

## Line of sight transmission

When a radio wave is sent from a base station on land, the wave travels through the air and is absorbed by the antenna of a receiver on the vessel at sea. Here it produces a small current which can be converted into voice signals and reproduced in a loud speaker.

Figure 1.1 summarises this process.

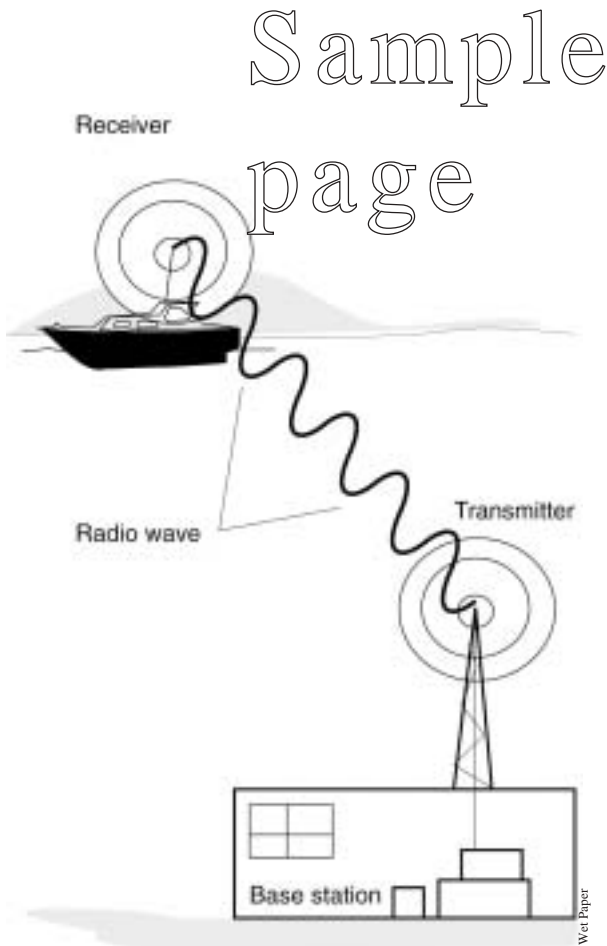


Figure 1.1 Principles of radio transmission

A **radio wave** is like a wave in the ocean. It has a top (the crest) and bottom (the trough) a height called the amplitude and a length as shown in Figure 1.2.

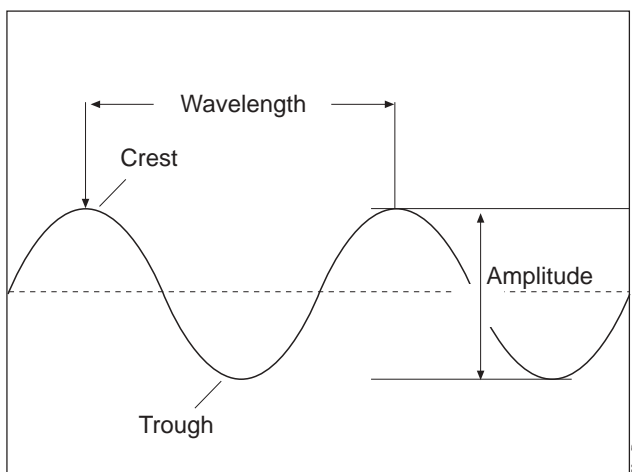


Figure 1.2 Wave characteristics

A radio wave is usually called a **carrier wave** (Figure 1.3) since it carries the information to produce the sound for the radio. You could turn the radio transmitter on and off in accordance with a recognised code, such as Morse code, and be able to convey information from the transmitter to a receiver. Today radiotelephony has replaced Morse code which is now seldom used.

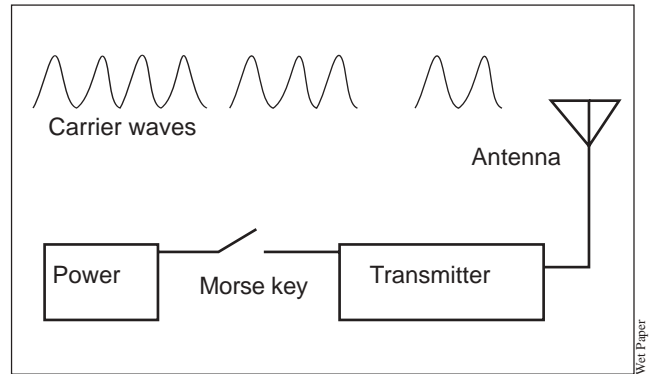


Figure 1.3 A diagram to show interrupted carrier waves

Because Morse code is difficult to learn, information exchange by radio between small vessels is usually conducted by radiotelephony (voice signals by radio). To be able to transmit voice signals by radio it is necessary to alter the carrier wave in synchronisation with the speech information to be transmitted. This is known as **modulation**.

Carrier waves may be modulated to carry speech information by altering the size (amplitude) of the wave. This is known as **amplitude modulation (AM)**.

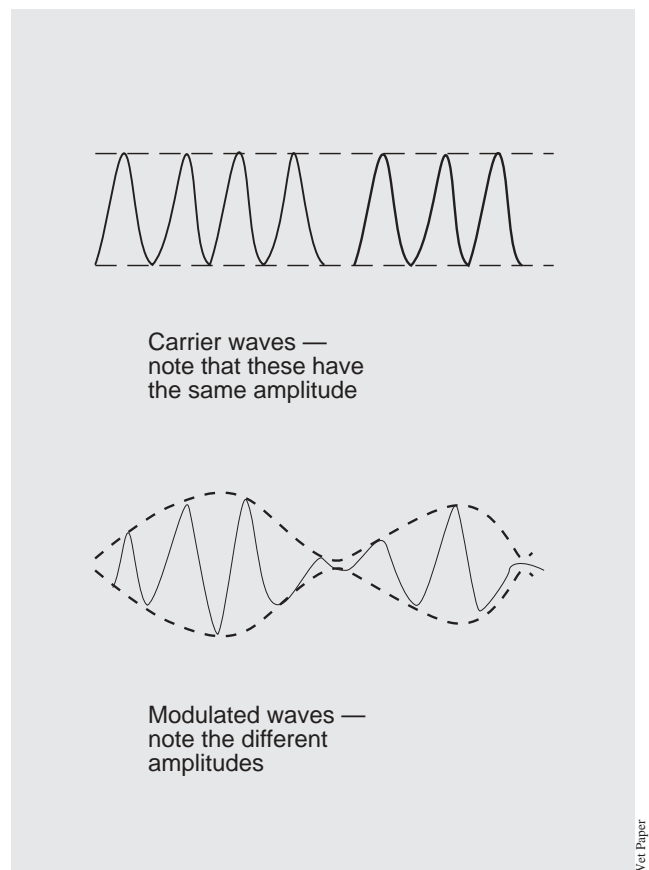


Figure 1.4 A block diagram of an AM speech transmission

# SECTION 3 EMERGENCY POSITION INDICATING RADIO BEACONS

A distress beacon is a small electronic device that, when activated in a life-threatening situation, assists rescue authorities in their search to locate those in distress.

In Australia, three types operate on the 406MHz frequency:

- Emergency Position Indicating Radio Beacons (EPIRB) used in ships and boats;
- Emergency Locator Transmitters (ELT) used in aircraft;
- Personal Locator Beacons (PLB) for personal use by bushwalkers, four-wheel drivers, other adventurers on land, employees working in remote areas, crew in boats and aircrew.

## Emergency Position Indicating Radio Beacons (EPIRB)

EPIRBs are designed to float in the water to optimise the signal to the satellite. An EPIRB is required to operate for a minimum of 48 hours continuously once activated. An EPIRB has a lanyard that is used to secure it to something that is not going to sink so that it can float free.

Float-free EPIRBs are held in a bracket and fitted with a hydrostatic release that is water activated deploying the beacon automatically if the vessel sinks. If the vessel continues to float then the EPIRB can be manually deployed where a distress situation exists.

406 MHz beacons come in two basic types: those that provide an encoded (GPS) location and those that do not. The satellite system can calculate a beacon's location, but locating a distress site is usually much faster if the beacon signal provides a GPS location.

### What is the HexID or UIN?

The HexID or Unique Identity Number (UIN) is the unique code programmed into each 406 MHz distress beacon and transmitted when the beacon is activated.

When registering a distress beacon, this code must be included on the registration form as it is the only code that links the individual distress beacon to the registration database. Without the HexID the beacon cannot be registered. For the latest information on EPIRB coding and decoding see: [http://beacons.amsa.gov.au/distress\\_beacons.asp](http://beacons.amsa.gov.au/distress_beacons.asp)

### Old EPIRBs

In February 2009 the 121.5 MHz system was turned off. Do not dispose of old EPIRBs in the garbage bin. Check with the web site above for the correct method of disposal.



Figure 2.1 An Emergency - Position - Indicating - Radio - Beacon

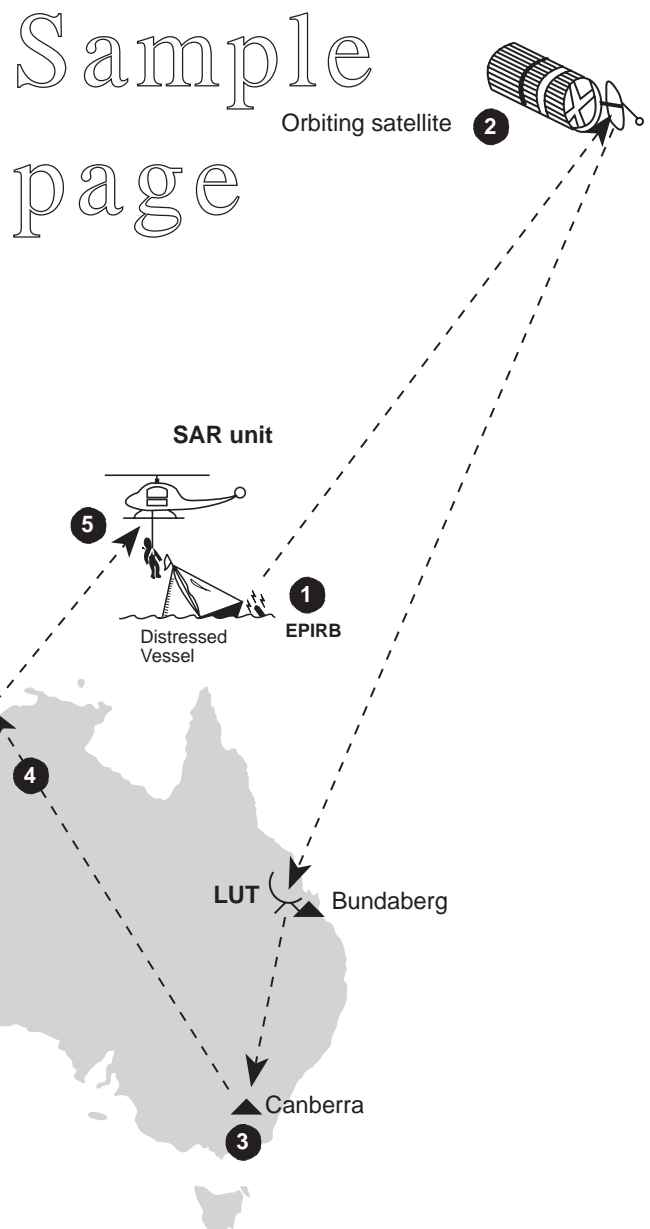


Figure 2.2 Rescue sequence involving an EPIRB. (Note: SAR - Search and rescue, LUT - Local user terminal)

# WORKSHEET 13 MAYDAY RESEARCH QUESTIONS

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1. List equipment considered by the yachtsman as vital for safety during offshore passages.

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Sample  
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2. 27 MHz Radio is most used by which marine groups?

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3. How is the EPIRB activated and deployed?

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4. Why are EPIRBs still activated when vessels have sent distress messages by marine radio?

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5. What other distress signals are commonly used by mariners in trouble?

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6. Why should abandoning ship be a last resort?

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7. What are some of the features built into inflatable life rafts?

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8. List the commentator's key survival tips on a life raft.

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9. What is the function of the local user terminals at Albany and Bundaberg? (Remember the video is out of date)

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10. What resources can the Maritime Rescue Coordination Centre call upon in emergency rescue situations?

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# SECTION 10 KEEPING YOUR RADIO WORKING

There are six main areas that can cause problems with keeping your radio working in good order. These are flat batteries, faulty earths, incorrect power supplies, faulty antennas, faulty microphones and blown fuses.

## 1. Flat batteries

### The battery

The battery supplies power for the radio on most small boats and consists of a solid case made of hard plastic containing lead electrodes and filled with an electrolyte (Figure 4.1).

In many cases this is sulphuric acid however some batteries are filled with a gel to produce a similar effect. The chemical reaction between the acid and the lead produces an electric current which serves as the power supply. Batteries are an essential part of the electrical system of a larger boat with a key to start the motor.

### Number of batteries

The number of batteries depends on the power needed to operate the boat. If the batteries are connected in series, the voltage can be increased. If connected in parallel, the number of amp hours they supply can be increased (Figure 4.2). Only use marine batteries because they run critical electrical systems such as the engine starting, radio, lighting and navigation instruments.

### Testing a battery

Testing is designed to tell us things we want to know about individual cells and batteries (Figure 4.1). Some typical questions you can ask the person who tests your battery are:

- Is it fully charged? How much charge is left in the battery? How long will it last?
- Does it meet the manufacturer's specification? Has there been any deterioration in performance since it was new?
- Does it generate interference or electrical noise? Is it affected by interference or electrical noise?

The answers are not always straightforward and places like Battery World can help you solve these issues.

### Battery care

- Use a good quality marine battery - check it at regular intervals and charge it when necessary.
- Batteries should always be secured in brackets and properly ventilated - be careful not to spill acid on yourself
- Keep terminals, cables and casing clean. Grease cables regularly. Terminals and connections need to be tight and secure.
- Battery cells need to be topped up with distilled water and checked with a hydrometer.
- Batteries should never be overcharged. They should be charged at a rate as set down by the manufacturer. Turn the power off before removing charging leads to prevent an explosion.

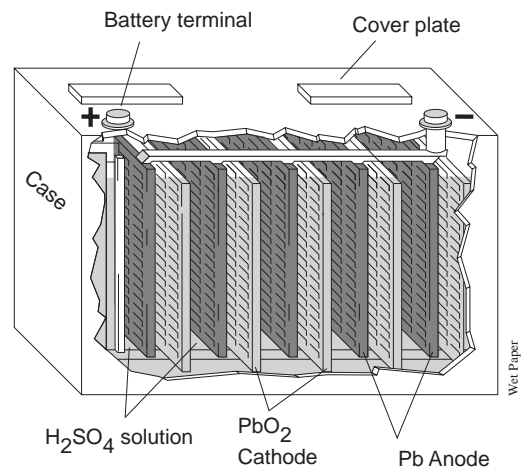


Figure 4.1 Parts of a battery

Sample

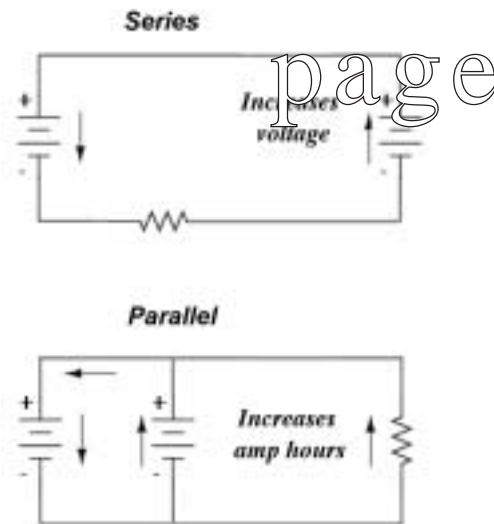


Figure 4.2 Series and parallel circuits

Wet Paper

### Safety and hazards

If you check or carry a battery you MUST wear protective clothing and acid resistant gloves.

- Battery acid is very poisonous and never wipe your eyes if you spill the acid on your gloves (for acid spills, irrigate all areas with lots of water).
- Coming loose during your trip - make sure the battery is securely tied down and the battery box is ventilated to stop build up of flammable gases.
- Salt water in the bilge and battery acids can make for an explosive mixture.
- Electrical hazards can include shorting with the hull, frayed wiring and globes that short out. If using shore power make sure there is proper grounding and circuit breakers to protect you from being electrocuted. Boats need marine electrical grade wiring as household copper wire will corrode in days making it useless.
- Dampness, dirt, and acid on the battery case can create a circuit between the terminals that will drain the battery.