

MARINE RADIO IN A NUTSHELLv5

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GENERAL

- **Operators** of VHF and MF/HF equipment must be licenced
- A **ship station licence** is also required for **MF/HF**

USE OF SHIP RADIO STATIONS

- * A ship radio station is placed under the authority of the Master/Skipper or the person responsible for the safety of the vessel.
- An obligation of secrecy applies to all radio information received
- * Secrecy does **NOT** apply to DISTRESS, URGENCY OR SAFETY alerts or to ALL STATIONS messages
- * Secrecy **DOES** apply to Radio Telephone Calls, Personal emails, and private calls
- Distress calls and alerts must be accepted with priority over all other radio communications
- The transmission of false or deceptive distress, urgency or safety signals or calls is forbidden
- A log should be kept of all **distress alerts and messages** and include station name, time, date, frequency and nature of message
- * All precautions should be taken to avoid interference including:
 - a. Listen before transmitting
 - b. Use minimum power
 - c. Call on correct frequency
 - d. Keep test calls to a minimum
- * A vessel or station must identify every transmission by way of call sign and name or both. If the vessel does not have a call sign or name then the registration number of the vessel should be used.
- Transmissions without identification are forbidden
- * Must have the following documents on board:
 - a. Station Licence (if applicable)
 - b. Operators Certificate
 - c. Marine Radio Operators Handbook
 - d. Radio Logbook
- Record all Distress alerts and messages
Include:
 - a. Name of station/s
 - b. Frequencies
 - c. Date and time of Tx and Rx

SILENCE PERIODS

- International regulations no longer require silence periods

- * In Australia silence periods are observed from the hour to 3 mins past the hour and from the half hour to 3 mins past the half hour on the following frequencies:
- * MF/HF 2182, 4125, 6215, 8291, 12 290, 16 420 kHz and
- * VHF Channel 16
- No silence periods exist on MF/HF DSC frequencies or VHF DSC channels

MARITIME COMMUNICATION STATIONS (Operated by Australian Maritime Safety Authority) (Long Range Stations)

- A MARITIME COMMUNICATION STATION (**MCS**) is a land station
- **Two MCS stations** are operated by **AMSA** as part of Australia's commitment to GMDSS
- These stations are strategically located at Wiluna (WA) and Charleville (QLD)
- The stations have the ability to detect a call from a ship at sea and relay the call to the Rescue Co-ordination Centre (RCC) in Canberra
- * **MCS stations provide DSC listening watch on HF frequencies, co-ordinate SAR operations and issue automated weather forecasts and warnings,**
- * When DSC has been established stations should switch to a radiotelephony channel and call 'RCC Australia'
- SHIPS STATIONS may use a DSC urgency alert in the case of Medical Emergency to establish contact with a MARITIME COMMUNICATION station

COAST RADIO STATIONS(Middle Waters Limits – to 200 n.m to sea)

- The COAST RADIO SERVICE NETWORK consists of 9 radio stations located around the coastline. **These stations are operated by the States/Territories.**
- COAST RADIO STATIONS provide distress and safety services up to 200 n.m. to sea
- COAST RADIO STATIONS offer 24 hour listening watch for distress and safety situations on **4125 KHz, 6215 KHz and 8291 KHz** and **broadcast** navigational warning information on **8176 KHz.** (Basically there is no 2 MHz service)

LIMITED COAST STATIONS (For near coastal areas)

- **LIMITED COAST STATIONS** are operated by **Harbour Authorities and Volunteer Organisations.** They are stations on land communicating with the following vessels at sea:
 - a. Commercial fishing vessels,
 - b. Commercial vessels,
 - c. Charter boats,
 - d. Tugs,
 - e. Vessels attached to fishing clubs,
 - f. Port and harbour authorities,
 - g. Marine rescue organisations.

- * **LIMITED COAST STATIONS offer services in the VHF and MF/HF bands**

- Hours of operations for LIMITED COAST STATIONS vary and many DO NOT operate continuously

OPERATING PROCEDURES FOR GENERAL COMMUNICATIONS

- Test transmissions should be kept to a minimum
- * Establish communications on a **calling frequency** (Example VHF Ch 16)
- * When communications established change to a **working frequency** (Example VHF Ch 73)
- * During communications, when the other station is invited to respond the word **OVER** should be used
- * During routine communications between a SHIP STATION and MARITIME COMMUNICATION (land) or LIMITED COAST STATION (land) the **LAND station controls the working.**
- SHIP STATIONS must not interfere with MARITIME COMMUNICATIONS or LIMITED COAST STATION communications
- * During routine communications between SHIP STATIONS the SHIP station **CALLED** controls the exchange of communications
- The main frequencies for establishing routine communications with LIMITED COAST STATIONS or another SHIP STATION are:
 - * MF/HF * 2182 kHz, 12 290 kHz, 16 420 kHz
 - * VHF * Channels 16 and 67
- * When transmission has finished indicate this by using the word **OUT**
- * When spelling out words the **PHONETIC ALPHABET** should be used

ROUTINE CALLING (INITIAL CONTACT) AND REPLYING PROCEDURES

- As a general rule it rests with the SHIP STATION to call and establish contact with a MARITIME COMMUNICATIONS or COAST RADIO and LIMITED COAST STATION
- CALLING
 - * Select **MF/HF** frequency to call on (Example 2182 MHz, 4125 MHz etc) – Listen before calling – Use the name or call sign of station being called x 3 – **THIS IS** - use own ships name or call sign x3
 - * Select **VHF frequency** to call on (Channel 16 or Supplementary 67)) – Listen before calling – Use name or call sign of station being called x 1 or x 2 – **THIS IS** - use own ships name or call sign x1 or x2.

Cease calling if no response received after 2 mins

Repeat calls can be made after waiting another 3 minutes

- **REPLYING**
In MF/HF bands use name or call sign of station calling x3 – THIS IS- use own ships name or call sign x 3 – change to channel indicated by either land or ship station called (i.e. Change to 2284 MHz)

In VHF bands use name or call sign of station being called x 1 or x 2 – THIS IS- use own ships name or call sign x1 or x 2 – change to channel indicated by either land or ship station called (i.e. Change to channel 72)
- **WHEN COMMUNICATIONS ARE ESTABLISHED**
* When communications have been established between stations all following communications should be conducted on a **WORKING** frequency or channel

A **WORKING** frequency or channel is for the exchange of messages and public correspondence information after initial communications have been established
- **DURING TRANSMISSIONS**
* Station identification (Call sign, Name, registration number etc) should be provided during every transmission

ALARM SIGNALS

- A radiotelephony alarm signal consists of two audio frequency tones, one high and one low, designed to attract attention to operators that a message is to follow

DISTRESS COMMUNICATIONS

- * A **DISTRESS CALL** has priority over all other transmissions
- The obligation to accept a distress call is absolute and must be accepted with priority over all other communications
- * A radiotelephony alarm signal, distress call or distress message may only be transmitted on the authority of the Master/skipper or person responsible for the safety of the vessel
- The following frequencies are used for distress:
International
* MF/HF 2182, 4125, 6215, 8291, 12 290, 16 420 kHz
* VHF Channel 16
- Additional Australian frequencies:
VHF Channel * 67

MAYDAY - DISTRESS

- A * **DISTRESS MESSAGE** consists of the word **MAYDAY**
Example; MAYDAY X 3 - This is – name of vessel and/or call sign X 3 – position – nature of distress – type of assistance required – other information to assist in rescue.
- Message may be repeated as often as necessary
- * If no response on distress frequency then any other frequency may be used
- * When a Distress call is heard you should cease transmission, listen and be prepared to write down the Radio Log book the distress message that may follow

- * A vessel in the vicinity should immediately acknowledge receipt. (RECEIVED MAYDAY)
- * A vessel not in the vicinity **may delay acknowledging** to allow a vessel closer to acknowledge (use the term RECEIVED MAYDAY when acknowledging)
- A vessel a long distance away need not acknowledge unless no other vessel acknowledges
- * A vessel a long distance away that receives the message and no other station acknowledges should acknowledge the call and relay the distress message (* MAYDAY RELAY)
- The control of distress traffic lies * **WITH THE VESSEL IN DISTRESS** however they may * **delegate control** to a MARITIME COMMUNICATION or LIMITED COAST STATION
- The vessel or station **in control** of distress traffic may impose silence to other traffic (* **SEELONCE MAYDAY**)
- * When **normal working** may be resumed after a distress situation this is announced by the expression **SEELONCE FEENEE**
- A station that cannot provide assistance should monitor the situation until assistance has arrived to the vessel in distress
- A vessel not involved in the distress MUST NOT transmit on any frequency being used for the distress traffic unless permitted by the station controlling distress traffic. **Restricted Working** may resume by the announcement of **PRU-DONCE**
- When the distress situation is over the station controlling the distress traffic should transmit a message announcing the resumption of **normal working** by stating * **SEELONCE FEENEE**
- A vessel, maritime communication station or limited coast station which learns of a vessels in distress may transmit on its behalf by using the term **MAYDAY RELAY** when:
 - a. The vessel itself cannot transmit a distress message
 - b. The Master/Skipper of the vessel not in distress, or persons responsible for the maritime communications and/or limited coast station consider further help is necessary
 - c. Although not in a position to assist it has heard a message which has not been acknowledge

PAN PAN - URGENCY

- The * **URGENCY** signal consists of the words **PAN PAN** spoken 3 times
- A urgency signal may only be transmitted on the authority of the Master/skipper or person responsible for the safety of the vessel
- Urgency signal and message may be sent on any of the distress frequencies however may be sent on a working frequency if the message is long (i.e. Medical emergency message)
- Urgency message may be addressed to all stations or to a particular station

- If addressed to all stations message must be cancelled when further action is not longer required

SECURITE - NAVIGATIONAL SAFETY MESSAGE

- The * **SAFETY** signal consists of the word **SECURITE (SAY-CURE-E-TAY)** spoken 3 times
- Indicates a navigational or weather warning – should not be used for normal weather forecasts
- * The safety signal and/or call is normally made on a distress frequency and the message which follows is transmitted on a working frequency

DIGITAL SELECTIVE CALLING (DSC)

NOTE: Digital Selective Calling frequencies are **NOT** voice frequencies. They send a digital signal containing the MMSI to alert a vessel or land station of an incoming call. The operator should then use normal radiotelephony voice frequencies.

- * DSC may be used for **distress, urgency, safety and routine** calling
- * DSC is a semi automated system that establishes INITIAL contact between stations
- When INITIAL contact has been establish NORMAL radiotelephony is used for subsequent communications

DSC ALERT

- Information transmitted by DSC is generally known as a **DSC Alert**
- * A DSC Alert is typically a brief burst of digitised information consisting of the MMSI from one station to another of about **7 secs on MF/HF and 0.5 sec on VHF**
- * A DSC Alert will contain **the position of the vessel and an indication of when the position was last updated**
- * On receipt of a DSC Alert standby Channel 16 and be prepared to write down in the log book any signals or messages heard

MMSI (Marine Mobile Service Identity) NUMBER

- * DSC radios are permanently programmed with a unique identity * **9 digit ID number (MMSI)**
- * The DSC transmission ID number is known as the Marine Mobile Service Identity (MMSI)
- Frequencies used for DSC Distress, Urgency and Safety Alerts:
MF/HF * **2187.5**, 4207.5, 6312.0, 8414.5, 12 577 and 16 804.5 kHz
* VHF **Channel 70**
- Following radiotelephony alerts communications should then be conducted on the associated channels (i.e. DSC on channel 70 then normal communications on a working VHF frequency – 72, 73,74 etc)

- Australian * **MARITIME COMMUNICATION STATIONS DO NOT** maintain a continuous watch on the following frequencies:
VHF Channel 70
- It is important to remember that an 'ALL SHIPS' DSC will go to all ships as well as MARITIME COMMUNICATION STATIONS and COAST RADIO and LIMITED COAST STATIONS
- A DSC Distress Alert can only be transmitted on authority of the Master/Skipper or person in charge of the vessel
- A DSC Distress Alert will continue to be automatically repeated until terminated by the operator or acknowledged

EPIRBS

- An EPIRB is an Emergency Position Indicating Radio Beacon that is small, self contained, battery operated, watertight and buoyant.
- It identifies the position of survivors in S&R operations

406 MHz EPIRBS

- 406 MHz EPIRBS are detected by satellite anywhere on the earth's surface when activated
- There are 9 satellites in stationary low altitude orbit above the earth
- As the earth rotates at least 4 satellites are able to pick up an EPIRB transmission
- Satellites have the ability to remember an EPIRBS signal
- * Every 406 MHz EPIRB has a unique code (**Unique Identifier**) which identifies the country of registration
- It is an essential part of the 406 MHz system that purchasers of these EPIRBS register them in their country of origin
- * **EPIRBS must only be tested in accordance with the manufacturers instructions**
- There is no penalty for accidental activation provided the operator advises the rescue authorities of the activation
- * When an EPIRB is activated it transmits a brief burst of data (0.05sec) containing the beacon identity. This signal is transmitted every 50 sec for 48 hours and allows for constant update by the satellites
- An EPIRB is detected by satellites in the **COSPAS-SARSAT** system and relayed to RCC Canberra via the LUT's
- The satellite sends the data to a ground receiving station known as a **LUT (Local User Terminal)**. The data contains the position of the EPIRB for S & R Authorities. LUT's are located in Bundaberg QLD and Albany WA

SEARCH AND RESCUE

- AusSar is a division of AMSA (Australian Maritime Safety Authority) and is the authority for the Australian Rescue Coordination Centre (RCC)
- * A National Plan delegates the authority to **State and Territory Police** for inshore boating emergencies
- * When communications are **between a ship station and aircraft** this may occur on **VHF Ch 06**

SEARCH AND RESCUE TRANSPONDERS (SARTS)

- SARTS are portable battery powered devices used in rescue craft. They should be kept dry and placed at least 1 metre above the rescue craft. They should be switched on which places them in the 'stand by' mode.
- * A SART will operate in the **standby mode for 96 hours with a further 8 hours of transmission time**
- * A SART will start to transmit a signal when it is activated by the 'radar' of a searching vessel.
- * A SART will show as a series of **12 blips** extending in a line over 5-8 miles on a receiving vessels radar screen

MARINE RADIO COMMUNICATION EQUIPMENT

- There are 2 main types of marine radios available in Australia (**excluding 27 MHz**)
 1. VHF Band and
 2. MF/HF Bands
- VHF Marine equipment offers the following:
 - A range of 20 klm to 50 kml (11 n.m. to 27 n.m) and sometimes more
 - Serviced by LIMITED COAST STATIONS
 - Relatively inexpensive with higher quality signals and lower interference
 - Disadvantaged by blind spots from cliffs and sand hills etc
 - * **VHF is least affected by interference from atmospheric and ignition/engine noises**
- MF/HF Marine Radio equipment offer the following:
 - A range of thousands of kilometres and worldwide depending on the frequency band used
 - Serviced by LIMITED COAST STATIONS
 - * Able to change frequency bands for communications of desired ranges
 - Availability of Radiotelephone service
 - Disadvantage of high cost and complex installation
 - * **MF/HF radio with DSC capability is recommend for lengthy coastal and overseas voyages**

EQUIPMENT FUNCTIONS

- * **Squelch Control/Mute – This control allows the operator to stop or reduce atmospheric interference and the internally generated and annoying background noise emitted from the transceiver**

- * Dual Watch – usually found on VHF radios and allows for the operator to maintain a LISTENING WATCH on a **WORKING CHANNEL** (Example Ch 13) and the **DISTRESS CHANNEL 16**

RADIO PROPAGATION

- * VHF is basically a 'line of sight' communication system and emits a **ground wave**.
- * **The range of VHF transmissions is determined by the height of the transmitting and receiving antennas**
- * Greater ranges will be obtain if the transmitting and receiving antennas are placed at a greater height
- VHF does not reflect energy from the ionosphere under normal conditions
- MF/HF emits sky waves in addition to ground waves and as a result greater distances are obtained. The sky wave travels up to the 'ionosphere' a gaseous layer 80-350 klms above the earth.
 - 2 MHz has a range of within 100 klm (55 n.m.)
 - 4 MHz has a range greater than 100 klm (55 n.m.)
 - 6 MHz can give distances up to 400 n.m
 - 8 MHz and above can give distances of thousands of miles
- *MF/HF ranges and which frequencies to use are best gained from experience rather than out of the book
- * **The rule of thumb when using MF/HF is to use a higher frequency to obtain a greater communication distance**

SINGLE SIDE BAND

- * Radiotelephony using amplitude modulation, single sideband, suppressed carrier. Often this is referred to as "**SSB**" and identified internationally by the letters **J3E**.

SIMPLEX

- This is where transmission takes place by the pressing of the transmission button to speak and the releasing of the button to listen. Only one station can talk at a time but the transmission can be heard by all stations in the receiving area.
- * Transmission and reception takes place on a single frequency
- Marine radios use the simplex mode

DUPLEX

- * **This is where transmission can take place with both transmission and reception occurring simultaneously on 2 paired by separate frequencies** (Example of this is a telephone conversation)

COMPONENT PARTS OF MARINE RADIO EQUIPMENT

- The 3 major components of radio equipment are:
 - a. Antenna or aerial
 - b. Transmitter and receiver (usually combined as a transceiver)
 - c. Power source
- * Each part is dependent on the other. A fault in one part will not allow the equipment to function properly.
- The main issue in relation to the antenna and transceiver is corrosion from the elements

CARE AND MAINTENANCE OF LEAD ACID BATTERIES

- * Batteries should be positioned in a well ventilated area
- * Batteries in 'series' produce higher voltage (i.e. 12v in series with 12v = 24v)
- * Batteries in 'parallel' produce equal voltage (i.e. 12v in parallel with 12v =12v)
- * **Battery voltage is created by the reaction of the lead acid cell and the sulphuric acid**
- A Lead Acid battery will have a voltage of 2 volts per cell
- Larger cells can produce higher current than smaller cells or the same current for longer periods
- * **The ability of a cell to produce current for a period of time is measured in ampere-hours (Ah)**
- * Batteries should be kept clean
- Battery terminals should be free of corrosion
- * **The level of the electrolyte should be maintained with distilled water about 10mm above the plate**
- Overcharging and undercharging can affect a battery
- * **A hydrometer is used to measure the specific gravity of the sulphuric acid in a battery cell**
- * **A fully charged battery should have a specific gravity of 1.250 (water is taken to be 1.00 therefore the solution is heavier than water)**
- * Two risks associated with batteries are explosion (from hydrogen emitted) and chemical burns (from battery acid) (sulphuric acid)

FAULTS IN MARINE EQUIPMENT

- * Antenna faults include:
Poor or broken connections
Poor or broken whip antennas
Poor or deteriorated insulators

SYMTHOM

- Crackle
- Intermittent or broken transmission
- Hissing
- No transmission or reception

Faulty or non existent earth connection

- Transceiver Faults

- * Battery faults include:
Loose or **corroded terminals**
Flat battery
Blown fuses
Loose or frayed cables

Equipment could be live due to 'earthing' Problems resulting in sharp burning sensation

A fault in the transceiver will usually
Specialist attention however a faulty hand
piece is common (from dropping) and not
affect reception but will prevent
transmission

Flickering of dial lights or channel display Able to receive but not transmit Not operational at all