

Society Members' Bulletin



Falkland
Islanders'
vote to stay
British.

Engineers Memorial moved to HMS Drake SR Mess

Royal Naval Engineers Benevolent Society

The building referred to on this memorial board is the headquarters of the RNEBS at 113 North Hill, Plymouth (formerly 2 Alton Terrace), from where the Society still functions today. The building, funded by members voluntary subscriptions, cost £665 in 1919.

This memorial board is presented to the Warrant Officers and Senior Rates Mess HMS DRAKE as a reminder to all personnel of the sacrifice made by our Artificer forebears and as an invitation to all members of the Engineering Branch of the Royal Navy to contribute to and benefit from the continued work of the RNEBS.

November 2012



Date for the Diary:

Fri/Sat 11/12 October 2013—Type 21 Club Reunion at Plymouth— www.type21club.org.uk
06-08 September 2013—Series 47 Grand Reunion at Portsmouth—www.series47.org.uk

March 2013
Issue 6

Royal Naval Engineers Benevolent Society
Founded in 1872

ROYAL NAVAL ENGINEERS' BENEVOLENT SOCIETY

Society Members' Bulletin

Issue 6— March 2013

Welcome to the 6th issue of the Bulletin and I hope you enjoy the articles and information included within. As you can see, we have produced another 24 page edition which I am sure will keep you interested and informed although there is more of a bias towards the air and weapon engineers in this edition.

It is nice to get responses from members and I have printed some of them in this edition, thank you. I would welcome any communication with serving members and get some ideas of what is happening around the fleet with respect to the various forms of engineering. If you want to broadcast class reunions then give me the details and I can put them into the next edition.

99.8% of the Falkland Islanders voted to remain a British Overseas Territory in the referendum that took place on the 10th-11th March. Foreign Secretary William Hague has accused Argentina of "bullying and intimidatory behaviour" towards the Falkland Islands and he has promised "never to negotiate over the islands' sovereignty unless their people called for it."

If anyone is attending the event mentioned on page 17, please let us know so that we can have the opportunity to meet up.

Discussions regarding the new Society tie are on-going and I hope to have more details later in the year.

And finally, the RNEBS website has moved up the rankings from 2,634,456th to 1,030,428th in the UK (urlspy.co.uk), so there has been quite an improvement since last year!

Regards

Mark Stevens

Editor, Society Members' Bulletin

Opinions expressed in the Society Members' Bulletin do not necessarily represent the views of the Executive Council of the Royal Naval Engineers' Benevolent Society, E&OE. The RNEBS also cannot guarantee the accuracy of any information provided by contributors. Information sources and photographs will be accredited where possible or where known.

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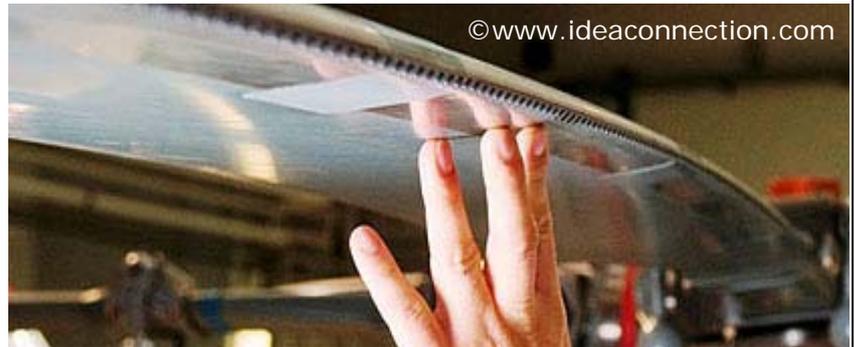
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New Rotor Blade Technology

In this section I wanted to look at some of the technology that can make helicopters fly faster and/or more efficiently. Blade length is a key factor as the tip cannot exceed the speed of sound and there has to be a trade off with the rotor speed and the amount of lift the blade can produce. Longer blades produce more lift but shorter blades produce less drag. So if you want a fast helicopter you need to keep it lightweight and use the shortest blades possible. A couple of interesting ideas that are fairly new are a way to reduce drag and another to reduce sound levels.

Leading-Edge Vortex Generators - Bumps of the Blades...

Aerodynamics impose huge limitations on helicopter speed and manoeuvrability. The airflow over a backward-moving main rotor blade separating from the aerofoil during fast forward flight or manoeuvring, referred to as a 'dynamic stall', creates turbulence, loss of lift and exerts large forces on the rotor. Drag increases and the rotor head control rods are subjected to large



dynamic loads. Kai Richter from the DLR Institute of Aerodynamics and Flow Technology in Göttingen explains that "This limits the top speed of helicopters at high altitude and, in particular, their manoeuvrability,". DLR researchers looked at bumps, called tubercles, that humpback whales have on their pectoral fins and found that they significantly delay stalling and increases buoyancy. Translating this idea into rotor blades meant gluing small rubber bumps, 6 mm in diameter and weighing just 0.04 grams each, onto the blade. Although this potentially cheap solution has not yet been tested accurately, pilots have claimed that they have noticed some differences in the behaviour of the blades. This new technology has been patented by the team as Leading-Edge Vortex Generators (LEVoGs).

Silent Rotor Blades—The Stealth Blade?

The noise that helicopter blades produce is normally extremely loud due to the whole length of the blade chopping through the eddies of the previous blade, a phenomenon known as blade-vortex interaction. The simple way to reduce the helicopters noise is to increase the pitch of the rotor blades and slow them down, but this would reduce the lifting power and eventually cause the blades to stall. The alternative is to increase the number of blades as each blade carries less of the helicopters weight, as in the Eurocopter 5-bladed Blue Edge™ rotor. This can increase the complexity of the rotor head and increases its weight, but can reduce sound levels by up to 3 to 4dB.

Eurocopter have produced a new design of blade tip that promises to dramatically reduce the noise by up to 5 dB, this doesn't sound (no pun intended) like much but it is more than you think. This is achieved by changing the shape of the blade tip and by using piezoelectric motors to adjust the trailing edge flap modules 15 to 40 times a second to reduce the vortex interaction.



Report from the General Secretary

Since the last Newsletter in October 2012 and thanks to some excellent support from Paul Stevenson the Head of Programmes - Civil Nuclear at Rolls-Royce plc I was able to arrange a meeting with Captain Richard Carrick of Fleet Commander's staff in December 2012. This allowed me to follow up my letter to CinCFleet and we discussed several ways in which it may be possible to raise the Society's profile within the Royal Navy, make the Society more relevant to the Royal Navy as it is today and make a positive contribution towards the promotion of Royal Naval engineering excellence and its relevance to ship availability and fighting capability

We covered several topics and agreed there were 3 proposals which we felt could provide some mutual benefits for the Society and for the Service. They will form the basis for further discussions which I hope to have with Captain Carrick in the near future and are as follows:

Contributions from the Society to the Review of Naval Engineering (RNE) in the form of articles or letters, to be acknowledged as coming from the Society or its members, that could take the form of a section, a page or an article in the Review devoted to the Society and its engineering aspirations. The Society could then purchase sufficient copies of the RNE to send one to each of our members.

I see this as a means of carrying the Society into the heart of Naval Engineering, although I understand we have not always enjoyed unqualified popularity with the RNE in the past. Nevertheless Captain Carrick kindly agreed to explore the possibilities with the Review Editorship and I said would do the same with the management of the Society. I don't see this as supplanting the Bulletin or taking the place of the NER should it be resurrected.

There could be an annual event, such as a dinner, for members of the Society and invitees from the wider Naval Engineering

fraternity at which a presentation or speech can be given by a professional RN speaker. This would raise our profile and give substance to our support of engineering excellence. In terms of cost I believe that, in addition to some subsidy from the Society, the bulk of the costs could be met by members purchasing tickets in the same way that such events are managed by the professional institutions. Clearly it would need to be suitably erudite and entertaining to make it an event capable of attracting sufficient attendees and we would need to decide what form it might take, who might attend, where it might be held etc.

There could be an annual prize awarded (possibly at the above event) to the person or group who, in the judgement of the RN and the Society, has made the most significant or valuable contribution in terms of innovation and utilization of engineering skills and knowledge to improve availability or capability or to deal with an operational problem.

I do not believe that such an award should compromise the present level of prizes that are given at the training establishments on behalf of the Society (although these are in fact funded by the Chatham Memorial Fund and the Captain Marrack Memorial Fund). I undertook to explore the possibilities with the Society's management with a view to establishing if such a prize was possible and if so what value it may have and if there are any restrictions the Trustees would need to impose; such exploration continues.

Those members of the Society I have been able to speak with so far indicate there is general support for these proposals. It would, of course, be most useful to receive more feedback and, possibly, some more ideas to help the Society create a reputation as a forward looking organisation keen to engage with Engineering in the RN of today.

We are also moving forward with the production of a Society version of the Navigator's Notebook that many of us found

so useful to have in our overalls' pocket. It will be emblazoned with the Society's crest and it is planned that it will be given to new members to mark their joining the Society. It will also be available to existing members for a small fee.

I am also investigating the provision of a Society Tie as it appears that production of the previous tie has gone into abeyance.

Clearly all these measures are designed to raise the Society's profile and attract new members. The general view being that new members will ensure the Society's future, maintain its financial viability, maintain the Benefits Multiplier, maintain members' contact with Naval Engineering and maintain stewardship of the traditions of Engineering excellence; although I would welcome the members' views.

Finally, on a lighter more artistic note, may I draw your attention to the poem by **Charles Mackay** (26 March 1812 – 24 December 1889) Scottish poet, journalist, author, anthologist, novelist, and songwriter in which he expands on the words of Genesis, Chapter 4, verse 22.

TUBAL CAIN

Old Tubal Cain was a man of might,
In the days when earth was young;
By the fierce red light of his furnace bright,
The strokes of his hammer rung:
And he lifted high his brawny hand
On the iron glowing clear,
Till the sparks rushed out in scarlet showers,
As he fashioned the sword and spear.
And he sang—"Hurrah for my handiwork!
Hurrah for the spear and sword!
Hurrah for the hand that shall wield them well,
For he shall be king and lord!"

To Tubal Cain came many a one,
As he wrought by his roaring fire;
And each one prayed for a strong steel blade,
As the crown of his desire;

And he made them weapons sharp and strong,
Till they shouted loud for glee;
And they gave him gifts of pearls and gold,
And spoils of the forest free.
And they sang—"Hurrah for Tubal Cain,
Who hath given us strength anew!
Hurrah for the smith, hurrah for the fire,
And hurrah for the metal true!"

But a sudden change came o'er his heart,
Ere the setting of the sun;
And Tubal Cain was filled with pain
For the evil he had done:
He saw that men, with rage and hate,
Made war upon their kind,
That the land was red with the blood they shed,
In their lust for carnage blind.
And he said—"Alas! that I ever made,
Or that skill of mine should plan,
The spear and the sword for men whose joy
Is to slay their fellow-man!"

And for many a day old Tubal Cain
Sat brooding o'er his woe;
And his hand forbore to smite the ore,
And his furnace smouldered low.
But he rose at last with a cheerful face,
And a bright courageous eye,
And bared his strong right arm for work,
While the quick flames mounted high.
And he sang—"Hurrah for my handiwork!"
And the red sparks lit the air;
"Not alone for the blade was the bright steel made,"
And he fashioned the first ploughshare.

And men, taught wisdom from the past,
In friendship joined their hands;
Hung the sword in the hall, the spear on the wall,
And ploughed the willing lands:
And sang—"Hurrah for Tubal Cain!
Our staunch good friend is he;
And for the ploughshare and the plough,
To him our praise shall be.
But while oppression lifts its head,
Or a tyrant would be lord;
Though we may thank him for the plough,
We'll not forget the sword!"

Nuclear Powered Batteries

In August 2012, NASA's Mars Science Laboratory Rover – named 'Curiosity' landed on the surface of Mars to undertake scientific exploration. Traditionally, solar panels would provide electrical energy to power extra terrestrial devices but this would not be sufficient to power 'Curiosity' which at 890 kg is about five times the mass of previous Mars rovers (data provided by www.world-nuclear.org). For applications where there is a need for reliable, continuous power over long periods of time, radioactive decay is high on the list of options to consider and this can be provided in the form of a nuclear battery or Radioactive Thermoelectric Generator (RTG).

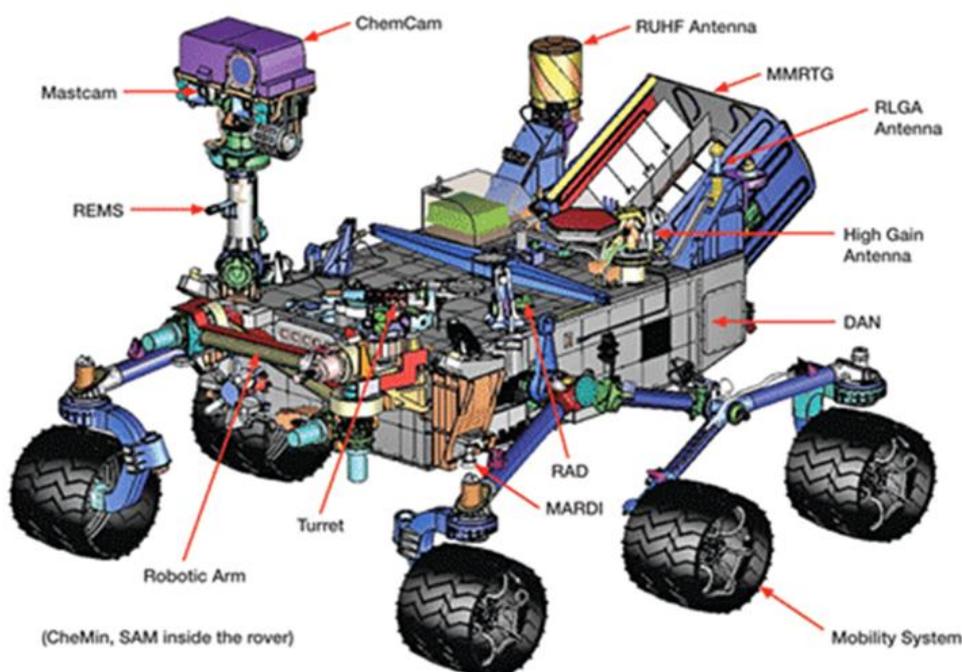
The latest RTG, and the one that is installed on the Mars rover, is a 290-watt system known as the General Purpose Heat Source (GPHS) RTG. It will supply heat and electricity for Curiosity's components and science instruments. Reliable power from the Multi-Mission RTG (MMRTG) will allow it to operate for at least one Mars year (687 Earth days). The thermal power for this

system is from 18 x GPHS units where each unit contains four iridium-clad ceramic Pu-238 fuel pellets, stands 5 cm tall, 10 cm square and weighs 1.44 kg. MMRTG will use 8 GPHS units with a total of 4.8 kg of plutonium oxide producing 2 kW thermal which can be used to generate some 110 watts of electric power, 2.7 kWh/day.

The history of RTGs in space: RTGs are not a new part of the U.S. space program. In fact, they have enabled NASA to explore the Solar System for many years. The Apollo missions to the Moon, the Viking missions to Mars, and the Pioneer, Voyager, Ulysses, Galileo, Cassini and Pluto New Horizons (to the outer Solar System) missions all used RTGs.

The RTGs for the Pioneer 10 spacecraft operated flawlessly for three decades until the spacecraft signal was too weak to detect in 2003. The spectacular Voyager 1 and 2 missions, operating on RTG power since launch in 1977, now are on the verge of reaching interstellar space. Over the last four decades, the United States has launched 26 missions involving 45 RTGs. While RTGs have never been the cause of a spacecraft accident, they have been on board three space missions that did fail for other reasons. In all three cases, the RTGs performed as designed. Early RTGs carried smaller amounts of radioisotope material and in keeping with the safety philosophy at the time, were built to burn up at high altitude during an accidental re-entry.

One such re-entry occurred in 1964 during the malfunction of a navigational satellite for the Navy. Later RTGs were designed to contain their plutonium in case of re-entry. RTGs performed this function successfully in the case of a failed weather satellite in a 1968 launch and during the South Pacific jettisoning of the Apollo 13 Lunar Lander, which contained an RTG to power a science package. In both instances, upon re-entry and ocean impact, there was no release of plutonium to the environment.



How RTGs work: RTGs work by converting heat from the natural decay of radioisotope materials into electricity. RTGs consist of two major elements: a heat source that contains plutonium-238 dioxide and a set of solid-state thermocouples that convert the plutonium's heat energy to electricity. Conversion of heat directly into electricity is not a new principle. It was discovered 150 years ago by a German scientist named Thomas Johann Seebeck. He observed that an electric voltage is produced when two dissimilar, electrically conductive materials are joined in a closed circuit and the two junctions known as thermoelectric couples are kept at different temperatures. The power output is a function of the temperature of each junction and the properties of the thermoelectric materials.

The thermocouples in RTGs use heat from the natural radioactive decay of plutonium-238 to heat the hot junction of the thermocouple, and use the cold of outer space to produce a low temperature at the cold junction of the thermocouple. The MMRTG is designed to use a heat source composed of eight General Purpose Heat Source (GPHS) modules. The MMRTG contains a total of 4.8 kg plutonium dioxide initially providing approximately 2kW of thermal power and 120 watts of electrical power. The thermoelectric GPHS Module materials have demonstrated extended lifetime and performance capabilities and are the same as those used for the two Viking spacecraft that landed on Mars in 1976. The MMRTG generator is about 64 cm in diameter (fin tip to fin tip) by 66 cm long and weighs about 43 kg.

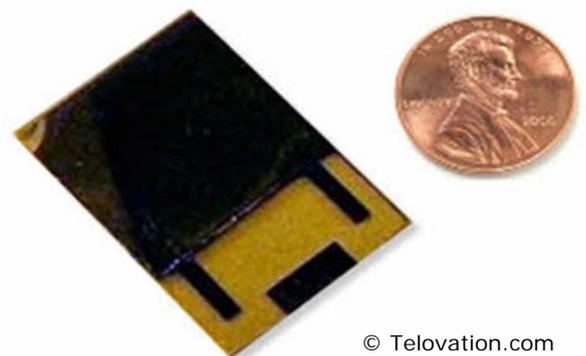
The use of Nuclear Batteries on Earth: Unfortunately, opposition to the use of nuclear energy, the recycling of useful nuclear materials and irrational concerns about the effects of low level radiation has virtually eliminated this valuable technology. Costs to built RTG's are not available but it would seem unlikely that they would compare favorably with traditional electricity generation costs such as coal, gas or even uranium dioxide based nuclear power stations.

Another concern is that supplies of Plutonium-238 are dwindling and efforts to produce more are somewhat uncertain in the current economic climate. The US stopped producing plutonium-238 in 1988 and has between 40 and 70 pounds of the deep-space power source left in stock. The US Department of Energy has estimated that it would cost between \$70m and \$150m to resume production. In the meantime, engineers are developing an alternative to the RTG that uses plutonium-238 to drive a Stirling engine to generate electricity. For the same amount of output current, the new design is said to require one quarter of the plutonium current RTGs require.

Smaller nuclear batteries have been available for a number of years, not much bigger than the larger thumb batteries you find in everyday electrical devices such as timers. It has been said (by some American Universities) that these batteries can hold up to a million times as much charge as a standard battery of similar size. Nuclear batteries are an attractive proposition for many applications because the isotopes that power them can provide a useful amount of current for phenomenally long times - up to hundreds of years or more. Most nuclear batteries use a solid semiconductor to harvest the particles, but the particles' extremely high energies means that the semiconductors suffer damage over time. This means that to build a battery that can last as long as the isotope inside, they must be built larger, which defeats the object of making a small battery.



© ANS Nuclear Café.com



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The top picture (circa 1970) – is several inches across and originally designed for use in pacemakers. In comparison, lithium iodine or lithium monofluoride batteries can last around 8 years. The lower picture (circa 2009) shows a flat battery just slightly larger than a US penny.

Gibraltar — The 300th Anniversary of British Rule

On the 4th August 2004 there was the celebration in Gibraltar of the 300th anniversary of the British taking control of the territory; however this year, 2013, sees the 300th anniversary of official British Rule.

Admiral Sir George Rooke leading an Anglo-Dutch force, during the War of the Spanish Succession (1701–1714), captured Gibraltar in 1704 on behalf of the Archduke Charles, pretender to the Spanish Throne. The territory was eventually ceded to Great Britain by Spain in the 1713 under Article X of the Treaty of Utrecht as part of the settlement of the War of the Spanish Succession. In that treaty, Spain ceded to Great Britain:-

"the full and entire propriety of the town and castle of Gibraltar, together with the port, fortifications, and forts thereunto belonging ... forever, without any exception or impediment whatsoever."

Spain later attempted to recapture the territory militarily by a number of failed sieges, and reclamation of the territory by peaceful means remains its government's policy. A clause in the treaty states that if the British government should ever relinquish Gibraltar, then it must be first offered to Spain.

"And in case it shall hereafter seem meet to the Crown of Great Britain to grant, sell or by any means to alienate there from the propriety of the said town of Gibraltar, it is hereby agreed and concluded that the preference of having the sale shall always be given to the Crown of Spain before any others."

In recognition of and with thanks for its long association with Gibraltar, the Royal Navy was given the Freedom of the City of Gibraltar.

Possibly as an act of defiance or more likely just to celebrate the occasion, a human chain of Gibraltarians dressed in red, white and blue (mainly in red T-shirts), linked hands all the way around the Rock. After the freedom ceremony on the Parade Ground, some 300 servicemen marched through the town including the crew of HMS Grafton.



© Jim Wright, 2004



© Jim Wright, 2004



By some happy and totally unplanned coincidence, I just happened to be in Gibraltar that weekend on holiday with my wife and we saw most of the celebrations throughout. Main Street, and most of the island, was decked out with bunting and flags and there was a very impressive firework display in the evening, that was best viewed from a waterside seat at the Royal Gibraltar Yacht Club, with gin in hand.

I still have my red T-shirt somewhere at home (although not wearing it in this photo) and it was almost embarrassing going into one of the shops asking a Spanish shop assistant to print the words " Gibraltar 300 Years" onto the front of the T-shirt.

We saw the international mediator, Terry Waite and Gibraltar Governor Sir Francis Richard on the balcony of the governor's official residence, The Covenant, and later in the evening managed to get a few words with former Defence Minister Geoff Hoon in Casemates Square. It was reported in the Spanish press that Spain was deeply offended by U.K. participation in the local celebrations.

I haven't been able to ascertain if Gibraltar will be hosting any events recognising this other 300th anniversary, but I suspect that if there is anything planned it will be fairly low key.



HMS Rooke, named after Admiral of the Fleet Sir George Rooke, an English naval commander, (1650 – 24 January 1709) was commissioned in 1946 after the name became available when the boom defence central depot at Rosyth was closed down. HMS Rooke continued to operate as the main naval base until becoming a Joint Service Base in 1990 and was eventually paid off in 1996. A statue was raised to honour George Rooke at Gibraltar in 2004.

Rooke joined the navy only one year before he was made a Post Captain at the age of 23 and promoted to Rear Admiral "of the Red" aged 40 and knighted two years later in 1692. He was promoted to Admiral of the Fleet in 1696 until he retired in 1705 and died in 1709 in his home near Canterbury. He is remembered for his service in the wars against France and particularly for his victory at Vigo Bay where he burnt a Franco-Spanish fleet, and for capturing Gibraltar for the British in 1704. He was also the Member of Parliament for Portsmouth from 1698 to 1708.

The Day I Found a Torpedo

Rod Lampen

During the 80's I worked at the Admiralty Research Establishment, Egdon Hall, Weymouth for Captain Weapon Trials and Assessment (CWTA) conducting Tigerfish Consolidation submarine torpedo trials at the British Underwater Test and Evaluation Centre (BUTEC) and Atlantic Undersea Test and Evaluation Centre (AUTEC) ranges.

The BUTEC range is not very glamorous, being situated between the Scottish mainland and the Isle of Skye and is used for shallow water torpedo trials. However, deep water firings were carried out at the AUTEC range, which is situated in the Tongue Of The Ocean (TOTO), a 6,000 feet trench parallel with Andros Island, in the Bahamas.

It was during Operation Knit, on 29 March 1984, at approximately 1340 local time, that a Tigerfish Consolidation Mk24 Mod 1 torpedo, fired from a UK nuclear submarine, surfaced after a successful series of attacks against a fast submerged target, on the AUTEC range. Due to a fault in the torpedo, the AUTEC pinger was not initiated and as a consequence no tracking was possible. The torpedo's position was estimated but not determined accurately enough for a helicopter search from surfacing until dusk, plus a further 2 hours search the following day. The sea conditions made searching over a wide area difficult, with high winds and a 6 foot swell. The torpedo was considered lost. Three other torpedoes were, however, successfully recovered on the same day, using Range generated datums.

On 7 April 1984, during the second serial of Operation Knit firings, during ideal weather conditions, I was deployed on AUTEC Range Recovery Vessel TR 711, to advise and assist in torpedo recovery. At about 1700 that day, I was on the bridge of TR 711 surveying the weapons range, through binoculars, when I sighted what appeared to me, a torpedo, on the surface, at about 3 miles range. I thought to myself, this doesn't tally and then, after a bit of head scratching, realised it must be the torpedo fired 9 days ago. On recovery, I confirmed it was the torpedo lost in the previous serial and we recovered it undamaged.

That evening we had a few celebratory rum punches with the Marconi Underwater Systems, Ferranti, Gresham-Lion teams and the crew of TR 711, at the beach bar on Andros Island.

Perhaps I should have claimed salvage money for finding the torpedo, but I did get a nice letter from Flag Officer Submarines, Vice Admiral Sir John Woodward.



PERSONAL

From: Vice Admiral Sir John Woodward, KCB



Flag Officer Submarines
Northwood
Middlesex
HA6 3HP

SM.5922/99.A(i)

Northwood 26161 Ext. 260

CPO WEA R J LAMPEN
Staff of Captain Weapon Trials and Assessment
Admiralty Research Establishment
Edgon Hall
WEYMOUTH

| November 1984

Dear Chief Petty Officer Lampen,

1. I was very pleased to hear from Captain Weapon Trials how, largely through your initiative whilst embarked in the AUTEK Range Recovery Vessel, a Mk 24 Torpedo which had been lost was located and subsequently recovered.
2. Your vigilance was all the more commendable as this is the first time that a heavy weight torpedo has been located and recovered more than three days after firing. Valuable data has been recovered from the weapon record, and a serviceable weapon and modified sub system has now been made available for further use. The aims of the trial would not have been achieved without the data obtained from this weapon.
3. Well Done.

*Yours sincerely
A Woodward.*

JB

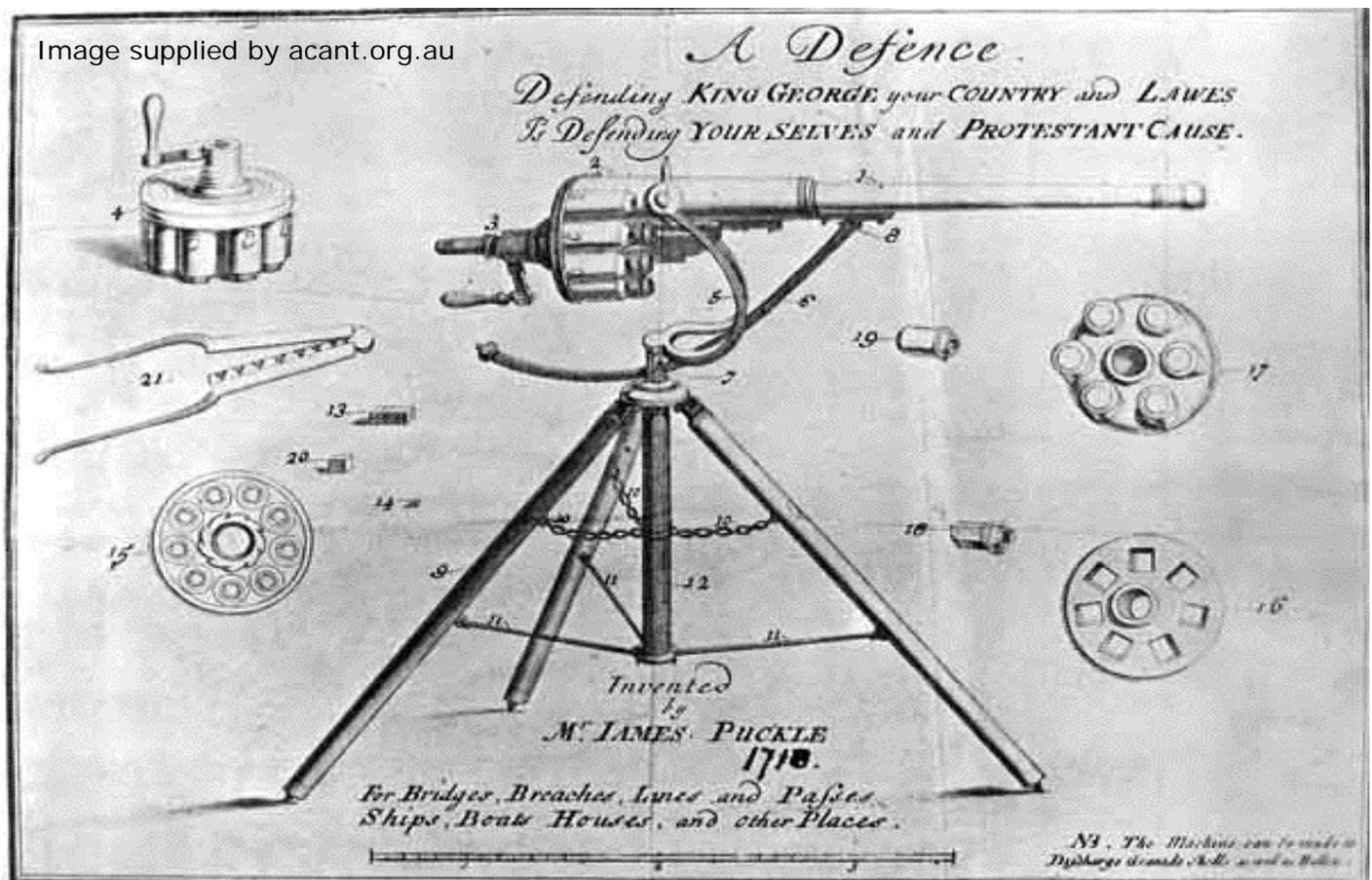
PERSONAL
PERSONAL

The First Machine Gun

Machine guns are thought to be a fairly modern weapon but in fact the first mechanical machine gun of sound design was patented in London by James Puckle (1667-1724) on 15th May 1718. He demonstrated his new invention, a tripod-mounted, single-barrelled flintlock gun fitted with a multishot revolving cylinder. Puckle demonstrated two versions of the basic design. One intended for use against Christian enemies, fired conventional round bullets, while the second variant, designed to be used against the Muslim Turks, fired square bullets, which were believed to cause more severe and painful wounds than spherical projectiles. Although functionality was limited by the weapon's method of ignition, the gun was operable and was put into production.

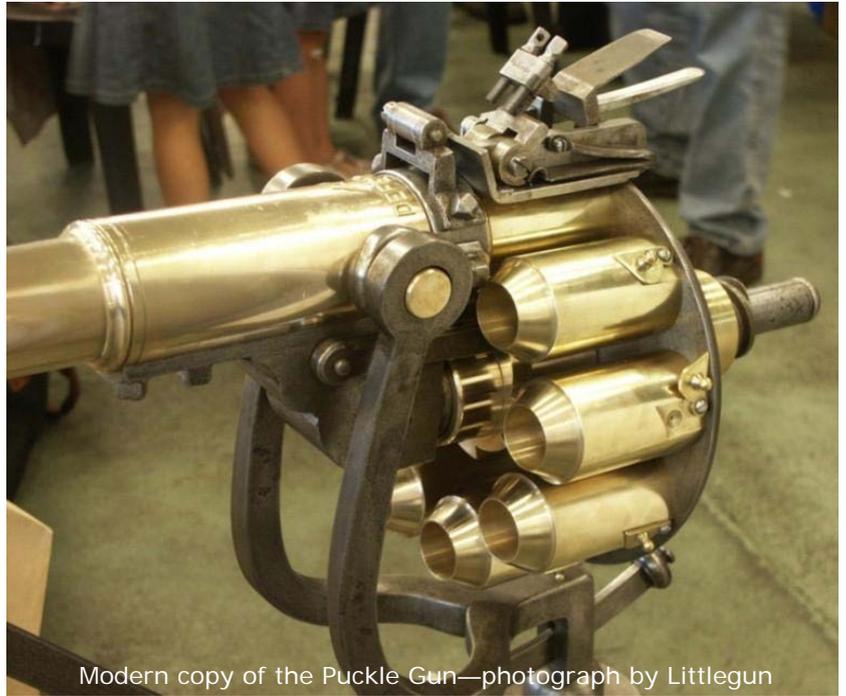


Historically, Puckle's gun was not a huge success, partly because the engineering of 1718 simply wasn't up to the task of producing components with fine tolerances. His gun had promise, though, as it could fire shots around three times faster than a well-trained fusilier who could load and fire three rounds per minute.



- | | |
|---|---|
| <ol style="list-style-type: none"> 1. The Barrel of the gun 2. The Sett of Chambers charged put on ready for firing 3. The Screw upon which every Sett of Chambers play off and on 4. A Sett of Chambers ready charged to be slipped on when the first Sett are pulled off to be recharged 5. The Crane to rise and turn the gun round 6. The Curb to level and fix the guns 7. The Screw to rise and fall it 8. The Screw to take out the Crane when the gun with the tripod is to be folded up 9. The Tripod whereon it plays 10. The Chain to prevent the tripod extending out too far | <ol style="list-style-type: none"> 11. The Hooks to fix the tripod and Unhook when the same is folded up in order to be carried with the gun upon a Man's shoulder 12. The Tube wherein the Pivot of the Crane turns 13. A Charge of Twenty Square Bullets 14. A single bullet 15. The front of the Chambers of the gun for a boat 16. The plate of the Chambers of the gun for a ship shooting square bullets against Turks 17. For Round Bullets against Christians 18. A single square chamber 19. A single round chamber 20. A single bullet for a boat 21. The mould for casting single bullets |
|---|---|

Two Puckle guns were taken on an expedition to the West Indies to colonize the islands of St. Vincent and St. Lucia against French opposition in 1722 but no fighting actually happened and the potential of the weapon in the field was never proved and so remained a matter of conjecture. However, it is recorded that a Puckle gun fired in a public demonstration achieved a rate of fire of sixty-three rounds in seven minutes. The 'Defence' was not put into general issue but three survive in calibres of 1.2 inch (30.5 mm), 1.3 inch (33.0 mm) and 1.6 inch (40.6 mm).



Modern copy of the Puckle Gun—photograph by Littlegun

The Armoury of the Tower of London has an original Puckle gun in brass with a flintlock mechanism

and another rather crude model in iron, possibly a prototype, with a matchlock mechanism. A third survivor, a brass, matchlock model is in the Trojhusmuseum in Copenhagen.

According to the Patent Office of the United Kingdom, "In the reign of Queen Anne, the law officers of the Crown established as a condition of patent that the inventor must in writing describe the invention and the manner in which it works." James Puckles' 1718 patent for a gun was one of the first to provide a description.

"It achieves its rapid-fire capability by using pre-loaded breech chambers that are rotated into line with the barrel, fired, then a new chamber is positioned for the next shot. This is achieved mechanically by the operator revolving a handle at the back of the piece. As long as loaded magazines are available for the piece, a Puckle gun can be kept in rapid fire action!"

However despite its promise of rapid fire against the enemy, the Royal Navy never bought any and other potential buyers were equally reluctant to part with their money. Puckles' career as a gunsmith ended in failure for him and his investors.

The patent granted to James Puckle in 1718

*Whereas our Sovereign Lord King George by his Letters pattents bearing date the Fifteenth day of May in the Fourth Year of his Majesties Reign was generously pleased to Give & Grant unto me James Puckle of London Gent my Exors Admors & Assignes the sole priviledge & Authority to Make Exercise Work and use a Portable Gun or Machine (by me lately invented) call'd a **Defence** in that part of his Majesties Kingdom of Great Britain called England his Dominion of Wales, Town of Berwick upon Tweed and his Majesties Kingdom of Ireland in such manner & with such Materials as shou'd be ascertain'd to be the New Invention by writing under my Hand & Seal and Inrolled in the High court of chancery within three Calendary Months from the date of the pattent as in & by his Majesties Letters Pattents Relacon being thereunto had Doth & may amongst Other things morefully & at large Appear **Now** I the said James Puckle Do hereby Declare that the Materials whereof the Machine is Made are Steel Iron & Brass and that the Trepied whereon it Stands is Wood & Iron And that in the Above print (to which I hereby Refer) the Said Gun or Machine by me Invented is Delienated & Described. July the 25th 1718./.* - Information by courtesy of The Patent Office ~ Newport.

Responses to the last issue of the Bulletin (Issue 4)

Mark, Many thanks for the Bulletin and the Titanic Special Edition.

Reading through the history of the RNEBS and having its roots in what today is the RMT. Still being in existence after 140 years is some thing to be proud of.

As an active union member the Barrow Trades Union Council that since 2004 I have been the Secretary has like the Society been around since 1872. It was Industrial Disease namely Asbestos that caused me to become involved, it has been a long journey, in many ways I can be proud of what I have achieved over the past eight years.

The first union in Barrow was the Amalgamated Society of Engineers in 1857 which would predate the forerunners of todays BAe Systems. Since those days that union as has many others merged, amalgamated or ceased to exist as trades and skills changed with advances in technology. Today it comprises with the old Electrical Union the major elements in what is now UNITE.

Yet after the passage of time, even with the changes to the Artificer Branch the Society remains in existence.

Regards

Bob Pointer

Series 47 (Jan 1963) Reunion

Dear Classmate,

Remember me little Paul Merrett - Frobisher Hut and then Marlborough 126.

In 2001 I found the Fisgard Site on the Internet www.fisgardassociation.org and it brought memories flooding back and I wonder what happened to all those buddies I spent up to 5 years with, and a few "tot times" afterwards, therefore I decided to set up my own site like some of the guys had done before, www.series47.org.uk , and track down the whole of the entry that joined with us.

I soon found Jim Hough in Canada and Len Munro not far from him, I found Jim "kiwi" Neville in NZ and Payne-Hanlon (now Rtd Commander) and Ian Stanley of Falklands fame. See for yourself on the site.

There is of course the original guys who formed S47 (175) and then there is the S48 guys (44) who were advanced and then there were the back classes (14) so I am up to about 233 and I have surprisingly "found" quite a few abroad.

Would you care join us and let us know how you are getting on please. I should be very grateful for contact, either email, letter or a text to my mobile 07957 542 811 whichever way you decide or better still contact me via the web-site.

Best Regards

Paul Merrett

S47 REA1

Grand Reunion Weekend 06-08 September 2013 in Portsmouth.

Series 48 and Series 49 welcome. Come and meet your old classmates after 50 years.

Details: Paul Merrett Email editor@series47.org.uk

32 Laverock Lea, Portchester, Fareham, Hampshire PO16 8DA

Telephone: 023 9237 2526 Email: paulmerrett@ntlworld.com

'Blazing Badges' update (from Issue 4, page 18)

Pete Woodyard ex WOMEA(P) (series 25) informs me that an ex-artificer friend of his served in HMS Cleopatra 1967 - 1970 with Richard Feneck, the son of the Naval Tailor, Joe Feneck (not French), in Union Street. Richard was the Chief EA at the time and RN Judo champion!!

David Woollard says that he bought his blazer badge (LH pic) from Sweets Naval Tailors, Union St, Plymouth in 1961. Graham Eason-Bassett believes that his blazer badge (RH pic) came from the same place as Keith Radfords. He recalls that his mate, Brian Ackerman (S54/55 ERA) having one with 'RNEBS', not 'Royal Naval Engineering Artificer' wording and the motto 'Tubal Cain' and date 1868.

Having trawled though the net I have found the following instances of blazer badges. Does anyone know of any other variations? Info to the usual email address please.

1. Royal Naval Engine Room Artificer
2. Royal Naval Electrical Artificer
3. Royal Naval Ordnance Artificer
4. Royal Naval Engine Room Artificer – 1868 - Tubal Cain
5. Royal Naval Aircraft Artificer – 1868 – Tubal Cain



Britannia Royal Naval College

150 years old

The town of Dartmouth and its association with HMS Britannia began in September 1863 when a cadet training ship the 120-gun 'Prince of Wales' (renamed Britannia in 1869), arrived in the river Dart to house and train-up new naval officers. The main reason why the ship moved from Portsmouth, via a short spell in Portland, was because it was thought that Portsmouth was an unsuitable venue to train officers due to the 'temptations' of the town. The cadets moved into their new accommodation ashore in 1905. The hulk, originally built in 1848, was eventually towed away and broken up in 1916.

Mark

Thanks for bulletin issue 4 and Titanic special. Interesting, well written and informative.

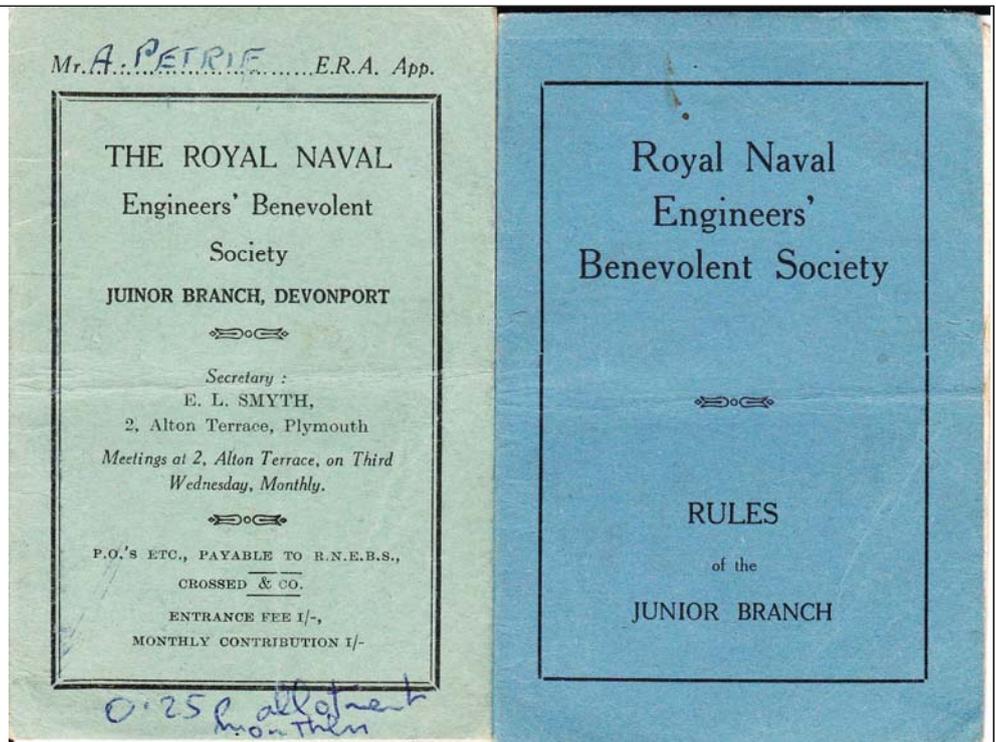
I notice you were looking for RNEBS membership cards of an earlier date. Please find attached my Rule card and paying in book issued to me by CERA Robbins in early 1957. The subs were 1/- per month then and death benefit was £10.

I am currently copying all HMS Caledonia and Artifex magazines onto hard disc for the OCAAA and eventually deposit

into the archives of HMS Sultan museum. At present I have 26 on computer file from the 1940's, and a pile ready to copy. However I am missing the following issues 1952/53, 1960/61, 1965/66, 1970/75, and 1984/85. I wonder if you could advertise in the next issue of the Bulletin if anyone has copies of these issues if they could donate or loan them to the OCAAA for copying. They can send them to my address at Harness Cottage, 4 Mayfield Mews, Lee-on-the-Solent, Hampshire. PO13 9HT. We will refund any postage.

Thanks and regards

Alan Petrie



Update on HMS Queen Elizabeth

You may have seen in the news recently (early February) that the 680-ton forward bridge of the new aircraft carrier has been moved 600 miles from the BAE Systems base in Portsmouth to Rosyth where it will join the rest of the ship. With the bow section being joined to the front part of the hull, approximately two thirds of the ship has now been built. It is due to be launched in 2014 and will commence sea trials and final fit outs before entering service in 2017.



An Evening with Don Wales

Grandson of Sir Malcolm Campbell MBE

In association with Ian Glover and
Bloodhound Supersonic Car

To raise funds for The Sam Beare Hospice

In Memory of Pat Greene

Friday May 10th 2013

18.00hrs for 19.15hrs start

at Brooklands Museum, Weybridge. Napier Room



Don Wales, World Land Speed record holder for a car driven by Steam and holder of various other Land Speed records, will give a talk about his experiences from the hot seat!

He will also talk about his grandfather, Sir Malcolm Campbell MBE and his uncle Donald Campbell CBE, who between them broke over 20 World Land and Water Speed records.

Ian Glover, President of the Bloodhound SSC 1K Club will give a short update on the supersonic car project attempting to break the World Land Speed record at over 1000mph.



Tickets in ADVANCE £ 10.00 available from Sam Beare Hospice on 01483 881752 also include limited entrance to the museum.

Please arrive between 18.00hrs - 19.00hrs to visit the museum and to purchase food and refreshments as required.

There will be a raffle and a small auction relating to the evening. Talks will start at 19.15hrs and the event closes at 21.00hrs



BLUEBIRD

www.bluebirdspeedrecords.com



www.brooklandsmuseum.co.uk



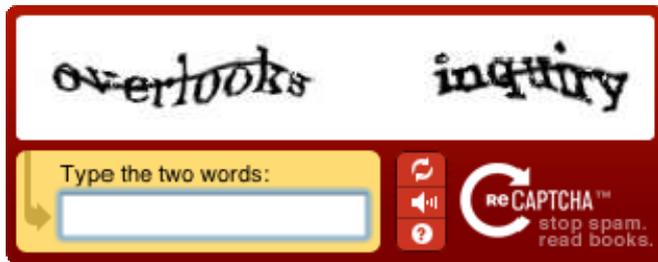
www.wsbhospices.co.uk



www.bloodhoundssc.com

CAPTCHA—More like GOTCHA!!!

Have you ever tried to buy theatre or concert tickets online and get to the screen where you have to type in the words displayed in a box that are so distorted that you can hardly read them? You try to copy the displayed words only to get told that you entered them incorrectly and after several attempts the screen is reset to the one you were on before and you have to start the whole process again. How frustrating is that? Have you ever wondered why and how these annoying security challenges came about and why they are used?



CAPTCHA stands for “Completely Automated Public Turing test to tell Computers and Humans Apart” and is used as a test to make sure that responses are generated by a human and not a machine i.e. another computer program. The CAPTCHA system prevents activities run by automated software that can clog up email and database systems.

This reverse Turing test is named after the celebrated English mathematician Alan Turing (1912-1954) who devised a series of tests and published a number of papers to explore machine intelligence and investigations into artificial intelligence, AI.

The reason that the CAPTCHA images are distorted and have wavy a line drawn through them is to stop image recognition systems from automatically decoding them and bypassing this security measure. Early versions were easily bypassed and much research and a growing industry of human solvers is looking into CAPTCHA circumvention.

This security system was devised and developed by Luis von Ahn, Manuel Blum, Nicholas Hopper and John Langford of Carnegie Mellon University in 2000 for use by the Yahoo website.

The system can be freely downloaded from <http://www.captcha.net/> and where more detailed information can be found.

113 North Hill Matters

In case you did not know, there are ten properties in the terrace, ours being the second from the South end / Alton Road (formerly 2 Alton Terrace).

The Property was bought by the Society in 1919 from the Trustees of the South Devon and East Cornwall District No. 66 Independent Order of Rechabites as a Memorial to the ERAs of the Devonport Division killed in the First World War. As a point of interest, the Rechabites were a Friendly Society, founded in 1835, that promoted temperance—the abstinence of alcoholic beverages. This society still exists and has now transformed into a financial institution based in Manchester.

A business occupies the ground and lower ground floors with parking to the rear (currently South West Fostering & Adoption Agency), a one bed flat on each of the 1st and 2nd floors plus parking to the front and the Shearsby Suite on 3rd floor (Attic/Penthouse).

Of course, a building of this age with a mixed commercial and domestic use requires maintenance, insurance and strict adherence to safety legislation. Even with these costs, the return from the rents of the business and flats yields a better pro rata income than many investments in these straitened financial times.

Flats are inspected at six monthly intervals by the Letting Agent (currently Tuffin & Co).

- A satisfactory inspection of the first floor flat has been completed and that renewal of the lease was recommended.
- The Terrace steps have been repaired and repointed at a cost to the Society of £147.00 (10% of the total bill as 113 is a five story building, in a terrace of ten, and the steps are common to all ten)
- Water ingress into Flat 2 during the recent heavy rains is being investigated and repaired. It is expected that some of the costs will be covered by insurance.

The Armed Forces Covenant

Community Covenant Grant

The MOD introduced, late in 2012, a Community Covenant Grant scheme allocating up to £30m over four years. The aim of the Grant will be to support projects, at the local level, which strengthen the ties or the mutual understanding between members of the Armed Forces Community and the wider community in which they live. The Scheme will consider applications from local groups for practical projects which delivered rapid results in support of the Armed Forces Community.

Working with Service Charities to identify how they can best use their Resources

Most Service charities have a clear view of how and where they wish to spend their funds. However the MOD along with other central Government Departments is ready to work with charities who would like us to prioritise key projects, with which charitable help could then be matched. As independent charities, they are free to work to their own agenda. The Government recognises and respects the independence of these organisations but will help if asked.



NEW The Defence Privilege Card is now available to help you save on the high street



Prime Minister David Cameron has issued a call to action to all companies to sign up to the Defence Discount Service. "This is a very small way to say thank you to our men and women who do, and who have done, so much for us. As well as for their families who support them while they are on operations."

If you sign up for this service you can get online discounts from a large number of retailers and you can also get cashback that is administered through the discount scheme.

Registration is free but you have to pay £4.99 for a Privilege Discount Card that lasts for 5 years. The charge will undoubtedly cover the cost to produce and dispatch the card.

Follow this link to the website;

<https://www.defencediscountservice.co.uk/>

The Defence Discount Service is available to:

- Serving Armed Forces
- Reserve Forces
- Veterans
- Service Family Members
- MOD Civil Servants
- Cadet Forces (over 16)
- NATO Personnel serving in the UK



If you do get one of these cards, please let me know how you get on with it. Is it worth the bother? Do you get discounts from the places you want discounts from etc.?

Responses to the usual email address please.

A New Home for the Naval Engineers War Memorial Board

David Woollard

At 3 p.m. on Saturday, 10th December 1921, the new RNEBS Club House was opened and dedicated at 2 Alton Terrace, Mutley, Plymouth (now 113 North Hill), and coincided with the unveiling of the Naval Engineers' War Memorial, by the then president, Engr. Lt. E. Richards, OBE, RN.

In 2012 the issue was raised within the management committee of whether the memorial board would be better housed in a Royal Naval environment where today's artificers and technicians could appreciate this fine memorial that so well recognises the sacrifice of all naval engineers during the Great War 1914 - 1918. It was decided therefore to approach the Warrant Officers and Senior Rates Mess HMS DRAKE.

We were delighted by their President's enthusiastic response and some of you will know that this fine board now occupies a privileged position within the Starling Suite. The Board has been transferred into the safekeeping of the WO & SR Mess for housing and display and the agreement ensures that the Society's approval will be sought if the Board ever becomes surplus to requirements or its transfer is considered.



We have commissioned a contemporary plaque which has been fitted in the bottom right hand corner of the Board in an area previously blank. When next in the Mess please visit and take a moment to reflect on this fine memorial to our naval engineering forefathers.

The text at the top of the memorial board reads as;

THIS BUILDING is dedicated to the Immortal Memory of the Members of the Devonport Branch of the Royal Naval Engineers Benevolent Society who served in the Great War 1914 – 1918 and were killed in Action or died as a result thereof.

The names include those of Engineer Lieutenants, Mate. E., Commissioned Engineers, Warrant Officers, Chief Engine Room Artificers and Engine Room Artificers.

NEVER FORGET

THIS BUILDING is dedicated to the Immortal Memory of the Members of the Devonport Branch of the Royal Naval Engineers Benevolent Society who served in the Great War 1914-1918 and were killed in Action or died as the result thereof

Engineer Lieutenants	Chief Engine-Room Artificers	Chief Engine-Room Artificers	Engine-Room Artificers	Engine-Room Artificers
FG BLAKE TH MORGAN MATEL W.F. BREBNER Commissioned Engineers W DEVEREUX W.MORRELL COXFORD Warrant Engineers T JIBATTLE J.C. BLAMPEY W.DAY C.A.FINCKEN E.HILL A.TJOHNS T.H.PELLATT L.PEPPETTO J.VICKERY J.WOODROW	IASHTON H.F.AULT A.I.BARTLETT A.G.BAZLEY E.BUCKINGHAM R.BRACEWELL A.ECCOLE J.W.GOLEMAN H.CRAWFORD H.R.DARKE E.GUNN A.S.HAWKINGS W.I.HEMMINGS W.I.HOWELL J.W.HUMPHREYS A.J.JEFFERIES P.H.JENKINS C.A.JEPSON G.JONES	ILAKY W.H.M'QUILLLEN W.H.MEEK A.A.PATTEN E.M.SMITH I.TILL A.E.WAKLEY C.H.WARREN W.SWILLS E.E.WITHELL Engine-Room Artificers I.BASS R.T.BLOFIELD S.F.BUJETT T.J.BOWERMAN G.C.BROOKS K.B.BUDGE F.S.CLENCH F.G.COLE	W.L.COPLAND C.W.COWARD FICOWLS C.H.CE A.BB. F.W.DAVIS FEASTERBROOK S.D.FITZWATER A.F.GARRY J.W.GOAD M.G.GRIFFITHS H.HAILES T.R.HORSHAM D.HOUSTON F.I.HUTCHINS W.I.LEAVER A.H.LIPIETT A.F.MARTIN N.MARTIN D.H.O'BRIEN	H.H.PARKER A.C.PEARCE K.PERROTT B.SAMBEEDS P.SEARLE P.G.SILK A.SMALE I.T.TILEY E.C.TRETHEWBY A.C.TRURAN A.TTYLER K.WURQUHART H.WATTS

Fast Electric Cars

In this section, I want to show you what is happening in the world of electric cars, not your everyday cheap and affordable commuter cars, but fast and very expensive electric cars. Which one is the quickest and which one holds the world and UK speed records?

In September 2012, 'Nemesis', the first electric supercar to be built in Britain broke the UK speed record with a top speed of 148.7 mph. This heavily modified Lotus Exige was designed and built in Britain by the utility company Ecotricity.

The Motor Sport Association was on hand, at Elvington Airfield in Yorkshire, to officially verify the record. 'Nemesis' completed two runs over a one mile distance, in opposite directions, within one hour to account for prevailing winds – the average speed of the two runs providing the official time. Driver Nick Ponting broke the record on the first set of consecutive runs with an average speed of 148 mph and then went on to extend the record to 151 mph.



The Goodwood Festival of Speed was the world's first look at the technology behind the new Drayson racing car that was first unveiled back in January 2012. Drayson Racing Technologies has set a world record with its new electric-powered prototype racing car, the B12/69EV, at this year's Goodwood Festival of Speed hillclimb. In front of thousands of fans, Paul Drayson's second timed run of 53.91 seconds placed the car eleventh overall, but made it the fastest electric car in the race.



The unique electric Le Mans prototype racing car attracted a great deal of attention throughout the event, both on and off the track, with the crowds amazed by its performance. The zero emissions B12/69EV race car is powered by an 850 horsepower electric drivetrain. The car not only impressed the crowd, the Drayson technical team were also impressed with the prototype's reliability and overall performance at the event.

"Electric racing is set to transform the future of our sport and through continued advances in technology, we now have a viable alternative to fossil fuels. The Festival of Speed attracts an outstanding number of visitors and is the perfect place for us to demonstrate our car to the public for the first time."

In addition to its 850 horsepower electric drivetrain, the B12/69EV features new technology like inductive charging that allows the battery to be recharged through charging spots on the floor, effectively doing away with typical charging cables.



The previous record for the fastest electric car in the UK was held by Don Wales who raced up to 137 mph with Bluebird Electric (photo above) in the year 2000. His son, Joe Wales, attempted to break the record in August 2011, but failed after the car hit a pothole on Pendine Sands in Carmarthenshire. They are hoping to eventually hit 500mph and pass the 307.7 mph record set by the American Buckeye Bullet 2.5 (photo below) team in 2010.

The car built by students from Ohio State University, uses approximately 1600 lithium-ion batteries (rated at over 600 kW) and posted a top recorded speed of 320 mph on Utah's Bonneville Salt Flats. Their new car, the Buckeye Bullet 3, will be built from scratch, use custom made 'Venturi' motors and prismatic A123 batteries. Drag will be reduced by 5% and wind deflectors fitted to improve stability and minimize further drag, all with the hope of hitting speeds in excess of 400 mph.



For comparison, other fast electric vehicles (EV) that are street legal are:

1. Starting with the fastest EV, a Chevy S-10 called 'Smoke Screen' which was built and is owned by Dennis Berube. The S-10 has a best quarter mile time of 11.083s at 120 mph and can accelerate to 60 mph in less than 3 seconds. The S-10 runs a series wound DC motor and in this car a 13 inch diameter General Electric unit, running on 400 volts is mounted in place of the gearbox.
2. The second fastest street legal EV is a 1972 Datsun 1200 called 'White Zombie'. The Datsun features two 8 inch Advanced DC series wound motors that put out 250 hp (183 kw) - with an impressive 772 ft/lb (1045 Nm) at the back wheels. it can do 0-60 mph in 2.9 seconds.
3. The Wrightspeed X1 is an Ariel Atom fitted with an electric power train sourced from AC Propulsion and is capable of 0-60 mph in 3.07 seconds. Where EV drag cars normally all run DC motors, the Wrightspeed uses the same AC power plant found in the Tesla Roadster.
4. The AC Propulsion 'tzero' can do 0-60 mph in 3.6 seconds and is the vehicle credited with being the first in the world to demonstrate the amazing performance possible with off-the-shelf Li-ion "laptop" batteries powering a 165kw 3-phase AC motor and inverter.
5. The 'Tesla Roadster' claims the title of worlds fastest production electric sports car with a 0-60 mph time of 3.9 seconds. With its 185 kW 3- phase AC motor and 53 kWh Li-ion battery pack capable of a range of 240 miles, the 'Roadster' is the production version of the 'tzero'.

RNEBS Affiliated Charities

The Captain Marrack Fund (<http://opencharities.org/charities/240858>) will hand out approx. £300 this year to provide prizes to FAA, ME and WE technicians at LH level.

The Chatham Memorial Fund (<http://opencharities.org/charities/240857>) will distribute approx. £1,900 this year to provide prizes to FAA, ME and WE Engineering Technicians at various levels as well as Senior Upper Yardmen.

These prizes will be distributed to personnel in both HMS Collingwood and HMS Sultan.

Obituary

Lt Cdr Stephen (Big Steve) Bennetts

1949 – 2013

Steve was born and brought up in rural Cornwall. He was a country boy who developed a love of gig rowing and sailing.

He went to Newquay Grammar School and joined the RN as an Artificer Apprentice.

He served in a variety of ships including Carriers and Frigates, serving in three Type 21s, AMBUSCADE as 4.5" gun maintainer, AMAZON as DWEO and ARROW as WEO.

As well known for his professionalism, generous spirit and affable nature as he was for his size, Steve was a life-long sailing enthusiast involved in racing and organisation in Plymouth and with the RNSA.

He died suddenly of a heart attack aboard his Thames barge at Reading on 4 February 2013.

Steve joined the Society in 1966 and is survived by his wife Lynn and their son and daughter.

Donations may be made to The Polycystic Kidney Disease (PKD) Charity c/o Co-operative Funeral Care, 61 Exeter Street, Plymouth, PL4 0HA.

Crossing the Bar

Those members who have passed on since October 2012;

Reginald Barry Stacey, 09026, D084928, born 15/04/47, died 11/09/12, benefit of £975 paid to widow, Elizabeth.

D. P. Morgan, 11420, born 3/10/1957, joined the Society Feb 1975. Benefit of £1,365 paid to widow Caroline.

F.J. Burrows, 06609, born 01/07/1930, Joined the Society Feb 1948. Benefit of £975 paid to daughter Liz.

100th Anniversary of the Australian Royal Navy

The Australian International Fleet Review is to be held in Sydney Harbour 4th - 11th October this year as the Royal Australian Navy (RAN) celebrates a century of defending the island continent in war and representing its national interests around the globe in peace. Originally intended for local defence, the navy was granted the title "Royal Australian Navy" in 1911, and became increasingly responsible for defence of the region.

The Royal Navy continued to support the RAN and provide additional blue-water defence capability in the Pacific up to the early years of World War II. Then, rapid wartime expansion saw the acquisition of large surface vessels and the building of many warships and patrol boats.

In the decade following the Second World War, the RAN acquired a small number of aircraft carriers, the last of these, *HMAS Melbourne*, leaving service in 1982.

Today, the RAN is one of the largest and most sophisticated naval forces in the Pacific region, with a significant presence in the Indian Ocean and worldwide operations in support of military campaigns and peacekeeping missions.