be the travel and accommodation costs to consider unless these courses can be provided at a location near to where you live.

Rates of pay are in the order of £150 to £300 per day and companies can offer work for short or long durations. I.e. you can get a contract for just 10 days and work as and when you want, or you can become a permanent employee of a company. Moving up to becoming a Ships Security Officer or a Company Security Officer will pay considerably more.

Cruise Benefits

By Mark Stevens

If like me you enjoy cruise holidays, then there some ways that you can save money and get some additional onboard spend.

First, choose your cabin well. Most people will opt for a balcony cabin as you get a bit of space to sit outside without having to wander off around the ship trying to find a spare sun lounger. But remember, for those who smoke, that facility is no longer permitted on personal balconies. An outside cabin will cost you around 15% - 20% less with an inside cabin saving you in the region of 25% to 35%, depending on the ship and the length of cruise. A suite will be more than double the cost of a balcony cabin. Not everyone will like an inside cabin but there are several advantages other than the cost, mainly there is very little light, less noise, and a more consistent temperature.

Secondly, you can increase the level of onboard-spend (essentially onboard-credit) you have available, but remember that this is not refundable, so if you don't use it you lose it. There are four ways you can obtain onboard spend, the first being that you pay the full price for the cruise and don't opt for free parking or some of the other benefits that are offered. However, most people tend to pay the full price and automatically receive a certain level of onboard-spend, but in reality you are just buying onboard credit. So you need to work out the sums to see what options are better value for money.

There are a number of loyalty schemes that can give you some small perks such as:

- Priority embarkation and disembarkation
- Free or discounted laundry services
- Cocktail parties and senior officer hosted dinners
- Some free or discounted internet time, can be up to 120 minutes
- Discount (between 5% and 10%) on goods and services bought onboard
- Priority for complementary cabin upgrades
- Discounts on future sailings, usually about 5%

On the whole, cruise lines give away very little and apart from priority embarkation, they do not actually add up to much.

There are three other ways of getting extra money and they are; Future Cruise Deposit, Shareholders Benefit and Military Benefits.

Future Cruise Deposit (FCD); allows passengers to secure the onboard booking benefits to apply to a future booking without having to commit whilst onboard and costs £50 per person. This benefit can only be taken and paid for during your current cruise

and cannot be purchased afterwards. When you come to book your next cruise holiday, the £50 your paid for your FCD will be deducted from your deposit amount You do not have to take your cruise within this year you only have to make a booking within 12 months. The extra you will receive is based on nights spent onboard and can be spent in the onboard shops, bars, spa and shore excursions. You can also purchase an FCD for a friend or family member who is not onboard as long as you can provide their details; name, address, date of birth.

Shareholder Benefit; is available to shareholders holding a minimum number of shares. All other fares types, including onboard spending money benefits are normally currently combinable with shareholder benefits. This benefit is not transferable and cannot be used for purchasing art work, bingo, use in the casino, medical expenses and currency. It is non refundable/transferable and cannot be exchanged for cash on any of the company's facilities. Only one person need hold shares and is applied on a per cabin basis.

You will need to provide proof of share ownership before the sailing date in the format required by the cruise line.

Military Benefits; are available to serving members of the military as well as retired and disabled veterans. Army, Royal Navy, Royal Air Force, Royal Marines and reserves are all included. You must declare your intention to claim this benefit at the time of booking and you will be required to take relevant documentation onboard with you in the form of an official military ID card or a proof of service such as your discharge papers.

Not all of these benefits may be combinable with some late saver offers and will depend on the cruise line.

So how much can you get?

The following figures are based on those provided by Peninsular and Orient (P&O) and the most up to date amounts can be checked by looking on their website. If you are sharing a cabin with someone who has claimed FCD, you get it as well, so only one person needs to claim military benefits, whereas shareholder benefits are on a per cabin basis. The table below shows the amounts of free spend you could receive depending on the duration of the cruise.

Duration	FCD	Shareholder	Military	Total per cabin
0 to 6 days		£30		£30
2 to 7 days	£25		£15	£80
7 to 12 days		£60		£60
8 to 14 days	£50		£30	£160
Over 13 days		£150		£150
15 to 21 days	£75		£75	£300
Over 22 days	£100		£125	£450

Other Carnival Line cruise companies such as Cunard and Princess Cruises will offer similar amounts to serving or retired armed forces personnel. Please note that the amounts quoted by these other companies are generally in US dollars and not pounds.

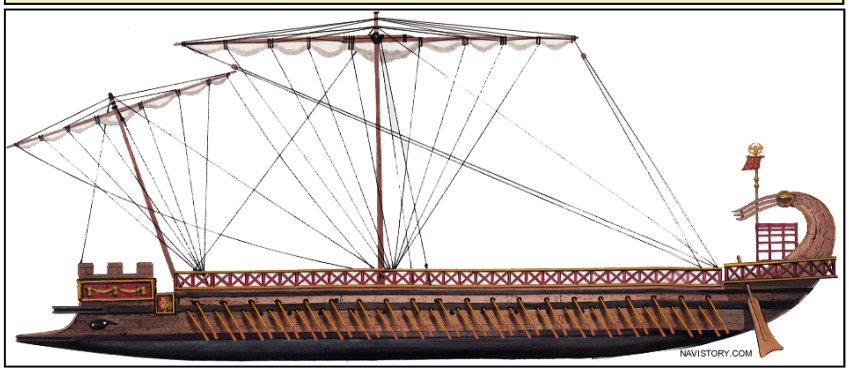
Early English Warships — to 1485

Records containing details of early English warships are few and far between as are the beginnings of the Royal Navy as we know it. Saxon boat burials at Snape (about 550) and at Sutton Hoo (about 625) indicate that clinker built warships were being constructed at this period in history. However, there was no evidence of a mast, sails or sailing fittings, so the only form of propulsion must have been by rowing.

It does appear that almost all warships at the time belonged to invading forces rather than to the indigenous population. The term warship here really means that these vessels were capable of transporting personnel rather that being specially built for actually waging sea battles. But they were built more for transportation rather than for carrying goods although both activities would have been carried out.

The first documented invasion of Britain was in 55 BC, when Julius Caesar used a fleet of 80 transport ships, an unknown number of warships and an additional 18 transports of cavalry. It is likely that these vessels were triremes of biremes that were only suitable for use in relatively calm seas.

Typical 3rd century Roman bireme galley



Roman scouting galleys circa 300 AD typically has 40 oars with a corresponding crew of 80 men.

Hengest and Horsa led the Anglo-Saxon invasion in about 449 consisted of 19 ships that were likely to be flat and wide and designed for rougher seas.

The first recorded battle in British waters took place in 719 as part of a civil war between the ruling Scottish families of the time, the Dalriata.

The Vikings landed on the Northumbrian coast in 793 and destroyed the church at Lindesfarne, slaughtering all persons present. The Anglo-Saxon Chronicle for the year 840 says that Æthelwulf of Wessex was defeated at Carhampton, Somerset, after 35 Viking ships had landed in the area. It is known that the Kingdom of Wessex maintained a small fleet of ships and King Athlestan and Ealdorman Ealhhere captured nine ships from the Vikings in 851 at Sandwich, Kent, thought to be the first naval battle in English history.

King Alfred (reigned 871 to 899) has sometimes been called the 'Father of the Royal Navy' as he had an understanding of the strategic use of military ships. He had been involved in naval actions in 882, fighting against four ships and capturing two. In 896 he ordered the construction of a number of larger warships, and at 60 oars they were twice the size of

Galley: A lightly-built fighting ship, chiefly propelled by oars. Galleys were fast and could move independently of the wind, but they could not carry heavy armament.

Balinger: This small vessel used both sails and oars and usually weighed between 30 and 120 tons.

Cog: A type of ship that first appeared in the 10th century, usually built of oak, flat bottomed, fitted with a single mast and a square-rigged sail, weighing up to 200 tons.

Ship: a larger vessel and had sails only.

Carrack: These were large ships with high sides and a large amount of space for cargo which were also equipped to fight.

Viking raiders and had higher sides designed for fighting instead of carrying cargoes.

Some 40 years later, ship designs had advanced and in 934, Alfred's grandson King AEthelstan (reigned 924 to 927), invaded Scotland by land and sea, where his fleet raided Caithness. It was reported that King Edgar (reigned 959 to 975) instigated annual musters and training manoeuvres.

One of King AEthelred's (reigned 978 to 1013) East Anglian noblemen, Ulfcytel Snillingr, fought against the Danes near Thetford and nearly destroyed their ships in 1004. In 1008 a new fleet of ships was created on a national scale but there were some problems with one of their commanders turning to piracy. A prominent Viking, Thorkell the Tall, attacked England in 1010 but defected to serve Ethelred the Unready in 1012 with a ship of 80 men and fought against Sweyn Forkbeard and his son Cnut.

In 1015, Cnut, the king of the North Sea Empire and future King of England (reigned 1016 to 1035), sailed for England leading some 200 longships and 10,000 men. But when Wessex submitted to Cnut, Eadric Streona, the Ealdorman of Mercia, deserted AEthelred together with 40 ships and their crews and joined forces with Cnut.

Pictures from top to bottom:
1. Cog and galley circa 1200—1500
2. Carrack from about 1480

After 1016, Cnut has a standing navy of 16 ships including a 120 oared flagship. In 1018, Cnut disbanded the standing army and retained 40 ships and their crews as a standing navy. It was reported that Cnut fought against pirates in 1018 and destroyed some 30 ships. In 1028, Cnut set off from England to Trondheim, with a fleet of 50 ships and defeated Olaf Haraldsson, thus gaining the crown of Norway to add to the crowns of England, Denmark and part of Sweden.

When Cnut died in 1035, his younger son, Harold I, reigned until 1040 when his half bother Harthacnut (reigned 1040 to 1042) succeeded to the English throne. When Harthacnut sailed to England he had a fleet of 62 warships as he did not want to take any chances with the succession. He doubled the size of the English fleet from 16 to 32 ships, partly so that he had a force capable of dealing with trouble elsewhere in his empire. Earl Godwin also contributed a ship of 80 men.

Harthacnut's successor Edward (Reigned 1042 to 1066) had no personal seat of power, and he does not seem to have attempted to build one. In 1050–51 he paid off the 14 foreign ships which constituted his

standing navy and abolished the taxes raised to pay for it. In 1054 Earl Siward took the remaining fleet to Scotland to defeat the King of Alba, Mac Bethad mac Findlaích (Mackbeth). In 1063 a fleet was sent from Bristol to Wales to fight against Gruffydd ap Llywelyn.

It is known that William I (reigned 1066 to 1087) sent a fleet of ships together with an army to Scotland in 1072 to subjugate the King of Alba, Malcolm III. However by the end of the 11th century the fleet had almost disappeared.

In May 1147, a fleet of 167 ships carrying a contingent of crusaders left Dartmouth to capture Lisbon from the Moorish invaders. Leadership was provided by Henry Glanville, Constable of Suffolk as no prince or king was in charge of the expedition. Its participants seem to have been largely made up of townsmen.

In 1155 Henry II (reigned 1154 to 1189) raised a naval force comprising 57 ships each crewed by 21 sailors to provide cross-Channel transport. Another fleet was raised in 1190 for the Third Crusade. Richard I (reigned 1189 to 1199) established the first basic maritime laws, known as the Laws of Oleron, which dealt with the fundamental rights and responsibilities of ships' captains.

King John founded the Royal Dockyard at Portsmouth by this order, dated 20th May 1212:-

"*The King to the Sheriff of Southampton. We order you, without delay, by the view of lawful men, to cause our Docks at Portsmouth to be enclosed with a Good and Strong Wall in such a manner as our beloved and faithful William, Archdeacon of Taunton will tell you, for the preservation of our Ships and Galleys: and Likewise to cause penthouses to be made to the same walls, as the same Archdeacon will also tell you, in which all our ships tackle may be safely kept, and use as much dispatch as you can in order that the same may be completed this summer, lest in the ensuing winter our ships and Galleys, and their Rigging, should incur any damage by your default; and when we know the cost it shall be accounted to you.*"

In 1206, King John (reigned 1199 to 1216) had 54 galleys constructed at a cost of £5,000. These were split up into three squadrons under the charge of Reginald de Cornhill, William de Wrotham and William de Manson. In 1213, with the Earl of Salisbury in command, the fleet raided Damme in Flanders, where they destroyed many French ships.

By 1212, a naval base existed at Portsmouth where 10 ships were supported. In 1228 it was seriously damaged by the sea and was filled-in. In 1233, the two remaining galleys at Portsmouth were transferred to Bristol to deal with Pembroke's rebellion. By 1253, the dock was dismantled, perhaps being too expensive to run and maintain or more likely it was no longer useful. In 1265, Portsmouth was burnt and cargoes in the port were seized by the barons of the Cinque Ports who resented the growing importance of the village.

In place of the dockyard Henry III (reigned 1216 to 1272) established a number of covered slips or galley houses. A house for 2 galleys was built at Winchelsea in 1237 and for seven galleys

at Rye in 1243.

Edward I (reigned 1272 to 1307) ordered the building of 20 x 120 oared galleys in 1294 to prepare against a possible French invasion. In the late 13th century there were Northern and Western fleets commanded by admirals. The first recorded English admiral appointed was William de Laybourne who held the title 'Admiral of the sea of the King of England'. Throughout the 14th century the only royal establishment having a naval function was the Tower of London as it was the principle depot of military stores. No maintenance or repairs were carried out there and vessels were laid up on mudflats at Greenwich.

During The Hundred Years' War (1337–1453) a number of cross-Channel raids both ways were mostly unopposed due to lack of effective communications. The navy was used for reconnaissance as well as attacks on merchantmen and warships where prize ships and cargos were shared out. However, French, Genoese and Spanish ships continued to raid along the south coast. Portsmouth was burned in 1338 and again in 1342, Plymouth was attached in 1340 and Winchelsea in 1342. The Battle of Sluys in 1340 was a significant English victory, with Edward III (reigned 1377 to 1399) 160 ships assaulting a French force in the Zwyn estuary and capturing 180 French ships in hand-to-hand combat. Possibly the first recorded English major sea battle, 'Les Espagnols sur Mer' was fought in the Channel off Winchelsea in 1350 and was a victory for the 50 English warships, commanded by Edward III and the Black Prince commanding a further 40 Castillian ships. The English captured 14 Spanish ships. The English ships consisted of the following;

> *Thomas, Edward, Jonette, Plenty, Isabella, Gabriel, Michael, Welfare, Mariote, Jerusalem, Thomas Beauchamp, Mary, Godibiate, John, Edmund, Falcon, Buchett, Lawrence* and 32 other vessels.

The 14th century also saw the creation of the post of Clerk of the King's Ships, appearing from 1344 onwards, in charge of some 34 royal vessels. By the mid-14th century Edward III had a navy of some 700 ships. By the end of the reign of Richard II (reigned 1377 to 1399) because of declining fortunes and problems with manning the kings ships, the navy had been reduced to only 4 ships and by 1409 during the reign of Henry IV (reigned 1399 to 1413) there were only 2 left. The post of Lord High Admiral was created in 1408.

It was down to his successor, Henry V (reigned (1413 to 1422) to increase numbers as his experiences in Wales had shown him the value of ships. By 1418 there were 39 ships under the king's command. Some were built from scratch and some rebuild from existing or captured vessels greatly increasing their size and structure. This included Henry's flagship, the 1,400-ton Grace Dieu (which still exists, buried in the Hamble estuary). Henry also chose Southampton as a second naval base and it is reputed to be the site of the first stone naval building constructed, 126 feet long incorporating stores and a forge. When Henry died in 1422, most of the fleet was sold off to pay off his debts as they were treated as the king's private property.

The Grace Dieu of 1442 was the last ship built for Henry V and over the next 87 years, from the accession of Henry VI in 1422 to the death of Henry VII in 1509, only 6 ships were built for the crown. In the late 15th century, no fleet, however large, could command the high seas but with the advances in improved rigging and hull design, patrol and blockade were becoming more effective. By 1430 the navy had only the Trinity Royal, Grace Dieu and Jesus. All were dismantled, unrigged and laid up at Bursledon.

Naval vessels that we know about at this time are as follows;

Trinity: Dismantled c. 1409, materials used for Trinity Royal

Goodgrace: c. 1400

Le Carake: Ex-Genoese Sancta Maria & Sancta Brigida, captured in 1409

Christopher: Listed as a hulk in 1410-12

Mary: A 120 ton ship c. 1413. Lost in May 1426.

Holy Ghost: 120 feet long, weighing 750 tons, made from overlapping planks from 3,700 trees, and crewed by 200 men. First called the Santa Clara, she had been captured from Spain in late 1413, rebuilt at Southampton the following year and then renamed. It was beached in 1439 and broken up in 1452. The remains also lie in the mud of the River Hamble.

Trinity Royal: Built at Greenwich in 1416 and weighed in at 540 tons. It was beached in 1429 and abandoned.

Jesus: This 1000 ton carrack was built at Winchelsa in 1414 and completed in 1416 at Smallhythe. The ship was given away in 1446.

George: Ex-Genoese carrack captured in 1416 and sold to Venice in 1424.

Marie Hampton: Ex-Genoese carrack captured in 1416.

Marie Sandwich: Ex-Genoese carrack captured in 1416.

Agase: Ex-Genoese carrack captured in 1416 and wrecked on mudflats in 1418.

Andrew: Ex-Genoese carrack Galeas Negre captured in 1417.

Peter: Ex-Genoese carrack captured in 1417.

Paul: Ex-Genoese carrack Vivande captured in 1417.

Christopher Spayne: Ex-Genoese Pynele (a 600 ton carrack) captured in August 1417 and sold in May 1423.

Marie Spayne: Ex-Spanish captured in 1417.

Grace Dieu: Built in Southampton and launched in 1418. The three-layered clinker-built ship was 218 feet long, 50 feet wide, and having a draught of 21 feet 4 inches, making it comparable in size to HMS Victory and twice the size of the Mary Rose. The mainmast was 200 feet high and seven feet in diameter at the base. It sailed only once, under the command of the Earl of Devon, in 1420. She spent most of her life laid up in the River Hamble, dismasted and stripped of equipment, where in 1439 she was struck by a bolt of lightning and burnt to the waterline.

Grace Dieu: Built at Hull in 1449. - rebuilt 1473. It was broken up by Sir Reginald Bray in 1487 to provide materials for the Sovereign.

Peter: - Abandoned 1462

George: Built in Hull it was captured by the French Admiral De Bréze in 1456.

Edward Howard: Built by John Spens and sponsored by the Duke of Norfolk, John Howard, between 1463 and 1466 at Dunwich, Suffolk. Weighing between 80– to 100 tons and having three masts, two main and a mizzen.

The next Bulletin will continue the story of Early English Warships from 1485 to 1509.

Royal Navy School

Has anyone been watching the Channel 4's documentary series, Royal Navy School? If this is supposed to show the navy in a good light them something has gone terribly wrong. The programme seems to concentrate on the older joiners who for one reason or another have not succeeded in civvy street and see the navy and a way out of their current situation.

Don't these new recruits ever bother to find out what life in the navy will be like and attempt to prepare themselves for the inevitable hard work? Mind you, if you are an older recruit you are almost guaranteed to be made a class leader.

Where is the hardship and daily grind of basic training portrayed? The constant cleaning and polishing, the washing and ironing, preparing for rounds, as well as the academic side of things. I would suppose that if the programme showed the grim reality of life in a blue suit, then it would probably put people off joining up. However in is not a good advert for the navy.

I seem to remember that the young lads (and yes, the girls as well) had a bit more about them and were keen to improve their situation and progress up the ladder. We always thought the navy was the first choice and that we generally attracted the better recruits—perhaps not these days… What do think?

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 NER. 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 JPG's please. T's & C's apply.

Website Updates

Later on this year it is intended to start uploading PDF versions of the Naval Engineering Reviews. It is a lengthy task to scan the pages and to knit them into a single document and to crop the pages to remove the side borders and staple marks, but we hope the effort will be worth it.
There is likely to be request going out to members to see if anyone has copies of 'missing' NER's.

Crossing the Bar

Those members who have passed on since the last publication.

William George Hicks, 06885. Joined the Society November 1949, died 18 July 2015
Widow; Mrs Irene Hicks.

William Francis Lewis, 06315. Joined the Society October 1946, died 29 September 2015.
Widow; Mrs Susan Lewis.

David Ronald Lloyd, 08753. Joined the Society May 1964, died 01 January 2016.
Widow; Mrs Pamela Lloyd.
Pamela has kindly donated the benefit to the Society and will be used to help pay for the enhancement of the lettering on the Memorial at the NMA.

Derek Fletcher, 08571. Joined the Society January 1964, died 29 January 2016.
Widow; Mrs Caroline Fletcher.

Brian Sollick, 07980. Joined the Society July 1962, died 17 November 2015.
Widow; Mrs Glenda Sollick

Visit to the National Memorial Arboretum

2016 will see the fifth anniversary of the dedication of the Memorial to Royal Naval Engineers that was designed, crafted and placed in the National Memorial Arboretum on 01/10/2011.

A visit has been planned for Sunday 2nd October, to avoid a clash with The Ride To The Wall, a motorcycling fundraising event with a dedicated service of remembrance. This provides an opportunity for motorcyclists to ride as an organised group to the National Memorial Arboretum to pay their respects and recognise the sacrifice made by the service men and women whose names are engraved on The Wall of the Armed Forces Memorial.

Intended itinerary

10:00 Group arrive on site

10:15 Refreshments in marquee pod 4

11:00 Remembrance service at memorial stone

13:00 Lunch in marquee pod 4

16:30 Refreshments in marque pod 4

Please let the Man Sec know if you are thinking of attending this event so that we can get an estimate on numbers for the provision of lunch and refreshments. We have not confirmed who the 'speaker' will be yet so look to the website nearer the time for an update.

If you have not been to the arboretum before then I would recommend you go, it is well worth the visit.

National Memorial Arboretum
Croxall Road
Alrewas
Staffordshire
DE13 7AR
Tel: 01283 792333
info@thenma.org.uk

How To Get There

By Car—Take the A513 Tamworth then local directions.

By Train to Lichfield Trent Valley Station (5 miles away) or Burton Railway Station (8 miles away).

For further details of buses, taxis and car park charges, visit the NMA website at

www.thenma.org.uk/index.aspx