Hamming it up

with John Campbell

I FIRST BEGAN to get interested in amateur radio about seven years ago while delivering a forty-foot ketch from Tahiti to Hawaii, I discovered that the boat was fitted with a ham radio, and that one of the crew was an aspiring operator. During the trip, a two thousand, five hundred mile beat, we spoke to many people, of whom the most useful was a ham in Hawaii who worked at the local met office.

He was most interested to receive our weather reports (he called them *'actuals'*) from an area where few large ships visit; we were equally interested in the personalised weather forecasts he could give us. As we approached the equator, and that frustrating area of calms and squalls known as the doldrums, he used satellite photographs to help us pick a route. Crossing the doldrums can be tedious, but choosing a spot where the weather was most disturbed probably reduced the total passage time by several days.

That incident made me realise that a ham radio could be a useful tool on an extended passage rather than just a fairly expensive toy. Since then, we've used ham radio on many occasions to get weather forecasts, both from hams ashore and from other yachts on passage, who may be a few hundred miles ahead or astern of us. For example, if we hear that a yacht ahead of us is in light winds, while another fifty or a hundred miles south has a good breeze, we alter course accordingly. *(See also Jimmy Cornell, No. 194 p.40 — Editor).*

We've come to realise that a ham radio can also be a valuable safety item. We've listened to three vessels in distress being rescued via ham radio, and heard of many other similar incidents. There's somebody listening on the amateur bands every minute of the day, and it should always be possible to talk to *somebody somewhere* in case of distress.

What's up, doc?

For example, a crew with a medical emergency may be able to cope if they can discuss the problem with a doctor. If the emergency can be handled on board, there's probably less risk to the patient than if he were to be evacuated. But if evacuation *is* deemed necessary by the doctor, the ham radio enables you to discuss exactly how it will be done, which should make the process easier and safer.

Then there's the general interest that comes from using ham radio. We've made countless new friends over the radio, both on other yachts and ashore. Much valuable information can be gathered, such as where and when to clear customs, places to avoid, or places of special interest.

Let's take a look at what's involved in getting a licence, and what equipment is required. Then we will consider how to install it, before taking a brief look at some of the frequencies used to make contact.

For a vessel operating on the high seas, a licence issued by the country where the boat is registered should be used. When operating within the territorial waters of another country, it's necessary to obtain a licence issued by *that* country. In almost every case, production of a UK licence and a small fee will result in a reciprocal licence being issued with no problems.

In the UK the Home Office puts out a booklet *'How to Become a Radio Amateur'*, which can be obtained from: *The Home Office, Radio Regulatory Department, Licensing Branch (Amateur), Waterloo Bridge House, Waterloo Road, London SE1 8UA.* This booklet outlines the basic requirement for getting a licence, but don't hold your breath while waiting for it to arrive! Requests for information seem to move exceedingly slowly through the myriad channels of the Home Office . . .

The basic requirements are the passing of two written exams on theory and procedures, then a Morse test, sending and receiving at twelve words a minute. You don't have to have a Morse test for a Class B licence, which limits you to the VHF portions of the amateur bands, which basically are good only for local communication.

Perhaps the easiest way to prepare for the theory exams is to attend one of the many courses sponsored by various local educational authorities. There's almost certain to be a course run near you, and details can be obtained from the local education authority.

I found the Morse Code a problem. My sense of rhythm is zero at best, and I found it very difficult to build up my speed to the required level. However, practising a little each day, with a cassette tape, will result in a slow but sure build-up in speed. Like most people, I found I reached a plateau at ten words a minute. Don't get discouraged; keep at it, and finally you'll reach the magic speed. If I can do it, anybody can!

What type of radio should you buy? There's no easy answer. Choice is often dictated by price. However, I would strongly suggest buying a radio which is completely 'solid state'. Many radios have valves in the final amplifier, and such a radio requires a warm-up period before transmitting, which means extra drain on the battery. Such radios tend to use more power anyway than their solid-state cousins, and are usually more complicated to use, requiring an involved 'tune-up' process.

If the budget allows I would suggest getting a radio which incorporates a general frequency coverage receiver. That means you can receive signals outside the ham frequencies, such as commercial ship frequencies, coastal weather stations, Coast Guard reports, as well as news and entertainment from stations such as Voice of America and the BBC World Service.

We have such a radio, an Icom 720-A. A similar radio is the Drake TR7. For either of these radios you should expect to pay around eight hundred pounds. For around five hundred pounds, you could get a radio without the general frequency coverage, such as the Yaesu FT-707, Icom 730, or Kenwood TS-130. Any of them would be suitable for a boat. All draw an amp or two in the *receive* mode, and around twenty amps in *transmit*, running off 12 volts.

A marine SSB will cost rather more than any of these. Even a modest one of limited capabilities will start at around £1,500, and the price soon escalates to £4,000 or more for a radio covering several bands.

After the radio itself, the next piece of equipment to consider is the aerial. The success or failure of your communications will depend very largely on the efficiencies of the aerial. There are almost as many variations on the aerial theme as there are hams afloat. Everybody has his own 'pet' aerial, and what works well for one boat may not work for another. However, we can

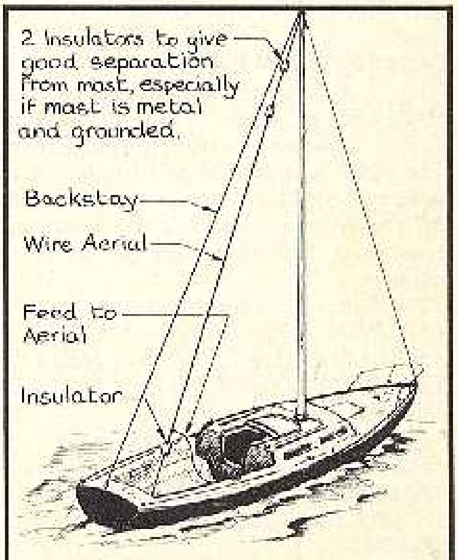


FIG.1 Long Wire Aerial

narrow the practical selection of an aerial for a boat to three main types.

The most common type is the random, long-wire aerial. This works well for many people. The most popular way is to use an insulated backstay. But we've seen several such backstays fail in use, so perhaps a better way would be to set up a separate wire from the masthead to the transom to act as an aerial. The farther away it can be led from the backstay the better. For optimum performance, fit two insulators at the top and another at the bottom (see Figure 1).

The length of wire should equal a quarter of the wavelength for the lowest frequency at which you wish to operate. It may sound complicated, but isn't. The length is found by a simple formula; divide the frequency in megahertz (MHz) by 234. That gives the answer in feet. The so-called 40-metre band is popular for short-to-medium range transmissions, and that starts at 7MHz. Applied to the formula, that gives us a length of 234/7, or a little over thirty-three feet. If we want to go to a lower frequency, such as the 80-metre band, which starts at 3.5MHz, then the formula tells us we need a wire twice as long —almost sixty-seven feet. Obviously, the length of the mast dictates how long such a wire can be.

Such an aerial will require the use of a tuner. A good tuner will allow the aerial to operate at any frequency higher than the one used in the formula; in other words, with a tuner a wire 33 feet long will operate on any frequency above 7MHz.

At this stage, we don't really need to look at how a tuner works, but if you're buying one, then choose one that offers a so-called 'T' match rather than the common 'L' match. A 'T' match aerial tuner will have two variable capacitors, and these must be bigger than 200 pf capacity. The larger these capacitors are the better the gadget will work, other things being equal.

The tuner should be mounted as close as possible to the base of the aerial, and should be connected to it with a well-insulated wire such as the HT cable used to connect spark plugs on car engine. However, it must be the type which has copper wire in the centre, not carbon granules. The tuner, in turn, must be connected to the output of the radio, this time using coaxial cable. The specifications for the radio will tell you what kind of coax to use; probably it will specify cable with 50 or 75ohm impedance. By the time you've studied for your licence, you will understand what that means!

The last requirement for this type of system is a good earth. This is absolutely vital to the operation of this type of aerial. If your boat has an external iron or lead keel, it will probably suffice. The tuner and the radio should be connected to the keel, and the best material to use for making this connection, is copper strip, about two inches wide. Nothing will work as well despite what people will tell you as they try to sell you battery cable or copper braid.

The more things you can tie into the earth system, the better it will be. Include the engine, metal tanks, even guard rails and stanchions; you cannot get too much earth! Connect everything with pieces of the same copper strip.

For those of us with boats with internal ballast, there's another way of achieving the same result: by installing a 'counterpoise' system. The textbooks will glibly tell you to install a hundred square feet of copper mesh, in a horizontal plane. Well, not many boats can find a hundred square feet of horizontal surface, and it's easier to buy hen's teeth than copper mesh. All mosquito screen now seems to be made of plastic or aluminium, neither of which is suitable.

We lucked into some old mosquito screens which were copper mesh, but they took two years in the finding, and themselves were probably about 40 years old!

Assuming you can find copper or bronze mesh in someone's garage or attic, then put up as much as possible. Bunk tops, under the deck, under the cockpit, are all possible areas. Each piece of mesh used should be soldered around the edges to ensure a good electrical connection between each and every strand or wire, then each piece must be connected together using the same two-inch copper strips. Finally, the whole lot must be connected to the ground connection on the tuner, using more of the copper strip. As you can see, it's not a job to be lightly undertaken, but a good counterpoise system, either along with, or as part of, a ground system, will make all the difference to your signal.

Why not a whip?

The next type of aerial is the free-standing whip aerial, of which there are several variations. Such an aerial will usually have what is called a 'loading coil', which has the effect of reducing the physical length of the aerial, yet provides the full electrical length required for the radio to work. It may be useful to get such an aerial for the lower frequencies, if the mast is not long enough to run a wire suitable for them. If a separate aerial is used for each band of operation, then a tuner won't be required. However, these short aerials tend not to be quite as efficient as the long wire, but still require the same earth system as the long wire. Without a really good earth or counterpoise, they won't work at all.

Our own boat is junk rigged, with unstayed masts, which precludes the use of a backstay-type long wire. The next problem was getting a good earth. Our ballast is inside the glassfibre hull and consists of many individual blocks of iron bedded in resin. Not a good earth. For two years, we failed to locate any copper screen, so that led us to experiment with the third type of aerial, the dipole.

A true dipole is a piece of wire, one-half wavelength long. In practice, the length is found by dividing the frequency in MHz by 468, to give the length in feet. The wire is split at the centre, and fed with coaxial cable at that point. The centre conductor of the coax goes to one side of the dipole, the outer sheath goes to the other side (see Figure 2). Because each half of the dipole is a quarter wavelength long, the ground no longer plays such an important part. One side of the dipole acts in a similar manner to the ground.

For the popular 20-metre band, which starts at 14MHz, the length of the dipole is a little over thirty-three feet. That makes it feasible to hoist one end of the aerial and suspend the whole thing vertically. We use a couple of feet of nylon fishing line at either end as an insulator. The coax feed line should be led away from the antenna at a right angle for a couple of feet, before being led down to the radio (see Figure 3).

For the lower frequencies, the length of the dipole will probably preclude

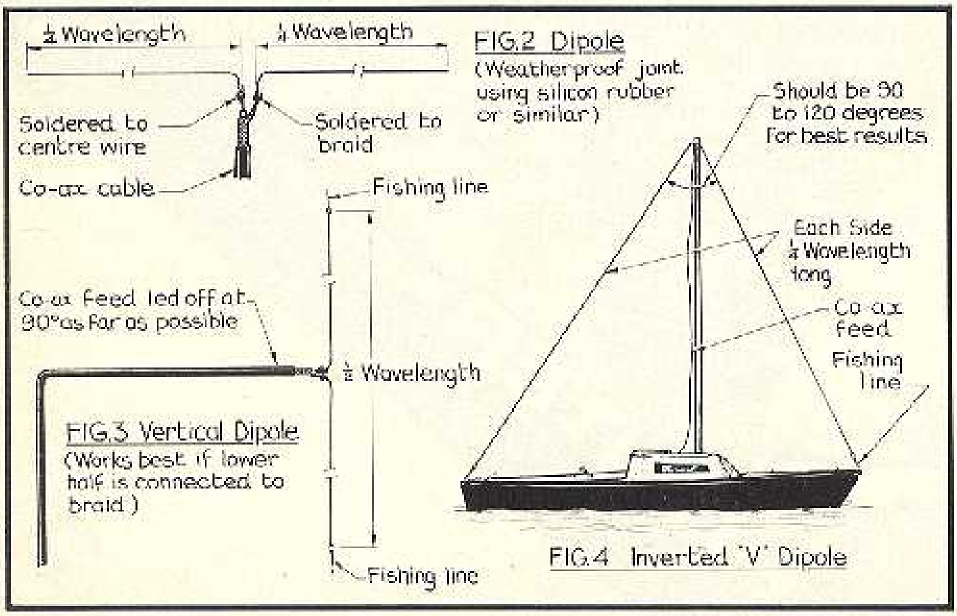


FIG.2 Dipole (Weatherproof joint using silicon rubber or similar)

FIG.3 Vertical Dipole (Works best if lower half is connected to braid)

FIG.4 Inverted 'V' Dipole

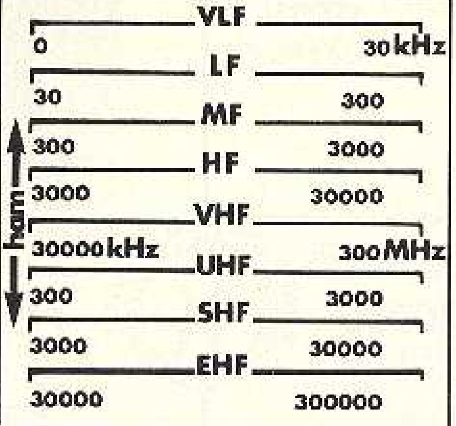
hoisting one end. For example, a dipole for the 40-metre band will be over sixty-six feet long. But don't despair. A good aerial can be made by hoisting the centre of the aerial and leading both ends down to the deck, to make an 'inverted V' aerial (see Figure 4). The angle between the two arms should be at least 90 degrees, otherwise, the efficiency falls off rapidly.

On 20 metres, we use a vertical dipole, fed with 75ohm coax. On 40 metres, we use an inverted 'V' fed with 50ohm coax through the tuner. This aerial also works very well on 15 metres. Dipoles work very well for us, but we have no rigging wires to upset the radiation pattern. And our non-conductive masts help. *(See No.194, p.42.)* However, a little experimenting will show what will work best for you.

Get netted

There are many nets which are operated by and for yachtsmen. The UK Maritime Mobile Net operates on 14.303MHz at 0800 and 1800 GMT, or Coordinated Universal Time, as we are now supposed to say. This net is run every day and yachts from all over the world check in to exchange information or just to say 'hello'. The equivalent net from the US is the Transatlantic Maritime Mobile Net on 21.400MHz at 1200 GMT in the summer, and 1300 GMT in the winter. This too is quite informal and serves yachts in the Atlantic.

FREQUENCIES



VLF (Very Low Frequency) LF (Low Frequency) MF (Medium Frequency) HF (High Frequency) VHF (Very High Frequency) UHF (Ultra High Frequency) SHF (Super High Frequency) EHF (Extremely High Frequency)

Useful References

'How to become a Radio Amateur'; free of charge from D.T.I. (Radio Regulatory Division), Licensing Branch (Amateur), Waterloo Bridge House, Waterloo Road, London SE1 8UA.

Radio Amateur Licensing Unit, D.T.I., Chetwynd House, Chesterfield, Derbyshire S49 1PF.

Radio Society of Great Britain, Lambda House, Cranbourne Road, Potters Bar, Herts EN6 3JW. Tel: 0707 59015.

'Passport to Amateur Radio', Practical Wireless Publication, Enefco House, The Quay, Poole, Dorset BH15 1PP (0202-678558). (£1.50 + 60p p&p).

There are many local nets, especially on the 80 and 40 metre bands. We regularly checked into the Caribbean Maritime Mobile Net around 7.240MHz at 1130 GMT. They are useful for making contact with other yachts, and finding out how and where to clear Customs, etc. You can find out places of special interest and those best avoided, whether steel or aluminium propane tanks are currently being accepted at the local depot . . . and so on.

A number of nets share the frequency of 14.313MHz. One such is the US Maritime Mobile Net, but it exists mainly for passing of 'phone traffic to and from yachts. The US Government has perhaps a healthier attitude toward ham radio than does our own Government. They allow US operators in international waters, or in those countries which have third-party agreements, to make telephone calls over the ham network. Unfortunately, it's not legal to pass so-called third-party messages into the UK. Nor to patch into the telephone network.

Nonetheless, ham radio does provide a good means of staying in touch with family and friends when sailing. It has also helped us make many *new* friends, both afloat and ashore. You will find that most hams are friendly and willing to help each other. If you visit your local radio club, you will no doubt be encouraged to join the ranks of the hams, so, who knows, one day we might meet on the air! ●