RNARS

NEWSLETTER

Royal Naval
Amateur Radio
Society

Summer 2018

< CONTENTS >

Front Cover:
HMS Barrosa launched at Glasgow in 1945 at the end of WWII. She was a Battle class destroyer laid up soon after launch until her later conversion into a 'Super-Battle' class destroyer working as a radar picket -the eyes of the fleet. She served in the Indonesian (war of) 'confrontation' -so called, because the US supported General Sukarno the Indonesian leader who threatened Singapore and Malaya. Sukarno also turned to Russia and China for military support. His ambitions were undermined by the formation of the Malaysian Federation. Barrosa returned to the UK in 1966, but returned to the FES in 1967/8 before paying off back home a short time later. Scrapped in 1978.



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Items published in the Newsletter do not necessarily represent the views of the RNARS. The RNARS is affiliated to the RSGB.

The RNARS is grateful to Phil Taylor MØVSE and his brother Wayne G6NGV of **Shine Systems** for hosting our web site free of charge: **www.rnars.org.uk**

CHAIRMAN'S CHAT

David Firth
2E0GLL@mail.com

We have had an impromptu day's work in the field -a somewhat loosely applied term for working on our aerials at Collingwood. If like me, you remember the sizeable aerial fields at Suara and at the old Nore Command then you will know that our tiny patch of earth pales into insignificance. We were on the hunt for solutions to poor aerial performance when someone had a flash of inspiration by way of eliminating at least one aerial run up to the mast. 'Why not temporarily replace it with this spare run already made up?' The light goes on in one's head -we have a spare run? 'That'll do it!' and before long we realised the awful truth, we had two problems in the shack, not with four aerials. It was late in the day, but the discovery did allow us to scratch a second day's work.. Now we have the satisfaction of knowing the nature of our problem and the bypass without the nagging doubts of uncertainty. It reminds me of Arthur Haynes and his sketch on fried eggs with Kenneth Connor as his foil. He wanted two fried eggs, one fried on one side, the other fried on two sides, but kept on changing his mind to the utter distraction of the waiter, Kenneth Connor.

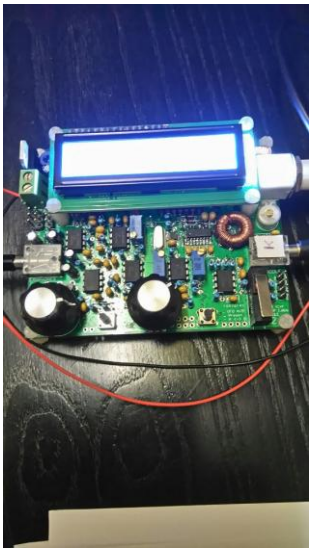
The Rally at Kempton Park was better than expected with three major suppliers turning up; Icom, Yaesu and Kenwood. Some of the pundits in our neck of the woods decided not to go because they believed none of the big boys would turn up. We have two new members and two re-joiners from the event; among several more enquiries. There were other goodies on show with aerials being snapped up from the Moonraker stand, and from the many smaller stands selling off electronic bric-a-brac. Joe Kirk sidled back to the RNARS stand with a new aerial under his arm while I fell for a lovely little noise limiter from BHi. Makes all the difference to receiving HF faxes!

Best wishes to you all,

David

THE QCX QRP TRANSCEIVER

John Taylor M0HTE



The QCX comes in kit form from QRP Labs and costs about £38. It is available for 80, 60, 40, 30, 20 and 17m bands and has an output of about 5 watts from a 13.7v supply. Very portable measuring about 4in x 3.5in x 1.5in high.

It is CW only and has an on-board keyer and can be used with an iambic or straight key. Key speed is easily controlled and displayed on a long display easily read, there is a decoder so if the operator misses a callsign it can be read off. There is even a small cw key provided bottom right on the board.

The receiver is excellent and has a 200Hz cw filter. The VFO comes with A, B and split operation. There is WSPR and CW beacon mode available.

The manual is available as a PDF download and is very extensive. This is only a very brief description. The QCX was reviewed in detail in a recent RadCom.

John Taylor

MEMBERSHIP MATTERS

A very warm welcome to our new members, and to re-joining members.

New Members		
Mark Peerman	M0HBQ	5045
Tim Forbes*	G2BFC	5046
David Chapman*	2E0EGM	5047
Re-joiners		
Richard BENTON	G4WKW	2503
Tom Howarth	G4BKF	0638
Pacco BOUNTOUKAS	SV2AJX	3528
Bob WILSON	G0FEK	2182
Bob New	G0BSJ	2427
Mike Rowe	G7BLX	4651
Changes		
Resigned		
Silent Keys		
Ted LATTER	G0UMI	4001
Les Crompton	MW0CLU	2726
David FLEMINGTON	MW1AXV	4188
Tony MAYES	G4ZQJ	2249
Harold BOURNER	G3NCB	2799
Don LAWSON	ZL4QO	3567
Peter FINCHAM	M0BTY	4536

* Kempton Park Rally

DATA PROTECTION LEGISLATION

A summary of the GDPR

Dear Member,

***With reference to legal necessities*.** By now many of you will have heard about the General Data Protection Act (GDPR) which will be in force (25/5/18) by the time of publication. The GDPR is clear in its intent which can be summarised by saying that each of us has the right to expect that our personal information is not compromised or used inappropriately. Under our data protection policy we will store your personal data diligently and use it only to deliver membership benefits to which every member is entitled, such as this newsletter or in other forms of communication. We will not sell your information or allow it to be offered to third parties for marketing purposes. We have controls in place to ensure that your data is protected. The GDPR gives you the right to access your personal data that we hold, the right to have any errors corrected, and the right to have your details removed. Bearing in mind that if we do not have your consent then we cannot retain your personal details and you will no longer remain a member.

All new members will be informed that signing the application form gives consent to the Society to hold their personal information and process it as described above. For existing members the view is that processing your personal data to deliver such benefits is part of your contract with the RNARS and therefore, we will not be requesting an 'opt-in' from you.

Best wishes,

David

David Firth, Chairman
Royal Naval Amateur Radio Society

DIVERSE REPORTS

The Blackpool Rally

The 56th Blackpool Rally, held at Norbreck Castle Hotel Exhibition Centre went ahead in good weather on the 29th of April, Ken Randall (G3RFH) reports. Assisted by Keith (M0IHN) and Peter G3XGE, they signed in 14 members during the event. Ken tells us that attendance was good with plenty of people at the venue visiting well stacked stands that were trading briskly during the day. Well done guys, for keeping the RNARS in the public eye. (Photo: M0SCG)

Visit To HMS Belfast - London Group AGM

A small number of us made our way to join our affiliated London Group members at HMS Belfast (GB2RN) on 6th of April for their AGM. On arrival we were well looked after and when the business of the day was ended, we mustered on the fo'csl for a brief parade and VIP inspection under the beady eye of our Parade Marshall, Mick (the LIK) Puttick, before being generously dined at a buffet lunch of memorable proportions. Our thanks to Gavin Keegan the Chairman and his willing crew of volunteers, and we wish them well as they seek to navigate their way around the problems of being aboard an ageing lady of the sea with a rusting bottom -if that isn't too much of a down to earth subject for their radios. On behalf of all of us from RNARS HQ, I Thank you Gavin, for your kind invitation and excellent Hospitality, DGF.

The Kempton Rally

There were plenty of sightings and signing-in during the rally. Weather was good with brisk trade at the big stands at first, which settled down to a steady flow at the smaller stands. In addition, G7BLX (4651) and G3USX (3254) have come back in the fold.

SEA STORY - continued

© Eric Bray M0HFF

When we were 'on', Pete showed me the workings of the UA9, saying that the UA8 was mechanically identical, and the UAZ. He left me grappling for understanding of the logarithm tables, and NIXI tubes, which between them, calculated the pulse repetition frequency of the radar beam being studied. I had to learn to tune in the UA9 accurately, and write into the log the target's radio frequency, compass bearing, pulse repetition frequency, (prf), pulse length, (which was displayed on a long, narrow CRT on the UAZ), the arp, and its possible identity. That item could be gleaned from a thick book titled STICS that was normally kept in the safe. It was an American publication that listed every known radar, and its characteristics. It also detailed what ships and/or aircraft the radar was fitted to. Naturally, as we were in a Naval dockyard, almost all the radar's that we detected were bog-standard Navy navigation sets, NATO designated 978. I was also introduced to another delightful pastime, the book muster. All the books that 'lived' in the safe were listed by serial number on a sheet of paper, which also lived in the safe. At the start of each watch, the incoming watch had to check that all the books were present. They also had to be presented, at Evening Rounds, to the Duty Officer, who read the list off, while we produced the relevant publication for him to see. While we had been in dry-dock, the books had been 'away' for updating, so we hadn't seen them.

Deep in the bowels of the ship, the stokers were beavering away at whatever stokers do, including lighting the boilers. The boilers provided the steam that drove the generators for the electricity, once we disconnected from shore-side power, and the condensers, which desalinated the sea-water, providing us with cold fresh water, as well as the fresh water for the boilers. Which in turn provided steam for the aircraft catapults, and the main engines, that would propel us through the water, eventually, and also provide hot water for us. You could say that the boilers were the heart of the ship, the electronics were the brains, the wiring equated to the nerves, the radio and radar, the eyes and ears, and so on.

Once disconnected from shore, we were a self-sustaining city of two thousand men, and not one woman. In the early hours of Monday, we changed over from shore to ship's power, when the electrical demands were at their lowest. Taff the Tiff was up, guarding his 'baby', watching for power surges that might upset the temperamental creation. Because there were only three Aircraft Carriers in the

whole fleet, the EWO equipment was effectively hand-built, and the three sets were as different as chalk and cheese, although built to the same schematic!

A floating crane was muscled alongside, to port, by a tug, which then bustled off on another task. It later returned with a 'lighter', a sea-going barge. On the barge were half a dozen large steel boxes on wheels, which the crane hoisted to the flight deck. A flight deck tractor, a four-wheel drive, four wheeled steering, low-slung aircraft shifter, towed them to the start of the catapult tracks. We had two catapults, which faced directly ahead, intended for throwing aeroplanes into the sky from a standing start. The 'dolly's' were connected, one at a time, to the catapult shuttle, via a wire rope, or strop, and held back by another, which was designed to snap at a particular level of strain. These 'dollies' were then fired off, being flung out ahead of us, to fall with a mighty splash into the water, where the tug rounded them up, and brought them back for the crane to hoist onto deck. I discovered that this was the safest way of testing the catapults. After a while, in the mess, we became used to the 'pshshshsSHSHSHTHUD!' Then the jolt of the end stroke brake, and finally the 'sssssclunk!' of the return stroke of the huge steam-driven piston that was the catapult.

After lunch, they carried on, working up to full steam pressure. A few 'goofers', or spectators, watched from safe points until they got bored, and wandered off. I watched from the open safety of the Flag Deck, where I was out of sight of marauding Officers looking for any volunteers. Yet could see anything that might happen. I was hoping that the cat team would manage to shoot the tug with one of the 'dollies'. Some of the stokers were busy pumping fuel into the ship's tanks. Fleet Fuel Oil, for the boilers, and stuff called AVTUR, (AViation TURbine), which was similar to paraffin, for the aircraft engines. Later, a much more volatile stuff, called AVPIN, was pumped aboard. This was used for starting the aircraft engines. I was later told that it would spontaneously combust at body temperature! A lot of the Senior hands found reasons to be elsewhere about the dockyard while this stuff was being transferred. This left the ship to the few stokers involved in the task, and us nobodies, who knew no different, and had no value, anyway!

Later in the afternoon, two Westland Wessex helicopters arrived. They were our Search and Rescue aircraft. Space was hastily created on the back end of the flight deck, so that they could land, as they hadn't been expected until tomorrow. The deck was littered with cables, crates, paper, bits of rope, lengths of pipe, welding gas cylinders, and half stowed stores that had been dragged aft to make way for the cat testing! When the Wessex had shut down, and the rotors had stopped turning, crews swarmed over them, folding the

rotors down, and the tail-cone round, so that the machines would fit down the lift into the hangar. Hermes had two lifts. One was centrally positioned on the flight deck, but two thirds of the way aft, while the other was on the extreme port side of the angle-deck, the 'runway', forward of the island. Just aft of the after lift, four thick wire cables trailed limply across the width of the deck, spaced about fifteen feet apart. These were the 'arrestor' wires, which the landing aircraft were supposed to hook onto, hopefully preventing them from shooting off the front of the ship, and from falling into the water. After the helicopters had been whisked away, the flight-deck crews vanished, as they now had some of their own toys to play with. The crane hoisted the last of the 'dollies' back onto the lighter, in preparation for them being towed off. Below decks all the tangle of pipes and cables had mysteriously vanished... *-to be continued*

Eric M0HFF

NEW BASEBALL CAPS - NOW IN STOCK!

Our wiley Commodities Manager has recently acquired stock of this very good looking headgear -only a tenner -and very handsome it is too!

Doug Bowen GØMIU

Stop him and buy one -***you know you're worth it...***

BUILDING A HIGH VOLTAGE CAPACITOR

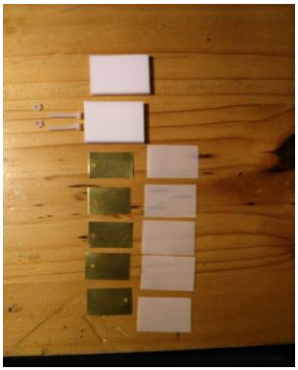
Paul Balaam G4LNA

This little project is an off shoot to a remote balanced antenna matching unit I wanted to build for my open wire lines. Previous to this I used an SGC-230 smart tuner, although this worked, I was aware that the antenna system was not in balance, but enough about that for now, that will be subject to another article.

Getting back to the capacitors, I wanted specific values for the matching unit, namely 10pf, 20pf, 40pf and 80pf for the low ranges and 100pf, 200pf, 400pf and 800pf for the high ranges and 1000pf for the final capacitor, this one I sourced from a pair of 500pf capacitors I had in the junk box. I didn't have any other capacitors in my junk box suitable and trying to source them in the UK was either difficult or if I did find them they were way too expensive, so in true amateur spirit I decided to try and build them. Using this formula below I was able to calculate the approximate capacitance I needed:

$$C = \frac{KA * (8.84 \div 1000)(n-1)}{d}$$

K is the dielectric constant of the material (PTFE 2.1)
A is the overlapping surface area of the plates mm²
d is the distance between the plates mm
n is the number of plates minus one
C is the capacitance pf



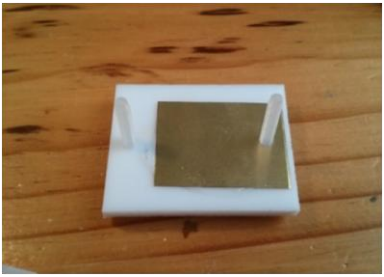
I say approximate because I found that the actual measured capacitance was always slightly higher than the value calculated, this was not a problem, more about that later. The materials I used were sheets* of PTFE or Teflon 0.25mm thick and brass shim 5 thou or about 0.13mm. Below are the parts I used to make a 120pf capacitor. The two end plates were 4mm thick PTFE sheet, you could use whatever is to hand, apart from some of the Nylon based material which can be lossy to RF, if in doubt do the microwave test on it. They comprise of 5 sheets of PTFE cut to size and 5 pieces of shim cut to size. The shim was easily cut using a pair of decorating scissors.

The actual size of the plate will depend on the capacitance you require, in my case I used a shim size of 30mm x 20mm which gave me an overlapping area of400 square mm. Use the formula to calculate the size. I used a spreadsheet and put the formula in that.

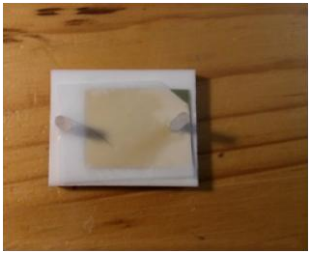
Drill and tap one of the end sheets, I used M3 x 200mm and spaced 30mm apart, again it will depend on the size of the plate. The other end sheet just needs M3 clearance holes drilled in it the same spacing.

The capacitor can now start to be built, I used a little blob of silicon grease between each layer, firstly to stop the capacitor plates moving around and to exclude air that is likely to form between the plates.

Start building by placing the brass plate over the stud and press down to get rid of any air that might be under the plate. If you are using anything else apart from PTFE as an end plate it might be wise to start with one of the small sheets of PTFE: first, then place the brass plate on top.



The next picture along shows the first of the PTFE sheets, just continue the sequence alternating the plates left and right until you reach the calculated number. Note that one corner of the PTFE sheet has been clipped to make it easier to solder the brass plate once the capacitor is finished.



Once all the layers are finished, solder all the plates on each side together and fit the remaining end plate. The capacitor is now ready for testing.

The capacitor tested as 170pf, deduct 10pf for the self-capacitance of the analyser that comes to 161pf. All I had to do was to remove the end plate and snip away bits of the top brass plate off until I arrived at the capacitance I wanted.

I am not sure of the actual voltage working of these capacitors, but the PTFE sheet was rated at 11.5kv DC so the HF AC would be somewhat less but more than enough for my 100W and maybe even good enough for our UK legal limit of 400W, but I can't test that because I don't have an amp.

If you need smaller capacitance just add more PTFE sheet between the plates, for instance for the same size plates I use 400mm square, 1mm or four sheets of PTFE between the plates gives 7pf.

The actual cost of the materials was around £30, and I had enough materials to make dozens of capacitors if I need them, so I think that is very good value for money, and I had fun making them.

*The PTFE sheet can be sourced from Direct Plastics.

Good luck and happy building!

73 Paul G4LNA

"No! You can't wear your bat-suit at the commissioning!"

DO I NEED ONE?

Tony Koeller M5AGB

Of course, -you do, and at this price, well really, no argument. And when you hear "What have you bought now?" In that exasperated tone you can say. "That box of bits will come in handy even if I do not know what they are, has become actually useful, and the chaos of the world is reduced."

So what is so good about it? Size? Price? Functionality? -all of that.
You checked your resistors with the multimeter, you checked your capacitors -the electrolytics made the old AVO kick, but that big analogue meter has long gone, you checked the inductors, well they were not open circuit, you checked the transistors (AVO on ohms across emitter collector short base to emitter and resistance goes down, it's a goodun. (which are the base, collector leads anyway). Now you will know the connections, the hfe, the capacitance. The capacitor value, and its ESR, even the tiny ones. The Inductors milli-, micro-, and Henry with resistance (now you can work out the permeability (or something?) of the core.)

So what's not to like as the internet says.
Well, you will have to find out for yourself all it can do. There will be no instructions included, but Google will provide. The ZIF socket to connect the component might be confusing if you don't know how it works (Lever Up = blades open, insert component ...Lever Down = blades closed, connection made). No on/off, so it goes through the start-up routine every time you press "measure," so it's a bit slow but at least you will never run the battery down by leaving it on, it auto shuts down.

Have I convinced you yet? No? you say, "Owmu chisit!"
Small ones about a fiver, big ones up to 20.

Where? E-Bay and Banggood, and Aliexpress, I expect
Search for MK-328 TR/LCR/ESR tester
Delivery? sometime soon, 1 or 2 weeks

Ethics. I believe the design originated in Germany as an open-source project and has been developed in China, so no worries, it is not a knock-off

Which to buy? I bought the open frame one first, I found it performed admirably, but I thought it might be vulnerable to damage. The cased one also has the advantage of having test leads as well as the ZIF socket but there are two screws to undo to install the battery. I use the big one, it sits nicely on the workbench looking ready for business.

Did I tell you what it was? Its A COMPONENT TESTER.

Tony, M5AGB

A FALKLANDS STORY

Dr Stephen Palmer VP8CIL/GM0EQS

The European Space Research Organisation -(ESRO)- Telemetry Station in the Falkland Islands 1969 - 1973

At the far western end of the town of Stanley, not far from Moody Brook, stand the remains of a now largely forgotten piece of Falkland Islands' recent history. A few concrete walkways and pads and a rusting steel structure resembling a twenty feet high ice cream cone are all that remain of a scientific project that was at the forefront of scientific research in the late 1960s. The ESRO Station, as it was known locally, was one of the early satellite tracking stations built. But the history of space research greatly pre-dates the building of the ESRO Station in the Falkland Islands: NASA had a complete chain of STADAN stations around the world long before that time. [including one on Ascension Island]. A substation already existed in Stanley at the ionospheric site, using NASA equipment.

The ESRO station in the Falkland Islands was part of a major international initiative to use earth orbiting satellites to understand outer space better and also how the use of satellites might improve worldwide communications. The ESRO Station at Moody Brook was built in collaboration with a number of European countries.

Photo 1 - ESRO 1967

News of a possible involvement of the Falkland Islands in a satellite tracking and observation programme was first heard in the Falklands Islands from a BBC broadcast in July 1960. In a letter from DSIR Stanley to DSIR UK, the Officer-in-Charge stated that while such a development would be welcome, there would be considerable practical difficulties to be overcome, namely the housing of staff, the provision of electrical supply, and the lack of local labour for construction of the satellite tracking station. On his return from UK leave the Governor expressed his enthusiasm of 'the idea of establishing a satellite observatory' in the Falkland Islands.

According to the European Space Research Organisation Convention, the purpose of the organisation was to provide and promote collaboration among European States in space research and technology, exclusively for peaceful purposes. The member states were: Belgium, Denmark, France, the Federal Republic of Germany, Italy, the Netherlands, Spain, Sweden, Switzerland and the United Kingdom – Austria, Norway, Iceland and Ireland were granted observer status.

Under the ESRO umbrella various centres and organisations were established; a satellite tracking and data processing centre (ESDAC) was established at Darmstadt, in West Germany; a tracking and telemetry network (ESTRACK) was established comprising of stations at Fairbanks in Alaska, in Stanley in the Falkland Islands, Ny Alesund in Spitzbergen and Redu in Belgium.


Photo 2 - View From The Rear

The Minister of State for Science wrote to the Colonial Office in 1964 noting that the UK was to become a member of the ESRO organisation imminently and that there would be a need for a network of tracking and telemetry stations to receive and handle data transmitted from 'space vehicles'. The letter requested that consideration be given to the locating of one of the tracking stations alongside the Ionospheric Radio Research Station of the D.S.I.R. (Department of Scientific and Industrial Research) already located in the Falkland Islands. The ionospheric station had been established in the Falkland Islands in 1946. 'Such a station [*i.e.* ESRO] located very far south would be of very great importance.' Accommodation would be required for the staff and a suitable site alongside the existing establishment would have to be acquired.


Photo 3 - View Across The Water

The first ESRO satellite was due to be launched in 1967 and everything would need to be in place within two and a half years. Some important decisions needed to be taken within three months.

The Governor of the Falkland Islands (called in this article 'the Islands') was consulted asking if the Falkland Islands Government (FIG) would agree with the proposal for such a project. Governor Arrowsmith replied on 21 February 1964 that 'the establishment of the station would be welcome.'

The first essential was the need for housing for the staff since there was no accommodation available locally. The Officer-in-Charge of the Radio Research Station had previously written to the Colonial Secretary about the general lack of accommodation in Stanley in December 1962:

'I realise that Officers-in-Charge here have been writing in gloomy terms on this subject ever since 1947, so I hesitate to do so again … recent developments have meant that accommodation of all types is becoming a major obstacle to Government [UK Government] plans and with the increasing size of our Sub-Station, we are now taking a substantial proportion of the available accommodation. The Governor is concerned about this … From our RAF men, we heard rumours of a substantial increase in satellite work here, and, although I am well aware of what fertile ground RRS [Radio Research Station] is for such talk, if there is any truth in it, I would suggest that the Falkland Islands Government is consulted as soon as possible.'

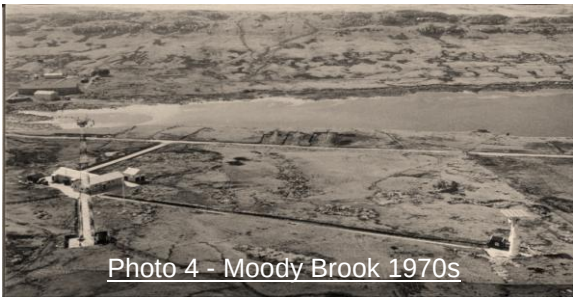


Photo 4 - Moody Brook 1970s

The Colonial Secretary replied that: *'At present the housing shortage is acute.'* The Governor also gave warning that there was no local labour available and thus construction would require outside contractors.

The acquisition of suitable land would not be a problem. The British Embassy in Buenos Aires on 25 February 1964 advised the Foreign Office that:

'The Argentines will no doubt protest about [the proposal] and that any publicity should be handled so as to avoid hurting Argentine susceptibilities more than necessary ... the new Argentine government is likely to adopt a more nationalistic stand than its predecessors ... it would be wise to stress the European as opposed to the British interest in this project and to lay emphasis on its scientific aspects.'

From the outset the Argentine interests tried to derail the Islands ESRO Station project; at an early technical meeting held in London in October 1965 it was noted that:

'… ESRO had been approached by Argentine scientists urging location of the station in Patagonia … There is as yet no indication that these approaches are backed by the Argentine Government, but this could well develop.'

Argentine 'sensitivities' continued to be a factor throughout the whole of the ESRO project in the Islands. In 1967 the British Ambassador in Buenos Aires said that the Argentine Foreign Minister had made it clear that:

'The Argentines were considerably put out by the fact that when already engaged in talks about the Islands we had pursued plans for the tracking station without telling them ... he [the Foreign Minister] looked glum and said that he had received no reply to his note to ESRO (on 20 December 1966) offering Rio Gallegos as a site [for the location of the telemetry station] ... In sum I expect that the Argentines will be obliged to accept situation but will continue to be huffy about it.'

Photo 5 - Command Antenna & Tx Hut

The Argentine Ambassador in Paris wrote to the Secretary General of ESRO in 1967 formally protesting about the location of a telemetry station on the Islands. The Foreign Office was anxious to reassure the Argentine Government:

'The Argentines were informed last year… that [the project] does not introduce a new element or in any way conflict with the policy of HMG have adopted towards the Falkland Islands question in their bilateral discussions with Argentina.'

It soon became apparent that a dramatic improvement in our telecommunications between the Islands and Europe would be needed to fulfil the requirements of the project. The system that was in use in 1964 used hand-coded messages sent via Morse code and a low power Tx; atmospheric conditions limiting availability of the link to the UK to four hours per day. ESRO would require a 24 hour link with the UK and Germany that would use multi-channel teleprinters.

ESRO HQ staff soon cooled to the proposal to establish a telemetry station in the Islands when it was realised that current radio communications with the Islands were poor and that the arrangements for the regular collection of the telemetry magnetic tapes from the telemetry station for onward despatch to Europe were '*hardly adequate*'.

'The obvious alternative would be to be to place our station in Southern Chile or Southern Argentina ... the installation of a teleprinter link from such places would present no special problem.'

ESRO asked the Foreign Office if there would be any political objections to moving the station from the Islands to a non-member state in South America. Decisions needed to

be made urgently. The Foreign Office replied that they would have no objections to wherever ESRO decided to locate the station – provided that ESRO was entirely responsible for all the cost of the project. The French government expressed strong misgivings about locating an ESRO telemetry station in the Islands:

'*Her Majesty's Government seemed to want to have its cake and eat it. They could not expect ESRO to pay large, indeed excessive, sums for a station to be wholly owned and controlled by Her Majesty's Government.*'

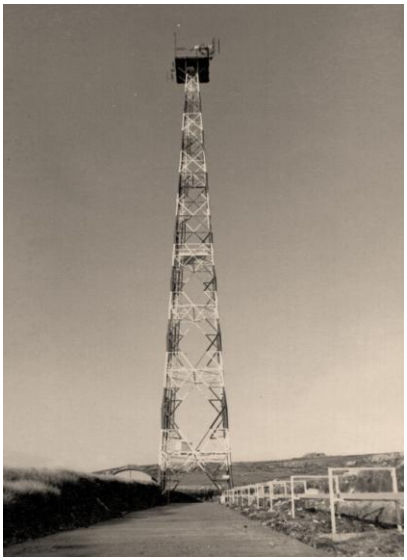


Photo 6 - 40m Calibration Tower

The cost of providing larger HF transmitters (with RF power up to 7.6kW) and rhombic directional aerials plus all the ancillary equipment to provide the ESRO project and also FIG with two channels of 24hr direct communications with the UK was estimated to be £63,000. The GPO, advising HM Government, considered this to be the minimum required for adequate service. The question now arose - how much would FIG be prepared to contribute towards this cost – or would ESRO be required to bear the whole cost? Governor Haskard replied that Executive Council (ExCo) and Legislative Council (LegCo) were agreeable to the proposals '*but much remains to be investigated*'.

ESRO continued to press the UK Government for a speedy conclusion to discussions on a draft agreement; the Colonial Office explained on a number of occasions, that any final agreement must await the views of the Governor and the agreement of FIG. ESRO were clearly frustrated by this and regarded the process as being too long-winded. The Colonial Office insisted that ESRO be responsible for any capital costs. FIG would only be responsible for the provision of the communication links with UK.

The Ministry of Defence was consulted about the HF communication problems and their possible interest in improving the radio links. They were informed that: '*The present communication services of the Falkland Islands are antiquated, and it is necessary for the FIG to give consideration to providing improved facilities in the near future*'.

There was some frustration at ESRO about the length of time that it took to consult the Governor and FIG and to obtain FIG's agreement; ESRO and several UK Government departments regarded the consent of the FIG as merely a formality and believed that FIG was acting simply as a cipher for the UK Government. They were unable to understand how slow communication was with the Islands (*i.e*. sending coded

telegrams and despatches by Morse code) and also that the UK Government was only acting as the 'postman'; the FIG had to approve the proposals and pass the necessary legislation. At one stage the Science and Research Council accused the Colonial Office of being non-cooperative because of all the delays in obtaining agreement from the Islands. Governor Haskard complained that the FIG could not agree to the proposals until they had detailed plans and accurate estimates of the costs involved.

By December 1965 ESRO had agreed not to try to relay communications via Barbados (as it had originally planned) but to work direct with the UK (and then thereafter to Germany to ESRO HQ). ESRO also accepted the use of reduced speed of transmission *i.e.* 66 words per minute. ESRO agreed to share the channels (known in the final agreement as *'the Circuit'*) with FIG and British Antarctic Survey. The GPO withdrew its proposal to assist with the setting-up of the new direct UK/Stanley HF teleprinter link; Cable and Wireless (C&W) sent representatives to the Islands and they established the new system of communication with Germany via London. The formal agreement between C&W and the FIG was not signed until January 1969 - although the C&W team arrived in the Islands eighteen months earlier to ensure that the equipment and aerials were speedily installed. The costs were initially paid by the FIG in ten equal annual payments. The costs of all civil engineering work were paid by the Science and Research Council (SRC) – but once again this was paid, in the first instance, by FIG taking out a loan from the Savings Bank. The first Cable and Wireless Manager states that:

Photo 7 - TLM Antenna Before Demolition

'I arrived in Port Stanley with my team on 13 August 1966. The other married member and I occupied the Dorran houses at 1 and 2 Racecourse Road. The rest were already occupied by then. The rest of my team were aerial erection specialists from a Company called Cubro and Scrutton and were billeted in the town … Our station, with new transmitters and error correcting teleprinter equipment along with a little Receiving Station at Felton Stream (just past the seaplane hanger) with diversity receivers and rhombic aerials was complete and working by January 1967 … The original service was indeed morse operation and when our system was commissioned we had a full speed channel for ESRO and two sub speed channels for the British Antarctic Survey and the public service channel. It was at a time of maximum sunspot activity and the

north-south radio route was very good. So much so that we opened the first telephone service to London while I was there.'

Good radio communications were the key to success of the venture. The ESRO Station Manager commented:

'*Communication with our operations control centre (OCC) in Darmstadt, Germany was a key aspect of our operations. We were scheduled by telex from there and reported our activities to them by telex. The scientific data was downloaded from spacecraft, on our command, recorded on magnetic tape, boxed securely and sent monthly by ship to Montevideo and thence to Darmstadt by air.*'

Governor Haskard continued to be concerned that the Colony would be 'out of pocket' after the project was completed. He pointed out to the Colonial Office on several occasions that although everyone agreed that the old communications system was out-dated and in need of replacement, it had been funded from FIG funds alone. The running costs of the new telex system would be much higher than the old system. Executive Council was supportive of the project but they were also very concerned about the long-term financial implications. An ExCo Meeting on 19 July 1968 confirmed the initial loan from the Savings Bank of £51,000 'provided that the British Government gave a categorical undertaking to underwrite the loan in the event of ESRO being unable to repay it.
The Colonial Secretary at the time recalls that he was:

'Surprised how easily the Falkland Islands Executive Council accepted what came about; none of us had any understanding of what ESRO was all about, but the proposals seemed to offer some guarantee that, at last, the UK Government was noticing us and, consequently, this might help at keeping the Argentines at bay … In the Interregnum between [Governor] Arrowsmith and [Governor] Haskard, when I was acting Administrator [i.e. Acting Governor], the Argentines had overflown us several times and the Belgrano had come up to the three-mile limit … the ESRO proposal seemed good, and perhaps helpful.'

The whole ESRO project was subject to significant delays as the result of disagreements between the UK government and its European partners in the project. At the heart of the delay was the dispute about the rocket launcher that would be used for the first stage. The UK government favoured the use of the British-made *Blue Streak* whereas the French government insisted on the use of its own system. The costs of the launcher spiralled from £70 million in 1961 to £158 million in 1966. *Blue Streak* was very well engineered but was underpowered for putting satellites into geostationary orbits. *Blue Streak* was only capable of putting satellites into medium altitude orbits (also known as low-earth orbits). In the event low-earth orbiting satellites were used in the first instance by ESRO (using US-made *Titan* rockets) – and these were the satellites that were tracked by the station in the Falklands Islands. But the initial programme was overtaken by the pace of scientific developments and further

delays occurred as the result of ESRO's later desire to place much heavier astronomical satellites into orbit.

Both the French and UK governments had serious reservations about the usefulness of the initial ESRO programme and the rapid escalation of the costs. The French government also insisted on the strategic necessity of developing a powerful European rocket launcher; the UK government was more concerned with developing satellite technology and was content to use US rocket facilities to launch the satellites. Early in 1968, mainly as the result of the failure of the French made second stage of the rocket there was a major crisis of confidence with both Governments and at ESRO - this resulted in yet more delays.

During this period of engineering 'difficulties' the negotiations involved in the final acceptance of various contracts and agreements between the FIG and ESRO continued for another three years. There was a great deal of tortuous discussion about who would pay for what. The FIG wanted assurance that '*they would not be out of pocket*' and that the profits from the new communication system would be fairly shared – whereas ESRO wanted to avoid paying for the cost of the new communications system in addition to the costs of erecting and running the telemetry station. '*Unfortunately, negotiations have taken an exceptional amount of time*.'

The Agreement between ESRO and FIG was finally signed in August 1969 – shortly before tracking commenced at the four telemetry stations. At the last moment ESRO had considered withdrawing altogether from the proposal to build a tracking station in the Islands because of press reports that the Islands were to be ceded to Argentina. 'ESRO have asked what safeguards there would be to the main agreement between HMG and ESRO, and also for the Telecomms Agreement with FIG, in the event that the Falkland Islands would be ceded to Argentina. The FCO swiftly denied that the Islands were going to be ceded to Argentina:

'*the transfer of sovereignty of the Falkland Islands does not arise at this time.*'

This denial did little to calm the nerves. The final cost of the civil engineering part of the ESRO telemetry station in the Islands was £49,643 – slightly less than the estimate. The SRC used its own contractors for the work of constructing the telemetry station. The Dorran Construction Company from Perth, Scotland, designed and built the ESRO Station buildings, the Cable and Wireless transmitter and receiver buildings and all the accommodation units. The so-called '*Dorran Houses*' remain a distinctive feature of a number of houses located at the west end of Stanley to this day. A concrete road was laid to extend Ross Road West to the ESRO Station; this road is still currently (2014) in use. ESRO also paid the full cost of the HF communication circuit plus the telemetry tracking equipment and associated aerials to a total of £340,000. ESRO agreed to pay an annual rent for the use of the land and facilities.

Much of the construction work of the telemetry station was done by UK-based specialist contractors, but the house building was completed by a mixture of UK labour

and locally recruited labour. Several farm managers wrote letters of concern to the Governor expressing their strong disapproval of the practice of recruiting local labour because the high wages offered attracted farm labourers and the farms could not match the salary levels available. The Manager of Roy Cove (Sidney Miller) – also a senior LegCo Member wrote:

'*These things soon get known in the Camp and who can blame any farm employee when such prizes are dangled in front of them. As a farmer I am still deeply disturbed by the present state of affairs, and I expect the Government to be equally disturbed and to do something, and not just shrug their shoulders and accept things as they are.*'

In reality the problem was minimal and the labour situation in Camp was satisfactory; the Acting Colonial Secretary wrote in October 1966:

'*the rumours had greatly exaggerated the position. Executive Council noted the position and asked the Contractors to 'curtail as far as possible the employment of local labour because of the urgent need to maintain an adequate labour force in the Camp.'*

One of the early appointments that ESRO made to staff the new Station in the Falkland Islands was Victor Brown. He comments:

'*In 1965 I answered an advertisement in the local newspaper for work in the Falkland Islands for the Radio and Space Research Station. I was interviewed by Arnold Wilkins and offered a post in the Islands. Firstly, I had to work for a year at Winkfield out-station, one of the NASA STADAN chain. During this time, I went for ESRO courses in Delft and for the Aerial construction in Milan. I arrived with my family in the Falkland Islands in November 1966. The ESRO station was not ready and we were allocated to work at the East station [the ionosopheric station] by Don Mortimer the OIC… There was a satellite data acquisition and tracking facility there using a Taco receive aerial and a Slough built Isis transmit aerial. During 1967 Don Mortimer left and we had a 3 month gap before Gordon Johnston came out. I was put in charge of the East station for that time. During this time, we covered the WRESAT launch by Australia. After a year the ESRO personnel went to the West station [the ESRO Station] to work. I took over specialising in the PCM [Pulse-code Modulation] equipment. We left the Falkland Islands in November 1968. We [ESA] had not launched a satellite by the time I left.*'

The Ionospheric station in Stanley was first used to track satellites from the Canadian National series of 'Top-side Sounder' satellites, the first of which was *Alouette 1* launched in 26th April 1962, followed by others. The equipment including tracking antennas were sourced from NASA.

The telemetry and command tracking station [in Stanley] was linked to the NASA STADAN (Satellite Tracking and Data Acquisition Network) and known as SOLANT JJ. The Canadian Topside sounders preceded the UK National Satellite series but I suspect the tracking and command facilities were installed to support both of the

programmes at the Stanley site when the UK needed to create an element of its own tracking network Three stations were built, the Falklands Singapore and Winkfield (a NASA STADAN station operated on behalf of NASA by RSRS from Ditton Park) Most of the staff posted to Stanley for Satellite duties 'trained' before departure at Winkfield (near Ascot).

Photo 8 - Toppling TLM Antenna

The Station Manager of the ESRO Station in the Islands from July 1967 (when it first became operational) until July 1970 was Frank Stainer. He worked for the Ministry of Defence but was on loan to the Science Research Council (SRC) for three years. Stainer was given extensive training in Europe in early-1967 for his role. He comments: 'The station technical staff was scientific staff of the SRC, and support staff were locally recruited. The number varied according to shift requirements and at its peak was 14 technical staff.

The ESRO Station in Stanley was a happy and efficient organisation. But life for the expatriate staff living far from the UK was not without its complexities:

'Bearing in mind the location of the station and the resultant domestic and environmental issues a major concern was the general aspects of living and working there. In such a small community there was close contact in all areas with little personal privacy. Of course this led to some difficulties but it did have the positive effect of good mutual support and assistance in all areas. There are many examples, but it is an indication of this that a group of us who met and worked in various roles in that period maintain contact and meet regularly after 43 years!'

Initially ESRO carried out a modest programme of sounding research on the ionosphere using the British-made *Skylark* rocket. There were 89 launches from Sardinia and Norway of this rocket –this research project was devoted to investigating the ionosphere. Immediately after the construction of the first ESTRACK telemetry stations (including the station in the Islands) in late 1969, satellite tracking began. ESRO launched two small satellites into low-earth polar orbit, each carrying five experiments on-board. ESRO1 and ESRO2 (renamed *Aurorae* and *Iris* after launching) were non-stabilised and in low-earth orbit around the Poles. These satellites studied the polar ionosphere and cosmic rays. Rocket launchers purchased from the USA were used. HEOS1 and HEOS2 were launched a few months later; they were also small satellites, but they had highly eccentric elliptical orbits. The ESTRACK telemetry stations were not designed for such orbits and this meant that they could only track them for part of their orbit. It was these first European satellites that the telemetry station located in the Falkland Islands tracked, downloading their data. ESRO also

planned for a large astronomical satellite (in which the UK was particularly interested) but it was abandoned because of the projected costs.

The ESRO tracking stations in the Islands and at Spitzbergen were closed at the end of 1973: 'for scientific, technical and in particular economic reasons. The termination of the project in the Islands was unexpected and it caused FIG to be concerned that without ESRO's presence in the Islands the C&W operated telecoms link might not be able to be maintained. In the event the Governor advised the Foreign Office that ExCo and the local C&W representative were confident that local staff could be obtained to man the radio station and that a saving of £25,000 per annum could be achieved. It is clear from the records that C&W were keen to maintain the telecom link for FIG. The local C&W representative advised the Governor that 'in a spirit of goodwill' it would be possible to re-negotiate the agreement to provide radio facilities from the Falkland Islands to the UK.

Photo 9 - Cal. Tower Demolition

The sudden closure of the ESRO Station was also a surprise for the ESRO staff in the Islands. The Officer in Charge in Stanley (GM Johnston) only a few weeks earlier had confidently broadcast on the local radio station in November 1972 that:

'A new long range satellite (HEOS) may be launched next year with its closest approach over the South Pole. Space Research in Stanley has a very definite future and that we shall be here for quite a while yet.'

In February 1974 a Ministry of Defence team visited the Islands to inspect the condition of the military buildings at Moody Brook that accommodated Naval Party 8901 and the hovercraft unit. The team were to consider possible alternative sites for a new barracks and offices. Some of the buildings were in a poor state. The MoD team also met the local Officer-in-Charge of ESRO to consider the purchase of the ESRO buildings and houses with a view to moving the Naval Party to this more modern accommodation. The main building was valued at £16,350 and the houses for £9000 each. The purchase of the ESRO assets in the Islands by the MoD was eventually ruled out on the grounds that moving all the other buildings (including the Hovercraft hanger) to the ESRO site would be too expensive. The MoD team also noted that with the proposed development plans for Stanley that included building a new runway, school and alginate plant, there would be a significant need for accommodation for the UK contractors:

'*If the development plans go ahead, competition for these houses [i.e. ESRO houses] will be brisk, and indeed we formed the opinion that an offer had already been made.*'

Of the four original tracking ESRO stations built – only the one at Redu in Belgium remains operational today (2014).

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Conclusion

Photo 10 - ESRO

Despite all the initial practical problems in the construction of the ESRO Station, the technical problems involved with establishing a pioneering scientific project in a remote location, the lack of a modern infrastructure to support the project and the political pressure applied by the Argentine government, the ESRO Station in Stanley played a significant part in a major scientific achievement. During the years that the station operated, a vast amount of scientific data was collected. Between 1965 and 1972, over 11,000 satellite passes were observed and tracked – and nearly 2,500 miles of magnetic tape was used to record the data. The ESRO Station cooperated regularly with the American NASA organisation and collected data for them from this unique geographical location.

One of the most important consequential effects of the arrival of the ESRO Station in the Islands was that FIG, FIC, BAS and the local populace had a significantly enhanced radio communication system with the outside world – and all paid for by a European agency. The western end of Stanley was transformed by the building of sixteen new houses with their necessary infrastructure and services. Over the next few years these houses were released on to the open market and they provided much need additional local housing.

The Falkland Islands remains a good location to conduct radio research; the Rutherford Appleton Laboratory (RAL) Ionospheric monitoring station continues in operation not far from the old ESRO Station location, the British Antarctic Survey's Super Dual Auroral Radar Network (SuperDARN) is part of an international radar network for studying the upper atmosphere and ionosphere which operates from a site outside Goose Green, the BAE Systems ionosonde station operates at Mount Pleasant military base (and is linked with a similar station on Ascension Island) and a ground

station for the European global positioning system '*Galileo'* is currently (2014) under construction (by Cable and Wireless) at Mullet Creek.

In the light of the history of dealings between the UK and Argentine governments during this period it is not surprising that the suggestion of the ESRO Council that Argentina might be approached to take over the running of the station, and to purchase the equipment, initially received the enthusiastic support of the FCO. This suggestion came as the result of an approach by the Argentine Ambassador in Paris to the ESRO Council. The proposal was initially fully supported by the FCO, but the idea was later rejected after strong opposition from the Governor and the Executive Council of the Islands. But, as with so many matters concerning the discussions with the Argentine Government about the sovereignty of the Islands at this point in the Islands' history, there was some ambivalence about this matter at the Foreign and Commonwealth Office, where the prevailing view at the time was: '*the time is not yet right when we can be sure that there would not be friction surrounding the residence in the Islands of Argentineans*'.

Acknowledgements:

The Shackleton Scholarship Fund, who made the research visit, in 2014, to the Archives in Stanley possible
Tansy Bishop, National Archivist, Jane Cameron National Archives, who first suggested that this history be written; in her inimical way she suggested that "it ought to be done before the eyewitnesses 'pop their clogs'"!
Leona Roberts, Stanley Museum Curator
Sir Cosmo Haskard, former Governor of the Falkland Islands
W H Thompson, former Colonial Secretary of the Falkland Islands.
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Frank Stainer, former Station Manager ESRO Stanley.
Victor Brown, former staff member of ESRO Station, Stanley.
John Wright, former staff member of ESRO Station, Stanley.
Rupert Thorogood, the first Cable and Wireless Manager in Stanley.

As always the help of those listed above is gratefully acknowledged, but any errors or omissions are entirely my responsibility.

Dr Stephen Palmer FRGS, FLS

RIG PROJECT – DC SUPPLY CABLING

Jürgen Timcke HB9ANE

Cable connection: mechanically robust and electrically safe

Dipl.-Ing. Jürgen H Timcke - www.juergen-h-timcke.ch jhtimcke@gmx.ch

Starting position
Like the one or other TX/RX of different manufacturers also my new TX/RX, the YAESU FT-450D, has no built in power supply. For its operation a DC-voltage of V = 13,8 [V] is required and during „transmit" flows a current of I = 22 [A] at a HF-output of P = 100 [W]. Part of the delivery was a cable to connect the TX/RX with an external power supply.

Power supply
Comparing the technical data of different power supplies of various makes I decided on the PSU-1250 (made in China) with a DC output voltage of U = 13,8 [V] fixed, a continuous output current of I = 40 [A] and a maximum output current of I = 50 [A]. Regarding power supplies (made by myself or bought ones) I prefer a certain oversizing referred to the current loading capacity.

Cable
The cable to connect the TX/RX with the power supply has at the one end a plug (TX/RX side) and at the other end the insulation is removed of a length of L = 50 [mm] and the two wires are tinned, see figure 1. These two wires are to connect at the power supply. The black case in the cable contains the fuses.

Connection of the power supply
At the rear of the power supply are two threaded bolts with insulated nuts. The threaded hole of the last one is in a metallic insert. For the connection of the wires there are basically two possibilities:

< direct clamping of the wires under the nuts

or

< solder of the wires on cable lugs (with slot or hole) and clamping them under the nuts.

I could not decide on one or other of these methods of attaching the wires and realized therefore, my own design.

My design
Basically I do not like 'flying cables' on my station. To avoid this I designed and built a corresponding cable holding device. The two parts of it are:

< the cable bushing (made of Pertinax, s = 6 [mm] thick)

< the two contact pieces (made of brass plate, s = 1 [mm] thick).

These two parts can be seen in figure 1. The cable bushing is U-shaped to avoid that the opening for the fan is too much covered.
Each contact piece has four holes of d = 1 [mm] (can be seen in figure 1) to fix the tinned wires with thin copper wires before soldering them on the contact pieces (can be seen in figure 2). In each of the legs of the U-shaped cable bushing is a through bore of d = 3.1 [mm], which is on the cable inlet side over a depth of t = 3 [mm] only Δd = 0.1 [mm] greater than the diameter of the cable insulation, this was in my case a diameter of d = 4.1 [mm]. Why this enlarged bore?

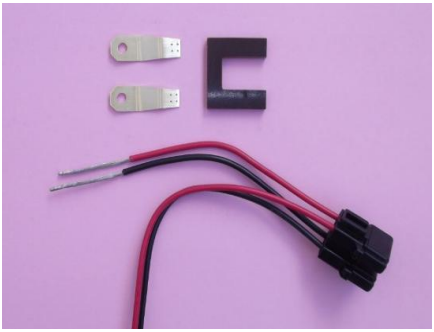


Figure 1 - Cable & Cable Holder Parts

Between the contact pieces with the soldered on tinned wires and the cable bushing is a distance of x = 1 [mm] to allow them a little movement with regard to their assembling at the threaded bolts.

Figure 2 – Assembled Cable Holder

Now to the explanation of this enlarged bore: in this bore the insulated cable is guided, but it can move out only y = 1 [mm], corresponding to the distance x between contact piece and cable bushing. Because of that the insulation of the cable is always inside the cable bushing! Figure 3 shows this in detail (only the half of the cable holding device is presented).
The finished cable holding device, is assembled and attached to the power supply, as shown in figure 2.

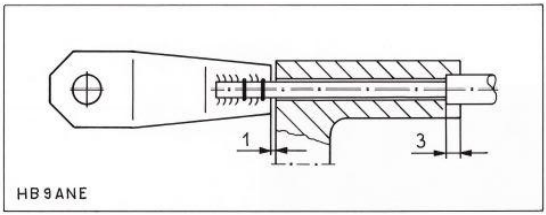


Figure 3 - Thumbnail of Half of the cable holder

Photography and drawing: Author

Layout: Rolf Rüttimann

Jürgen HB9ANE

FAREWELL TO HMS OCEAN

www.royalnavy.mod.uk 27/03/18

Her Majesty The Queen today officially bid a fond farewell to HMS Ocean as the Royal Navy's 'Mighty O' was decommissioned.

The Queen was welcomed to Her Majesty's Naval Base Devonport with a 21-gun salute in her honour. The Queen, who once launched the ship as the ship's sponsor, was guest of honour at the ceremony. She was joined by the head of the Royal Navy, First Sea Lord Admiral Sir Philip Jones and more than 500 of the ship's company, their families and affiliates of the ship. During the decommissioning ceremony, The Queen inspected a parade of the ship's company on the jetty and observed a flypast of military aircraft as she boarded the ship. The crowds were entertained by music from the Royal Marines Band.

The ceremony ended with the Royal Navy's White Ensign being symbolically hauled down from the ship's main mast.

NAVY AIRCRAFT IN THE NEWS!

The Ministry of Defence say the first 9 of the UK's currently 15 strong F-35B fleet will arrive at RAF Marham in the Summer.

It is understood that the jets will be supported on the move by Voyager tankers.

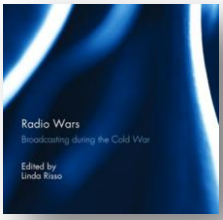
-George Allison
(© UK Defence Journal, April 20, 2018)

BOOKS CORNER

New RadioUser Series on Spy Radio

From May 2018, RadioUser magazine will begin a new series on the role of Radio During the Cold War. Our authors will look at 'spy' radio, numbers stations, misinformation, psychological warfare and propaganda in radio. *RadioUser* carries a review of the book **Shadows of the State** by Lewis Bush in its April issue. (www.radioenthusiast.co.uk)

Radio Wars - Broadcasting During the Cold War



David Harris examines a captivating collection of **essays covering the social and political roles of** radio broadcasting and of alternative channels of information in the Cold War, in both Western and Eastern Europe. Author: David Harris The volume's focus is on broadcasts aimed at Eastern Europe and the Soviet Union during the Cold War.One of the key challenges in trying to evaluate the broadcasts of such stations as the Voice of America (VOA), Radio Free Europe (RFE), Radio Liberty (RL) and the BBC is whether they actually helped to bring the Cold War to an end.

THE RADIO AMATEUR

Doug Hotchkiss G4BEQ

Ask most people of our vintage "What is a radio amateur" and it's a fair bet that the answer will contain a reference to Tony Hancock, and what a delightful programme "The Radio Amateur" was.

Amateur radio as a hobby is as old as radio itself, and since there was no radio professionals in the beginning it is arguable that Henry Jackson was the first Radio Amateur. You will note that I did not say Marconi. Who was Henry Jackson? Would you believe that he became an Admiral of the Fleet?

Henry Jackson joined the Royal Navy as a cadet in 1868. He became a torpedo specialist which gave him a good introduction in to electrical engineering which qualified him as an associate of Telegraph Engineers (IEE). In 1895, as a Captain, he was appointed in command of the Torpedo Training Ship, HMS Defiance, an old wooden hulk moored at Devonport. Jackson had been fascinated with the discovery of electromagnetic waves by the German scientist Hertz and thought they might have potential as a system of signalling over long distances. Whilst in command of Defiance he seized the opportunity to extend his research into the generation and detection of electromagnetic waves and succeeded in sending Morse code over a distance of 50 yards from one end of the ship to the other in August 1895. He was totally unaware that at roughly the same time Marconi was engaged in similar research in Italy. Marconi had sought the financial assistance of his Government to support his experiments, but was refused. He then decided to come to England in 1896 to try his luck here. On arrival, to safeguard his work, he took out a patent in June 1896.

Admiral of the Fleet Sir Henry Jackson

Had their Lordships been quicker on the uptake a similar patent could have been taken out on the basis of Jackson's achievements in HMS Defiance nearly a year earlier?

Had that been so then it would have gone down in history as Jackson being the inventor of radio and not Marconi. Jackson in would appear bore no malice or ill feeling about the way things had happened and he and Marconi became great friends and collaborators.

In June 1897 Jackson, by his own experiments had demonstrated to the higher echelons of the Navy that operations by wireless telegraphy between units of the Fleet was not only feasible but would bring about hugh benefits in tactical and strategic use. However, the Navy being what it was, and it has never changed, sent him off for two years as Naval Attaché to Paris. This separated him from his wireless interests whilst Marconi forged ahead with his, but still with Jackson supporting him from Paris.

Returning home on completion of his tour of duty, he was given command of HMS JUNO, which, with two other ships was fitted with wireless apparatus. They were sent on exercises against the rest of the Fleet to test the value of wireless communications. They won hands down. Wireless telegraphy had arrived and ordering as well as fitting of equipment and training of operators now began. In 1901 Jackson was elected a Fellow of the Royal Society (FRS) the highest scientific honour.

He went on to become First Sea Lord and retired to Hayling Island in 1920. He continued to operate as an amateur radio licensee until his death. During his retirement he took up the post as President of the Radio Society of Great Britain (RSGB), which is the National Society that represents all UK radio amateurs. Today the patron of the RSGB is the Duke of Edinburgh. KG.KT.

In recent times other famous amateur radio operators have included King Husain, Said Al-Said, Sultan of Oman, Juan Carlos, King of Spain, the Presidents of Argentina, Italy and Nicaragua, actor's Lord Rix and Stewart Granger and for good measure Helen Sharman the first British astronaut. There are more than 60,000 radio amateurs in the UK and two million worldwide.

© Gigapacket

Amateur radio should never be confused with Citizens Band radio which allows any unqualified member of the public to chat to friends over short distances using low power equipment on very limited frequencies. It should also not be confused with eavesdropping into the commercial uses of radio. The most famous case of this was the “Diana tapes". Unfortunately the Press always refer to anything concerning radio activities, such as the tapes mention, that is not commercial, as being carried out by "radio hams". The term "ham" originated in the States. The American habit of sticking a very aspirant 'H' on what they call 'swanky talk', together with the shortening of words, resulted in members of the amateur theatre, with their propensity to overact, truncate words, and adopt a posh accent, became known as Hamateurs and with the usual shortening of words it became HAM, for actors who went 'over the top' with their performances. Thus Ham is now an accepted term used in lieu of anything amateur, and not only in the theatre

Radio amateurs are qualified radio operators. The licence allocates a call sign, lists the rules under which radio amateurs are allowed to transmit. This includes the permitted frequencies - there are 25 bands of frequencies available, depending on the

class of licence held, covering the short waves, VHF bands and Microwaves. Transmissions can be made in Morse code (cw.), speech, electronic data and television pictures. They are not allowed to broadcast music, commercial or political messages. Radio amateurs are the only users of the radio spectrum who are permitted to build their own transmitters. This is because they are exam-qualified. Today, Most amateur radio stations have a mix of home-built gear and commercial equipment.

In the 1920's amateurs were allowed to use frequencies that were thought to be unusable or of little value commercially. We all have a lot to be grateful for as it was these pioneering amateurs who, through their efforts and experimentation, opened up the air waves to what we know them today. Nowadays the BBC's overseas service is the envy of the world of broadcasting. However, the origin of short wave broadcasts belongs to Gerald Marcus, a licenced amateur, who started his wireless experiments before World War 1. He first came to the notice of his contemporaries when he maintained contact with the Royal Geographical Expedition in Brazil from his home in Sussex. A remarkable achievement in the 1920's. His early work was carried out using CW. (Morse), but he soon became interested in the value of broadcasting speech and music overseas. He obtained a special licence from the then GPO to experiment on these lines. He was soon to be heard all over the world on 32.5 metres. He called his transmissions the "Empire broadcasting service". Having proved to all that it was possible to transmit across the world, it had never been done commercially, and the Government stepped in and closed him down removing that part of the radio spectrum from amateur use. The right to this frequency was handed over to the BBC, and hence the Overseas Service. Amateurs were also banned from transmitting music and other regulations were introduced.

Anyone who passes along the South Coast in the future should go into the church yard at Bosham. There is a plaque there in his memory. (Inside the Church is also the tomb of Canute's daughter. He never did get the tide to stay out!) There is also a lot of the equipment Marcus used, preserved at the Chalk Pit Museum, Amberley in Sussex. Each year the Chichester Amateur Radio Club obtain a special broadcasting license to work the world over a weekend, usually in July to remind people of his great contribution to radio broadcasting.

In 1932 the RSGB contacted the armed services and suggested that it might be prudent for them to develop volunteer reserves of radio amateurs as they would benefit enormously from this body of trained operators. The Royal Navy responded immediately and formed the Royal Naval Wireless Auxiliary Reserves. The Royal Air Force finally responded in 1938 and formed the Civilian Wireless Reserve: the Army never did get round to it. Hence when war broke out the Navy and RAF was well placed to immediately expand their communication ranks with these trained operators who had already been indoctrinated into service requirements.

The BBC recently produced a series on Bletchley Park and in it they showed how the enigma codes were broken. What was not shown was that all radio transmissions originated by the Germans were constantly monitored. This was a hugh task and here again the radio amateur was used. At the start of WW2 there were some 4000 amateur licences issued in this country. Many, as previously explained, had offered their services to the Reserves and were obviously some of the first to be called up. Many were retired or in reserved occupations. Lord Sandhurst, who was in fact a radio amateur, was given the task by Churchill to set up the radio monitoring service to listen to all enemy broadcasts. He immediately recruited all available amateurs not in the services, as Voluntary Interceptors. (V.I's). Like the Bletchley Park personnel they were required to sign the secret act and were committed to secrecy for life. The advantage of this system was that they were spread the length and breadth of the UK. Radio propagation being fickle meant quite often signals could be read in London but possibly not in Cardiff or Glasgow etc. With the V.I's is so wide spread it meant that a signal would always be read regardless of the conditions. Those V.I's in reserved occupations would, on returning home from the days toil, retire to their radio room and spend several hours of day/night listening and logging all signals heard. These would then be sent to Box 25 Barnet, a collecting point for Bletchley Park. There was a security problem for the V.I, everybody was doing their extra bit in some way or other, neighbours wanted to know why they were not in the Home Guard or doing something like Wardens or fire watching at night. In some cases their employers' were suspicious. In one known case a V.I. was marched off at revolver point to the local army camp as morse signals had been heard coming from his house. In such cases BOX 25 in Barnet had to be contacted to smooth the waters.

Royal Navy B28 Receiver

Radio amateurs are frequently called upon to assist in times of disaster. Their compact and simple equipment is frequently more flexible in an emergency than today's complex commercial gear. Help has been provided at earthquake sites, train disasters, plane crashes, the list is endless. During the Falklands war amateurs on the Island were in constant touch with their friends in England and passed on much vital information. Amateurs in this country at that time had direct phone contact with the War Office so that information could be passed both ways. Later in Bosnia, and in Yugoslavia, amateurs quite often provide the only communications to and from some of the besieged towns as well as passing information to the outside world.

On a personal note I first became licensed as a "ham" in 1968. I had dabbled in that area several years before but had never taken my City & Guilds. What made me take the plunge was my enforced 2-year stay in Haslar, devoting my body to improve medical science. Near the end of my first year there I was informed that the very best I could hope for was a permanent seat in a wheelchair. On receiving this news I began

to consider what my options were now that it appeared all active leisure pursuits would be out of my reach. It was then I thought of amateur radio. An ideal hobby, I could sit in my wheel chair and work the world, meeting all sorts of interesting people, letting my mind wander across the airwaves and forgetting my disability. I wrote off to the RSGB and asked them to supply me with all the information on how I could obtain my licence. They sent me a wealth of information and also supplied me with the books I would need for my studies. When I had prepared myself to the standard required to sit the City & Guilds they arranged special dispensation for me to take the exam from my hospital bed. Being a Boatswain of course I beat the system and finally and after two years, was able to walk out and get back to normal fitness. However, I was now a fully qualified radio amateur with an A licence. My only regret was that I had not done it years before. For the remainder of my time in the navy I never went anywhere in the world without an amateur waiting for me on the jetty. I would always work the next port of call and make this arrangement. On arrival I would be taken home, entertained, and given full use of that person's radio equipment. Two things would now happen. Firstly I would call up a near neighbour of mine, a fellow amateur, and tell him where I was etc. He would give my wife a call so that we could update each other on the latest news: much better than letters and far more personal. Then I would put out a call to the next `port the ship was calling at to fix up similar arrangements there. It never failed. In the same way of course I extended the same facilities to fellow amateurs from all over the world.... and still do.

HMRT Warden - HMS Warden

One of the great joys of amateur radio when in touch with another is the use of Christian names only throughout the contact. You never know who you are talking to; it could be a King or a road sweeper. The only way you can establish who the owner of the call are to look the details up in the International Call book. Even that is no guarantee as you can, by request, ask for your details to be withheld. Two incidents stand out in my mind as an example of this: I was travelling through London by car and got hopelessly lost. Putting a call out on my radio, Top Band in those days, I was answered by a man who told me his name was Brian. He patiently talked me through London, intermixed with general chat of interest to us both and even invited me to call into his home for a cuppa, until I declared I was quite happy and could now proceed without further problems. It was not until sometime later that I decided to look his call sign up in the book. It turned out to be Lord Rix the actor. At no time did we ever discuss our professions as it was of little interest at the time. On another occasion I had regularly worked a fellow amateur who lived just south of Banbury. Our contacts were always made using CW. I happened to mention on one occasion that I was motoring up to see my parents in Rugby which meant passing through Banbury. He invited me to call in on him on the way and told me he was in one of the Lord Cheshire Homes.

On arrival at the reception I was taken into his room and was amazed to see him in an iron lung. He worked his morse key with one of his toes. Local amateurs had rigged up all his equipment so that he could still go on air despite his obvious restrictions. At no time in my many contacts with him had he mentioned his disabilities. He told me whilst I was there that amateur radio had kept him sane as he could "talk" to the world and quite often imagine he was there when others described their surroundings. That really was a moving occasion. Amateur radio is a wonderful world and its members are some of the most friendly that it's been my fortune to meet. I have often thought that if the world was run by Radio Amateurs it would be a very peaceful place. An example of this friendship extended by amateurs to each other took place some years back. It was my routine on leaving RNB Portsmouth to operate "mobile" from the car on the journey home to Horndean. It quickly began a routine to talk to a German amateur who was travelling to his home at the same time in Hamburg. Our journeys coincided in time and distance. On one occasion he mentioned that the audio of my transmitter was becoming intermittent. I knew that would be caused by the output valve becoming soft and mentioned the type that I was using, saying I would have to purchase a new one as I did not have a spare. On arriving home my wife handed me a package and said "one of your ham friends has just left this for you". On opening the package it was the valve I needed with a quick note telling me he had been listening to my conversation and knew I needed it. Needless to say I rang him up as he lived about a mile from me and thanked him. There was no question of payment as it is quite normal to help each other that way when only small items are concerned. On that point, if you are thinking of taking up this superb hobby, join your local radio club and get to know your local amateurs, they will be more than keen to help you in your quest to get a licence.

Doug Hotchkiss

VACANCY

Newsletter Editor

Do you have the time?

Are you up to the job?

You will need to have a good command of English and English grammar to be able to compile and edit articles and photos submitted for publication four times a year. You will need to be familiar with MS Word or MS Office or similar. It's challenging but rewarding since the target audience will be RNARS Members and radio amateurs who are linked to the Society. Contact the Society's Hon Secretary for details.

NOTICE OF THE RNARS AGM

Joe Kirk, General Secretary RNARS, G3ZDF

Notice is hereby given of the RNARS next Annual General Meeting:

Venue:
The AGM of the RNARS will take place on 13th October 2018 starting promptly at 14:00 in the: WO & SRs Mess, HMS Collingwood, Newgate Lane, Fareham PO14 1AS

Apologies:
To be sent to Joe Kirk; G3ZDF, Honorary Secretary, see inside front cover for contact details.

Attendance:
Members attending must supply their name, call-sign, membership number, address and car details if arriving by car to Joe Kirk well in advance to arrange catering and security. Members should muster at the club at 11:00 and up-spirits will take place at 11:30 followed by lunch at 12:30, Joe's contact details are on the inside front cover. Ample car parking is available.

Voting:
You may vote on resolutions at the AGM either in person or by appointing a representative or proxy. The Chairman will act as your representative and follow any voting instructions given. If you do not want the Chairman of the AGM to act as your representative and wish to nominate someone else, write to the Honorary Secretary and inform him who that person is at least one week prior to the AGM. Give clear instructions to your representative for each item on whether you wish to vote "For" or "Against". A proxy voting form is supplied on the rear cover, photocopies are acceptable.

Accommodation:
Service accommodation is not available. Below are the contact details of the local tourist information office that retains a list of B & B's and suitable hotels, they can provide listings on request.

The society cannot be held responsible for the quality of the accommodation, but please note that the list is approved by the local tourist information services.
Gosport Tourist Information Centre
Bus Station Complex
South Street
Gosport
PO12 1EP Tel: 023 92522944 E-mail: tourism@gosport.co.uk

Royal Naval Amateur Radio Society

Chairman: David Firth 2E0GLL
Hon. Secretary Joe Kirk G3ZDF
111 Stockbridge Road, Chichester, West Sussex PO19 8QR

RNARS 2018 AGM Proxy Vote Form

I_____ being a fully paid-up corporate member of the RNARS hereby nominate the Chairman of the Society (David Firth) or

_____ [1] to act as proxy and vote in my name at the Annual General Meeting of the Society.

The proxy will be void if I attend the meeting in person.

Member's name: _____

RNARS Nr.: _____

Callsign: _____

Date: _____

[1] The person nominated as proxy must also be a fully paid-up corporate member of the RNARS.

THE TROUBLE WITH COMPUTER VIRUSES...

Doug Hotchkiss G4BEQ

I thought you would want to know about this e-mail virus. Even the most advanced programs from cannot take care of this one. It appears to affect those who were born prior to 1960.

Symptoms:

1. Causes you to send the same e-mail twice.
2. Causes you to send a blank e-mail.
3. Causes you to send e-mail to the wrong person.
4. Causes you to send it back to the person who sent it to you.
5. Causes you to forget to attach the attachment.
6. Causes you to hit "SEND" before you've finished.
7. Causes you to hit "DELETE" instead of "SEND."
8. Causes you to hit "SEND" when you should "DELETE."

Sounds Familiar?

WHEN THE ROYAL NAVY CALLED

Phil Whitchurch, G3SWH

It was the autumn of 1967 and I was the Radio Officer aboard the Trident Tanker *SS Talamba / GMUF* southbound from the Persian Gulf carrying about 60,000 tons of crude oil from Kharg Island, Iran. The Suez Canal was closed following the *'Six Days War*' earlier that year, so we routed around the Cape of Good Hope bound for that well known European port known as LEFO (Lands End for Orders). Sometime after clearing the Strait of Hormuz, the Chief Officer came to see me to obtain medical advice via Portishead Radio for a Pakistani seaman who had been taken ill. Portishead Radio was the main point of contact under such circumstances with access to a medical team who could remotely diagnose illnesses and recommend treatment.

The conventional method of contacting Portishead from that part of the world was on HF via the Royal Navy at *HMS Mauritius* who would relay the message via the excellent Commonwealth Area Scheme free of charge. However, I was a DX-er preferring to contact Portishead direct on HF whenever possible. Contact was quite easy and messages were exchanged describing and clarifying the man's symptoms such that he was diagnosed with kidney stones with the recommendation that he be landed as soon as possible. The Captain's only option was to land the man at Mombasa, Kenya and messages were duly sent via Mombasa Radio, 5ZF to the company's agent, making the necessary arrangements.

Fully laden, *SS Talamba* had a draft of around 50 feet (13 metres) and the seas around Mombasa are relatively shallow. The Captain was concerned as to how close he could safely approach the port to transfer the sick man. Instead of a tug coming out to meet us, the agent must have pulled lots of strings ashore and informed us that *HMS Leander* was currently on R&R from the Beira Patrol and that their helicopter would come out to the ship to collect the seaman. The Beira Patrol was a naval blockade of oil shipments to Rhodesia (Zimbabwe) under United Nations sanctions following Ian Smith's UDI of Rhodesia in November 1965. Communicating directly with a Royal Navy ship from a merchant ship is not that easy, particularly as we were still outside MF range and I had not been provided with any HF frequencies or even a callsign to use on MF. Maybe a call to GBXZ (any British Warship) on 500 kHz would have worked, but I wasn't prepared to try, particularly as *HMS Leander* was in port and presumably not maintaining a safety watch. Explaining to the Captain that we effectively had no means of communicating directly with the *Leander* or, more importantly, by VHF with their helicopter was difficult.

When we arrived at the agreed position, I was detailed to stand on the bridge wing with a portable Aldis lamp to establish contact. We had particularly poor visibility that day and heard the helicopter before we could see it. As it emerged from the murk I rushed on to the other bridge wing, but it just flew round our stern, presumably to make sure that we were the right ship, and calmly landed on the starboard foredeck and forward of the discharge manifold. I still have bad dreams about the possible outcome of the mixture of hot exhausts and volatile oil fumes, but nothing happened.

Out of the Wasp helicopter stepped a Lieutenant Commander and a Sub-Lieutenant who then proceeded to unload a rigid rescue stretcher. As if either of them would have been able to read Morse on an Aldis lamp! All of the ship's officers had dressed up in their white uniforms to meet the Royal Navy -apart from the electrician, who was a Geordie and decided to wear only his black and yellow striped swimming trunks. The patient was mobile, not needing a stretcher which posed a problem as there was not room in the helicopter for both the him and the stretcher separately. Thus, the stretcher was left with us to be landed at Cape Town, where we called to exchange films and to land it to be returned to the Simon's Town Naval base about a week later. We never learned of the fate of the seaman, but assume he was safely treated and then repatriated.

Phil, G3SWH

RAFARS & Royal Signals ARS Nets

RAFARS	Time	Freq	Control
Daily	1100 A 1830 A	3.71 3.71	GØSYF GI4SAM G3HWQ MØRGI
Monday	1900 A	3.7	G3PSG GØBIA
Tuesday	0730 A 1400 A 1900 A	14.27 7.015 3.567	G4IYC
Wednesday	1500 Z 1530 Z	14.29 21.29	?
Thursday	1830 Z	14.17	ZC4RAF
Friday	0730 A	14.055	CW Net
Sunday	0900 Z	5.403	?
First Monday of the month	1000 A	3.71	?
RSARS Nets	**Time**	**Freq**	**Control**
Monday - Friday	1000 A	7.17	GW3KJW M3VRB
Monday	1830 A	3.585	GM3KHH (RTTY)
Tuesday	1400 A	7.17	MØOIC
	1600 Z	14.18	G4BXQ
Wednesday	0600 Z	14.143	Various
	1030 Z	3.615	?
	1830 A	3.565	GM3KHH
	2030 A	1.946	2EØBDS
Thursday	1400 A	7.17	GØRGB
	1800 A	3.743	G6NHY
Friday	1830 A	3.583	GM3KHH (PSK31)
	1830 A	3.565	High speed CW
	2000 Z	14.055	CW
Saturday	0600 Z	14.143	SSB
Sunday	1000 A	3.565	G3JRY (Slow speed CW)
	1100 A	7.17	GW4XKE
	1100 A	3.745	GM4FOZ
Joint Service Net	**Time**	**Freq**	**Control**
Sunday	0900 A	5.4035	G3RAF
Tuesday	1900 A	5.4035	G3RAF

RNARS Nets

Mick Puttick G3LIK

All frequencies are +/- QRM. DX nets are GMT; UK nets are GMT or BST as appropriate. The list is compiled by Mick Puttick G3LIK mick_g3lik@ntlworld.com – 02392 255880 **who must be informed of all changes**.

UK	Time Local	Freq	Net	Control
Daily	2359-0400	145.727	Midnight Nutters	Vacant
Sun	0800	3.667	News 0830	G3LIK
	1030	7.065	Northern Net	GM4VUG
	1100	145.4	Cornish Net	GØGRY
	1100	7.02	CW Net	G4TNI
Mon-Sat	1030	7.065 / 3.743	Bubbly Rats	GØGBI GØOKA GDØSFI MØZAE
Mon	1400	3.575 / 7.02	QRS CW	GØVCV
	1900	7.088 / 3.743	North West-News 2000	GØGBI
Tue	16:00	7.068 / 3743	HQ Shack	GB3RN
	1900	7.028 / 3.528	CW Net	G3RFH
Wed	1400	3.74 / 7.088	White Rose	G4KGT
	1930	3.743	SSB News 2000	GØOAK
	2000	145.4	Stand Easy	Vacant
Thur	1900	3.542	Scottish CW	Vacant
	2000 GMT	1.835	Top Band CW	GØCHV G4KJD
Fri	1600	10.118	CW	SM4AHM
Sat	0800	3.74/7.088	GØDLH Memorial Net	GØVIX
DX	**Time GMT**	**Frequ**	**Net**	**Control**
Sun	0800	7.015/30555	MARAC CW	PA3EBA/PI4MRC
	1430	21.41/14.329	RNARS DX	WA1HMW/GD0SF/W1USN
	1800	Echolink	Echolink	VE3OZN / K8BBT
	1900	14.33	N American	WA1HMW
Mon	0930	3.615	VK SSB	VK1RAN/VK2RAN
Wed	0118-0618	7.02	VKCW	VK4RAN
	0148-0648	10.118	VK CW	VK4RAN
	0800	3.62	ZL SSB	ZL1BSA
	0930	7.02	VK SSB	VK5RAN
	0945	7.09	VK SSB	VK1RAN/VK2RAN
Thur	1430	21.41/14.329	RNARS DX	WA1HMW/GD0SF/W1USN
Sat	0400	7.09	VK SSB	VK2CCV
	1330	7.02	VK CW	VK2CCV
	1400	7.09	VK SSB	VK2CCV
	1430	21.41/14.329	RNARS DX	WA1HMW/GD0SF/W1USN

RN Activity Frequencies

FM	**145.40**								
CW	**1.824**	**3.52**	**7.02**	**10.118**	**14.052**	**18.087**	**21.052**	**24.897**	**28.052**
SSB	**1.965**	**3.66**	**3.74**	**7.088**	**14.294**	**14.335**	**18.15**	**21.36**	**28.94**

RNARS COMMODITIES

Doug Bowen GØMIU

Item	Price
Body Warmer, embroidered with the new RNARS logo, your name and callsign. Colour: Black only Sizes: S to XXXL	£30-00 P&P £4-00
Polo shirt, embroidered with new RNARS logo, your name and callsign. Colour: Navy only Sizes: S to XXXL	£16-00 P&P £4-00
Sweatshirt, embroidered with the new RNARS logo, your name and callsign. Colour: Navy only Sizes: S to XXXL	£16.00 P&P £4-00
Fleece jacket, embroidered with new RNARS logo, your name and callsign Colour: Navy only Sizes: S to XXXL	£21-00 P&P £4-00
Gold blazer badge with **new RNARS logo**	£10-00 P&P £2-00
Lapel badge with **new RNARS logo**	£2-00 P&P £1-00
RNARS Log Book	£4-00 P&P £3-00
Cap with RNARS (new) logo	£10.00 P&P £4.00

Size in inches:

Small 36-38 Medium 38-40 Large 40-42
Extra Large 42-44 2 Extra Large 44-46 3 Extra Large 46-48
4 Extra Large 48-50

Order Form

PLEASE write clearly and use block CAPITALS

Photocopies of this form are accepted

Call-sign | RNARS No: _____|_____

Name: _____

Address: _____

_____

Post Code: _____

Telephone: _____

Email: _____

Advisable to check before ordering as to availability in your size

Item Description	Size	Colour	Qty	Price	P&P	Sub Total
Enclose cheque payable to: ***Royal Naval Amateur Radio Society***					**Total Payment £**	

Overseas members, please add £5 to cover additional postage.

Send orders to:
Doug Bowen GØMIU
14 Braemar Road, Gosport, PO13 0YA
E-mail: g0miudoug@btinternet.com

Please allow fourteen days for delivery and while these prices are correct when going to press, prices do vary and are subject to change

HMS BELFAST - GB2RN - At Her London Moorings